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The Potential of the European Agricultural Fund for Rural Development (EAFRD) to Address Diffuse Pollution from Agriculture and Consequent Eutrophication of the Baltic Marine Environment.

Study Commissioned by
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To

VERDA Policy, E. Guttenstein
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Executive Summary

In Chapter 1, "**Introducing the EAFRD**", the report describes how the European Agricultural Fund for Rural Development – EAFRD, will be implemented throughout the 2007 to 2013 EU rural development programming period. The chapter describes how the legislation defined at EU level is quite strict in terms of the administrative requirements to be fulfilled by Member States, and invites them to pool efforts in designing programmes which are mutually supportive and deliver on EU-wide priorities. It also describes how Member States are required to undertake fairly substantial and on-going evaluations of the implementation and impact of their programmes, offering several opportunities for revising these throughout the programming period.

In Chapter 2, "**Diffuse Pollution & the EAFRD: a Legal Bind?**", the report highlights that the legal documents governing EU rural development policy refer to diffuse water pollution from agriculture (DWPA) mostly implicitly, through references on the need to protect soil and water resources. Interestingly, however, the Strategic Guidelines –which govern what content the programmes should address; do reference the up-coming Marine Strategy, providing an initial legal hook for Member States keen to use EAFRD measures to address land-based sources of pollution affecting the marine environment.

In Chapter 3, "**How Farming Causes Diffuse Pollution**", the report rapidly reviews the pollutants emitted from agriculture which contribute to DWPA, as well as the farming sectors that create the highest incidence of diffuse pollution. Identifying the type of farming being practised in the Baltic catchment area, and how each farming system contributes to DWPA is a first necessary step in identifying management solutions.

In Chapter 4, "**The European Legal Context for Diffuse Pollution**", the report demonstrates that the European Union has being trying to tackle diffuse pollution since the nineteen seventies, through a range of environmental and agricultural legislation. Typically, the approach is through water-related legislation. Whilst the Water Framework directive explicitly includes agricultural measures, the current Marine Strategy directive proposal does not build on or aim to work in conjunction with the Water Framework Directive (WFD) or other relevant legislation.

In Chapter 5, "**What Potential Does the EAFRD Hold?**", article by article the report looks at whether the measures and schemes funded under the EAFRD could potentially be used to address diffuse pollution. It illustrates how a very significant range of measures can usefully be put to this aim, whether traditionally associated with environmental management or indeed other objectives. However, the report also warns that this potential is unlikely to be tapped unless the competent Managing authorities have clearly identified the specific mitigation activities and actions that need to be undertaken – and that require financial support from the public purse. The existence of EU rural measures that can tackle DWPA does not automatically mean that Member States will make use of the opportunities available to them.

In Chapter 6, "**Early Indications for a New Programming Period**", the report reviews early information available from the eight HELCOM Contracting Parties on whether, and how, they intend to

address DWPA or the link to the Baltic Sea, in their 2007-2013 rural development programmes. At the time of writing, end of March 2007, no EAFRD programmes had yet been approved.

Chapter 7, "**Agriculture and Eutrophication in the Baltic Sea**" pools evidence of the specific link between agricultural practices and lifestyles in the Baltic catchment area, and the eutrophication of the Baltic Sea. The report reviews evidence suggesting that to reduce the nutrient load and consequent eutrophication in the Baltic, policies need to address anthropogenic sources of nutrients, and do so much more effectively and substantially than they have been able to achieve to date.

Chapter 8, "**Approaches to Tackling DWPA**" concludes the report with examples of uses for grant aid to support measures to reduce diffuse pollution from agriculture. Importantly, it concludes that this report endeavours to illustrate that there exists a wealth of knowledge on how to assess and tackle DWPA; a range of EU-level legal instruments requiring the reduction of DWPA; and a range of measures and funds to implement such obligations, including –notably, the EAFRD. One of the great challenges that remains may be making the case that eutrophication in the Baltic Sea can only be effectively addressed if there is the determined and active political will to use agricultural and land use policies to reduce DWPA. Without such political will, it is unlikely that measures will be developed, funded and implemented in such a way and on such a scale to reverse the Baltic Sea's eutrophication problems.

1. Introducing the EAFRD

The European Agricultural Fund for Rural Development (EAFRD[1]) entered into force on the 1st January 2007 and will be applicable for a seven years programming period, running through to the end of 2013. The EAFRD comprises both a *fund*, within the Common Agricultural Policy (CAP); and a *programme of measures*, with specific objectives. These objectives are further detailed and prioritised in the Community Strategic Guidelines for Rural Development (Strategic Guidelines[2]); whilst the rules governing the implementation of the EAFRD are detailed in a further Commission Regulation[3]. Together, these three documents define and govern EU rural development policy 2007 – 2013.

Current EU Rural Development policy both constrains and recommends Member State action. It offers Member States the freedom to choose, from a menu of measures, how they want to use EU funds to deliver on their territories, though at the same time encouraging them to pool efforts towards delivering EU-level priorities: *"Each of the Community priorities, and their contribution to the Lisbon and Göteborg objectives, will need to be reflected at Member States level […] In many cases there will be national or regional priorities for specific problems[4]".* The Community's Strategic Guidelines for Rural Development, adopted by the Council of Agriculture Ministers, provides the framework according to which Member States are expected to prepare *National rural development Strategy Plans (NrdSPs)* which[5]:

- Identify those areas where the use of EU support for rural development creates the most value added at EU level;
- make the link with the main EU priorities (Lisbon, Göteborg);
- ensure consistency with other EU policies, in particular cohesion and environment;
- accompany the implementation of the 2003 reformed CAP and the restructuring it entails.

Based on their national strategy plans, Member States select the EAFRD measures that best can deliver on the needs they have identified, and with these construct their Rural Development Programmes (RDPs). However, they must allocate minimum funding levels to each of the four axes around which the EAFRD is built:

- **Axis I** – on **improving the competitiveness of the agricultural and forestry sectors**;
- **Axis II** – on **improving the environment and the countryside**. All RDPs must include agri-environmental measures;
- **Axis III** – on **quality of life in rural areas and diversification of the rural economy**;
- **Axis IV** – on the **LEADER** approach, supporting locally-based bottom-up governance approaches to rural development. All programmes must include LEADER measures, which

[1] Council Regulation (EC) N° 1698/2005
[2] Council Decision 2006/144/EC
[3] Commission Regulation (EC) N° 1974/2006
[4] Council Decision 2006/144/EC page 5
[5] European Commission (2006) page 9

can cross-cut measures from other axes. LEADER has a strong focus on partnership and the exchange of experience through networking.

Each axis includes different types of measures. Some of the measures offer revenue compensation (e.g. agri-environment) others capital investment support (e.g. non productive investments). The EAFRD Regulation defines in its annex the amounts and rates of support eligible for each measure.

Rural development policy is co-financed by the European Union. This means that Member States must contribute part of the funding for the measures they choose to implement. The rates for co-financing vary according to a country's GDP and to which axis the measures selected belong:

Table 1 - Expenditure & Co-Financing Rates by EAFRD Axis

	Compulsory Expenditure Rates	Standard EU Co-financing Rate	Convergence Areas EU Co-financing
Axis I	Minimum 10%	Maximum 50%	Maximum 75%
Axis II	Minimum 25%	Maximum 55%	Maximum 80%
Axis III	Minimum 10%	Maximum 50%	Maximum 75%
Axis IV	Minimum 5% in old Member States Minimum 2.5% average over period, phasing-in 5% in new Member States	Maximum 55%	Maximum 80%

Convergence areas are defined as those Member States and regions whose per capita GDP is less than 75 per cent of the EU average. The rationale of this convergence objective is to promote growth-enhancing conditions in the least-developed Member States and regions of the EU. In the current EU of 27 countries, this objective applies across 17 Member States and 84 regions, affecting a total population of 154 million. Prior to the enlargement of the EU to the East and South, 16 regions in the Northern and Western Member States, affecting a total of 16.4 million inhabitants; also benefited from convergence objective support. For these regions, a phasing-out system has been granted for this programming period[6].

The total EU budget for EAFRD implementation 2007 – 2013 is of Euro 77.66 billion. The specific allocations per each Member State were agreed in 2006 as follows:

[6] DG Regional Affairs web-site

Figure 1 - Community Support for Rural Development by Member State 2007 - 2013

Current prices	07–13 total	of which Convergence total
Belgium	418.610.306	40.744.223
Czech Republic	2.815.506.354	1.635.417.906
Denmark	444.660.796	0
Germany	8.112.517.055	3.174.037.771
Estonia	714.658.855	387.221.654
Greece	3.707.304.424	1.905.697.195
Spain	7.213.917.799	3.178.127.204
France	6.441.965.109	568.263.981
Ireland	2.339.914.590	0
Italy	8.292.009.883	3.341.091.825
Cyprus	162.523.574	0
Latvia	1.041.113.504	327.682.815
Lithuania	1.743.360.093	679.189.192
Luxembourg	90.037.826	0
Hungary	3.805.843.392	2.496.094.593
Malta	76.633.355	18.077.067
Netherlands	486.521.167	0
Austria	3.911.469.992	31.938.190
Poland	13.230.038.156	6.997.976.121
Portugal	3.929.325.028	2.180.735.857
Slovenia	900.266.729	287.815.759
Slovakia	1.969.418.078	1.106.011.592
Finland	2.079.932.907	0
Sweden	1.825.647.954	0
United Kingdom	1.909.574.420	188.337.515
	77.662.771.346	28.544.460.460

European Commission (2006) page 18

1.1. How Rural Policy is Implemented at National Level

The EAFRD is implemented through programming. At the beginning of the seven years programming period Member States must submit to the European Commission Rural Development Programmes (RDPs) covering the whole period. The European Commission ensures the RDP meets all legal and financial requirements –as defined in the official documents described in section 2.1; before submitting it for approval to the Rural Development Committee (called the EU Committee for Agricultural Structures and Rural Development and known as the STAR Committee), composed of the Commission and the Heads of the Rural Development departments of each Member State administration.

Rural Development Programmes are developed at the most appropriate geographical level, according to the administrative structures of each Member State. Countries with central governments, limited territories or limited measures on offer may develop a single plan (e.g. respectively France, Slovenia and Sweden). Federal countries, or those with a regional set-up may develop a separate RDP for each region (e.g. for each German Land, or Spanish region, or country in the U.K.) potentially accompanied by an over-arching –generally more limited; national programme.

