



LIFE Project Number
LIFE05 ENV/D/000182

TECHNICAL INTERIM REPORT

Reporting date
27/09/2007

LIFE Project Name
WAgriCo

Project Data

Project location	Germany/United Kingdom
Project start date	01/10/2005
Project end date	30/09/2008 Extension date:
Total project duration (in months)	36 months Extension months 0 months
Total budget	€ 6,895,712
EU contribution:	€ 3,447,856
(%) of total costs	50
(%) of eligible costs	50

Data on Beneficiary

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2 List of abbreviations

ADAS	ADAS UK Ltd
AG	Arbeitsgruppe (working party)
AK	Arbeitskreis (working group)
AONB	Area of Outstanding Natural Beauty
ATKIS	Amtliches Topographisches-Kartographisches Informationssystem (Official Cartographic Information System)
Autumn N_{\min}	Mineral nitrogen concentration available in soil in autumn
BÜK	Bodenübersichtskarte (soil overview map)
CIWEM	Chartered Institution of Water and Environmental Management
CPD	Continuing Professional Development
Defra	Department for Environment, Food and Rural Affairs
DGs	Directorate-Generals
DipCon	Conference on Diffuse Pollution
DWI	Drinking Water Inspectorate (UK Regulator for drinking water quality)
DWPA	Diffuse Water Pollution from Agriculture
EA	Environment Agency
ECSFDI	England Catchment Sensitive Farming Delivery Initiative
EC WFD	EC Water Framework Directive
EGU	European Geosciences Union
ELS	Entry Level Stewardship
EMAS	Eco- Management and Audit Scheme
EPLR	Entwicklungsplan für den ländlichen Raum (rural development plan)
ESF	Environment Sensitive Farming
EU	European Union
FAL	Bundesforschungsanstalt für Landwirtschaft (Federal Agricultural Research Centre)
FWAG	Farming and Wildlife Advisory Group
FZJ	Forschungszentrum Jülich (Research Centre Jülich)
GAP	Good Agricultural Practice
GROWA	Name of a water resources management model
GW	Groundwater
HLS	Higher Level Stewardship
LBEG	Landesamt für Bergbau, Energie und Geologie (State Agency for Mining, Energy and Geology)
LS	Lower Saxony
LWK	Landwirtschaftskammer Niedersachsen (Lower Saxony Chamber of Agriculture)
ML	Niedersächsisches Landwirtschaftsministerium (Lower Saxony Ministry of Agriculture)
MU	Niedersächsisches Umweltministerium (Lower Saxony Ministry of Environment)

N	Nitrogen
NAU	Niedersächsisches Agrarumweltprogramm (Lower Saxony Agri-environmental Scheme)
NDR	Norddeutscher Rundfunk (Northern German broadcasting corporation)
NEAP-N	National Environment and Agriculture Pollution – N
NFU	National Farmers' Union
NITRABAR	Remediation of Agricultural Diffuse NITRAte Polluted Waters through the Implementation of a Permeable Reactive BARrier
NLWKN	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz (Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency)
N _{min}	Available soil concentration of mineral nitrogen
NSA	Nitrate Sensitive Area
NVZ	Nitrate Vulnerable Zone according to Nitrates Directive
Ofwat	Water Services Regulation Authority
OOWV	Oldenburgisch-Ostfriesischer Wasserverband
OSPAR	Oslo-Paris-Commission
PSYCHIC	Phosphorus and Sediment Yield Characterisation in Catchments
RSPB	Royal Society for the Protection of Birds
SCI	Society of Chemical Industry
UK	United Kingdom
UK ADAPT	Agricultural Diffuse Aquatic Pollution Toolkit
UKWIR	UK Water Industry Research Ltd
WAgriCo	Water Resources Management in Co-Operation with Agriculture
WSG	Wasserschutzgebiet (Water Protection Area)
WT	Water Table
WW	Wessex Water Services Ltd

3 Executive Summary



The LIFE project WAgriCo with financial assistance from the EU started on 01.10.05 and is due to run for three years. Its purpose is to draw up and implement integrated measures and Programmes of Measures in accordance with the EC Water Framework Directive (EC WFD) to reduce diffuse inputs caused by the agricultural sector. Various German and British authorities and research institutions are involved in this project as partners (cf. Chapter 5).

One of the important key areas of the project was to build up efficient project structures (e.g. kick-off events with all project participants, development of communication and dissemination strategies, designation of pilot areas, establishment of a model farm measuring network, etc.). A further step was to define target areas for the implementation of water-protecting measures within the pilot areas on the basis of technical criteria.

In parallel with this, a list of measures for action-orientated and result-orientated water conservation measures was drawn up in a broadly based discussion process between farmers and Project Partners. In Lower Saxony (LS) a successful implementation of these measures was made in autumn 2006, spring 2007 and autumn 2007 contractually agreed between NLWKN and farmers.

The United Kingdom (UK) partners have been working closely with individual farmers on a one-to-one basis in the sub-areas within the three UK pilot catchments in order to promote a strong working relationship. Current and historic farm, fertiliser and manure management data have been obtained to provide baseline information for the project. A risk assessment has been carried out and the pilot catchment sub-areas have been categorised as high, medium and low risk and mitigation measures have been identified, with farmers entering into agreements during 2007.

Development of the website, the further development and implementation of measures, and the use of synergies with other protection objectives are actual steps. Another task, in the context of an agro-economic analysis, is to assess the measures undertaken and check its integration into river basin management and agri-environmental schemes. The potential of the measures to reduce N-emission and imission will be defined. Acceptance of single measures will be reported and teaching material will be provided to vocational schools. Furthermore, networking activities will be continued and intensified to guarantee exchange of project outcomes on regional to international level.

The present report has been drawn up on a cooperative basis by all the partners.

4 Introduction

The increasing eutrophication of waters (rise in nutrient input) poses considerable problems for man and the environment: it gives rise to rapid plant growth in rivers and lakes. The increased quantities of dead plants and their subsequent decomposition consume excessive amounts of oxygen; the shortage of oxygen can in turn cause disturbances in the ecosystem. In individual sectors there is also evidence of an increase in inputs of pesticides. The groundwater is not only relevant as one of the main input paths into surface waters for both substances, but may itself influence water-dependent ecosystems and may also become unusable for drinking water purposes.

A considerable proportion of the nutrient input is caused by agricultural land use. In recent decades there has been an increasing intensification and specialisation of farming throughout Europe.

Among other things, it finds expression in increased production in both qualitative and quantitative terms and higher relative use of operating supplies (e.g. fertilisers and pesticides).

Various international conventions seek to reduce inputs of nutrients into water: one of the aims of the European EC WFD is to reduce inputs of nutrients into groundwater and surface waters in all Member States of the European Union. The Nitrates Directive aims to control losses of agricultural sources of nitrogen. The Oslo-Paris-Commission (OSPAR) also sets out to protect the marine environment of the north-east Atlantic from increasing eutrophication, among other things.

To date, specific measures to reduce nutrient and pesticide inputs have been developed and applied in drinking water abstraction areas in particular. The cooperation that has been successfully cultivated for over ten years in LS between the water management and the agricultural and forestry sectors has demonstratively helped to reduce inputs into the groundwater and surface waters. There is less evidence of improvement in UK waters, but it is only now that cooperation with land managers is being actively pursued – for example, in the English Catchment Sensitive Farming Delivery Initiative (ECSFDI).

The purpose of the project described here is to:

- draw up and implement, on the basis of water conservation experience to date, effective Programmes of Measures whose large-scale use will be calculated to bring about a decisive reduction in the input of agricultural pollutants (nutrients and pesticides) to water bodies and make a major contribution to achieving the aims of the EC WFD;
- promote a consistent and sustainable approach to integrated water resource management and demonstrate the large-scale implementation of extended measures (water-conserving agricultural production and management methods) as well as innovative cooperation approaches (multilateral cooperation) in the field of water conservation; and
- develop strategies for integrating the Programmes of Measures in agri-environmental programmes.

Description of technical/methodological solution:

- intensive involvement of farmers in six pilot areas, three in the UK and three in LS;
- assessment of environmental and economic impacts on the basis of impact scenarios and cost-effectiveness analyses of the measures at individual farm level; and
- widespread dissemination of results to introduce findings and proven methods into a debate about implementation of sustainable water management methods and the EC WFD at a variety of levels.

Expected results and positive environmental benefits:

- continuing development of the actors and increased acceptance of measures through integration of the topic “Water Conservation” into initial and further engagement with, and training in the agricultural sector;
- list of efficient and inexpensive measures;

- identification of the potential reduction in diffuse pollution from the agricultural sector;
- integration of measures (as Programmes of Measures) into the river basin management and agri-environmental programmes;
- water conservation synergies through linking with other protection targets (e.g. nature conservation areas, flood areas); and
- use of project experience and outcomes by actors, stakeholders and decision makers at local to international level (UK and LS) and also in other EU member states.

5 LIFE Project Framework

The WAgriCo project is being run by five German and five UK partners (cf. Annex 1-LS/UK):

- ADAS UK Ltd (ADAS);
- Chamber of Agriculture Lower Saxony (LWK);
- Environment Agency (EA);
- Federal Agricultural Research Centre (FAL);
- Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN);
- National Farmers Union (NFU);
- Research Centre Jülich (FZJ);
- State Agency for Mining, Energy and Geology (LBEG);
- UK Water Industry Research (UKWIR); and
- Wessex Water Services Ltd (WW).

Work on the objectives targeted by the WAgriCo project is characterised by intensive cooperation between these partners and the other parties involved, and also by an intensive linking between single tasks.

Cooperation and project structure:

Local/central: The interaction of local Working Groups and central Steering Groups (national and international) ensures feedback between proposals for national procedures and methods and local implementation experience.

Practical/theoretical: Work on individual tasks is carried out jointly in various working parties and expert groups with the participation of farmers, civil servants responsible at ministerial, regional or local level for implementing the EC WFD and agri-environmental programmes, and research institutions. The principal aim here is to cater for the various demands made by politics, administration, research and the public affected.

The following project structure was put in place for this cooperation:

A three-tier project structure was established for implementing the project: international, national and regional bodies ensure integration of the actors at all levels and active exchange of information within and between the levels.

Working groups were set up at the regional level in the 3 project areas in LS and in 6 sub-areas in the UK (cf. Chapter 7.1). In the UK, the Steering Group has developed a slightly different arrangement for its working groups. The UK structure recognises the variance in land management and agronomic advice organisation (Annex 2-UK).

These working groups foster ongoing cooperation with local interest groups and acceptance of individual regional responsibility with regard to the problems associated with diffuse pollution and their solution (cf. Chapter 7.2). They coordinate all working steps and their results. The working groups are managed by the local branches of NLWKN in LS and of UKWIR in association with the NFU in UK.

National coordination of the work in the project areas is handled by a National Steering Group in each country, consisting of representatives of the project partners and of the working groups. The Steering Groups draw up national guidelines and feed the project results into the political and administrative decision processes at national level (cf. Chapter 7.9).

Close links between the project work in the UK and LS are maintained at the level of the International Steering Group and through international expert teams (Annex 3-LS) and additional workshops, which not only ensure up-to-date sharing of interim results, but also promote contacts between farmers.

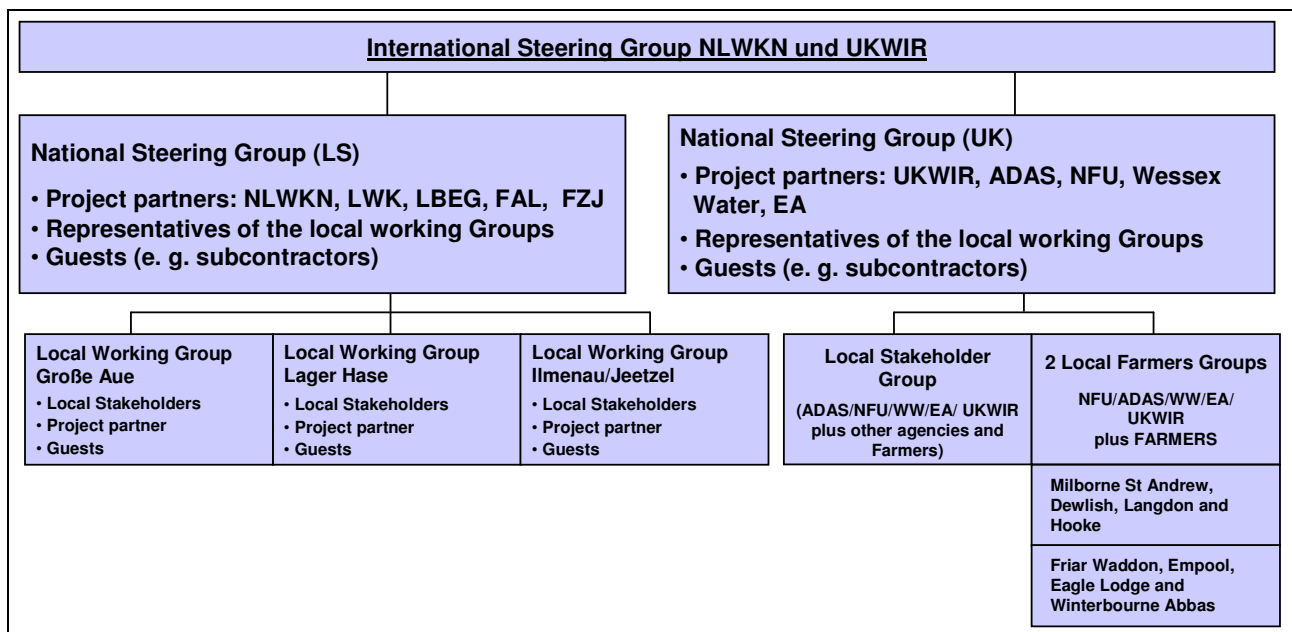


Fig. 1: Project structure

Numerous meetings have been held at all levels since the kick-off events. A list of the meetings can be found in Annexes 4-LS and 4-UK.

The NLWKN as beneficiary and as overall lead partner is responsible for the implementation of the project according to the time schedule, organization of the communication between partners and reporting to the EU. NLWKN is also responsible for the follow-up of the project's finances (cf. Chapter 12). Therefore, NLWKN signed Partner agreements setting out the tasks, rights and responsibilities of the participants with UKWIR and with the German partners (Annex 5-LS). Similar agreements have been agreed and signed between UKWIR and the UK partners (Annex 5-UK). Thus, UKWIR acts as the principal UK partner in relation to NLWKN.