Managing authorities must be designated for the development, implementation and financial management of RDPs. Often, the Ministries for Agriculture, Land Management or the Rural Environment will be the lead authority. However, the EAFRD requires rural development policy to be implemented in *partnership* not only between the Commission and the national managing authority, but also that Member States: *"…designate the most representative partners at national, regional and*

local level and in the economic, social and environmental or other sphere[7]*"*. These partners are to be consulted on the development and implementation of the RDP. They are also eligible to participate in RDP Monitoring committees. These committees are responsible for monitoring the effectiveness of the RDP, by periodically reviewing progress in implementation and –if necessary, considering or proposing to the Managing authority: *"any adjustment or review of the programme […] any proposal to amend the content of the Commission decision on the contribution from the EAFRD"*[8]*.*

1.2. Opportunities for Revising RDPs

Managing authorities are required to mandate independent evaluators to produce a fairly large number of progress and evaluation reports to accompany the development and implementation of their RDPs:

- *Ex ante* evaluations: when drawing-up RDPs, with the aim of optimising resource allocations and ensuring programming quality;
- Mid-term evaluations: in 2010, examining the rate of resource use, the effectiveness and efficiency of the programme, its socio-economic impact and impact on overall Community priorities. *"That mid-term evaluation shall propose measures to improve the quality of programmes and their implementation.*[9]*"*;
- *Ex post* evaluations: in 2015, examining the rate of resource use, the effectiveness and efficiency of the programme, its socio-economic impact and its impact on overall Community priorities;
- Annual progress reports: from 2008, addressing progress against objectives set, any changes in the general conditions, a summary of on-going evaluation activities, including on communications and technical assistance.

Drawing from any of the above evaluations, Managing authorities can submit requests for programme revisions once per calendar year, from the second year of implementation onwards. Requests need to be substantiated by explaining any problems encountered that would justify change, the expected effects of change and the relationship between the proposed changes and the national strategy plan[10].

Proposed changes can concern the introduction of new measures, the withdrawal of existing measures, information on existing measures in the RDP or even funding: *"transferring within a calendar year from and to any axis up to 1 per cent of the total EAFRD contribution to the programme for the entire programming period.*[11]*".*

The European Commission has limited responsibilities in the framework of monitoring, evaluating and revising RDPs. The only lead responsibility of the Commission is to ensure "sound financial management"[12]. A responsibility shared between the Commission and the Member States is to define

[7] Council Regulation (EC) N° 1698/2005 art. 6-1
[8] Ibid. art. 78
[9] Ibid. art. 86 - 4
[10] Commission Regulation (EC) N° 1974/2006 art. 6
[11] Ibid. art. 9
[12] Council Regulation (EC) N° 1698/2005 art. 73

the "common monitoring and evaluation framework[13]" to be used in reporting. To this end the Commission issues a rather large volume describing how Member States should monitor results, outputs, impacts etc and describes a substantial range of indicators to do this. Further Commission responsibilities are ensuring the reports are submitted on time[14], and commenting on them –if necessary[15].

The Commission does have two key responsibilities with regards to defining the scope and purpose of EU rural policy. It can review the European Strategic Guidelines for Rural Development: *"With a view to taking into account of major changes in the Community priorities in particular[16]"*. This review is intended for the current programming period. It can be assumed that any changes to the Strategic Guidelines would require Member States to assess the meaning of the review for their RDPs and justify any decision they might take to not include changes to their programmes. Finally, it is for the Commission to propose whether a further rural policy for the EU should follow the EAFRD post 2013.

In 2011 and 2013 the Commission will submit summary reports of the Member State evaluations to the Council and to the European Parliament[17] reporting on progress in achieving the EU priorities as set-out in the Strategic Guidelines. During the past programming period (2000 – 2006) the Commission also mandated an independent Impact Assessment of its rural development programmes[18], as well as issuing its own Impact Assessment[19]. Both of these papers were prepared in view of informing and shaping the current policy. Should a further rural development programming period be envisaged for post 2013, it is fair to assume that at least a similar –if not more detailed, process of analysis and revision would be undertaken by the Commission so as to be able to justify both the need for the policy and the ensuing funding allocations. At this time, however, it is unknown whether rural development policy will be pursued post-2013.

A "Health Check" in 2008 on how well the 2003 reform of the CAP is performing and a complete Budget Review in 2009 for the EU post 2013; are the two big non-rural policy challenges facing the future of rural development policy. The CAP Health Check is likely to be carried-out progressively over the next couple of years. It is highly unlikely to address any changes to the substance of rural policy for this programming period. However, it might bring about changes to other CAP instruments which could –by rebound effect, touch any rural policy envisaged for post 2013, particularly as regards funding and environmental *versus* agricultural priorities.

The Budget Review is scheduled for 2009. Given the troublesome experience of the last negotiations, the Summit of EU Heads of Government agreed already in December 2005 on this schedule in order to ensure a budget is agreed and allocated from 1st January 2014. Whether the schedule will prove effective will depend on the political state of the Union at the time. The Budget Review is likely to be fundamental for the future of rural policy. It will of course define how much money may be allocated to

[13] Ibid. art. 80
[14] Commission Regulation (EC) N° 1974/2006 art. 61
[15] Council Regulation (EC) N° 1698/2005 art. 82 - 3
[16] Ibid. art. 10
[17] Ibid. art. 14 – the reports will also be sent to the Economic & Social Committee, and the Committee of the Regions
[18] EPEC (2004) Impact Assessment of Rural Development Programmes in View of Post 2006 Rural Development Policy
[19] Commission Staff Working Document SEC(2005)914 and COM(2005)304 Final

it. More importantly, it may also define the over-arching priorities that should be delivered through EU funding, and thus define the purpose of any future EU rural policy.

2. Diffuse Pollution and EAFRD: a Legal Bind?

Very brief mention is made of any environmental (or other) issue in the **EAFRD Regulation**, as this legal text provides the toolkit for identifying and addressing problems, and does not expand on describing problems. Paragraph 31 of the preamble refers to environmental challenges and the key issues to be addressed. A short list of six lines follows, containing the following most relevant themes: the protection of water and soil, the reduction of ammonia emissions and the sustainable use of pesticides.

The **Strategic Guidelines for Rural Development** do make explicit mention of water pollution from agriculture when describing the challenges faced by rural areas: *"As regards water quality, total nitrogen surplus has declined slightly since 1990 in most of the old Member States, although some countries and regions still experience significant nutrient leaching problems. Problems of ammonia emissions, eutrophication, soil degradation […] persist in many areas.*[20]*"*. However, as the above quote indicates, water pollution (implicitly including diffuse water pollution) is listed as only one among several environmental pressures faced by rural areas. The whole chapter describes an even greater range of social and economic challenges facing rural areas.

Despite its implicit mention as a significant challenge, diffused water pollution from agriculture (DWPA) is not listed amongst the priorities for rural programmes. This should not be understood as an exclusion, as the priorities listed remain at quite broad a level. For example, in describing the priorities for expenditure under the "Improving the environment and countryside" axis II, the Strategic Guidelines list three high-level priority areas against which Member States are encouraged to develop measures:

1. Biodiversity, and the preservation of high nature value farming and forestry systems;
2. Water;
3. Climate change mitigation.

Tackling diffuse water pollution from agriculture through the EAFRD can comfortably be seen as servicing the objectives of point 2 – water. Depending on the measures taken and the type of problems engendered, tackling DWPA can also deliver for either biodiversity or climate change mitigation objectives.

The Guidelines further provide examples of key actions that Member States: *"are encouraged to focus*[21]*"* on. Here, the integrity of water and soil resources is clearly linked to farming and forestry activities. Given this explicit link, measures which can support maintaining and protecting such resources are explicitly called for in the document.

The Strategic Guidelines call on Member States to ensure consistency when programming their rural development measures and expenditure with the priorities, strategies and objectives of a wide range of EU strategies and policies. The starting point in ensuring consistency is in using the EAFRD measures to support the delivery of the objectives of Göteborg strategy for sustainable development and the Lisbon strategy for growth and jobs. Whilst this is not surprising, since all EU policies should

[20] Council Decision 2006/144/EC page 4
[21] Ibid. page 6

contribute to these guiding strategies, the Rural Development Strategic Guidelines take the surprising step of inviting Member States to consider taking into account consistency with other EU-level strategies: *" …, particularly those priorities identified as requiring thematic environmental strategies (soil protection, protection and conservation of the marine environment, the sustainable use of pesticides …[22]"*. This explicit reference in agricultural-related policy to the marine environment beyond coastal areas is novel, and provides an initial legal hook for Member States keen to use EAFRD measures to address land-based sources of pollution affecting the marine environment.

The **EAFRD Implementing Regulation,** unsurprisingly, does not make any reference to DWPA within the main text, since its purpose is to instruct on *how* to use the EAFRD measures, on not on *what* to use them for. Nonetheless, its annex VIII listing the "Common Baseline, Output, Result and Impact Indicators" to be used by Member States in reporting does list water quality "Gross Nutrient Balances" and " Pollution by Nitrates and Pesticides", and soil "Areas at Risk of Erosion" and "Organic Farming" as indicators for axis II. Whilst this does provide recognition for DWPA, it disappointingly limits the compulsory use of these indicators for assessing measures aimed at environmental improvement or land management only. The indicators do not have to be used to assess the impacts of measures from axes I, III or IV, though Member States are free to do so should they want, or indeed to define additional indicators not included in the Regulation.

[22] Ibid. page 9

3. How Farming Causes Diffuse Pollution.

3.1. Linking Agriculture and Eutrophication

Eutrophication is the over-enrichment of either aquatic or terrestrial resources by nutrients. This is caused by either diffuse or point-source pollution from a wide range of human activities as well as, in certain areas, natural atmospheric depositions. The high level of nutrients stimulates plant growth which, if left un-managed can become excessive, growing beyond the oxygenation capacity of soils and waters. The depletion of oxygen can make waters uninhabitable for fish and other animal life, as well as affect basic ecosystem services (e.g. the provision of drinking water or clean bathing waters)[23]. In freshwater systems, phosphates are considered the main nutrient limiting the rate of plant growth while in coastal waters, nitrogen as nitrate or ammonia is considered the limiting nutrient[24].

Nutrient pollution can affect all waters including rivers, lakes, groundwaters, coastal waters and seas. The interconnectedness between freshwater and saltwater ecosystems serves as a vehicle for transporting land-based pollution problems to seemingly remote and detached environments. Thus, the discharge of excess nutrients in the heartland of Europe can lead to a nutrient pollution problem in the Baltic, transported maybe for several hundred or a thousand kilometres or more through river catchments and the waters that feed them.

Figure 2 – The Baltic Sea Catchment Area and Sub-Basins as Defined in PLC-4

HELCOM (2005) page 5

Everyday farming activities such as tilling and ploughing the land, disposing of slurries and farm yard manures, using pesticides, veterinary medicines and fertilisers can all give rise to the inadvertent contamination of the soil and of water supplies[25], both through diffuse and point-source pollution. As the name suggests, *diffuse* means that the pollution does not have a direct source, but results from the accumulative effect of farming activities across an area.

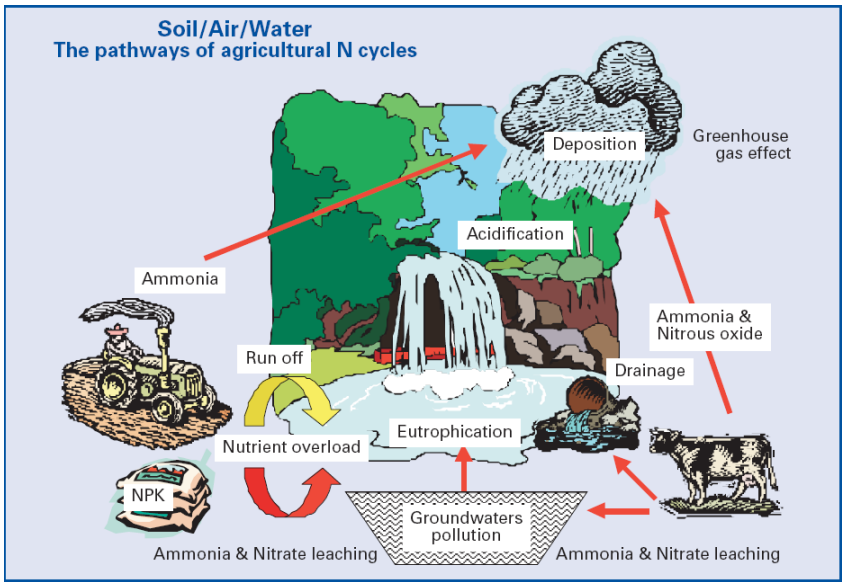
[23] EEA (2003) page 24
[24] Amin-Hanjani S. & Todd R. (2005) page 4
[25] Ibid page 2

Silcock et al. (2000) define diffuse water pollution from agriculture as "*pollution arising from agricultural land-use activities that are dispersed across a catchment, or sub catchment and do not arise as a process effluent, municipal sewage effluent or effluent discharge from farm buildings*" [26]. How prone a given site is to diffuse pollution, and the severity of the diffuse pollution, are determined by the interaction between the specific farming practices adopted across the site and the characteristics of the environment in which they are carried-out. Diffuse water pollution from agriculture (DWPA) will vary according to[27]:

- The propensity of agricultural land to release pollutants into the aquatic environment, which is largely determined by factors such as soil type, land slope and proximity to hydrological pathways;
- Land use and the specific farming practices used, which can modify the natural propensity.

For example, different soil structures determine different patterns by which pollutants access hydrological pathways. Pollutants can either be transported in solution or in suspension, and either in drainage (or irrigated) water moving through the soil or in water moving across the soil. In soils with little structure, water drains down –leaching; through the soil, transporting solutes towards groundwater tables. In more structured soils (e.g. clays and loams) water generally moves laterally, either as run-off across the surface or through surface layers via cracks, channels and, ultimately if installed, drains[28]. Weather, and in particular rainfall, is a further significant variable affecting DWPA[29]. Episodes of heavy rainfall can exacerbate the drainage of pollutants through the soil as well as run-off.

Figure 3 - Soil, Air, Water – The Pathways of Agricultural Nitrogen Cycles



European Commission (2002) page 11

Identifying the sources and extent of DWPA is difficult given the variety of different types of diffuse water pollution, and that the sources tend to be individually small, but numerous and widely

[26] Silcock P. et al. (2004) page 4
[27] Ibid page 8
[28] Amin-Hanjani S. & Todd R. (2005) page 10
[29] Silcock P. et al. (2004) page 6

dispersed[30]. Nonetheless, if rural development measures are to be offered across a given region with the objective of assisting farmers to reduce the impact of their activities on DWPA, trying to identify both the specific pollutants that are entering water sources, and the farming practices contributing to the release of these pollutants is necessary.

3.2. The Pollutants Contributing DWPA

Much is known about which pollutants emanate from agriculture, and how agricultural systems and practices might –in general terms; contribute to diffuse water pollution. This knowledge can already provide guidance as to the types of rural development measures that may be useful to apply across a territory in order to tackle DWPA, based on the farming pattern within the given region.

The main water pollutants from agriculture, their sources and problems are summarised by Silcock P. et al. (2004) as follows[31]:

- **Nitrogen levels**: Nitrogen fertilisers applied at levels above crop requirements and animal manures are major sources of nitrates found in water. Nitrogen is prone to leaching into watercourses as it is water soluble[32]. Both soil and crop types can have a significant impact on the level of risk of water pollution. Farming practices and their timing (e.g. when manures or fertilisers are applied) also determine the likelihood of pollution. The weather also affects the risk of nitrate leaching with heavy or prolonged rainfall making it more likely that nitrates are lost from soils.
- **Phosphorus levels**: Phosphorus in ground and surface waters can arise as a result of agricultural practices including soil cultivation and other techniques such as land drainage, the addition of artificial fertilisers containing phosphorus and the application of farmyard manure and slurry to soil. Feed concentrates given to livestock and excreted in manure contain phosphorus. Phosphate molecules bind to eroded soil particles and enter watercourses as run-off[33].
- **Siltation**: Soil can be lost from agricultural land by wind or water erosion or as a result of the physical management of the soil. Harvesting root crops can result in significant soil losses in some circumstances. Siltation of rivers affects the presence of fish, invertebrates and plants. Soil particles which find their way into watercourses as a result of erosion can also carry pollutants such as phosphorus, pesticides, heavy metals and micro-organisms.
- **Organic wastes**: These can comprise excreta (urine and faeces) into which can be mixed milk wastes, silage effluent and dirty water. Such materials are a source of organic carbon and nutrients such as nitrate, phosphorus and ammonia and can contain a wide range of micro-organisms, trace metals and veterinary products. The risk of release of organic wastes is high in intensive livestock systems.

[30] Ibid page 6
[31] Ibid pages 4-6
[32] Boatman N. et al. (1999) page 34
[33] Ibid page 34

- **Pesticides**: Pesticides can pollute soil and water through a variety of means including spray drift, volatilisation, surface run-off, leaching & through-flow, and drainage flow and are of both environmental and human-health concern. The timing and rate of application, the weather, soil types, drainage practices and the properties of the pesticides themselves all affect the levels of pesticides finding their way into water.
- **Veterinary medicines**: Significant quantities of animal health products are used in agriculture to improve animal welfare and increase production including treatments for internal and external parasites and the use of antibiotics for illness. Disinfectants are also used to wash udders before milking and on dairy unit equipment. The main route of entry of such products to the environment is through excreted faeces and urine and the dispersal of contaminated manures, slurries and dirty water to land.

3.3. The DWPA Risk Characteristics of Different Farming Sectors

As mentioned earlier, many everyday farming activities can lead to diffuse water pollution. Nonetheless, the practices inherent to certain sectors of agricultural production, or indeed the inherent characteristics of certain agricultural products, make some farming sectors more likely to be linked to diffuse pollution than others. Understanding which sectors have diffuse pollution risk characteristics can help to identify risk regions at which to target rural development measures addressing diffuse pollution, as well as the type of rural development measures which might be most relevant to offer. Table 2 provides a simplified typology of diffuse pollution for different farming systems.

Table 2 – Simplified Typology of Diffuse Pollution Problems per Farming System

Farm Systems ↓	Problem Typology	Causes
Intensive grassland for livestock	Overload	• Overstocking leading to phosphorus, ammonia and organic matter overloads • Direct defecation to streams • Fertiliser / manure / slurry applications above grassland requirements • Inappropriate pesticide usage • High risk feed crops (e.g. maize)
	Run-Off / Drift	• Inappropriate fertilizer or manure applications (e.g. rainfall) • Soil compaction from poor drainage (e.g. on farm tracks)
	Leaching	• Poaching (e.g. by gateways, feeders and water troughs) • Inappropriate manure management (e.g. uncontained losses from hard standings and manure heaps)
Outdoor pigs	Overload	• High stocking rates • Lack of vegetative cover • High dietary N and P feed • Nutrient hotspots (e.g. around feeding and defecation areas)
	Run-Off / Drift	• Poaching and compaction of soil • Foraging damaging soil structure • Lack of vegetative cover
	Leaching	• Inappropriate location • Infrequent rotation of feed crops
Dairy & Intensive Livestock	Overload	• Excess phosphorus in dairy feed concentrate • Overstocking
	Run-Off / Drift	• Contamination by disinfectants (e.g. to wash dairying equipment) and

Farm Systems ↓	Problem Typology	Causes
		medicines through soakaways, surface water drains or via its inclusion in stored slurry and subsequent application on land • Residues of drugs may also wash off the backs of animals in yards or on land • Poaching (especially winter out-door grazers like cattle and sheep) • Poor sheep-dip practices (e.g. leakage from poor installation and wash-off from fleece)
	Leaching	• Inadequate on-farm dirty water clearing systems • Poor siting of manure heaps adjacent watercourses or on free draining/drained ground
Arable – maize	Overload	• A wide variety of studies indicate that amongst arable crops, maize is the one that leads to the most severe nitrate leakages[34] • Yields and plants do not suffer unduly from excess nitrogen applications • Highest average pesticide applications amid arable crops
	Run-Off / Drift	• Pesticide pollution from run-off estimated at 2-5%[35] • Growing tendency to over-irrigate beyond soil water carrying capacity
	Leaching	• Lack of winter soil coverage • Frequent proximity of cultivation near water courses
Arable – general .	Overload	• The greatest impacts are associated with simplified, high-input arable systems[36] • Excess applications of pesticides above crop requirements[37] • Monoculture concentration of high risk crops (e.g. rape, sugar beet, potato) • High-risk land left un vegetated in winter
	Run-Off / Drift	• Inappropriate pesticide applications, e.g. through spraying or application in inappropriate weather conditions (e.g. heavy rainfall) • Phosphate run-off • Production of smooth seedbeds • Cultivation up and down slopes • Preferential pathway through cracks and drains
	Leaching	• Nitrate leaching can be high unless cover crops, undersowing or stubble regeneration are adopted • Increased silt loads to water courses from poor drainage (due e.g. to late harvests or inappropriate tillage)
	Accident	• Incidental pollution from spillage, inappropriate disposal, washing of sprayers

Draws from Poux (2000), Boatman (1999), Amin-Hanjani (2005) & Silcock (2004)

[34] Poux X. (2000) page 117
[35] Ibid. page 128
[36] Boatman N. et al. (1999) page 32
[37] Silcock P. et al. (2004) page 5 : Arable production is associated with the intensive use of a wide-range of pesticides, including atrazine, bentazone, simazine, chlorotoluron, diuron, mecoprop and isoproturon

4. The European Legal Context for Diffuse Pollution.

The pollution of water resources from agriculture, whether from diffuse or single agricultural sources, is a problem that European Union (EU) environmental legislation has addressed for many years. Effective implementation of these legal requirements would substantially improve the management of the agricultural sector's impact on the pollution of water resources.