Project phases: linking tasks

The aim of the project is to create a basis for effective achievement of the objectives of the EC WFD with regard to reduction of diffuse substance inputs from the agricultural sector.

This project aim is being pursued in two processes which are closely connected:

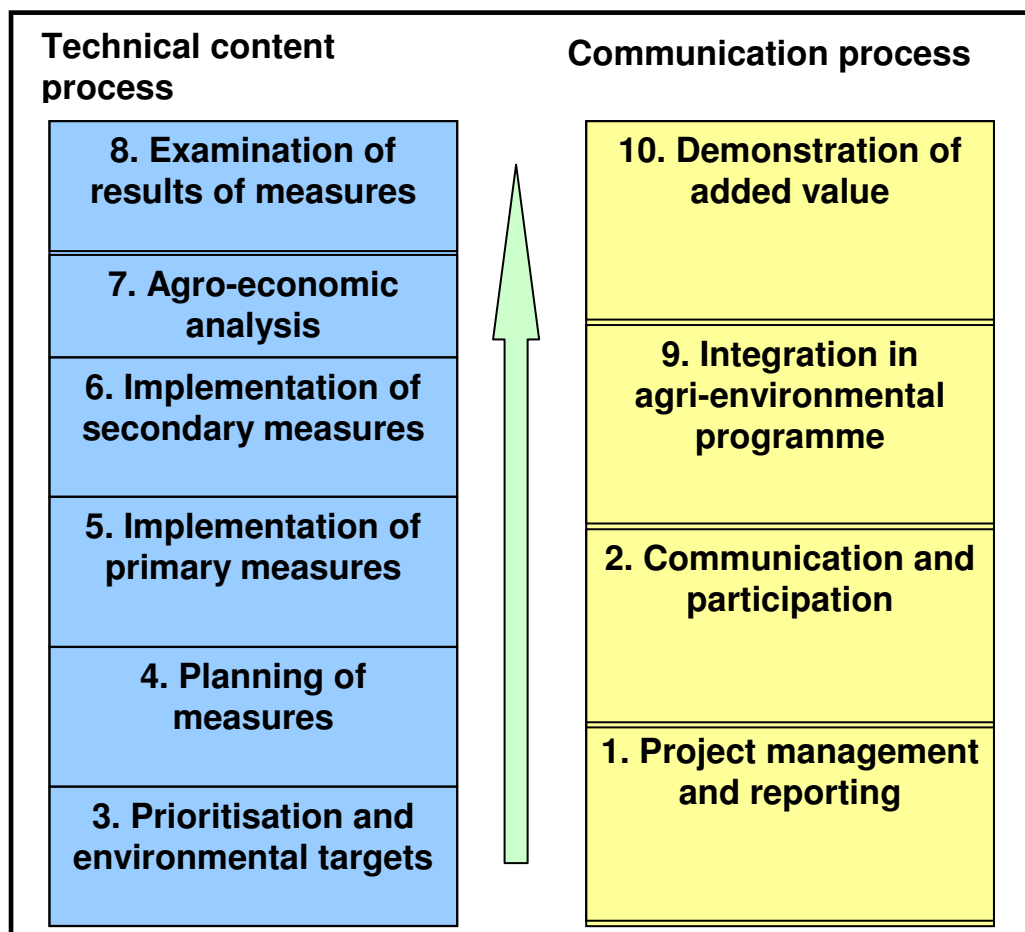


Fig. 2: The ten main compartments of the WAgriCo project structure

The course and interconnections of the technical work are described in the following chapter 6, and details of the individual tasks and results can be found in sections 7.3 to 7.8. The elaboration of these technical tasks is accompanied by a communication process supported by all participants throughout the duration of the project. In addition to establishment of the project structure (cf. earlier in this chapter), the individual tasks set are “Communication and Participation” (section 7.2),

“Integration of measures in agri-environmental programmes” (section 7.9) and “Demonstration of the added value created by the project” (section 7.10).

6 Technology

Figure 3 illustrates the interaction between the individual steps of the technical process in the EU LIFE project WAgriCo. Geographical prioritisation is undertaken on the basis of the regional inventory and an analysis of the pollution situation (target areas in the LS pilot areas for voluntary measures; cf. section 7.3). An expert group on “Environmental targets”, in consultation with the farmers, lays down the environmental targets under the Nature Conservation Act (cf. section 7.3). A comparison of the pollution situation with the environmental targets reveals the need for measures to improve the situation. This provides the basis for elaborating Programmes of Measures. This is where the Programmes of Measures run jointly with the German partners and the local farmers are drawn up (cf. section 7.4). Implementation of the measures for autumn 2006, spring 2007 and autumn 2007 is now complete (cf. section 7.5). In order to review progress and detect any trend reversal, monitoring will be performed in the areas where measures are carried out (cf. section 7.8).

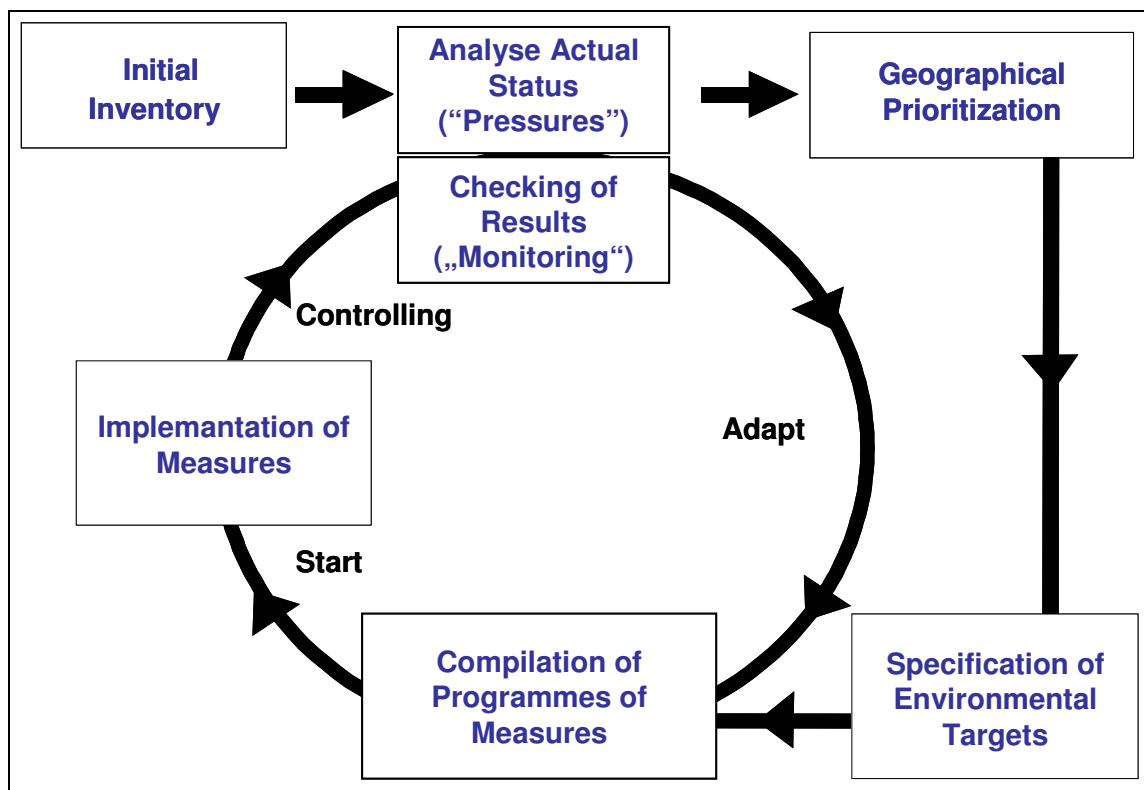


Fig. 3: Flow diagram for water conservation in the LIFE project WAgriCo

The basis for these steps is an understanding of the groundwater status, which is represented in an integrated pedologic-hydrogeologic concept model (Fig. 4). Important aspects are the description of the natural characteristics of the groundwater body, the description of the pollution situation (e.g. N-balances) and the chemical status of the groundwater (N-immissions). This concept model describes the state of knowledge on the basis of the data currently available and is continuously updated to take account of new findings.

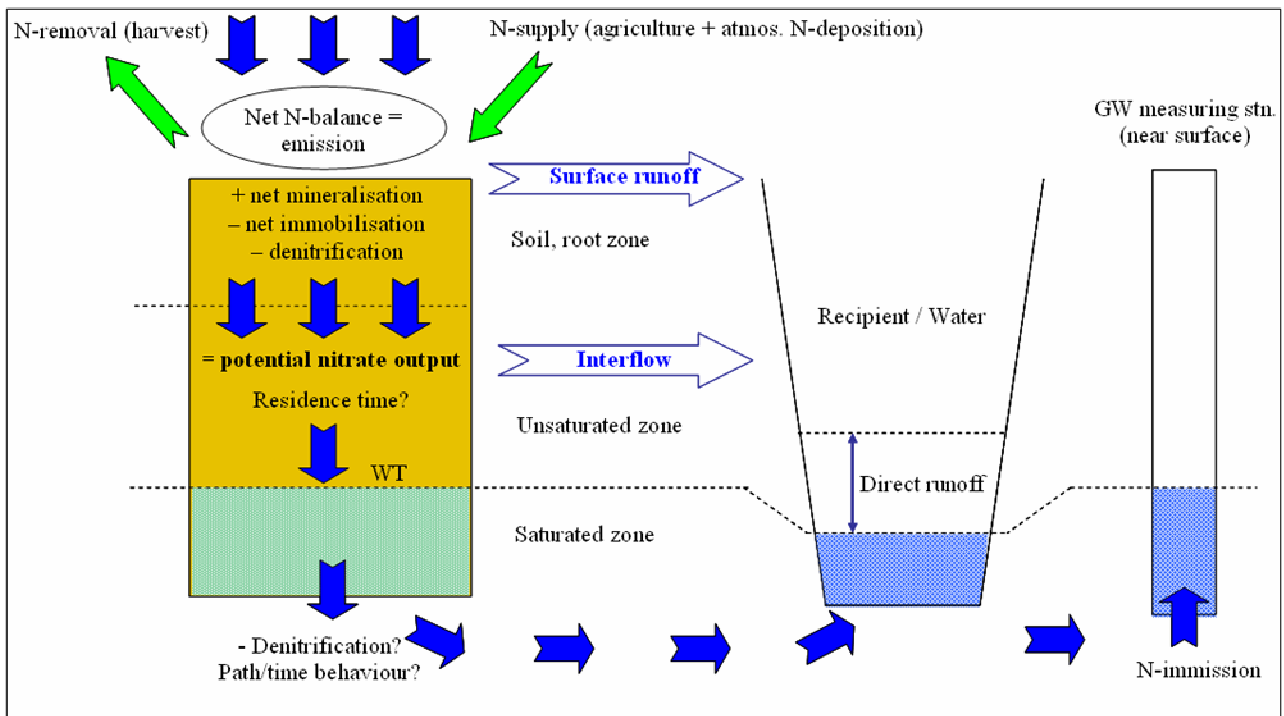


Fig. 4: Simplified integrated hydrogeologic/pedologic concept model

The natural characteristics are described on the basis of the geological and hydrogeological conditions of a groundwater body. These include the hydrological “building blocks” such as hydraulics (e.g. groundwater regeneration, permeability coefficients), groundwater resources and the ratio of groundwater to surface water (estimate of the time the water takes from seeping into the groundwater-bearing rock until it emerges into the surface water). It is also necessary to consider the geologically determined characteristics such as the protective potential of the groundwater cover and permeated subsoil and the natural chemical quality of the groundwater.

To represent diffuse nitrogen inputs due to agriculture and deposition (emission), the net N-balance per unit area is determined (N-removal and N-supply). The potential nitrate concentration in seepage water is calculated using not only the net N-balance per unit area, but also the denitrification potential of the soil and the total runoff.

Proceeding from this understanding of the system, geographical priorities and environmental targets are decided (cf. section 7.3) and used as a basis for drawing up Programmes of Measures (cf. section 7.4).

A broadly similar approach has been adopted as part of the UK component of WAgriCo.

7 Progress, Results

7.1 Project management and reporting, establishment of project structures

The establishment of the project structure has been completed. The basic structure is described in Chapter 5. The management of the project is the responsibility of the beneficiary, NLWKN in Germany and supported by UKWIR in the UK. All essential decision processes are carried out at the three levels of the project. Accordingly the present technical interim report has been drawn up by NLWKN in cooperation with the partners, having regard to the process of coordination with the National Steering Groups and the International Steering Group.

As an important step in the establishment of the project structure, it was necessary to designate six pilot areas, the principal features of which are described below. The participation process used in the pilot areas is outlined in Chapter 7.2. The LS memoranda in which the members of the regional working groups officially agreed the project targets as a basis for their significant participation in the project are attached as Annex 6-LS. In the UK, the Local Farmers' Groups have been established as well as a Local Stakeholders' Group which comprise of other interested agencies. At the meeting of this Group held in January 2007 local farmer were represented (Annex 6-UK).

The three pilot areas in unconsolidated rock (Grosse Aue, Lager Hase, Ilmenau/Jeetzel) selected in LS differ considerably as regards existing land use and the relevant problems. This ensures the development of a methodology that is applicable throughout the region.

Agricultural use in the Grosse Aue area is characterised by pig and dairy cattle farming with the associated fodder growing, plus a considerable proportion of cash crop farms. Compared with the relatively heterogeneous nature of the Grosse Aue area, production in the other two pilot areas displays a more clear individual focus: the Lager Hase area is dominated by livestock farming including fodder growing, while the emphasis in the Ilmenau/Jeetzel area is on cash crop farms.

In the UK, the three pilot areas are the Frome, Piddle and Wey river catchments in Dorset and are geographically bordering unlike the LS pilot areas which are geographically separate. In terms of geology, the upper parts of the Frome and Piddle catchments are both chalk. These then flow out onto the Tertiary sediments composed of sands, gravels and clays that overlay the chalk before entering Poole Harbour. In contrast, the River Wey flows across Jurassic limestone and Sandstones (Purbeck and Portland Units) and Kimmeridge Clay before it enters Weymouth Bay.