To this end cross-compliance requirements on direct payments and payments under axis II measures of the EAFRD include the respect of the Nitrates and Sewage Sludge directives. Furthermore, implementation efforts around the two most significant DWPA-related freshwater policy tools –namely the Water Framework and the Nitrates directives; include recommended basic and specific measures that could be implemented through EAFRD measures (please refer to Annex 4).

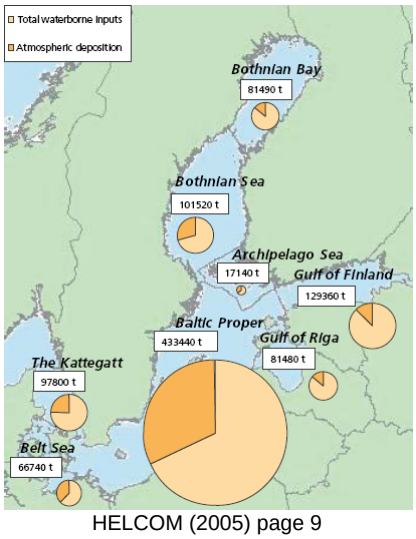
- **Water Framework Directive** (2000/60/EC): The Water Framework Directive (WFD) aims to ensure the integrity of the water environment and its associated eco-system functions by requiring the maintenance of *'good ecological and chemical' status* of surface waters where good status already exists. Or to achieve 'good ecological and chemical status' for surface waters and 'good chemical status' for ground waters where the status is poor. This includes preventing and controlling diffuse pollution from agriculture as well as other sources where this contributes to the failure to achieve good status. The WFD applies to all waters: rivers, lakes, estuaries, coastal waters out to one nautical mile, and ground waters.
- **Nitrates Directive** (91/676/EC): The Nitrates Directive concerns specifically the protection of water resources against pollution caused by nitrates from agricultural sources. Article 10 of the Nitrates Directive requires that Member States submit a report to the Commission every four years, including information about the codes of good farm practice applied in the country, designated nitrate vulnerable zones, any results from water monitoring and a summary of relevant aspects of action programmes for vulnerable zones[38].
- **Sewage Sludge Directive** (88/278/EEC): seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to prevent harmful effects on soil, water, vegetation, animals and man. The Directive also requires that sludge be used so that account is taken of the nutrient requirements of plants and that the quality of the soil and of the surface and groundwater is not impaired[39].
- **Waste Framework Directive** (75/442/EEC): establishes the basic legal framework on waste management at Community level. Of limited relevance today for DWPA, however according to Silcock et al. (2004) agricultural waste is likely to be covered by this directive in the future, thus reducing the risk of diffuse pollution from currently uncontrolled farm dumps. Currently the directive requires, for example, waste management planning and respect of the polluter pays principle.

[38] DG Environment web-site http://ec.europa.eu/environment/water/water-nitrates/report.html
[39] DG Environment web-site http://ec.europa.eu/environment/waste/sludge/index.htm

- **Bathing Waters Directives** (76/160/EEC and 2006/7/EC): these directives require specified microbiological standards to be met, some of which are threatened by diffuse agricultural pollution. Meeting bathing water standards is also supported by the effective implementation of the Water Framework Directive.
- **Birds & Habitats Directives** (respectively 79/409/EC and 92/43/EC): these two directives, and their dedicated financial instrument, the "LIFE-Nature" fund, form the cornerstone of EU conservation policy. Their priorities are to create the European ecological network (of special areas of conservation) called NATURA 2000, and to integrate nature protection requirements into other EU policies such as agriculture, regional development and transport.

Data from HELCOM confirms the link between the pollution of land based water bodies in its catchment area and eutrophication in the Baltic Sea. According to HELCOM (2005), waterborne inputs constituted the main input of nitrogen (75 per cent) and phosphorus (nearly 100 per cent) to the Baltic Sea in 2000. Furthermore, figures for nutrient input from different sources within the Baltic Sea catchment area indicate that the majority of waterborne nitrogen and phosphorus originated from diffuse sources, with inputs from agricultural land being the main diffuse source.

Figure 4 – Proportion of Waterborne and Airborne Nitrogen Inputs into the Baltic Sea Sub-Regions in 2000



HELCOM (2005) page 9

Given this interconnectedness between freshwater and saltwater ecosystems, achieving effective implementation of all of the above directives is a necessary step in tackling eutrophication in Europe's seas. Strategically, using the interface of freshwater environmental legislation can also help non-environmental policy-makers better understand the links between agricultural and land-based pressures to pollution problems in seemingly distant high seas.

A further advantage of linking the eutrophication problems of the Baltic environment with freshwater legislation is that the role of agriculture, its pressures and impacts, have been clearly identified and referenced both in freshwater (cf. for example Annex 4) and agricultural (cf. for example EAFRD Strategic Guidelines page 6) legislation. There is no longer need to make the case about whether agricultural practices need to be adapted to safeguard freshwater resources. Discussions now focus

on how the practices should be adapted, and the cost-benefits of doing so (cf. for example the work of the Common Implementation Strategy of the WFD).

4.1. Marine Strategy Directive

This is not, however, yet the case in the negotiations relating to the up-coming Marine Strategy Directive[40] (COM(2005)505). Proposed by the European Commission in October 2005, the Directive puts forward a framework for the development of national strategies to improve the health of Europe's seas. It requires Member States to draw up national strategies to enable them to achieve a healthy marine environment, or 'Good Environmental Status' (GES) - by 2021. As part of delivering national strategies, Member States have to produce: i) an environmental assessment of the current state of their marine waters; ii) a list of environmental targets; iii) a monitoring programme; and iv) a programme of measures. The Directive does not, in its current form, suggest follow-up legislation.

According to the NGO community, the proposal does not build on or aim to work in conjunction with the Water Framework Directive (WFD) or other relevant legislation. Furthermore, it contains no clear vision of what constitutes a healthy marine environment. Instead, the Commission proposes that "*generic qualitative descriptors, detailed criteria and standards for the recognition of good environmental status*" be established by means of the comitology procedure two years after the Directive is adopted[41]. NGOs fear this may lead Member States to set different national standards, draw up different definitions of GES, and consequently set different priorities for monitoring and assessing the marine environment in seas that are shared, instead of working collectively.

[40] Greenpeace (2006)
[41] Greenpeace et eNGOs (2006)

5. What Potential does the EAFRD Hold?

5.1. EAFRD Measures with a Direct DWPA Improvement Potential

It is widely believed that rural development measures, if well implemented, can be an important means to deliver environmental management and protection[42]. However, there are no widely known studies that assess the environmental impact or even the environmental potential of the full range of EU rural development measures. Knowledge is even more limited of the impact of rural development measures on water[43].

Annex 1 to this report provides a systematic review of EAFRD measures with the potential to address diffuse pollution from agriculture. This chapter looks more specifically at some of the more commonly used measures.

Often, environmental studies target the agri-environment measure[44]. However, experience collated since the 1990s and over the past two EU rural policy programming periods indicates that many measures drawn from across all four axes of the EAFRD, including measures traditionally associated with the farm only as an economic unit (e.g. Art. 26 – Modernisation of agricultural holdings) can deliver important environmental improvements[45], both directly or in a supporting role, and even more so if various measures are used in combination to address the range of constraints (e.g. income, investment grant opportunities, know-how), affecting a farmer's practice[46].

Measures that can have a *direct* impact on reducing DWPA are those measures that require changes in practices (e.g. organic farming) or support infrastructure or land improvement investments. These include:

Agri-Environment (art. 39): Agri-environment has undoubtedly been one of the most frequently used measures to address diffuse water pollution and other environmental problems in agriculture, by providing financial support to cover costs incurred or compensate for income foregone in delivering environmental services above and beyond those required by law or basic good practice. Typical measures over the years have included: long-term environmental set-aside, buffer zones near water courses, organic farming or maintaining vegetative cover against soil erosion. The Commission's impact assessment on the use of this measure in the previous programming period reports on twelve cases submitted by Member States where water quality had improved, or *was likely to have improved*, through agri-environment schemes. In many of the examples, impacts on water were not measured, but water resources were considered to have been affected by changes in practice due to the reduction of fertiliser and pesticide inputs, promotion of organic farming and integrated crop management[47]. Under the EAFRD the assumption of positive impact based on the potential of the measure is again the test for this measure as the implementing regulation stipulates that: *"Commitments to limit the use of fertilisers, plant protection products or other inputs shall be accepted*

[42] See for example : Dworak T. et al. (2005) & (2006), WWF et al. (2005) & WWF Scotland, Amin-Hanjani S. & Todd R. (2005)
[43] Dworak T. et al. (2006) page 7
[44] Dworak T. et al. (2005) page 11
[45] WWF (2005) page 24
[46] Dworak T. et al. (2005) page 11
[47] EPEC (2004) page 53

only if such limitations can be assessed in a way that provides reasonable assurance about compliance with those commitments[48]".

Payments Linked to the WFD (art. 38): This is a new measure, introduced with the EAFRD, and the first explicit reference to water policy in the framework of agricultural funding. The aim of the measure is to provide compensatory funding for income foregone or costs incurred in implementing the WFD. Implementation should be tightly connected to carrying out the actions included in the 'programmes of measures' (PoMs) identified within each river basin management plan[49], though a large portion is likely to be disbursed to compensate for restrictions placed on farmers.

Infrastructure related to the Development and Adaptation of Agricultural and Forestry Measures (art. 30): There are a number of technological developments that have a role in controlling diffuse pollution particularly from intensive farming. Precision application of inputs tailored to within field variation using GIS and satellite technology is such an example[50]. According to Dworak T. et al. (2005) reporting on the Commission's impact assessment of the use of this measure in the previous programming period, most evaluations indicated positive effects on water quality protection through the implementation of measures relating for example to the development and improvement of infrastructure related to water protection. The Austrian and Bavarian (Germany) programmes both reported the positive effects of such measures on their water quality[51].

Less-Favoured Areas (art. 37 & 50): This measure can contribute to reducing DWPA through the maintenance or promotion of extensive farming, often in the livestock sectors. Nine reports of such benefits were reported in the European Commission 2004 assessment of measures from the past programming period[52]. Poux X. (2000) also reports on the need for increased support for grassland areas and farming on extensive grassland systems as a means to countervail the polluting impacts of silage maize production[53].

Participation in Food Quality Schemes (art. 32): Organic farming and other environmental quality assurance schemes recognised by Member States, such as Integrated Pest Management (IPM) for example, have a role in controlling diffuse pollution particularly from intensive crop farming. For instance, integrated Pest Management can help reduce pesticide dependence. These schemes can be supported under either this measure or the agri-environment measure.

Adding Value to Agricultural & Forestry products (art. 28): Under the previous programming period, France used this measure with success to reduce the environmental impact and pollution of agricultural process: *"In France (RDP) for example there have been environmental improvements through the reduction of waste, discharges and environmental pollution and supplying of products made through environmentally friendly farming practices.[54]"*.

[48] Commission Regulation (EC) N° 1974/2006 art. 27-3
[49] Dworak T. et al. (2006) page 7
[50] WWF Scotland
[51] Dworak T. et al. (2005) page 12
[52] Dworak T. et al. (2005) page 12
[53] Poux X. (2000) page 120
[54] EPEC (2004) page 58

As the above review suggests, there are several measures under the EAFRD that could potentially be used to address diffuse water pollution from agriculture. However, the articles in the EAFRD are unlikely to become actual effective pollution prevention measures unless the competent Managing authorities have clearly identified the specific mitigation activities and actions that need to be undertaken – and that require financial support from the public purse. For England, for example, such an analysis has helped national authorities identify the best measures for their own farming context and environment: *"The most effective on-farm mitigation measures fall into three activity categories – nutrient management, soil erosion and runoff prevention, and farm landscape and infrastructure changes. The most effective mitigation measures for tackling N and P pollution relate to manure management. Soil management measures are shown to be comparatively less effective.[55]"*.

5.2. EAFRD Measures with the Potential to Support DWPA Improvement

Many of the constraints on farmers to effectively tackling diffuse water pollution relate to limited human resources, time constraints and knowledge gaps.

Measures that can have a *supportive* impact on reducing DWPA are those that can fund investments in the awareness and knowledge base of people (e.g. training) or co-operative approaches to learning and action (e.g. networks).

Advisory Services to Farmers (art. 24, 25): The attitudes of farmers can take time to evolve[56]. Farmers may not always see the need to implement measures to tackle DWPA –even if available; in particular as the responsibility for the impacts are difficult to link to any one farm. Farmers need to understand why measures are needed and what kind of benefits they can reap from implementing them. Advisory services can fulfil precisely such roles. The aims of the advisory services measures is to provide financial support for farmers to make use of advisory services, as well as financial means to set-up and start running advisory services that can support farmers in meeting their statutory obligations. Advisory services can prove to be extremely effective: *"There are some cases where compensation payments to farmers were not necessary, thanks to effective advisory programmes[57]"*.

Training and Skills Acquisition (art. 57, 58): With increased awareness of the environmental impacts of farming, many farmers want to ensure they do not cause environmental degradation. However, finding information and learning new approaches can be daunting and difficult. As the role of statutory farm advisory services has diminished in many Member States, the relative importance of providing education, technical assistance and advice to farmers – in particular with respect to new approaches and legal requirements; becomes all the greater: *"Implementing the WFD is complex and requires new ways of working across the EU.[58]"* or as the Lithuanian draft RDP indicates: *"… there is a lack of specialised consultations and training in the field of ecological farming and implementation of environmental and other requirements […]. Therefore, it is important in the future to ensure the*

[55] Amin-Hanjani S. & Todd R. (2005) page 10
[56] Dworak T. et al. (2004) page 4
[57] Dworak T. et al. (2005) page 14
[58] Amin-Hanjani S. & Todd R. (2005) page 6

provision of such type consultations to farmers and rural dwellers.[59]". New measures introduced under the EAFRD include training beyond advisory services, to help farmers (and other rural stakeholders) in environmental awareness and investments associated with the maintenance, restoration or up-grading of the natural heritage.

Monitoring (& data collection) (art.79): Monitoring should be a process of evaluation executed throughout the whole lifetime of a programme, with the intention of correcting any deviation from operational objectives and of improving programme performance[60]. Monitoring is especially important for programmes aimed at water protection, as these do not always result in fast improvements in water quality[61]. Monitoring has always been a requirement of EU-funded rural development programmes. However, the Commission's guidelines for monitoring have taken the approach of asking beneficiaries fairly open questions such as: *"what has been the effect of this measure on the environment?*[62]". This has not helped beneficiaries or Member States assess actual progress. The evaluations carried-out at the end of the last programming period demonstrated this. Some authorities (e.g. Denmark, Flanders) considered that there had been some impact on the environment, but that many impacts were hard to assess due to poor monitoring and documentation[63]. Data collected for the WFD Art. 5 reports on impacts and pressures to river basins should be used to help define the objectives and EAFRD measures that could usefully address DWPA. Furthermore, as the WFD's water management planning cycle (as described in Annex 4) is an iterative process, with ongoing monitoring and reviewing phases, where Member States use the results of previous analyses to identify and prioritise the follow-up actions for the next stages[64]; the results of the ongoing monitoring could also be used to establish indicators to assess the impact of EAFRD measures[65]. For this to happen, it is clear that the relevant competent water and rural authorities should work together. Monitoring and data collection are not measures to be funded under the EAFRD, but part of the evaluation cycle Member States are obliged to implement (as described in section 1.3).

National Rural Networks (art. 68) & the Leader approach (art. 61): the potential synergies that could arise from broader and more effective collaborative efforts between water and agriculture stakeholders could substantially increase the understanding of the needs of both sectors, improve the potential to identify relevant actions, and to implement them effectively as well as share best-practice. In order to address the specific support required by water (and potentially, in the future, marine) authorities to address DWPA, rural authorities need more detailed information from the River Basin (and Coastal) Management Plans, including –for example- the potential contents of the PoMs so that these can inform the planning of EAFRD measures[66]. The EAFRD recognises the potential benefits of collaborative action, as well as the importance of full stakeholder participation. Through these articles the EAFRD promotes and financially supports such approaches. National Rural Networks are

[59] Ministry of Agriculture Lithuania (draft 2006) page 8
[60] WWF et al. (2005) page 36
[61] Dworak T. et al. (2005) page 14
[62] WWF et al. (2005) page 36
[63] Dworak T. et al. (2005) page 12
[64] WWF et al. (2005) page 42
[65] Dworak T. et al. (2005) page 20
[66] Ibid. page 16

compulsory, and must be established by the end of 2008 at the latest[67]. LEADER must also be implemented, and offers the particular benefit of being able to operate trans-nationally, across national administrative boundaries.

5.3. Some Constraints on Tackling DWPA through the EAFRD

Lack of Priority for Administrations: The existence of EU rural measures that can tackle DWPA does not automatically mean that Member States have or will make use of the opportunities available to them. Despite the legal foundations upon which it is based, water protection is only one amongst the many European-level priorities for rural development measures. At national level, though Member States are obliged –over time; to reach the good status required under the WFD; water protection may represent an even lower priority amongst the full range of environmental, let alone socio-economic, priorities for rural development.

Limited Budgets: Whilst Member States are obliged to allocate minimum expenditure levels to each of the four axes of the EAFRD, they are entirely free to decide whether to allocate any money or not to water protection. Again, this will depend on their specific national priorities. Nonetheless, even if a country decides to use a significant portion of the EAFRD funds available to it for water protection, as the Strategic Steering Group on the WFD & Agriculture reported in their 2006 analysis: "*Due to budget cuts, but also to the large scale of the problem, current rural development funds will not be sufficient to tackle all pressures related to agriculture. Therefore, it will be necessary to consider additional funds.*"[68].

Table 3 – Estimation of the Relation Between Rural Development Budgets (2000-06) & Costs Incurred from Water Pollution from Agriculture

Region	Pressure	Costs of pressure	Average annual RD-budget of the MS [(a)]	Total RD-budget 2000-2006 of the MS
Germany	Nitrate	1 250 to 5 000 million Euro/year [(b)]	2 144.90 million Euro	15 014.3 million Euro [(c)]
Germany (West) (contamination of drinking water)	Pesticides	64 to 93 million Euro/year [(d)]		
England and Wales	Diffuse pollution	£385 million/year (554 million Euro/year) [(e)]	658.88 million Euro	4 612.20 million Euro [(f)]
France (700 000 hectares of drinking water catchments, representing 2% of the overall national agricultural area)	Diffuse pollution	150 million Euro/year [(g)]	3 934.48 million Euro	27 541.35 million Euro [(h)]

(a) The figure given in the table for the annual RD budget is calculated by dividing the total RD budget for 2000-2006 by the amount of years covered (7 years).

(b) The annual external costs are calculated for emissions to ground and surface waters and atmosphere in 1995 (Schweigert and van der Ploeg, 2002).

(c) The figures for Germany are taken from the EU RD country profile pages (European Commission, DG Agriculture, 2003a).

(d) This figure includes the contamination with pesticides in the former Federal Republic of Germany before unification (without the former East Germany). Source: Waibel and Fleischer, 1998.

(e) The costs are given on 2004 price basis. Source: EA, 2005. Please note that the end figure is a conservative estimate. The costs and benefits in this report are derived from the following sources: EA, 2002; Eftec, 2004; EA, 2004; DEFRA and Welsh Assembly Government.

(f) Source for England: DEFRA, 2005; and for Wales: The National Assembly for Wales, 2000.

(g) Costs are only addressing drinking water catchment issues. Source: Personal communication from the French Water Direction, 2005.

(h) The figures for France are taken from the EU RD country profile pages (European Commission, DG Agriculture, 2003b).

[67] Commission Regulation (EC) N° 1974/2006 art. 41-4
[68] Dworak T et al (2006) page 7

From Dworak T. et al. (2005) pages 40

Reticence of Administrations: Another significant break on administrations using rural development measures for DWPA if they have no history of doing so is their frequent reticence to try new measures or re-locate funding from previously supported measures and regions: *"many authorities prefer to roll forward existing measures and schemes which they have applied in the past (and are confident of administering) rather than offering new measures or developing new approaches to existing measures.*[69]*"*. The draft National Strategy Plan for Poland's planned EAFRD expenditure is an example of this: *"The financial division (%) between the axes has been done having taken into account the following aspects:[…] i) Experience and monitoring data from the realised programmes: SAPARD, RDP and Sectoral Operational Programme Restructuring and modernization of the food sector and rural development 2004 - 2006; ii) The need to take into account "old" obligations from the programming period 2004-2006, (ca. 2.8 billion EUR)[…].*[70]*".*

[69] WWF et al. (2005) page 24
[70] Ministry of Agriculture & Rural Development Poland (draft 2006) pages 23-24

6. Early Indications for a New Programming Period.

Table 5 collates (through a selective, basic cut-and-paste process, with minor linguistic adaptation to accommodate the cuts) information from English version official rural development documents available from the web-sites of the eight EU Member States bordering the Baltic sea. Not all of the eight Member States have or publish on the internet English version documents. They are under no obligation to do so. Member States are free to submit official documents in any official EU language. At the time of writing, end of March 2007, of the eight countries of interest for this study:

- Lithuania is the only country whose web-site provides the draft Rural Development Programme 2007-2013 in English;
- Latvia, Finland and Poland's web-sites provide English versions of the National rural development Strategy Plan (NrdSP) 2007-2013, produced in accordance to the requirements of the EAFRD regulation and the Community Strategic Guidelines;
- Estonia's web-site provides an English version of the Rural Development Programme 2004-2006 – used here as a reference of past environmental assessments and use of RDP measures. (documents relating to 2007-2013 are available in Estonian)
- Germany (NrdSP available in German), Sweden (draft RDP available in Swedish) and Denmark do not provide information in English.