In terms of land use, the three UK pilot areas are similar with farm enterprises consisting of arable, intensive dairy, intensive beef, sheep and a small number with pigs. The majority of the farms are within a Nitrate Vulnerable Zone (NVZ) so the amounts of organic nitrogen fertiliser (manures/slurries) that can be applied are regulated. Whilst the project is giving consideration mainly to nitrate in these areas within the Wey sub-area of Friar Waddon the major concern is one of pesticides.

Since the first report, the UK Partners have added two further sub-areas as part of the project consideration. These are in the Frome catchment and will be within the management structure for that catchment. These additional sub-areas, Eagle Lodge and Winterbourne Abbas, have been added following WW's agreement with the DWI to investigate catchment management as a solution to the diffuse pollution situation.

Further details of the physical classification, land use and pollution situation of all pilot areas are set out in Annexes 7-LS and -UK.

7.2 Communication and participation process

Communication and dissemination strategy

The basic principles of the communication and dissemination strategy were developed by NLWKN and UKWIR during the workshop at the beginning of February 2006 and at the meeting of the International Steering Group in March 2006. On the basis of these ideas, each country drew up a dissemination plan that was agreed in the National Steering Groups (LS and UK).

At the core of the LS dissemination strategy (Annex 8-LS) is the definition of which target groups are to be reached with what content. In addition to general information on the project and the financial assistance from the EU, the main aim is to describe the practical added value that the various target groups gain as a result of the project: the general public as the first target group is basically to be informed about the project in the context of the EU LIFE assistance programme (EPLR). As a second target group, farmers are to be informed about the connections between agriculture and water quality and about the ways in which water-protecting farming can make an important contribution to conserving and improving water bodies. As members of the working groups and in the National Steering Group, farmers play a key role in designing possible means of supporting the implementation of the EC WFD in this project. The experts, as the third target group, are not only involved to receive this information, but also to be informed about the basic principles drawn up within the project for the key topics of setting priorities and planning and implementing measures. In addition, the experiences gained with regard to necessary structural and administrative limiting conditions is useful to support the experts in their task of advising politicians.

The UK approach is similar to that of LS and the approved UK strategy is set out in Annex 8-UK. The strategy identifies the target audiences and covers the communication areas of press work i.e. news releases, trade journals and newsletters. From the dissemination perspective, the strategy covers such areas as the internet, technical newsletters, presentations; farm visits, field walks and training talks/workshops. The strategy also identifies the Local Farmers' and Stakeholders' Groups. It is hoped that through these Groups the UK partners will be able to share, along with other organisations that have an interest in catchment/farm management, the opportunity to combine farm visits and training talks/workshops.

Both the LS and UK strategies will be kept under continuous review to monitor how each group communicates and disseminates through its media interaction the nature and benefits of the project.

The following is a list of the communication instruments already used in LS and the UK (Annexes 9-LS and -UK):

- Press work
40 press releases, including reports about water protection days, activities in the pilot areas (e.g. demonstration plots) and the visits of project partners, were placed in local and regional newspapers in LS. Through several publications of technical articles on the WAgriCo project in the specialist journal "Land&Forst" which is published weekly in LS, at least 50% of farmers in LS and hence in the project areas are informed about the project's aims and content. More details can be found in Annex 10-LS.

The 2nd International Steering Group meeting and Farmer exchange was held during September 2006 and this was followed by a press release from the NFU (www.nfuonline.com/x10844.xml) to national trade press and regional press which resulted in an article being featured in the 'Grower' magazine. Following the fertiliser calibration exercise, the NFU again issued a press release (www.nfuonline.com/x14872.xml). The article was featured in the Farmers Guardian on the 18 April 2007.

- Radio and television

A radio report on the kick-off event in the Ilmenau/Jeetzel and Lager Hase pilot area. Following the 2nd International Steering Group meeting and farmer exchange visit in the UK, a report was given in a news bulletin BBC Radio Shropshire of the event. A radio report referred to one of the farm visits in Ilmenau/Jeetzel area during the 3rd International Steering Group meeting.

- Internet

The German website (www.wagrigo.de) on the project is regularly updated. This offers information about the project to all three target groups: farmers and consultants, technical experts, and the general public. In addition, a number of partners have inserted information about WAgriCo in their websites and provided links to www.wagrigo.de. UKWIR has established a contract for its website. The UK Partners have developed the architecture of the website and are formulating the information required for the site. The UK website address is www.wagrigo.org. The site will be progressively updated when appropriate.

Information on this project was also posted on the NFU website www.nfuonline.com/x12724.xml and at www.nfuonline.com/x17504.xml and disseminated to its' members and NFU staff through 'the Environment Matters' e-newsletter.

Details of the project have also been posted on the UK-ADAPT website www.uk-adapt.org.uk. UK-ADAPT is a resource for researchers and funders to make everyone aware of projects that contribute to our understanding of managing catchments to decrease diffuse pollution from agriculture. WAgriCo was also featured as a key project in the September 2006 issue of the UK-ADAPT monthly newsletter. This is distributed to over 100 registered users of the UK-ADAPT website.

In addition, the WAgriCo project has been featured in the NITRABAR project website/newsletter www.nitrabar.eu published in January 2007. The newsletter references WAgriCo in articles by ADAS and the UKWIR Project Manager. NITRABAR is a pan European EU LIFE project to demonstrate the passive system for the removal of nitrates derived from agricultural practice.

- Media design

LS activities:

Seven newsletters in German have been published (December 05, March 06, June 06, September 06, December 06, March 07, June 07). These are offered as downloads on the www.wagrigo.de website; they are also distributed at the working group meetings and sent by e-mail to a constantly updated circle of interested parties, which is considerably larger than the group directly involved in the project (e.g. municipalities, rural districts...). "Wasser und Abfall", the technical journal on water management, waste management, soil conservation, contaminated sites and environmental legislation, published an article (in its July/August 2006 issue) on various topics including WAgriCo. At each of the four locations for the "slurry side dressing" demonstration measures in the Lager Hase pilot area we put up two notice boards for providing information on the project and the measure in question.

We produced two project flyers, one with general information in English and German and the other one about the result-oriented measure. They are disseminated in the same way as the newsletters.

Every year the Lower Saxony Chamber of Agriculture produces a corporate communication brochure on projects and results. This is distributed at numerous national and international events. The 2006 brochure draws attention on pages 23 and 31 to aspects and results of the WAgriCo project. The brochure was distributed at the “Regional Water Management” event in Brake on 22 March 2007, organised by OOWV and the Lower Saxony Chamber of Agriculture to mark “Water Day”, which also involved international participants.

UK activities:

The UK partners prepared a newsletter/flyer related to the UK aspect of the project for both the International and National/Local Launches. This newsletter provided background information on the project and the issues of concern. This has been used for raising awareness of the project with others. A second newsletter was prepared in late Autumn 2006 to coincide with the 1st meeting of Local Farmers’ Group and has been distributed to all farmers in the sub-areas.

The partners have also agreed a programme to issue both technical newsletters and general newsletters over the coming year. These will be focused and relevant to agricultural issues at the time of release. Two technical newsletters have been distributed; the first was on fertiliser spreader calibration and the second was on understanding N behaviour in soil. A third (N efficiency on farm) will be distributed in autumn 2007. Although originally targeted at farmers within the priority areas, these have also been circulated to members of the National Steering Group to explore if the technical content is of value to other target audiences. These technical newsletters can be found at www.nfuonline.com/x17504.xml.

The WAgriCo project was featured in the ADAS publication ‘Insight’ (circulation: 5000 copies) in May 2007.

- Communication activities within the project structure
Annex 4-LS contains a list of all meetings within the project structure. The progress of the initial and further training measures is described in Chapter 7.5.

Annex 4-UK shows a list of all meetings in the UK. It identifies the continued interaction between partners to discuss aspects of the project to support delivery. In addition, WW has recently published an article updating progress in their in-house magazine, ‘The Source’ which goes out to all WW employees. They also have an article in their ‘Striking the Balance’ 2006 annual sustainability report.

In the UK, the National and Local launch was held in the catchment as a joint event on the 5 May 2006. A joint event was held due to the nature of the audience and the bordering catchments. Presentations reflected both national and local perspectives as well as the LS WAgriCo project which was presented by NLWKN. The Defra Minister of the Environment presented the key note address and a National Farmers Union headquarters officer presented on behalf of the farming industry.

In June 2007 the third meeting of the International Steering Group was held in Lower Saxony. The main focus of the three-day event, in addition to exchanges of technical information between the experts on modelling, measures planning and agro-economic analysis, was the

exchange of information between the farmers involved. To this end visits were made in two project areas to several farms taking part in the implementation of voluntary measures under the project. On this theoretical and practical basis, there followed a discussion of the differences between GB and LS with regard to the geographical, agro-structural, economic and legal situation and their significance for the running of the project. The next practical steps were agreed for joint elaboration of the tasks set out in the project application.

- Workshops, seminars and conferences

WAgriCo was the main topic of the 11th Groundwater Workshop in Hildesheim/LS on 11 October 2006. About 140 participants from water management, research establishments, agriculture, engineering offices and environmental and nature conservation associations participated in this workshop. There were also two speakers from the UK partners (EA and ADAS).

Both at the European Geosciences Union Conference (EGU, April 2006, Vienna) and at the 10th International Conference on Diffuse Pollution and Sustainable Watershed Management (DipCon, September 2006, Istanbul) the proceeding and the results of geographical prioritisation were presented.

In November 2006 an international workshop of the WaterCost Project (Interreg III B) took place in Newcastle upon Tyne (UK), which is the continuation of the Water4all-Project. During this workshop a data evaluation and planning steps according to the agro-economic analysis of the WAgriCo-Project have been presented by the NLWKN. During a following international workshop on 27 April 2007 in Oldenburg/LS project contents according to cost effectiveness were presented by Federal Agricultural Research Centre (FAL), one of the German partners.

On 08.03.07, as part of a presentation from the Chamber of Agriculture Lower Saxony at the 'enmar' conference European Network of Municipalities and Rivers "regional water management", issues concerning the WAgriCo project, particularly task 6 – "Implementation of secondary measures" – were drawn up and the first results and other options for action were discussed.

The UK partners have made presentations at various seminars/conferences since the project commenced either specifically on WAgriCo or where it was referred to in presentations about diffuse agricultural pollution. This included the 11th Groundwater Workshop in Hildesheim ('UK lessons learnt from the WAgriCo project'). Following the 11th Groundwater Workshop, WAgriCo-specific meetings were held between the Lower Saxony and UK Partners to discuss project related matters on Programme of Measures and Modelling (Annex 3-LS).

In the UK, a high profile conference was organised by CIWEM (Chartered Institute of Water and Environment Managers) in November 2006 as a part of their Land-use and Water series of meetings. This conference was entitled 'Farming, Water and the Environment – Communicating lessons into practice', and WAgriCo featured within presentations from both the NFU on farm-scale measures as well as from Wessex Water on the wider project rationale. There were over 200 delegates including policy makers, regulators, stakeholders and catchment practitioners. A presentation describing the aims and objectives of WAgriCo was given at the British Hydrological Society Young Hydrologists' symposium (UK) in June 2007. Other conferences are being identified to maximise the exposure of the WAgriCo projects. This includes a CIWEM

meeting in September 2007 and a meeting on Drinking Water Safety Plans in Denmark (November 2007).

Presentations have also been made to the Local Farmers' Group, November 2006, March 2007 and July 2007 and Local Stakeholders' Group, January 2007, to promote discussions on the projects aims including high risk areas and Programmes of Measures. The meetings also included advice on what actions had been taken on the project upto the date of the meetings and indication of the results determined based upon the information from the farmers. At the meeting in July 2007 of the Farmers' Group, three of the farmers who attended the 3rd International Steering Group meeting in Lower Saxony, reported back to the Group on their findings from the farm visits. These meetings will continue as part of the exchange with those Groups.

ADAS promoted WAgriCo at three farm open days June-July in Northern England, Western England and Eastern England. In all about 1000 farmers attended. A poster and LCD presentation were available to assist discussions with farmers about the project.

- Internal communication by partners:
All participating institutions in LS have presented the WAgriCo project at internal meetings and to some extent in staff circulars. Two staff circulars from NLWKN are included. In its Newsletter December 2005, UKWIR identified the commencement of the project. This newsletter is widely circulated to all in the water industry and too many other stakeholders. WW has also carried out meetings with its staff and others to keep them aware of this catchment management project. The project has featured in the internal communications of the participating organisations. Generally, the profile of the project is high amongst policy makers, stakeholders, scientists and catchment practitioners. This is a result of communication about the project through a range of media and by a range of approaches

Participation Process

In accordance with Article 14 of the EC WFD, it is necessary to ensure active participation by the public, including the users, at an early stage. In the interests of broad acceptance of the management plans that have to be drawn up, there is therefore a need for cooperative involvement and integration of the parties concerned (including land users, authorities, associations) with a view to establishing efficient structures.

Important cornerstones of cooperation within the meaning of the EC WFD, which is intended to ensure a broadly based participation process, include:

- an initiator as “driving force” and overall coordinator (e.g. NLWKN, ...);
- defining the areas concerned (e.g. river basin area, sub-basin area);
- addressing and integrating the relevant social groups (see above);
- defining an internal circle of participants for cooperation meetings and regulating the inclusion of external multipliers;
- regulating responsibilities and tasks (e.g. drawing up rules, producing minutes of meetings, terms of reference); and
- drawing up a communication and dissemination strategy.

The basic principles of this process and the experience gained are described in the “Guide to participation process” (Annex 11-LS).

In LS, the structures of the 'Cooperation Model for Drinking Water Protection' and the many years' experience gained are used as a basis and starting point. These bilateral cooperations between the water sector and the agricultural sector are potentially suitable forums for expansion to take in the interests and requirements of the EC WFD. The above mentioned structures were used for WAgriCo. At the initiative of NLWKN, working groups were set up in the 3 pilot areas on the basis of the cornerstones described above. A list of the participants in the working groups is attached in Annex 12-LS. The working groups meet at regular intervals. Due to the requirements of the EC WFD and the results of the inventory, the working groups support all main steps in the project, e.g. the preparation of action plans which are then implemented in previously prioritized target areas as part of a coordinated procedure.