At the time of writing no Rural Development Programmes 2007-2013 have yet been approved[71]. Where reference is made to the EAFRD in the right-most column of table 5, this refers to material published in the National Strategic Plans (NrdSPs) or Lithuania's draft RDP. These are a reliable source of information, but differences between measures suggested in these documents and the final EAFRD Rural Development Plans could occur.

Case studies of measures and projects of potential interest have been included in Annex 3.

The Latvian NrdSP indicates a clear focus on biodiversity amongst the environmental pressures from agriculture that should be tackled via EAFRD funding. Similarly, the Estonian RDP for the past programming period highlights the important contribution of Estonian plant and animal biodiversity to Europe's natural heritage. Nonetheless, the status of waters, soil and the pressures they suffer from agriculture do form the most significant portion of the agri-environmental measures offered. The Finnish NrdSP is more descriptive than the Latvian one, and does not detail the exact EAFRD measures the government intends to use to deliver on its priorities. Despite indicating that the nutrient loads of Finnish surface and ground waters from agriculture are a particular problem, measures to address this are not included as a priority in any of the approaches proposed under the four EAFRD axes. The Polish NrdSP is brief and descriptive, like the Finnish one. Tackling the challenges of social and economic development are clearly highlighted as remaining the highest priority for EAFRD expenditure. Furthermore, whilst the poor state of soil and water resources is described in the NrdSP, it is not deemed to be linked primarily to

[71] Personal communication with the IEEP, 20th March 2007

intensive or poor agricultural practices. Measures offered to address the environmental impacts of agriculture concern, therefore, training, advice and agri-environmental measures to help farmers meet the requirements of EU environmental legislation and prevent potential future problems linked to the restructuring and (hoped for) intensification of production.

Lithuania is the only country to have published an English version of its draft national Rural Development Programme 2007-2013 on internet. Information about Lithuania's ambitions and the specific measures it intends to use to reach those ambitions is clearly greater than that available for the other countries reviewed. However, the document published is a DRAFT, and therefore might still change following negotiations with the European Commission and the Rural Development Committee (see section 2.2). The Lithuanian document includes the ex-ante evaluation and independent strategic environmental assessment – pre-requisites to the RDPs approval. The document also provides greater insight into the type of indicators the Lithuanian authorities intend to apply to assess the performance of the measures implemented.

Table 4 – How DWPA is Addressed in Selected NrdSP & draft RDPs 2007-2013

	Status as Described			**Measures Used & Proposed**	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
Latvia NrdSP 2007-13	Agriculture is the main source of **ammonia** emissions in Latvia. They are expected to increase with livestock expansion. The amount of **manure** put in to the soil has decreased since early 90ies. In 2001 the level of manure worked in to the soil was 3 % of amount in 1990. The highest loads of **organic matter and biogenic elements (nitrogen and phosphorous**) are produced by agricultural processing establishments, sea-ports and establishments of other industries.	3.7% of the Latvia's territory is covered by surface **waters**. According to monitoring data from 527 smaller rivers obtained in 1998, based on the criterion: biological status of water environment: • 21 % are clean or slightly polluted • 64 % of rivers are evaluated as slightly polluted • 11 % - as polluted • 4 % - as highly polluted • 90 % of lakes are subject to processes of anthropogenic eutrophication. Degradation of **soils** is the one of environmental problems created	Results of a year 2000 study revealed the non – existence of relevant **manure handling and storage** facilities in 92 % of farms questioned. Inspections by the state environmental service between January and August 2006 found 31of 56 farms did not have manure handling and storage facilities, and in 2 of them were not appropriate. **Organic farming** has grown significantly concerning both farm sizes and area. In 2005 the certified areas occupied 4.2% of all agricultural land. The number of organic farms over the last period of time has doubled so, that out of 2873 farms 506 are already organic, 535 have been awarded the second year	**Nitrates Directive**: Taking account of the gradual transition to more intensive agricultural methods in the future, agriculture may endanger the quality of inland and Riga Gulf waters. In May 2004 an Action Program was approved for particularly vulnerable territories. In 2004, the average annual nitrate nitrogen (N/ NO_3) concentration in particularly vulnerable territories per river was 0,8 – 6,4 mg/l. In particularly vulnerable locations with intensive agriculture the highest established water pollution was 38 mg/l. Good Agricultural Practice conditions (hereinafter GAPC) were elaborated in 1998 – 1999. They represent an extensive aggregate of advice,	**Axis I: (50% budget)** • Development of organic and integrated agricultural products processing; • Investment into Environment Infrastructure - improving reuse of agricultural by-products, including their processing into biogas and other usable products, particularly in the field of animal production; • Enhancement of Knowledge and Skills - provision of agricultural advisory services. **Axis II: (30% budget**) • Agri-Environment - support provided to environmentally friendly production methods aimed at conservation of

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
		by agriculture. There are two erosion types: water erosion and wind erosion. 9.3% of the arable land area threatened by wind erosion, while water erosion affects 15.4% of the arable land. Establishment of large-sized flat crop fields has enhanced wind and water erosion and depletion of plant feed material. Organic matter decrease in mineral soils has taken place in 25 % of all areas.	transition period, while 1832 entered upon the first year transition period	recommendations and regulatory enactments covering the main fields of agricultural activity and applicable on voluntary basis in the whole territory of Latvia.	biological diversity, improvement of sustainable use of natural resources (such as maintenance of soil fertility, lowering the erosion and acidification of soils, improving water protection, preserving the cultivation of breeding of farming animals of important local breeds; reducing of climate change), a higher product quality, reduction of diffusive pollution with nitrates and phosphorus. ● Assistance to attain objectives laid down in the Water Framework Directive. ● Support to Agricultural Activity in Less favoured Areas. **Axis IV (at least 2.5%)** LEADER approach will be achieved by implementation of separate measure consisting of support to local action groups, their training and implementation on cooperation projects. **Indicators** Average concentration of nitrates in vulnerable zones, mg N/NO_3 per litre: 0.8 – 6.4.
Estonia RDP 2004-06	In the 1970s and 80s intensified and concentrated livestock production caused groundwater pollution in areas where Quaternary deposits are thin. Surface water and air were also polluted; the condition of soils was impaired. The main **diffuse sources** of pollution of nitrogen compounds in	Most of the Estonian **water bodies** (rivers, lakes, and coastal waters) are rather shallow and therefore sensitive to pollution. In Estonia, groundwater is divided between five aquifers, the uppermost being insufficiently protected in most areas. The nitrogen content of Estonian rivers is generally quite high in	Most of the existing **manure storage facilities** are too small considering the number of animals in the holding, and many facilities are deteriorated. Over 80% of manure storage facilities are older than 10 years. Sedimentation basins and buffer swamps, which greatly reduce the risk of transfer of agricultural	In accession negotiations with the EU, Estonia undertook to bring all manure handling into compliance with the requirements of the WFD. Under the **meeting standards** measure further investments were made to the manure storage, transport and spreading equipment. **Agri-environmental support**:	

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
	water bodies are the mineral and organic fertilisers used in agriculture. In 1997–2000, 77–89 kg/ha of active substances (N+P2O5+K2O) of mineral fertilisers were applied to fertilised fields. The quantities of **nitrogen** taken to the agri-ecological systems have decreased 3–5 fold. While 72,000–112,000 tonnes of active substances of nitrogen fertilisers were used to fertilise field crops in 1980–1990, the quantity has dropped to only 20,000–25,000 tonnes in recent years (1997–2000). Nitrogen quantities applied to the soils in the form of fertilisers form the largest part. The **phosphorus** quantities applied to the soils with mineral fertilisers have decreased from 49,000–62,000 tonnes in 1980–1990 to 3000–4000 tonnes in 1997–2000. The production and use of organic fertilisers (**manure**) has significantly decreased owing to the smaller number of animals. But because of the smaller number of small farms and overall intensification of livestock farming in industrial enterprises, the use of manure is more concentrated. Concentration is particularly apparent in pig farming, where a large part of production is concentrated in the hands of a small number of owners and large farms. Such pig factories cannot always spread liquid in compliance with environmental	spite of the fact that the average concentration of total **nitrogen** in water bodies decreased at the beginning of the 1990s. During 1992–2000, the concentration of total nitrogen in river water was between 1.9 and 3.0 mg/l, which is higher than the natural background. Average values of 1.25 mg N/l were measured in background rivers in 2000. The **phosphorus** content of Estonian rivers is generally quite high. In natural river water its content is usually below 0.05 mg P/l. During the nine-year period that river water quality has been monitored at the state level, the total phosphorus concentration has decreased from 0.107 mg P/l in 1992 to 0.061 mg P/l in 2000. Based on experts opinion the main problems concerning **soils** are: • *decrease in organic matter and nutrients in soil*, caused by the lack of classical crop rotation, the lack of nutrient balance records and the related fertilising plans, single crop cultivation, a reduced use of manure; *water erosion* occurs in uneven areas where soil particles are easily drained with flowing water. *wind erosion* occurs in the big fields of Central Estonia and in coastal regions	pollution, have been established in many places in the course of restoration work. The **agricultural advisory system** was initiated in Estonia by a EU PHARE project. The agricultural advisory service component of the World Bank agricultural loan project launched in August 1996 continued the process of building the system. The component consisted of support scheme for the private advisory system; strengthening of the public advisory system (technical assistance and training); and support for rural information centres. In June 2003, there were 96 attested advisors in Estonia, who can provide advice with support from the state. Information on attested advisors is available at the Ministry of Agriculture, the Agricultural Registers and Information Board (hereinafter ARIB).	• *Environment-friendly Production Scheme* – a farmer has to prepare and follow the nutrient management plan and crop sequence plan. In addition, a farmer has to participate in the training where soil protection questions will be discussed; • *Environment-friendly Management Scheme* – a farmer has to keep the plant (crop) cover of 30% of the land on which crop rotation is applied and follow the crop rotation plan; • *Organic Farming* – a farmer has to comply with the Organic Farming Act; • *Winter Plant Cover* – a farmer has to keep the plant (crop) cover of respectively 30% or 50% of the land on which crop rotation is applied. Advisory services & training - Special attention given to national agri-environment support in 56 municipalities. In 2003, 28 information days were organised where the principles and the requirements of the support were introduced. Environment-friendly management plans were prepared in farmer-adviser co-operation. There was also requirement for the 6-hours compulsory training under the environment-friendly management scheme in the 2	

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
	requirements. In 1970–75, organic fertilisers were used in a quantity of 10.7 t/ha; by the year 2000, the quantity had decreased to 2.3 t/ha and the spread area formed only 7% of arable land, i.e. 31 tonnes of manure were applied per hectare of fertilised arable land. Some manure is not spread at all, or is not spread in due course.			special pilot areas. **WFD & HELCOM** According to a resolution of the Government of the Republic, the Estonian territory is a part of the Baltic Sea hydrographic basin and forms a single integral basin divided into nine sub-basins. Each sub-basin has to be managed according to a specific water management plan, which collectively form an integral water management plan. **Nitrates Directive** In Estonia the areas vulnerable to nitrate pollution are the Pandivere and Adavere-Põltsamaa. Restrictions also apply in the surroundings of springs and sinkholes and in the areas of unprotected groundwater. Estonia has prepared the Code of Good Agricultural Practice. Producers' organizations approved it in 2001. Observance of the Good Agricultural Practice is recommended under the Water Act.	
Finland NrdSP 2007-13	Farming accounts for more than 60 per cent of phosphorus loading and 50 per cent of nitrogen loading. The balances indicating the fertilisation of **arable lands** and exit of **nutrients** have improved from the level in the early 1990s until 2000 as follows: the nitrogen balance has decreased by more than a third to 58 kilograms per hectare, while phosphorus balance had decreased by about	The coastal regions of the Gulf of Finland and the Archipelago Sea are shallow and they often suffer from eutrophication. The loading of waters is the highest in the catchment areas of rivers discharging into the **Baltic Sea**. In recent years the state of the **rivers** flowing to the coasts and coastal waters has declined. Recent studies have provided some indications that the content of **organic matter in arable**	One reason for the extensification has been the increase in the **organic** cultivation area over the past 15 years from 2,300 in the early 1990s to 153,000 hectares. The concentration of **livestock** production to larger units may, however, have opposite effects locally; for example, nutrient loading on the environment may increase as a result of spreading manure on arable land.	**Reducing the non-point source pollution** has received more and more attention since the early 1990s, but it has been very difficult. Efforts have been made to reduce nutrient loading, surface runoff and erosion through headlands or field margins, filter strips, riparian zones, plant cover and better methods for storing animal manure and by decreasing the use of plant nutrients. The whole of Finland has been	**Axis I** Of the Community funding for axis 1 the minimum of 60 per cent is allocated to the structural development of agriculture and the minimum of 5 per cent is allocated to utilising research and promoting innovation to develop, in particular, the food, wood and bioenergy sectors: ● To develop the business management skills,

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
	a third to 11 kilograms per hectare.	**lands** may be declining, especially in clay soil and in southern regions. One reason for the loss of organic matter may be the decline in the diversity of farming within regions (monoculture) and the concentration of grass production and manure spreading to fewer farms. As a result of climate change, the decomposing of organic matter may accelerate as the temperature and humidity rise, and the risk of erosion and release and leaching of nutrients may grow.		classified as a **nitrate vulnerable area**. In the past decade the amount of nitrates in surface water has decreased by 12.3 index units. Changes in nutrient loading from agriculture are slow and the transportation of nutrients is influenced by several factors, such as the weather. It takes a long time before the impacts are manifest in waters.	**environmental awareness** and awareness of the welfare and health of the production animals among agricultural entrepreneurs. ● Of the new agricultural and forestry production sectors bioenergy is an obvious key area for development work, which also comprises the **handling and treatment of animal manure** to reduce nutrient emissions. In the utilisation of manure it is possible to combine several important objectives, such as reduction of nutrient emissions to waters as the utilisation rate of phosphorus improves, increased use of bioenergy and reduction in greenhouse gas emissions. A separate, nationally funded research programme will be undertaken in 2008-2010 to solve the local problems of depositing livestock manure that contains phosphorus. Axis II Of the Community funding for axis 2 at least 50 per cent is allocated to natural handicap payments and at least 40 per cent is allocated to agri-environmental support. The rest of the Community funding is allocated to the other measures of the axis (animal welfare, non-productive investments and first afforestation of agricultural land). It is estimated that about 1 per cent of the support under the axis will be paid for agricultural land

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
					included in the Natura 2000 network. The funds released through the modulation of direct payments are allocated to agri-environmental support. • A priority is to **reduce environmental load** to the soil, surface waters, groundwater and air from agricultural sources by the promotion of environmentally-friendly production methods. • To support the reduction in greenhouse gases and the **preservation of the organic matter** in the soil and carbon sink effect through renewable bioenergy produced on agricultural and forest land. In water protection the most important instrument is the Community funded agri-environmental support, but also measures under axis I.
Poland NrdSP 2007-13	The **intensive use of natural resources**, which is characteristic for numerous European countries, **does not concern the Polish agricultural** model to such an extent, as it combines moderate increase of capital-intensity of production with relatively high labour-intensity. Poland does not exceed the **nitrogen** content in waters regarded by the Code of Good Agricultural Practice as critical and safe (30 kilograms per hectare). This is a very good result if compared to EU average (55 kilograms per hectare).	Natural and **soil conditions** in Poland are worse than average the EU soil conditions (according to their applicability in agriculture). This is the result of the major influence of subsequent glaciations on the soil forming process, which led to the major part of the country being covered with light soils on sandy, permeable ground. The important threats related to the condition of the environment include: wind, water surface and ravine erosion, concerning 27.6%, 28.5% and 17.5% respectively of agricultural and forest land,	**Consultancy** is very important as farmers are not familiar with modern methods of management, cross-compliance, market niches etc. Needs in this regard concern all active farmers. **Adjustment to the environmental standards** will soon require farm equipment to comply with environmental protection, affecting structures such as liquid livestock manure tanks. This a particularly significant issue in the light of compliance of the farms with common good agricultural practice and with cross-compliance in the	The previous activities carried out by **advisory services** for farmers and inhabitants of rural areas concentrated mainly on preparing farmers for integration with the European Union and on enabling the use of aid from Community funds. **Nitrates Directive** In Poland, 1.7% of the country area has been specified as OSN. The areas have been established by way of regulations issued by the Directors of Regional Water Management Boards in 2004. **Water Framework Directive**	**One horizontal plan** for the whole country will be developed, justified by the fact that the majority of planned measure instruments are horizontal in their nature and the process may hardly be transferred to the regional level because of their complexity. **Axis I** Greater emphasis shall be put on activities related to modernization of agricultural holdings and industry (ca. 40-50%) than on innovative activities and activities relating to the development of

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
	In particular, standards related to the **storage of artificial fertilisers** are important from the perspective of environmental protection in Poland. It is necessary to remember, however, that this level is achieved mainly due to low, in general, level of use of mineral fertilizers. In this aspect it is important to effectively prevent water pollution originating from **animal production**. The quality of surface and ground water should improve constantly in relation to activities taken up for the sake of limiting pollution, i.a., from agricultural sources, and the improvement of sanitation of rural areas.	significant decrease of **organic matter** content in the soil has been noted on 54.4% of arable land area, density and acidification, with 51% of soils particularly acidic. These problems co-exist with the **limitation of water resources** in Poland, resulting from unfavourable hydrological conditions – together these factors significantly limit the possibilities of the development of agricultural production. The **quality** classification of **surface and ground water** (data, CSO Environment 2005) indicates that water of III and IV quality classes prevail (1193 per 1566 measurement points), with very little class II water and no class I water. Lake purity is much better (CSO data, Environment, 2005), as 61.7% of lakes have II class of water purity, and only 6.9% has water without class. **Shallow ground waters,** which absorb a considerable amount of pollutants, including widespread pollution of agricultural, livestock breeding, horticultural and municipal origin, are of the lowest quality.	future.	At the national and regional level work has been completed on establishment of typology of surface waters, identification of uniform surface and underground waters, preliminary analysis of anthropogenic influence and its impact of surface and underground waters, economic analysis of water management and determination of protected zones. The analysis of anthropogenic pressure on surface and underground waters has allowed to identify uniform bodies of water threatened, not threatened and potentially threatened with non-achievement of environmental objectives of the WFD. At present it is not possible to specify the degree of limitations to agricultural production and rural areas development resulting from the implementation o WFD. **Cross-Compliance** In 2009 Poland will have implemented the full cross-compliance instrument (the first two are applied in Poland since 2004): • maintaining the whole area of the holding in Good Agricultural and Environmental Condition (GAEC) developed to facilitate sustainable land management, • maintaining the area of permanent grassland at the level of May 2004, which is aimed at preventing the destruction of meadows and pastures,	human resources (ca. 10-15%). ● *Modernization and restructuring* both in terms of agricultural holdings' adjustment to increasing Community requirements (including those related to environmental protection) and improvement of their competitiveness. ● The increase of education level and skills improvement will be implemented through *vocational training, information* and training activities and provision of the access to *advisory services*. ● The new challenges imply an increasing engagement of consultancy in the process of upgrading skills and knowledge of agricultural producers in the field of modern farming, pro-environmental methods of agricultural management (including organic and integrated farming), managing the holding as an enterprise, application of the cross compliance principle, norms of production, public health, animal welfare, food quality and application of good agricultural and forestry practice compliant with environmental protection requirements and active protection of natural resources. **Axis II** Support for the scope of realisation of protection needs, in particular within the scope of protection of the good condition of waters, anti-erosion protection, of

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
				• fulfilment of statutory management requirements (SMR) regarding environmental protection. providing for the implementation of the following directives: WFD, on conservation of natural habitats and of wild fauna and flora, wild birds and soil.	both soils and waters, can be a result of agricultural and environmental programmes and support for LFA, where the usage of the ordinary good agricultural practice is a requirement. Accordingly, the funding allocation will be: LFA (ca. 40-45% of the funds allocated for the axis); agri-environmental programme (ca. 30-32% of the funds allocated for the axis) and forests (ca. 13-15% of funds). • *Agri-environment* and Natura 2000 measures shall be promoted both in the areas of high natural values and areas exposed to an excessive environmental pressure excised by agriculture. • Agri-environmental programmes will have a more significant role than currently. • Special support instruments for farmers will be introduced which will be favourable for the *conservation and improvement of natural habitats* and species sanctuaries constituting the public good. Areas where measures compliant with the WFD are to be implemented within the scope of Community activities related to water policy are of special importance in this respect (implemented using many instruments).
Lithuania RDP	**Agriculture** is considered as one of the **key diffused water pollution sources**. Out of total 790 water bodies identified for the	In 2000, about 14% of agricultural land was affected by erosion, resulting in a loss of valuable topsoil and productivity. The	Animal breeding sector is the underlying branch of national agriculture dominant by **milk and meat production** and makes 49	In relation to implementation of the **Nitrate directive** Lithuania has committed to have it implemented through two action	**One horizontal plan** for the whole country will be developed. A priority criterion to be applied during the actual project selection