In the UK, the co-operative alliance between Agriculture and Water Resource Managers is a relatively new concept. This is therefore being developed within the WAgriCo project and the approach is detailed in Annex 2-UK. In the first instance, both WW and ADAS made 'preliminary' approaches to the local farmers. WW made direct approaches to local farmers within the 'sub area' pilot catchments they were managing. However, ADAS's approach was different in that they wrote to all the farmers in their sub-area pilot catchments and then followed up with one to one contact. This enables both to develop the 'routine' and 'detailed' levels engagement and participation. This approach has enabled the establishment of the 2 Local Farmer Groups to cover each of the sub-areas one for the WW managed sub-areas, the other for the ADAS sub-areas.

Based on the knowledge and experienced gained through the project, the UK partners have developed their 'Guide to Organising Participation Process' entitled 'Stakeholder Facilitation Guide' (Annex 11-UK).

7.3 Geographical prioritisation for planning of measures and environmental objectives

Geographical prioritisation

In order to prioritise within the pilot areas, LS and UK use information about impact and utilisation of resources to identify areas with high priority for measures.

In LS, numerous measurements show that by comparison with other uses, nitrate levels in seepage water are highest under arable fields (often in excess of 100 mg/l). This is also reflected by the results of the inventory, which were presented and discussed in the pilot area working groups.

For the delineation of areas with high priority for measures, a GIS-based methodology was applied. On the basis of the land use map of the official cartographic information system (AKTIS-DLM 1) and the soil overview map 1:50,000 (BÜK 50), all arable land with a low nitrate degradation potential in the soil was designated as potential target areas. The hydrologic/hydrogeologic model GROWA was then used to undertake a differentiation of total runoff into direct runoff and formation of new groundwater recharge. In a further step, this was used to identify arrive at target areas for groundwater conservation (high level of new groundwater recharge formation) and areas for conservation of surface waters (high direct runoff). These target areas form the planning basis for the selection of farms for the implementation of measures. The methodology is described in detail in the guide to setting geographical priorities (Annex 13-LS).

The described working steps give rise to the following land categories in the pilot areas:

- target areas for groundwater conservation measures: arable land with low nitrogen degradation potential and large share of total runoff going to form new groundwater;
- target areas for surface water conservation measures: arable land with low nitrogen degradation potential and large share of total runoff accounted by direct runoff, plus 50 m-wide riparian strips alongside surface waters; and
- areas with low priority for measures (all other areas).

The target areas designated for groundwater conservation essentially comprise the intensively farmed Geest areas (e.g. Sögeler, Cloppenburger, Syker and Lüneburger Geest). The target areas for surface water conservation comprise the flood plains of the surface waters and the intensively farmed parts of the large lowland districts – especially in the region of the Quakenbrück basin in the Lager Hase pilot area. The target areas for both categories are shown in the maps in Annex 14-LS.

In the UK, the Piddle and Frome river catchments were selected because of the existing nitrate problems in these catchments and the amount of work that had already been undertaken by WW and other agencies on catchment management issues. The River Wey was selected as there has been in recent years an increasing problem of significant pesticide peaks. The maximum permissible level for each individual pesticide is 100 ng/l while the total pesticide level is 500 ng/l. At Friar Waddon there has been historic individual pesticide peaks of 2500 ng/l (April 2002), 1250 ng/l (November 2002), 400 ng/l (November 2003) and 250 ng/l (November 2004).

The specific target sub-areas within these three catchments are based on eight public water supply sources, Empool, Hooke, Langdon, Eagle Lodge and Winterbourne Abbas in the Frome, Dewlish and Milborne St Andrews in the Piddle and Friar Waddon in the Wey. These sources are considered to be the ‘endangered water bodies’ on the basis of their rising nitrate trends, or pesticide in the case of the River Wey. They represent a mixture of borehole and spring abstractions. The nitrate peaks on which WW performance is measured, are running close to EC Drinking Water Directive defined permissible levels. The areas around these sources are further defined by the Environment Agency’s Source Protection Zones. These zones were defined on the basis of the assessment of experienced Hydrogeologists and groundwater modelling. Further details of the justification for these sub-areas are given in Annex 7-UK and Annex 16-UK.

Environmental Objectives

Definition of environmental objectives is an indispensable precondition for assessing the required amount and efficiency of water conservation measures. If, when deciding on these environmental objectives, one regards the groundwater/surface water as an asset to be protected, then the anthropogenic substance inputs should be low enough to achieve “good status” of the waterbody and ensure it on a long-term basis. In view of the limited project period of 3 years, we see a need to make a distinction between objectives for the reduction of these inputs (emission) that can be achieved in the “short-term” and set out on an annual basis, and possible “long-term” objectives for the quality of groundwater in particular (immission).

The environmental targets for chemical status of groundwater bodies according to the EC WFD are specified in the Groundwater Directive (directive 2006/118/EC). In LS a large number of groundwater bodies are at risk of being classified as bad chemical status because the quality standard of nitrate is exceeded in a part of the groundwater measuring stations. Other diffuse pollutants associated with agriculture (pesticides, etc.) have only a small importance. For this reason

the definition of environmental objectives is focussed on nitrate only. It is assumed that environmental objectives concerning other chemical substances can be derived in a similar way.

In the WAgriCo project it is considered necessary to use the assessment criterion “nitrate concentration in seepage water” (calculated or measured) as a basis for the definition of environmental objectives. In particular, this parameter permits a rapid estimate of the attainable immission objectives that makes it possible to show compliance with the ban on quality deterioration or, ideally, a trend reversal even in the short-term, i.e. within the project period. In LS the nitrate concentration in seepage water is considered as the environmental target for nitrogen reduction measures. A value of 50 mg/l is used as a conservative starting point. This value, however, is not to be applied to each individual site, but is regarded to be an average value for a larger area defined by the groundwater bodies and their hydrogeological subdivisions. The average value for the actual situation is calculated on the basis of a detailed map of nitrate concentrations in seepage water which is the result of a coupled agro-economic/hydrologic-hydrogeologic/N-export model system.

As discussion on environmental targets proceeds, it may be necessary to change the average value of 50 mg/l dependent on the magnitude of observed nitrate concentrations in the groundwater of the individual hydrogeological subdivisions. This proposal may lead to higher values for the environmental target in those subdivisions where the mean of nitrate concentrations in the groundwater monitoring stations is lower than the mean of nitrate concentrations in seepage water. The defined quantitative values will be used for the assessment of the probability of achieving the environmental targets (task 8.2).

In the UK catchments of the Frome, Piddle and Wey, one of the main environmental drivers is the reduction of nitrate concentrations to an acceptable level in order to protect the public water supply sources. In the Wey catchment WW is faced with having to install expensive, unsustainable treatment works to remove pesticides. In cooperation with the DWI it has been agreed that treatment can be deferred by setting up formal agreements with the three farmers that prohibits the use of any pesticide on the immediate catchment area. The environmental objective is to reduce or remove the pesticide contamination from the surface and groundwater with the ultimate objective of removing the need for any treatment at this site.

Interactions with surface water are also being considered, since this has potential to impact ecological status. In other parts of the wider catchments (i.e. outside the sub-areas), the priority is sediment and phosphorus loss to surface waters – this is being addressed under the Defra’s England Catchment Sensitive Farming Delivery Initiative (ECSFDI). The UK partners are in close contact with this ECSFDI to allow investigation of synergies between approaches and resources. There is also a need to understand the actions being undertaken in the other initiatives and how they impact on the WAgriCo pilot sub-areas. To aid this, the EA river water quality data is being monitored to identify any discernible changes or trends.

7.4 Measure planning and compilation of Programmes of Measures

In Lower Saxony

- Action-oriented measures for water protection

The aim was to implement action-oriented water protection measures into practice already in the first project year in LS to allow two years of practical demonstration during project time. Therefore, a selection was performed on the basis of water protection measures already applied under practical conditions to reduce nitrate inputs into ground- and surface water in LS (e.g. voluntary agreements in water protection areas, cooperative approaches, agro-environmental scheme NAU) supplemented by information from other German Federal States. A catalogue of 42 possible technical-organisational measures for practical testing was compiled and assessed by experts from LWK, NLWKN, FAL and farmers collaborating in the working groups in the three pilot areas with regard to their ecological effectiveness, economic efficiency, acceptance and controllability (Annex 17-LS). Out of this catalogue, measures were selected that allow a progress review after only one year and that display the best possible ratio of cost to results while offering good acceptance and good controllability. The selected measures had to be suitable for an action-oriented approach (prior measures for arable land use) and were defined regarding the management conditions and the level of compensation payments (4 working group meetings organised by FAL; cf. Annex 4-LS and Annex 12-LS). The National Steering Group agreed on the implementation of six measures for autumn 2006 that primarily focus on the reduction of N-losses during winter time and five measures for spring 2007 (Annex 18-LS). In 2006 49 farmers signed water protection agreements (Annex 19-LS and Annex 20-LS) with about 1.300 ha contract area (Annex 21-LS). In spring 2007 the selected measures were reviewed, first with the farmers in the pilot areas and then in a final working group meeting (May, 21st). Due to the experience of the farmers with the eleven measures little modifications in the management conditions were undertaken for the practical testing in 2007/2008. Furthermore the catalogue was enlarged by two new measures to reduce nitrate leaching over winter (Annex 18-LS) .

- Result-oriented measure

In addition to adjustments of existing action-oriented measures, an innovative result-oriented approach was developed within the project: The objective is to reward farmers for the improvement of nutrient management at the farm level. This approach has potentials to increase positive environmental impacts and cost-effectiveness. Farmers have free hand in their adjustments to fertilizer usage, fodder and crop growing. The idea was firstly presented in March 2006. After a number of consultations in the pilot areas and working group meetings of project partners, representatives from the pilot regions, advisers and farmers a consensus was achieved by mid-January 2007 on the design of the result-oriented measure to be tested in 2007 (6 experts group meetings organised by FAL; cf. Annex 4-LS and Annex 12-LS). With the result-oriented measure farmers are actively involved in a water protection scheme and can show entrepreneurial behaviour (Annex 22-LS). The calculation of improvements to be rewarded is based on a farm gate balance, with additional information about on-farm use of fodder and organic fertiliser. Coefficients for N-efficiency are calculated separately for mineral and organic N to allow a documentation of efficiency improvements independent from structural changes. All farmers that signed for the basic agreement (Annex 19-LS) are invited to participate in this result-oriented measure.

Besides the detailed measure planning for practical testing, a report with an overview over the water protection measures affecting the nitrogen cycle on agricultural land was elaborated and put to discussion to the project partners (Annex 23-LS). This “toolbox” emphasises on qualitative and

quantitative information about ecologic effectiveness and factors that enforce or weaken the impact of the individual measures. The detailed measure descriptions could be a useful help especially for those farmers within the project who participate in the result-oriented measure. Details about the cost-effectiveness of the selected measures are given in Annex 25-LS.

Special measures which aim to minimize diffuse inputs into surface waters were selected and discussed additionally according to its possible application as well as acceptance at the halftime of this project (Annex 24-LS). This includes a differentiation of the geographical prioritisation for planning of measures (chapter 7.3) on the one hand and possible enhanced synergy effects while applying secondary measures (chapter 7.6) on the other hand. Measures especially focussing on surface waters will not be implemented in this project but different possibilities to reduce diffuse pollution were listed systematically. The effect of single measures on diffuse inputs into surface waters is considered to be included into the modelling. The effect of the selected measures for groundwater protection on the surface water will be assessed in the modelling

In UK

Previous studies undertaken in the UK for Defra (NT2511 - Cost curve of nitrate mitigation options; PE0203 - Cost curve assessment of phosphorus mitigation options relevant to UK agriculture; and ES0121 COST-DP - Cost effective diffuse pollution management) had identified a range of measures that could be adopted to reduce diffuse water pollution from agriculture. Along with the 'Inventory of Measures to Control Diffuse Water Pollution from Agriculture (DWPA)' handbook, these projects described a list of 44 potential mitigation methods (Annex 23-UK) that farms could adopt.

These have been tailored specifically to the WAgriCo project and it has been accepted that this list will be used within the UK WAgriCo project and forms the 'tool-box' of measures. This list will be kept under review and modified as appropriate. For example, this initial list did not include fertiliser spreader calibration, although the WAgriCo project has identified this as a potential priority area.

In order to obtain an unified understanding across the UK sub-areas, a Field Work Plan has been developed and all partners have signed up to it, thereby ensuring a consistent approach by all (Annex 26-UK).

Following the ongoing detailed analysis of many of the farms within sub-areas (Annex 27-UK), results from nutrient budgets and farm audits illustrate that there are very few radical mitigation methods that need to be imposed on the farms at this stage within the project. It is more about less demanding changes in practice. An appropriate and meaningful initial range of mitigation methods (catalogue of measures) that would be suitable to undertake on the farms within the study areas have been identified as the central approach (Annex 23-UK). These methods will be kept under review to ensure they are appropriate to both action and result-oriented tasks as the project moves forward.

The analysis also suggested that there were few examples of poor practice that could be immediately identified as being the cause of diffuse pollution problems within the sub-areas and that not all the implications of management practices on nitrate in the catchment (e.g. unlined slurry lagoons) are understood.

In summary, the audit concludes the mitigation methods that could be implemented can be categorised thus:

- Good Agricultural Practice (GAP);
- Enhanced GAP; and
- Infrastructure Changes.

These three categories have been broken down further to form a total of six measures. Each measure has been reviewed and a support and co-operation approach has been detailed in 'Programme of Measures for the Priority Catchments' (Annex 23-UK). The measures are used as the basis of identifying and agreeing with Farmers what they will undertake. The implementation programme for these measures has been determined and is shown in 'Programme of Measures – Implementation Programme' (Annex 28-UK).

7.5 Implementation of primary measures

Model farm measuring network

In the LS pilot areas the project succeeded in recruiting a total of 52 model farms. An up-to-date cartographic overview of the farm locations is shown in Annex 29-LS. The farms reflect the representative farm types in the regions. In the Lager Hase pilot area, there are 22 farms taking part in the project, mainly livestock breeding farms, with an average size of approx. 71 hectares. Cash crop farms form the bulk of the model farms in the Ilmenau/Jeetzel area. Here are 17 farms with an average size of around 135 hectares taking part in the project. In the Grosse Aue area there are currently 13 farms with an average size of about 110 hectares taking part in the project. The main farm types here are fodder growing and livestock breeding farms.

The farms used for the 3rd International Steering Group visit were selected as being representative of the range of practices that are undertaken by farmers within the wider catchments. By working with these farmers we expect to extend the relationships that have already been developed and to promote these as 'model farms'.

In the UK a range of samples (Annex 30-UK) are being taken during the project and are controlled by the Field Work Plan. The measurements are:

- Soil nutrient status;
- Soil mineral N;
- Borehole/well /spring/stream sampling; and
- Nitrate leaching using porous cups.

These measurements will be used for several purposes: supporting farmers and their co-operation in the project, assessment of effectiveness, identifying problems and demonstration of effects to farmers.

Implementation of measures Autumn 2006, Spring 2007 and Autumn 2007

In the UK, implementation of the primary measures has initially targeted those farms that fell into the 'high' and 'medium' risk categories, as identified by initial farm visits and audits. Farmers falling within these categories have been sent individually tailored 'farm packs'. These packs contain general information on the primary measures, which were identified under Task 4. Further detailed information tailored to the individual farm outlining the suitable measures which could be

undertaken on that farm, the payment structure for each of these measures, and the potential technical support available to them has also been included, along with a range of sampling results which have been taken on that farm.

The catchment advisers followed up the 'farm packs' with visits or telephone calls to each of the farms to discuss their primary mitigation measure options further and to answer any questions the farmer might have had. Farmers are being asked to sign a contract with UKWIR for the duration of the rest of the project. There will be the opportunity for farmers who choose not to enter the project in 2007 to opt into the project at a later date (2008).

Primary measures were put in place in spring 2007 starting off with 'fertiliser spreader calibration' in early February. This exercise is planned to be repeated in November/December 2007. This will coincide with fertiliser and manure recommendations being prepared for all the farms within the priority catchments.

In LS, measures in question were introduced and discussed in the regional working groups. In autumn 2006 a list of action-oriented autumn measures was then discussed with the project partners. The Chamber of Agriculture advisors offered six measures to the model farms in the project, of which catch crop growing met with great acceptance. On about 1300 hectares, measures for autumn were agreed. These autumn measures and the contract areas in the individual regions are set out in tabular form in Annex 21-LS.

In spring 2007, all action-oriented measures were discussed with the farmers in the local working groups and new measures and suggestions for improvements were formulated. These suggestions and new measures were then discussed with the project partners and a re-worked and supplemented catalogue of measures was developed.

In total, five springtime measures were offered by the advisors. The contract area for springtime measures comprises 970 ha. The use of the trailing hose application method was well accepted, particularly in the Große Aue and Lager Hase areas. The use of the CULTAN technique was only applied in the Ilmenau/Jeetzel arable farming area. A list of the extent of the completed springtime measures in the individual areas is provided in Annex 21-LS.

In autumn 2007 nine action-orientated measures have been offered in total. As a result of an intensive exchange between working groups and the Expert Group 'Measures', improvement suggestions were included and two additional measures were offered. Thus the measures catalogue actually consists of 13 measures. The autumn measures will be applied at round about 2400 ha.

Intensive advice and the slurry demonstration trial have contributed to the implementing of the measures for slurry side dressing for maize in the pilot area Lager Hase, on two model farms.

Guide to environmental management in agriculture

The "Practical Guide to Continual Improvement of the Environmental Performance of Farms", which was compiled at the request of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, was scrutinised by experts at the Lower Saxony Chamber of Agriculture and analysed to identify any need for additional information or updating. An English version has been sent to ADAS, too. Both English experiences as well as experiences from LS will be compared and included into the practical guide. An outline concept has been drawn up for additional contents about water conservation aspects to supplement the Guide (see Annex 31-LS)

and will be specified in more detail in the course of the project. It is planned to undertake a revision of the Guide over the entire project duration in international cooperation and then to make it available to advisors and farmers from the pilot areas. The test of the existing concept is underway in the pilot areas. It will be available as PDF at the end of the project.

Initial and further training

In the course of field inspections and specialist events in LS (e.g. crop protection days, see Annex 32-LS), agricultural apprentices and technical college students as budding farmers, and also farming community representatives as multipliers, were informed about the objectives and significance of WAgriCo. Ways and means of groundwater-conserving farming were presented and discussed at these events, and extensive additional information material was handed over. In addition, further information material was prepared and sent to all vocational schools for the agricultural sector in LS. (For lists of schools, events and materials see Annex 32-LS.)

The WAgriCo measures so far included in initial and further training in LS focus on basic measures under the EC WFD. Relevant topics such as use of fertilisers and pesticides are increasingly discussed from the point of view of water conservation. A start has also been made on teaching apprentices and technical college students specialised technical knowledge about water conservation with regard to supplementary measures under the EC WFD. This work will be continued as the project goes on (events and materials).

To ensure optimum integration of the teaching materials developed by the project in the official vocational training of farmers and to guarantee intensive use by teachers and students, the materials developed to date will be tested in lessons, and they will be corrected and supplemented if necessary. Additional material for LS will be prepared on special focus topics that emerge in the course of this testing.

The UK Steering Group has considered developing training material that can be disseminated through Defra's Environmental Sensitive Farming (ESF) initiative being delivered by ADAS. This approach will provide a platform for:

- Consistency of message and advice; and
- Easily accessible information.

The UK's approach is set out in more detail in Annex 15-UK.

The programme for initial and further training was discussed with the Local Farmers Group in November 2006 and March 2007 and the Local Stakeholders Group in January 2007 as it is considered the farmers are key actors to identifying training needs. The training could be shared with the other local stakeholder groups who are working in the catchments. This would ensure that there is participation by both farmers and other agricultural advisers thereby extending engagement in the participation process. It was agreed at the Local Stakeholders' meeting that the local agricultural college, Kingston Maurward College, should be invited to participate in that Group because of its educational and training links.

Some initial training has been undertaken as part of one-to-one contacts with the farmers at which WAgriCo has been explained and the beneficial outputs that can be expected. This will be expanded further through specific workshops such as the PLANET Workshop held on the 18 April 2007. This workshop was run to discuss the requirements of Nutrient Management Planning and had a high

content of 'hands-on' work using the PLANET interactive software version of Defra's 'Fertiliser Recommendations (RB209)' publication. In addition, as part of the Fertiliser Calibration contract the benefits of maintaining good calibration was explained to the farmers. Also the Kingston Mauward College farm a group of students attended the calibration exercise as it was very relevant to their studies.

It is expected that all future events will look to include 'Continuing Professional Development' (CPD) points as a part of technical registration schemes for those farmers attending an event. It is also considered that any technical newsletters, which are produced, will serve as training aids. Training material is being developed, and this will tie in with other projects which are underway in the priority catchments e.g. ECSFDI and ESF. This ensures a consistency of message, something that was identified as critical to successful diffuse pollution advice (cf. Stakeholder Facilitation Guide, Annex 11-UK).

During the fertiliser spreader calibration exercise undertaken in February 2007, the opportunity was taken to explain to the farmers the process and the need for calibrating spreaders on a one to one basis. Furthermore, at the farm at Kingston Maurward College students attended the spreader calibration being undertaken as they were interested in the methodology used as calibration is part of their course and this provided the opportunity to see it being undertaken first hand. At this time the WAgriCo project was also explained to both the lecturer and students.

7.6 Implementation of secondary measures

Persons responsible for measures have been determined, and planning projects with other protection objectives that can at the same time serve water conservation interests have been identified. An initial analysis of areas with other protection objectives that were also capable of being turned to account for water conservation under the EC WFD (nature conservation areas, landscape reserves, water conservation areas etc.) was made for the three pilot areas in LS in November 2006 in consultation with the NLWKN and LBEG, and is shown in first planning maps with potential compensation areas (for maps see Annex 33-LS).

Planning maps for joint target areas were prepared, in accordance with the project application in cooperation with the planning authorities. In preparation for this, the relevant rural districts and land consolidation authorities were integrated in the project activities through a joint information event run by NLWKN and LWK in the individual project areas.

- Lager Hase – 13 December 2006
- Große Aue – 29 January 2007
- Ilmenau/Jeetzel – 08 February 2007

An intensive exchange of views and information with the aim of identifying and developing possible synergies is under way, as is increasing networking of the regional actors.

In the interests of timely and continuous exchange and, where appropriate, coordination with state-wide specialist bodies, a presentation of the results took place at the end of 2006 at the Lower Saxony Environment Ministry with regard to the project focus "Synergies with the relevant bodies for the implementation of the EC WFD" (extended expert group on groundwater).

A detailed description of the activities, results to date and steps planned, and also the maps mentioned, can be found in the report on Deliverable 6.1 in Annex 34-LS.

There is a national initiative across 'priority catchments' within England 'The England Catchment Sensitive Farming Delivery Initiative' (ECSFDI). The Frome and Piddle catchments have been identified as 2 of the 40 'priority catchments' and Natural England (an agency of Defra) has appointed local Catchment Officers one whose responsibilities includes the Frome catchment and one whose responsibilities includes the Piddle catchment. The ECSFDI priority is surface water pollution, particularly sedimentation of the river beds. The UK WAgriCo Steering Group has agreed with the Defra ECSFDI Officer's to share the knowledge gained from the WAgriCo and ECSFDI projects.

The Farming and Wildlife Advisory Group (FWAG) are currently commissioned by the riparian owners to engage with farmers to help address the sedimentation issues. The Steering Group has a working relationship with FWAG. These relationships are being extended through the Local Stakeholders Group. There is also an interest group in the Wey catchment concerned with the sedimentation of a Site of Special Scientific Interest. This site is managed by the Royal Society for the Protection of Birds (RSPB). Through the Local Stakeholders' Group it has been identified that within Dorset there is an AONB Grassland Project.

Continued work within ADAS on other related projects is allowing further investigation and improvement on work carried out within the WAgriCo project. For example, the development of nutrient trading schemes to reduce diffuse pollution has been investigated as a policy option. This information will feed directly into the WAgriCo project.

Secondary measures may also be implemented through the ELS and HLS which are part of Defra's Environmental Stewardship schemes. These two stewardship schemes encourage a large number of farmers across a wide area of farmland to deliver simple yet effective environmental management and to deliver significant environmental benefits in high priority situations and areas. For those farmers wishing to undertake either of the secondary measures then advice and help with the application process will be given through either the WW or ADAS catchment advisers or advisers to be specifically appointed for this purpose.

An external assistance contract is being prepared to enable a study to be undertaken on a range of environmental schemes to identify what secondary measures are embedded in the schemes and to assess their beneficial effects which impact on groundwater. An outline of the brief for the project is given in Annex 33-UK.

7.7 Agro-economic analysis

In order to allow the start of practical measure testing in autumn 2006 in LS, it was necessary to define payment levels for the offered measures. For this a consensus on compensation payments for the eleven action-oriented measures has been achieved (Annex 18-LS). A uniform payment per hectare for each measure was defined although similar existing measures offered within water protection areas in the three pilot areas display a variety of payment levels and management conditions, and despite considerable differences in the production structure of the three pilot areas. This was possible because for most selected measures an expenditure-related compensation is paid. They show only minor variations between farms, unlike measures with a direct impact on crop yields. Independently from the agreement for practical testing, where the payment per hectare ranges between 15 €/ha*year and 125 €/ha*year, it is necessary to follow defined calculation methods, especially for a successful implementation of new or improved water protection programmes. An overview on payment calculation methods at farm level for agri-environmental measures and

weaknesses and potentials for improvements is given in Annex 35-LS. The total amount per hectare is not a useful indicator, only in combination with information about reduced nitrogen inputs/N-efficiency improvements it is possible to make cost predictions at the level of the individual farm, region, river basin district and state and to select cost-effective measures. A concept for a cost estimation approach is presented in Annex 36-LS. The problem of information availability, a fundamental condition for a realistic cost prediction, is considered, too.

To overcome the problem of missing data to assess the cost-effectiveness of measures put into practice in the pilot areas for the participating farms, a detailed inquiry is conducted (Annex 29-LS). Furthermore, plot-information about the ecological effects will be collected (cf. Task 8). In the result-oriented approach the outcome indicator “N-efficiency improvement” is directly rewarded. As the costs of this measure are considerably influenced by production alignment and intensity a tender approach has been discussed. However, it was not acceptable for farmers to put this approach into practice during the project. Farmers who take part in the result-oriented reward scheme will receive a fixed amount per kg nitrogen reduction (1,20 €/kgN). But only improvements in fertilization efficiency will be rewarded, no reward will be given for structure-induced changes (cf. Annex 37-LS).

As it is not possible to make estimations for all existing farm specifications, different water protection strategies and possible structural changes with their implication on the nitrogen cycle impact scenarios will be defined (cf. Annex 38-LS). For the target year 2015 scenarios for different model farms (typical farm types in LS) and different levels of ecologic improvements are defined.

In the UK, the farmers are entering into an agreement with UKWIR for any funding awarded for actively participating in the project (Annex 19-UK), notably implementing changed practices and providing data and feedback on the mitigation methods taken up. The works to be agreed with the farmer forms part of Programme of Measures funding application (Annex 39-UK) to ensure consideration has been given to the methods available. As part of the Agreement the farmer must in return provide real time costs of the impact of the measure to ensure a true agro-economic assessment to be made. This approach shall be undertaken for both action and result-oriented mitigation methods. It is important that the economic effects on individual farm businesses in the WAgriCo catchments are taken into account, this is vital for good farmer relations.

To date, any analysis of the cost of farm mitigation methods has been based on generalised farm costs using representative or model farms, which has allowed an initial assessment of the likely costs (to the farmer) and effectiveness of the mitigation methods (cf. Annex 31-UK). This forms the basis of our initial analysis, which will be validated using real-farm costs as the project progresses.

This work also links closely with an assessment of the cost and effectiveness of a range of policy instruments that ADAS has undertaken. The information will feed into the overall findings for WAgriCo.

The UK Steering Group believes that use of generalised farm costs, as described above, is a good starting point for understanding the economic issues surrounding our mitigation methods and their implementation. Additionally, the majority of mitigation methods bear small or zero cost or may show a saving to the farm (excluding the cost of providing the external assistance, such as advice, for example). Once data has been collected on actual farm costs from the farmers (i.e. after they have trialled mitigation methods), then a more detailed economic assessment will be undertaken

using external assistance. However, it can be demonstrated that, through the use of the DWPA Handbook, farmer costs are being considered at this time.

The initial assessment has illustrated the cost to farmers undertaking the 'Good Agricultural Practice' and 'Enhanced Good Agricultural Practice' primary measures. These costings are based on model farm systems developed under Defra Projects¹ WQ0106 and ES0205, which looked at cost and effectiveness of policy instruments for reducing diffuse agricultural pollution.

Further, under the ECSFDI initiative, the costings of various combinations of mitigation methods are being considered. This work will eventually help to inform the agro-economic analysis undertaken in this project at farm, catchment and national levels.

7.8 Examination of the results of the Programme of Measures

Based on the farms participating in the Programme of Measures the model farm measuring network was installed in LS. To enhance the measuring network it is planned to extend the existing data sets by the inclusion of N-balance data from regular farm controls on the Nitrates Directive.

The results of the measures to reduce the use-related pollution pressure are to be shown in terms of emission reductions that are – as far as possible – quantifiable. In the selection of measures to date, a distinction has been made between two impact categories (cf. Fig. 2), namely: a) measures that have a largely “Nmin reducing impact in the autumn” (known as action-orientated measures), and b) measures with a more “N-excess reducing impact” (based on result-oriented rewards). The development of “action-orientated measures” (especially winter hard catch crops) has been completed and a start has been made on communicating and implementing them on the model farms. The potential of these measures for reducing substance levels can be monitored to a considerable degree by means of the nitrate concentration in the soil (autumn Nmin value). For this purpose, 81 Nmin-samples in November/December 2006, 43 Nmin-samples from February until May 2007 and 13 samples of manure have been taken on the model farms. In addition, to this the samples have been analysed. All the results have been discussed with local actors.

These samples make it possible to compare sites with measures and sites without measures implemented. A similar sampling campaign has been started for autumn 2007. The monitoring of the effects of action-oriented measures on nitrate discharge is based on the soil samples mentioned above as well as data (Nmin-samples and data on nitrogen concentrations in seepage water) resulting from long-term monitoring programmes in water protection zones (Nmin-samples and data on nitrogen concentrations in seepage water).

The model farms are also offered measures to reduce N excesses in conjunction with the result-oriented approach. Effects in reduction of N excess are monitored on farm level based on N-balances. The basic agreement signed with the model farms (Annex 19-LS) includes not only special advisory services by the Chamber of Agriculture to improve farm-specific nutrient management, but also contributions by the farmer (e.g. provision of data for calculating N-balances). According to the legislation until 2005 (nitrate directive) the farms were allowed to

¹ These two projects develop a cost-curve approach to diffuse pollution mitigation, whereby mitigation methods and associated costs of implementation are ranked according to their cost effectiveness. A multiplicative model has been developed to allow the cost effectiveness of combinations of measures to be calculated: see Shepherd et al (2006).

provide N-balances either on the basis of farm-gate-balancing or on the basis of field-stall-balancing. To demonstrate effects before and after measure implementation and to estimate the potential for reduction of N-excess in the pilot areas, the two balancing methods have to be made comparable. For this purpose, a software tool for the combined calculation of farm-gate and field-stall balances was provided to the farmers and agricultural advisers of the model farms. First results of N-balances on the model farms are now available and have to be checked for plausibility and comparability. A seminar on 26 September 2007 in Verden/LS will offer the opportunity to experts, farmers and advisers to exchange experiences with results-orientated measures and balance tools.

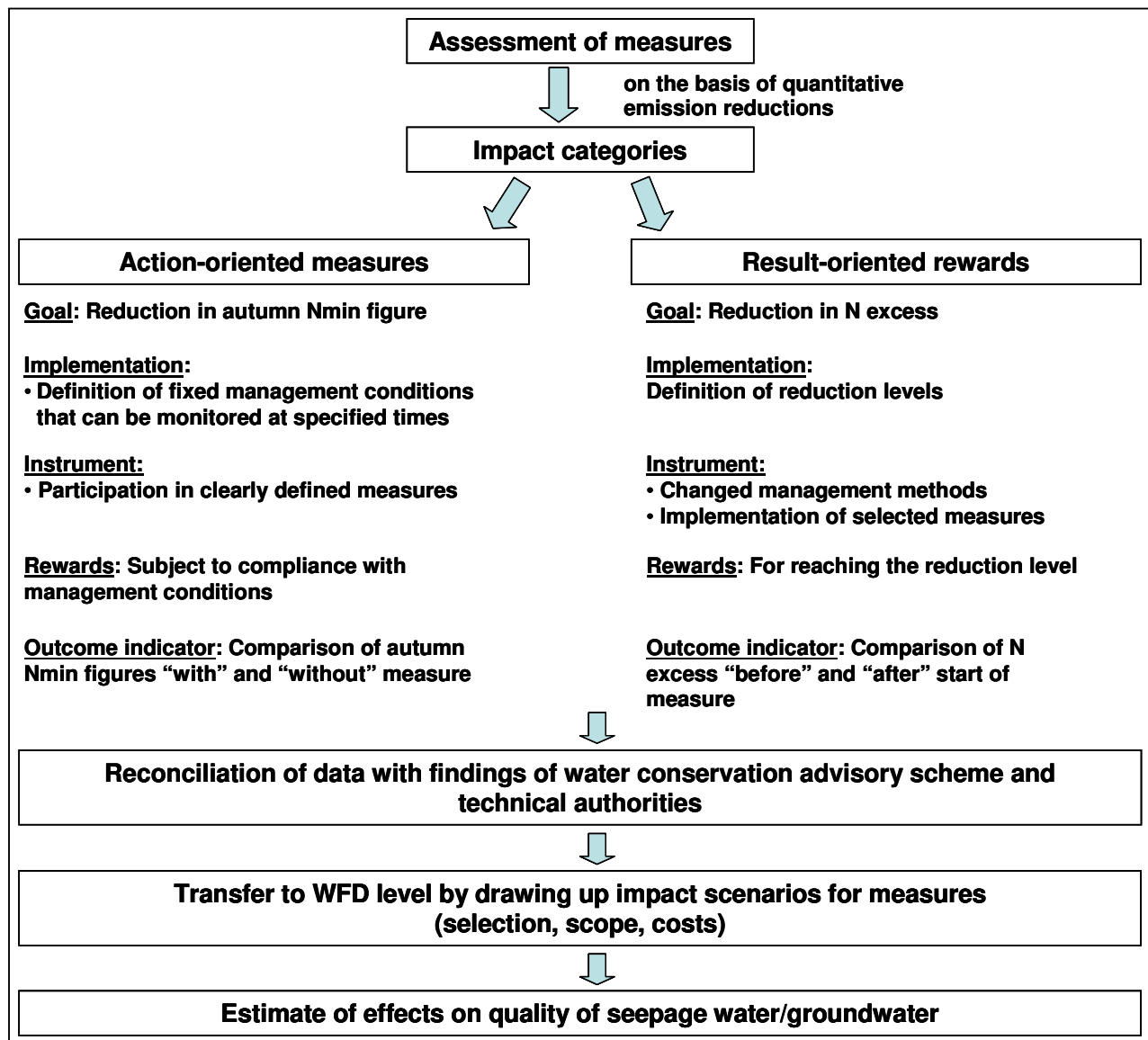


Fig. 5: Assessment scheme for action-oriented and result-oriented approaches

In the pilot area working groups and the National Steering Group there is a large degree of agreement about the reduction potentials (nitrogen pollution causes) to be achieved by means of the existing measures and the forthcoming counselling. The overall effect of the measures on seepage water quality (as a precursor to groundwater) at the geographical level of the EC WFD (river

catchments, groundwater bodies) and the associated costs necessary will be estimated by drawing up impact scenarios for model simulations.

For the state-wide quantification of the actual status of diffuse nitrogen inputs in groundwater and surface water, an agro-economic/hydrologic-hydrogeologic/N-export model system, applicable to the entire State of LS is used. The agro-economic model estimates the mean nitrogen excess at the scale of local administrative units based on official agricultural statistics. Hydrological variables (e.g. seepage, groundwater recharge) are calculated with the hydrologic-hydrogeologic model GROWA on a grid resolution according to natural conditions (climate, soil, topography) and land use. Nitrogen export variables (e.g. nitrogen degradation in soil, nitrogen load and concentration in seepage water) are calculated on the basis of the land use map (50 x 50 m grid), the calculated nitrogen excess, soil characteristics and the hydrologic variables. The combined models provide the actual status of nitrate concentrations in seepage water for entire LS on a 50 x 50 m resolution. The results are used as the basis for the state wide predictions of the effects of measures on the reduction of nitrogen emissions and nitrate inputs in groundwater and surface water.

Quantitative values for effects of the measures implemented on the model farms are not yet available as the monitoring is still ongoing. Therefore in a first step, the effects of measures on nitrogen excess and nitrogen export (task 8.3) will be estimated based on expert knowledge which is available from findings of existing water protection advisory schemes. The overall effects will be quantified for measure combinations which are expected to be realistic for the different farm types. They will be combined in scenarios using the distribution of farm types and the expected proportion of covered land. The costs associated with the investigated measure combinations will be available as a result of the agro-economical analysis. Finally, the expected effects will be combined with the nitrogen export model to assess the effects on nitrate inputs in groundwater and surface water (task 8.4). As the project proceeds the measure effect scenarios will be adjusted based on the monitoring results and advanced expert knowledge.

The reductions in nitrate input which are needed to meet the environmental targets defined for the hydrogeological subareas (mean concentrations of nitrate in seepage water) are currently quantified by inverse calculation using the model system described above. Based on the defined target values the tolerable nitrogen emission on the agricultural land will be calculated. By comparing this result to the actual state of nitrogen emission the required amount of reduction can be estimated. Finally, the probability of achieving the environmental targets (task 8.2) will be assessed by comparing the required amount of reduction to the predictions for the overall effects of measures.

A results report on the national emission reduction model and corresponding immission reduction (Deliverable 8.3) and the Guide for large-scale impact monitoring (Deliverable 8.1) cannot yet be delivered, because the effects of the individual measures (prerequisite of the scenario calculations on the overall effect of measures) are still a matter of discussion in the expert groups and the local working groups of the pilot areas. A report on the results of the model based estimation of achievable reduction of emission and immission (Deliverable 8.3) as well as on the probability of the achievement of environmental targets will be delivered as soon as reliable results are available.

The UK Steering Group considers it is unlikely that the monitoring network of soil and water measurements will be able to demonstrate changes in water quality during the life of the project. This is common with most catchment projects and the question of measuring 'effectiveness' is highly relevant to the implementation of the WFD. A number of parallel approaches are required,

each providing evidence of likely effectiveness, and providing data against which success can be judged.

Therefore, measurement data are being supplemented by the data collected on farm practices at the start of the project ('baseline data') and then again at the end of the project. These farm activity data are essential to understanding changes in the catchment brought about by the WAgriCo project and serve as an invaluable database for scenario testing and modelling the effectiveness of measures (to counteract the short-term nature of the project) – see later.

Activity has been undertaken to link the detailed studies in the priority areas to issues in the wider areas of the Frome-Piddle catchment. At the outset, workshops were held with key stakeholders covering a range of issues in the catchments (e.g. surface water, fisheries, groundwater and conservation), and the conclusion was that collecting previously inaccessible data into a single GIS was a priority for effective catchment management.

Consequently, more than 150 datasets have collated, which are relevant to diffuse agricultural pollution, and they have been incorporated into a GIS framework. This GIS framework has been passed on to workers in diffuse pollution, including the ECSFDI team within the Frome-Piddle.

This integrated dataset provides the foundation for the development of the conceptual models (the understanding of how the system is operating) and it is an essential precursor to any catchment modelling and integrated catchment management.

Some investigative modelling has also been undertaken. Initial modelling runs have been undertaken to identify hot spots for diffuse pollution risk from both N and P. These model runs were done using two models developed by ADAS called NEAP-N and PSYCHIC. Both models were run using national agricultural and environmental data sets.

The NEAP-N (N leaching model) has also been run to provide predictions of nitrate leaching for 6 changes in land use and could be implemented in the catchment. These results will be compared with the more detailed modelling that is being undertaken, as described below. Annex 42-UK provides more detail on the data collation activities and links to modelling.

In order to model the catchments in greater detail and to utilise 'baseline data' collected during the project, a detailed modelling programme is in the process of being implemented. The field-scale model (Nipper) which is designed to simulate the leaching of nitrate from agricultural land to watercourses will be used later in the project to test scenarios and to estimate the likely impacts of measures on nitrate leaching. Appendix A, within Annex 42-UK describes the structure of the model and the input data requirements. It can be seen that the model is designed to work at field and catchment scales and data requirements are minimal. It is able to simulate the major UK mitigation methods that have been selected for implementation within the WAgriCo project.

Along with modelling, N budget calculations have been developed within the priority areas, and this will allow further evaluation of the likely impacts of changes in farm practices on predicted changes in diffuse pollution; indeed, this is likely to be a key indicator of success within the project.

In order to further evaluate the success of the Programme of Measures, a PhD student started in October 2006. The aim of the PhD project is *'to compare and contrast selected monitoring methods (water quality measurement, farmer activity and modelling) in assessing the effectiveness of*

catchment management to control diffuse water pollution at several spatial scales (field, farm and catchment)'.

A first output has been to compare a range of approaches that can be used for assessing effectiveness (Annex 41-UK). This serves as a useful document to inform the project but is also a useful output to share with others. Annex 41-UK is not included in this Interim Report so far but will be available later. To request further information the UK Coordination at UKWIR can be contacted.

7.9 Integration of Programmes of Measures under the EC Water Framework Directive in state agri-environmental programmes

One important objective of the project is to reach agreement with the agricultural and environmental authorities on measures or catalogues of measures for integration in state agri-environmental programmes, and to support implementation in EU assistance programmes (e.g. EPLR).

As a first step towards this objective, the relevant authorities/ministries are being involved in the process of developing measures and assessing them on the basis of the environmental impact and cost of the measures, in order to achieve close consultation with the relevant decision makers at this early stage in the project.

In LS, the Ministry of Environment (MU) and Ministry of Agriculture (ML) are integrated in major decision processes in the National Steering Group. All steps relevant to the progress of the project are agreed in the National Steering Group. This applies, for example to the selection of the measures offered and implemented in the pilot areas until now. At various specialist events, staff members from the MU and ML have moreover indicated opportunities for and ways and means of integrating EC WFD measures in agri-environmental programmes. Current individual results of the project for certain measures have already been taken into account in draft planning of the rural development programme (EPLR) for the assistance period 2007-2013 (e.g. environmentally sound application of organic manure (towed hose), catch crop farming).

In addition to the specialist events mentioned above, working meetings between the project management and the representatives of the ministries (MU and ML) took place to discuss main topics. The topics have so far included the administration and controllability of the measures developed to date.

With regard to the progress review of results-oriented measures and ways and means of using appropriate instruments for demonstrating success, the necessary basic data and the use of a business management system are being discussed in a dialogue between the project management and the ministries. These joint deliberations focus in particular on the use of a business audit system in a cross compliance context. As mentioned within chapter 7.5, the "Practical Guide to Continual Improvement of the Environmental Performance of Farms", which is based on the business management system EMAS. The additional guideline will be constantly revised and upgraded in international cooperation. It will be submitted and be available as PDF document at the end of this project to guarantee provision of the most recent know how.

Further important key topics in the dialogue will be aspects of agro-economic assessment, data management and data availability, and criteria for checking N-efficiency.

Regular support meetings in parallel with the project work are planned, partly to maintain an ongoing technical exchange of information, and partly also to ensure that the measures tested in the project are implemented in agri-environmental programmes.

There is considerable activity within UK government on evaluating approaches to tackle ‘diffuse water pollution from agriculture’ (DWPA) which, driven by the EC WFD, is treated as a priority topic for water improvement by Defra. The WAgriCo project is informing this process in several ways. ADAS has met with Defra on several occasions to advise on results from WAgriCo and a Defra Officer sits on the project Steering Group.

- Developing catchment management processes – the WAgriCo project links well with the ECSFDI initiative, previously described within chapter 7.6. The WAgriCo project provides information on best approaches to implementing catchment management. The lessons learnt, combined with experience from ECSFDI provides a powerful learning tool for implementing sustainable catchment management.
- A central point of ECSFDI is the use of agri-environmental schemes to support changes in land management to protect water. Work undertaken within the WAgriCo project is able to advise on best options for water protection, as well as potential options for inclusion in revised schemes.
- Use of other instruments – work being undertaken by ADAS staff engaged on the WAgriCo project is also investigating the potential of a range of approaches (support/advice through to regulation) to bring about cost-effective changes in losses of pollutants to water. Again, this will help Government decision making.

7.10 Demonstration of the added value created by WAgriCo

Local and regional: In each of the three LS pilot areas, a member of the staff of NLWKN is responsible for the implementation of the local dissemination plans. In terms of their composition, the three pilot area working groups already have the status of cooperation at the geographical level of the working area/groundwater body. The working groups coordinate all work steps and their results; they meet as necessary. The participants are representatives of the rural districts, maintenance associations, water supply companies, the rural community association, the farmers and the forestry sector (cf. Annex 12-LS). The kick-off events of the three working groups were each reported in the local and regional press and in the Ilmenau/Jeetzel and Lager Hase pilot areas a report was broadcast on the radio. In general, 14 press articles have so far appeared about the working groups and/or the three WAgriCo pilot areas in LS (cf. Annex 9-LS). Through these publications in the local and regional press and in technical journals such as “Land&Forst”, and also through notices about the search for model farms, at least 50% of the farmers in LS and hence in the pilot areas have been informed about the project’s aims and content (cf. Annex 10-LS).

In the UK, the 2 different approaches made by ADAS and WW have both ensured engagement by the farmers in the sub-areas. This is recognised by the support and base data information being collected. Therefore the farmers are engaging with the project. In addition a small group of farmers attended the Local/National launch held in the catchment on the 5 May 2006 at which Defra’s Minister of the Environment made the key note address; the Launch helped to stimulate interest.

The current level of engagement is being built upon through the Local Farmers’ and Stakeholders Groups. As referenced earlier in Task 2, there have been meetings with the Local Farmers’ Group in November 2006 and March 2007 and July 2007 Stakeholders’ Groups in January 2007, following

an initial meeting in January 2006. At the four latest meetings the project was discussed including the outputs from the data acquired from the farmers.

The UK Steering Group has already raised the issue of sharing events with other stakeholders, such as farm visits and workshops so that all parties active in the area can share their experiences and have a common understanding. For example, at the Local Stakeholders Group meeting Defra's ECSFDI Officers gave a short presentation on the ECSFDI initiative and their activities.

A newsletter was also produced during Autumn 2006 and this was provided to farmers at the farmer group meetings and was posted to all the farmers within the identified sub-areas. Further communications since the start of 2007 has been sending letters about mitigation measures (Programme of Measures), including fertiliser spreader calibration and also farmers' packs relating to the other mitigation measures and how they can get involved with the project. In addition in the technical newsletters, as detailed earlier (cf. section 7.2 - Media design) UK activities were released.

Supra-regional: At its Wehnen experimental farm the Lower Saxony Chamber of Agriculture organized a field inspection tour (July 2006) especially for farmers from the pilot areas and for agricultural advisers. A report on this is attached in Annex 40-LS.

National: National coordination of the work in the WAgriCo project is handled by the National Steering Group. In LS the kick-off event was held on 17 January 2006. It is in constant contact with the regional working groups in the three LS pilot areas. The aim is to bring together the findings from the pilot areas to form concepts that can be implemented on a national basis and, in parallel, to examine the extent to which the methods elaborated in the pilot areas are practicable for national application. The Steering Group also feeds the project results into the political and administrative processes at national level. The Steering Group in LS is made up of the German project partners and representatives of water resources management, the agricultural sector and water supply companies. The National Steering Group held eleven meetings to date (cf. Annex 4-LS).

"Expert groups" were set up in the WAgriCo project to work on specific technical questions and concepts. The main topics were first prepared in a small group before being discussed in the working groups and in the National Steering Group. In some cases, the heads of the expert groups were in touch with the relevant UK (technical) partners. To date, there have been expert groups for the following topics: geographical prioritisation, development and planning of measures (action- and results-orientated measures), farm selection, modelling, environmental targets and monitoring. The composition of the expert group varied depending on the topic. Annex 12-LS lists all participants in the expert group, for example the expert group for development and planning of measures was made up of the German project partners and farmers from the three pilot areas.

Notes on the structure of the organisational units and cooperation between them can be found in the Guide to participation process (cf. Annex 11-LS).

The 11th Groundwater Workshop in LS, which was held in Hildesheim on 11 October 2006, was addressed to representatives of the water resources administration, technical agricultural authorities, farmers, research institutions, water suppliers and engineering offices, nature conservation organisations and maintenance associations, thereby achieving widespread multiplication of the information. A total of 140 attendees took part. A presentation was given on the background to and objectives of the EU LIFE project WAgriCo. From the point of view of German (MU, ML, NLWKN, farmer) and UK partners (ADAS, EA) it also considered the current position regarding

planning and implementation of measures and the possibility of integration in agri-environmental programmes.

In the UK, the awareness of the project is continuing to be raised. It has been widely disseminated through a number of platforms and consequently the government and other relative agencies are fully aware of the benefit of such a project.

In addition, at meetings between ADAS and Defra opportunities to discuss WAgriCo are available resulting from the close connection with other projects on which ADAS are engaged. This continues to ensure that government is aware of the project. A representative of Defra now attends the Steering Group meeting in a non technical role which again helps to engage with government. Further, the Defra's national officer responsible for the ECSFDI project met with the UK Steering Group in May 2007 to be briefed on, and discuss, the WAgriCo project and the activities to date and those planned.

The profile of the project has also been raised by the NFU as it has featured in discussions on the future of water management by the Water Group of the Quality of Life Policy Group, who are helping to advise future policy for the Conservative Party. Again, demonstrating engagement at the political level. In a letter sent on the 27 March 2007 from the President of the NFU, Peter Kendall, to the then Minister of the Environment for Climate Change and Environment, Ian Pearson MP, Mr Kendal wrote, *"We consider that water companies have a role to play in working with farmers to bring about improvements to water quality, this benefits the water company, the environment and the farmer. A good example of this is the EU LIFE funded WAgriCo project, which includes the NFU and Wessex Water as project partners and is exploring this very theme. The NFU feel that Ofwat should permit investment in catchment measures to reduce diffuse pollution rather than spending funds on expensive, energy intensive end of pipe solutions. Where customers' money would be better spent on long term catchment measures this has to be the long term sustainable solution. During the last price review, this was not permitted, Wessex have had to fund their own Catchment Advisers and are trying to address this problem themselves. These advisers have integrated well into the farming community and a good level of trust is starting to be built up."*

A presentation was made in July 2006 at the CIWEM meeting entitled 'Progress with Catchment Management Integration and Delivery' at which ADAS presented a paper. At the national CIWEM Land-use and Water series meeting in November 2006 entitled Farming, Water and the Environment – Communicating lessons in practice presentations were made by the NFU and WW which featured the WAgriCo project. The UK Partners continue to seek opportunities to raise and maintain awareness of the project for example the ADAS Open days and the SCI Agriculture and Environment event.

International: Close links between the project work in the UK and LS are maintained at the level of the International Steering Group and through international expert groups and additional workshops, which not only ensure up-to-date sharing of interim results, but also promote contacts between farmers. The International Steering Group is essentially composed of the two "lead partners" NLWKN and UKWIR. The official international kick-off event for the WAgriCo project was held in LS in March 2006. In addition to the German and UK project partners, the participants were the Lower Saxony Ministry of Environment and Ministry of Agriculture, and representatives of the farmers in the LS pilot areas. The kick-off event also included a presentation on the political framework conditions in LS and the UK and an explanation of the objectives of the WAgriCo project. The kick-off event was reported in the press (cf. Annex 9-LS).

The 2nd meeting of the International Steering Group took place in the UK in September 2006. As well as the representatives of the German partners, this second meeting was also attended by 6 farmers from the LS pilot areas and 3 farmers from the UK pilot areas. The main emphasis was on promoting the sharing of experience between the German and UK farmers (Annex 40-LS).

The 3rd meeting of the International Steering Group took place from 20 to 22 June 2007 in LS. Site visits were organised to the pilot areas and comprehensive information material had been prepared in advance. Three workshops on the topics modelling, measure planning and experience exchange between English and German farmers were integrated.

Good dissemination of results of the WAgriCo project at international level was achieved thanks to the three meetings of the International Steering Group, the conferences and the workshop.

At the European Geosciences Union conference (EGU, April 2006, Vienna) and at the 10th international conference on “Diffuse Pollution and Sustainable Watershed Management” (DipCon, September 2006, Istanbul), the German partner FZJ presented the methods and results of the geographical prioritisation in the WAgriCo project (cf. Annex 9-LS).

During a presentation by the Lower Saxony Chamber of Agriculture at the enmar conference on “Regional Water Management” on 08 March 2007, references were made to the WAgriCo project, especially Task 6, and initial results and further options for action were discussed (see also Annex 4-LS).

In November 2006 the 2nd second international workshop of the WaterCost project, a follow-up project to Water4all, was held in the UK in Newcastle upon Tyne. As a participant in the workshop, the NLWKN gave a presentation to the expert audience on the current progress of the WAgriCo project and the further steps towards agro-economic analysis that are planned under the WAgriCo project (cf. Annex 9-LS). At this workshop, practical steps were agreed for close cooperation and experience sharing. During a following international workshop on 27 April 2007 in Oldenburg/LS WAgriCo project contents were represented by one of the German partners (FAL). Also at the final international meeting of WaterCost (20th September 2007 in Assen/NL) was used to promote WAgriCo and make contacts to institutions in Denmark and the Netherlands.

As referenced earlier, two articles on the WAgriCo project were also written for the NITRABAR newsletter which will be disseminated to approximately 2000 people in the UK and Europe.

It is planned to hold an international conference to disseminate the outputs from the WAgriCo project and planning for this event is to commence shortly.

8 Dissemination Activities and Deliverables

The Dissemination activities and the Deliverables are set out in Chapter 7.2. The Dissemination Plans can be found in Annexes 8-LS and -UK.

9 Evaluation and Conclusions

With respect to the final report of the project, a detailed and quantified analysis of the achievement of objectives within the project will be produced at the end of 2008. The International Steering Group is already considering the structure and the detail of the final report, so as to ensure its timely

delivery. The interim report presented here sets out an estimate of the expected achievements based on the current position compared to the objectives formulated in the project application.

Project implementation

a. The process

For the implementation of this project, efficient structures were built up at local, national and international levels (cf. Chapter 5). This guaranteed the involvement of local farmers who were affected and their representatives, the relevant authorities and policy makers responsible for future implementation of the WFD Programme of Measures and representatives from research and science.

Accompanying this, a dissemination strategy was set up and put in practice (cf. Chapter 5, 7.2 and Annex 8-LS) by which the public is informed about the objectives and implementation of the project to the public and other farmers who may be affected in the future, and finally, to the political level for which the project will form the basis for future decisions.

b. The project management, the problems encountered, the partnerships and their added value.

The project management was carried out by the NLWKN as the beneficiary and UKWIR as the lead partner in UK (cf. Chapter XX). An efficient project management is guaranteed by the detailed project management plan and the administrative work of the Steering Groups.

Work on the project tasks is based on cooperation and participation of farmers and partners. This results in an excellent exchange of practical experience, scientific know-how and administrative demands according to agri-environmental programmes and it provides a good model for other catchment management initiatives/projects.

c. Technical and commercial application

The development of the measures within the project has shown that measures can in principle be developed at higher levels, but cannot dispense with the inclusion of regional framework conditions (for example, climate and soil conditions, business structures). The experience gained here locally is utilised at national and international levels.

d. Comparison against the project objectives

Project outcomes of every single task in comparison to the formulated project aims are described detailed in chapter 7.

The main cornerstones of the objectives for the first two project years were achieved:

- The creation of an effective project structure is complete.
- The development of a comprehensive dissemination strategy has been carried out and the implementation is an ongoing process.
- The determination and definition of spatial priorities for the planning of measures is complete.
- The development of suitable primary measures in cooperation with practising farmers has been carried out. The optimisation of this is ongoing.

- The implementation of the developed primary measures has been in progress since autumn 2006. The optimisation is constantly continued.
- The creation of planning principles and the inclusion of other planning authorities for secondary measures has been carried out. The cooperation will be continuously strengthened.
- The agro-economic analysis is carried out based on the implemented measures.
- Monitoring of impacts of the implemented measures on soil mineral N in autumn and N-balances is ongoing. The direct results relating to effects on groundwater will only be available after several years because of the long flow times.
- For the integration of the measures in agri-environmental programmes, there is an intensive exchange with decision-makers in UK and LS.

e. Effectiveness of dissemination activities

The effectiveness of dissemination activities was promoted through the constant updating of our project website (www.wagrico.de), through participation in international workshops, through numerous newspaper articles in local and technical publications, project notice boards (at the WAgriCo demonstration sites), the newsletter and a general information project flyer.

An appraisal of our project website revealed that during the last 18 months (April 2006 – August 2007), there were about 2700 visits on it. Accordingly, about 150 visitors look at the project website every month. In order to increase the number of visits, we will report on “current events” within WAgriCo at regular intervals on the NLWKN website, which was visited over 200,000 times during the same time period, and links directly to the project website.

The WAgriCo project flyer, providing general information was produced, with 1000 copies each in German and English. It was given to all partners to enable further dissemination. Actually, an international mailing list is prepared to spread the flyer as widely as possible. A technical project flyer on “results-oriented rewards for improvements in nitrogen application” is currently being prepared and should be completed and distributed in October 2007.

Until now, we have received numerous positive comments on the newsletter. It appears every three months and contains information about the participants, project objectives and current issues concerning the WAgriCo project. The seven newsletters which have been produced can be downloaded on the website and are sent out via a constantly up-dated mailing list.

We assess the effectiveness of dissemination activities regularly. The results of these assessments are used for further updating of the strategy (cf. Chapter 7.2 and Annexes 8-LS).

Analysis of long-term benefits

a. Environmental benefits

1. Direct / quantitative environmental benefits

The objective of this project is to develop suitable measures in order to reduce the diffuse inputs from agriculture, particularly nitrate. The main starting point here is an enhanced N efficiency (results-oriented rewards = calculation) as well as a reduction in direct inputs through suitable action-oriented measures.

The effects of the individual measures within the project are verified through the accompanying monitoring process. A statement on this will appear in the final report.

2. Relevance for environmentally significant issues or policy areas

In accordance with the project proposal, one objective of the project is to support the integration of the developed measures in agri-environmental programmes and with this, the inclusion of environmental concerns in other areas of policy, particularly agriculture, as suggested in the 6th Environment Action Programme.

For this purpose, various focal points are established within the framework of the project:

- The parties concerned, and in addition the wider public, are advised through the information services, particularly by the website, about the quality of the environment and the possibilities for improvement through changes in individual behaviour (cf. Chapter 7.2).
- The inclusion of economical instruments is supported by enhancement of the Eco-Management and Audit Scheme (EMAS) with an appendix focused on water protection issues (cf. Chapter 7.9).
- The consideration of environmental concerns in land use planning and regional planning will be strengthened through the creation of planning documentation for authorities responsible for measures within other programmes (Chapter 7.6)

The integration of the Programme of Measures in the agri-environmental programmes is a component of river basin management within the framework of the implementation of the EU WFD. To meet the cross-border demands of river basin management and to develop the pre-conditions for the promotion of environmental protection measures in agriculture within the framework of the common agricultural policy, there is a close meshing between the participating countries/member states involved in the project. Both the structures for participation and the relevant measures have been developed taking into account regional and countrywide adaptations necessary for the project. Therefore its transferability to larger areas and other member states can be demonstrated in the final statements on this project.

b. Long-term sustainability

1. Long-term / qualitative environmental benefits

The long-term effects of this project will be achieved, on the one hand, through the provision of measures developed for extensive Programmes of Measures in the future, and on the other hand, through the process of joint development of measures between agricultural practitioners, scientists and administrations.

Through this strong process of communication, a common understanding will develop in the countries, forming the basis on which the subsequent programmes can be implemented. Both the political structures involved and the informed public will be made aware of the situation concerning nutrient input into water resources through agricultural activities.

2. Long-term / qualitative economic benefits

One of the main topics of the project is the raising of awareness and provision of skill enhancement within agriculture with the objective of improving long-term fertiliser management on farms.

To achieve this, the long-term protection of water will be established as a component of vocational and further training, advisory services will be promoted and voluntary agri-environmental measures will be offered. The measures and the increase in knowledge will support more effective use of organic fertilisers and at the same time, an associated reduction in the purchase and use of mineral fertiliser.

Because of this, the economic efficiency of the developed Programme of Measures is an aspect of the project, along with ecological effectiveness.

Foresighted and sustainable action will reduce water pollution, meaning that increased water treatment costs in certain regions in some years can be avoided and the supply of qualitatively good drinking water can be guaranteed.

3. Long-term / qualitative social benefits

Through increased awareness within agriculture of the need for water protection, and the intensive exchanges between farmers, water suppliers and authorities, mutual understanding will be strengthened at both, national and international level. This leads to a better acceptance of the various objectives and to the achievement of common solutions.

c. Replicability, demonstration, transferability, cooperation

Transferability & potential for commercialisation

The concept developed within the project consists of improvements to vocational and further training, increasing synergy effects with other land uses and the provision of voluntary agricultural-environmental measures. It is generally transferable to other areas and member states.

It is based on an improvement in the level of awareness of the environmental pollution situation, chiefly through the education of young people as the central approach for long-term improvements. Supporting agricultural advisers fulfil the function of disseminators.

Parallel to this, the awareness of other planning authorities will be strengthened and therefore cost-efficient synergy effects can be supported.

d. Innovation

Level of innovation at international level

Based upon the experience available from environmental protection programmes for agricultural areas and drinking water, an approach aimed at results-oriented rewards according to water protection has been developed and implemented in a test phase for the first time in this project.

In this process, the experience of various institutions will be used and combined to set down guidelines (for example, a guideline on spatial priority setting).

Parallel to this, the ‘Practical Guide to Continual Improvement of the Environmental Performance of Farms’, which is based on EMAS will be supplemented with a guide specialised in water protection measures in general (see chapter 7.9).

10 After-LIFE Communication Plan

Even after the WAgriCo project ends in October 2008, we aim to continue disseminating the results and experience gathered during the project. The aim of this dissemination is not only to use the overall results of the project for providing political advice at European level and within the participating member states, but also to make experience available with regard to practical planning of local on-site measures. The most important dissemination methods in current use (Internet, media design, meetings and workshops etc.) are described in section 7.2. Annex 8-LS contains our current “Dissemination Strategy”. Use of these methods beyond the official end of the project is envisaged as follows:

Internet

The German project website www.wagrico.de, from which the results obtained during the project can be downloaded, is to be maintained and updated for at least five years after the end of the project (e.g. with regard to contacts for further information). The website’s target group will continue to include politicians, the general public, the agriculture and water sectors, administration, nature conservation and environmental protection associations, universities and (vocational) schools.

Meetings and workshops

Experience gained during the project will continue to be passed on in meetings and workshops after the end of the project. On the one hand this will involve initiating meetings specifically on the topic of “Results of the WAgriCo Project”, while on the other hand contributions will also be made to events organised independently of the project. In this case the principal target groups are the political and administrative circles directly involved in implementing the EC WFD, and also the interested public concerned.

Media design

All publications available for downloading from the website will also be kept available for at least five years after the end of the project. Flyers for participants are currently being distributed at meetings and workshops, and this will continue to be done after the end of the project.

11 Interim Report: Planned Project Progress

For timetable diagram see Table 1.

- **Task 1**
 - Further local, national and international meetings

- **Task 2**
 - Continuous updating of WAgriCo websites

- Ongoing production of reports on meetings of the International Steering Group and further exchange of information between the local and national cooperation activities and at international levels
- **Task 4**
 - Preparation of action recommendation in December for planning inexpensive measures for various types of areas
 - Assessment of the Programmes of Measures in pilot areas in the form of a workshop report
 - Assess measures by local stakeholder groups and by International Steering Group
 - Special assessment and further development of the results orientated measures
- **Task 5**
 - Production of a PDF document on acceptance with regard to financial compensation and implementation of each individual measure
 - Further development of a handbook on eco-management in agriculture.
- **Task 6**
 - Further evaluation of possible synergies between water conservation measures and other protection objectives
 - Guideline on multilateral co-operation alliances.
- **Task 7**
 - Macro-economic analysis of the Programmes of Measures scenarios during 2007
 - Proposal for state programme of measures.
- **Task 8**
 - Preparation of a first guide for large-scale impact monitoring of the effectiveness of the water conservation measures and hence the achievement of environmental targets (immission reduction)
 - Submission of a results report on the national emission reduction model
 - Guidelines for a large-scale impact monitoring
 - Report about the concept for a model farm measuring network and accompanying problems and solutions
 - Report about the results of catchment and state-wide related emission and input effects of the measures
 - Feedback to and from local stakeholders on the results.
- **Task 9**
 - Agreement on requirements in order to draw up a catalogue of measures that can be implemented on a national basis for integration in agri-environmental programmes
 - Catalogue of the measures suitable for agri-environmental programmes, their costs and their environmental impact
- **Task 10**
 - Production of working material for workshops at EU level with the assistance of the Environment and Agriculture Directorate-Generals (DGs) in May 2008
 - Organisation of workshops with other EU member states and preparation of two reports
 - Workshops for broader transfer of results

LIFE-Project number: LIFE05 ENV/D/000182			WAgriCo											
Tasks/ Activities			2005	2006				2007				2008		
			4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T
Task1	Project management and reporting and establishing project infrastructure	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task2	Communication and participation process	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task3	Setting geographical priorities to plan measures and environmental objectives	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task4	Measure planning and compilation of Programmes of Measures	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task5	Implementation of primary measures - intervention	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task6	Implementation of secondary measures – protection areas	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task7	Agro-economic analysis	Baseline		...	...	...	...	...	...	...	...	...	...	...
		actual		xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task8	Checking the results of the Programmes of Measures (evaluation of measures)	Baseline		...	...	...	...	...	...	...	...	...	...	...
		actual		xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Task9	Establishment of Programmes of Measures under the WFD in state agri-environmental programmes	Baseline				...	...	...	...	...	...	...	...	...
		actual				xxx	xxx	xxx	xxx	xxx	xxx			
Task 10	Demonstrating the added value of WAgriCo results and conclusion	Baseline	...	...	...	...	...	...	...	...	...	...	...	...
		actual	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			

Table 1: Comparison of the actual project realisation against the baseline implementation plan

List of Annexes

Annex 1-LS/UK	Project Partners
Annex 2-UK	UK Project Management Structure
Annex 3-LS	International Expert Teams
Annex 4-LS	Overview of events
Annex 4-UK	List of Meetings
Annex 5-LS	Partner Agreements
Annex 5-UK	Partner Agreements
Annex 6-LS	Partnership Arrangements [Deliverable 1.1]*
Annex 6-UK	Partnership Arrangements [Deliverable 1.1]*
Annex 7-LS	Technical reports by pilot areas
Annex 7-UK	Diffuse Pollution Control in England
Annex 8-LS	Dissemination strategy [Deliverable 2.1]*
Annex 8-UK	Communication and Dissemination Strategy [Deliverable 2.1]*
Annex 9-LS	Public Relations Activities [Deliverable 2.3 and 2.4]*
Annex 9-UK	Public Relations Activities [Deliverable 2.3 and 2.4]*
Annex 10-LS	50 % of the farmers in all pilot areas are familiar with the project's goals [Progress indicator 2.1]*
Annex 11-LS	Guide to participation process [Deliverable 2.2]*
Annex 11-UK	Stakeholder Facilitation Guide [Deliverable 2.2]*
Annex 12-LS	List of working group (AK) participants
Annex 13-LS	Guide to setting geographical priorities [Deliverable 3.2]*
Annex 14-LS	Outcome maps with target areas for primary measures in the pilot areas [Deliverable 3.1]*
Annex 15-UK	Teaching Materials [Deliverable 5.1]*
Annex 16-UK	Justification for Inclusion of Pilot Areas
Annex 17-LS	Overview of measures
Annex 18-LS	List of measures Autumn 2006 and 2007
Annex 19-LS	Basic Agreement Autumn 2006
Annex 19-UK	UKWIR / Farmers Agreement for the Implementation of the Agreed Programme of Measures
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Annex 21-LS	Extent of implementation of measures Autumn 2006 and Spring 2007 – Acceptance analysis [Deliverable 5.2]*
Annex 22-LS	Result-Oriented Measures Agreement Spring 2007
Annex 23-LS	Water conservation measures toolbox [Deliverable 4.1]*
Annex 24 - LS	Reduction of diffuse inputs in surface waters
Annex 25-LS	Action recommendations for priority cost-effective planning of measures [Deliverable 4.2]*
Annex 23-UK	Water Conservation Measures Toolbox – Implication for Implementing Mitigation Methods [Deliverable 4.1]*

Annex 26-UK	Field Work Plan for the on-farm component of WAgriCo
Annex 27-UK	Assessment of Farm Pollution Risk and Opportunities for Mitigation Methods [Deliverable 3.1 and 3.2]*
Annex 28-UK	Programme of Measures – Implementation Programme
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Annex 32-LS	Report on and evaluation of measures implemented in the field of initial and further training [Deliverable 5.1]*
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Annex 34-LS	Report on and evaluation of progress on use of third-party land rights for the objectives of the EC Water Framework Directive [Deliverable 6.1]*
Annex 35-LS	Payment calculation methods for agri-environmental measures
Annex 36-LS	Procedures for cost predictions at the level of the individual farm, region, river basin area and federal state [Deliverable 7.1]*
Annex 37-LS	Description of result-oriented measure
Annex 38-LS	Report on impact scenarios [Deliverable 7.2]*
Annex 39-UK	Programme of Measures Funding Form
Annex 31-UK	Generalised Assessment of Agro-economics [Deliverable 5.3]*
Annex 40-LS	Report on reciprocal visits by farmers [Deliverable 10.5]*
Annex 41-UK	Methods of assessment for the evaluation of mitigation methods controlling diffuse nutrient loss from agriculture in England and Wales: A Review
Annex 42-UK	Summary of Modelling Activity and Strategy

** in accordance with project proposal, form T1*