	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
2007-13	implementation of WFD in Lithuania as the ones at risk that good status will not be achieved by 2015, 22 pct of those have been identified as bodies at risk due to impact from agriculture.	average loss of **soil** from agricultural land is approximately 1,8 – 2,5 tonnes per ha. Approx. 19 pct. of the area of the country is sensitive to deflation. Therefore, there is a need to ensure proper farm management techniques on such soils, which would play a preventive role (establishment of grasslands, sowing of perennial crops, promotion of organic farming, etc). Furthermore, afforestation of such areas is given a high priority.	pct (2004) in the total agricultural production produced in all farms, whereas the crop production is regarded as a supplementary production. In Lithuania both milk and meat sectors are dominant by small-scale producers and this results into a low labour productivity, competitiveness of the primary livestock production, difficulties in complying with quality, hygiene, **environment** and animal welfare requirements. The number of **organic farms** has been steadily increasing - from 9 organic farms in 1993 cultivating 148 ha to 1811 farms in 2005 all together occupying almost 69,5 thousand ha. The area of certified organic farms is 2,7 pct of the total agricultural land in Lithuania declared as used for agriculture. In 2005 an average certified organic farm covered 38 ha. 55 per cent of them are plant growing farms, 41,3 per cent – mixed farms (plant growing, cattle breeding, bee keeping etc.), 2,5 per cent – bee keeping farms and 1,2 per cent – fishery farms. Lithuanian farmers have a good access to the **consultations** of general nature in the area of traditional production methods, farm economy and accountancy. However, there is a lack of specialised consultations and training in the field of ecological farming and implementation of environmental and other	programmes. The first Action programme for the period 2004-2008 will be implemented in the entire territory of Lithuania as the entire country has been designated as Nitrate Vulnerable Zone. It was approved by GoL in august 2003. Beside the mandatory measures related to proper fertilisation by organic and mineral fertilisers, land use, crop rotations, the installation of proper manure/slurry storages is mandatory to be installed in the livestock farms which have more then 300 LU and in all new farms being established. Further, in the second action programme also smaller farms having above 10 LU will have to install manure storages. Presently most of the livestock farms do not have manure storages meeting the environmental requirements therefore the emphasis in the Action programme is put on having this requirement fulfilled. Implementation of the provisions of the **Code of Good Agricultural Practice (CGAP)** is very important in order to minimise this diffused pollution thus there is a strong need to encourage farmers to use the nutrient balances, fertiliser and crop rotation as well as pesticide use plans. Lithuania has developed CGAP in 2000 and it is currently under implementation.	processes includes (amongst 12 others) *activities benefiting the environment*. **Axis I** (42,91% total budget) • Close to 61% of axis I funds will be used to support investments under EAFRD arts.20, 26, 28 and 32, in modernisation, technology and innovation within primary, processing and forestry sectors in order to ensure *inter alia* that farms are meeting EU Nitrate directive requirements, • 5.5% of the funds will be used to support investments into human capital (arts. 20, 21 and 52). The *impact indicators* provided for the measures relate both to outputs (e.g. n° of people trained) and outcomes (e.g. specific target for increased productivity value in EUR/AWU). None of the outcomes refer, however, to environmental variables despite the implementation of the Nitrates directive being a specific objective. **Axis II** (38,11% total funds) Measures supporting 'Environmentally-friendly farming practices" will absorb 42.17% of axis II funding. This will be channelled exclusively through four agri-environmental measures: • landscape stewardship, • rare breeds scheme, • programme for improving the status of water bodies at risk, • organic farming scheme.

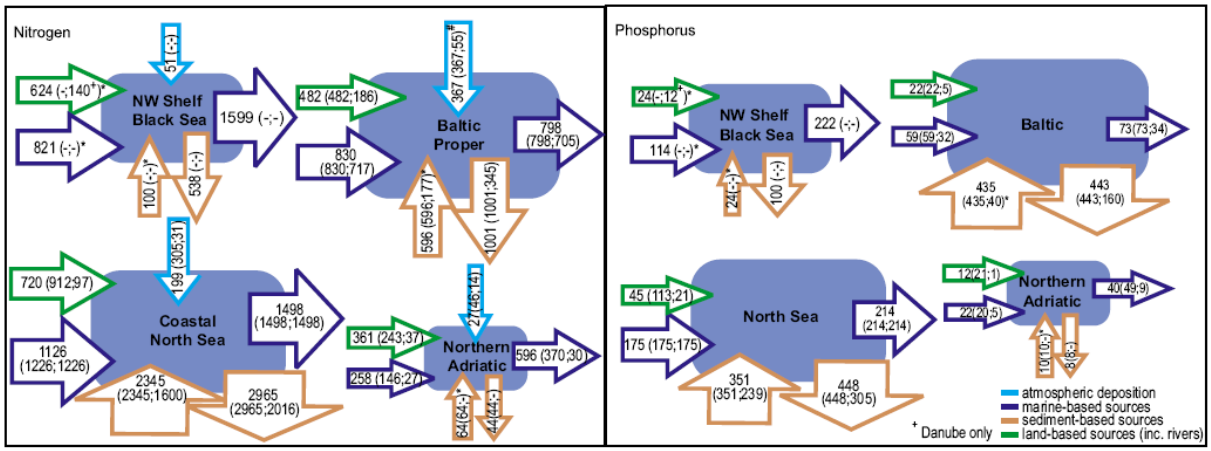
	Status as Described			Measures Used & Proposed	
	Emissions	**Water & Soil**	**Structures**	**Existing Measures (pre-2007)**	**EAFRD**
			requirements, community development and partnership (in particular as regards implementation of *LEADER* type actions), in the field of marketing and diversification of economic activities.		The *impact indicators* for this axis include: • 2000 hectares of land included in the water quality measures by 2013, • and on these that gross nutrient balances, and concentrations of nitrates and pesticides in ground and surface waters are proven, through test spots, to have maintained positive changes, • leading to a decrease of at least 0.17% of the water bodies at risk of non-WFD compliance in 2015; • 6 000 farms, 240 000 ha under certified organic production by 2013 (This target is very ambitious and will result in an increase from 2.7 % of declared UAA to 9 %, i.e. more than tri-doubling the area.). **Overall,** the **environmental effects** of the RDP are expected to be an enhanced responsibility for the condition of the environment and more respect for value of the rural heritage. This will mainly be achieved through the axis 2 measures. The environmental effects are also expected in terms of a better utility of resources resulting in saved water and energy.

7. Agriculture and Eutrophication in the Baltic Sea

The Baltic Sea has a long history of eutrophication[72]. The nature of the Baltic Sea, resembling more an estuarian environment where sea water and land drainage mix, rather than an open sea[73], contributes itself to the eutrophication phenomenon by supporting internal loading of nutrients, particularly phosphorus (P). In many areas of the Baltic freshwater inputs exceed seawater input. Freshwater floats over the denser seawater forming a sharp, vertical density gradient between the less saline upper layer and higher saline deeper layer. According to the European Lifestyles and Marine Ecosystems (ELME) research, during periods of major saltwater inflows, density gradients become stronger, and oxygen consumption in the bottom waters leads to the spread of hypoxia (low oxygen) and to the massive release of P and less efficient removal of nitrogen (N). Between periods of major saltwater inflows, the Baltic Sea becomes fresher, the area exposed to hypoxia contracts and the sea recovers its capacity to efficiently sequester P and remove N[74]. Saltwater flows are determined largely by meteorological conditions.

The ELME regional seas modelling suggests that the Baltic Sea (amongst others studied) is particularly vulnerable to increased nutrient discharges. The ELME project calculated nutrient balances for nitrogen and phosphorus in each of the seas it studied, comparing contemporary load estimates with historical 'pristine' and 'eutrophic' states where possible. These balances they believe demonstrate the importance of the sea floor as a source and sink for nutrients, effectively enabling nutrient retention in the system; and also the importance of exchange with neighbouring water bodies. In the case of the Baltic, it has been estimated that it takes up to 35 years for the sea's water to be entirely replenished by the North Sea[75]; and that the sediments provide the largest source of phosphorus to the Baltic.

Figure 5 – Nutrient Budgets as Calculated by the ELME Project



ELME "Joined-Up Thinking" page 1

The ELME project concludes that to reduce the nutrient load and consequent eutrophication in the Baltic, policies need to address anthropogenic sources of nutrients, but must do so much more

[72] EEA personal communication
[73] ELME (2007) "Baltic Sea" page 6
[74] Ibid.
[75] Richartz, S. & Cocoran, E. (2004) page 11

effectively and substantially than they have been able to achieve to date[76]. They define the interventions needed as "extreme". This is not surprising, given the need to countervail the Baltic seabed's own phosphorus releases. But the need for extreme measures is further compounded by the evidence that the majority of the impacts are anthropogenic. As mentioned earlier, the main nitrogen (75 per cent) and phosphorus (nearly 100 per cent) inputs to the Baltic come via waterbodies, primarily from diffuse agricultural sources[77]. The extreme nature of the measures needed may also relate to the geographical scale of the interventions required: the catchment area of the Baltic is so vast, spanning an area four times the size of the Baltic Sea itself, and is one of the most heavily developed in the world[78], not forgetting that a large proportion of the nutrients loading the Baltic Sea originate for away, even outside HELCOM areas[79].

Figure 2 – The Baltic Sea Catchment Area and Sub-Basins as Defined in PLC-4

HELCOM (2005) page 5

There is evidence that the tide can turn for the Baltic's eutrophication problems if effective land-based management measures are taken. Studies carried-out in Denmark by the Marine Ecology Department of the National Environmental Research Institute have demonstrated the link between the environmental recovery of estuaries, coastal waters and open waters in the Kattegat, the Sound and the Belt Sea, to an active management strategy to reduce nutrients from both diffuse and point sources in Denmark[80]. These findings support those of the ELME research in its findings that it is modern lifestyles that have increased pressures on the naturally variable Baltic Sea environment, causing ecosystem deterioration, and that policies to address anthropogenic impacts are needed.

The work by ELME also suggests the importance of taking action now, as the countries along the Southern and Eastern shores of the Baltic pursue economic and social restructuring following the collapse of Communism and expansion of EU membership. The ELME research illustrates this

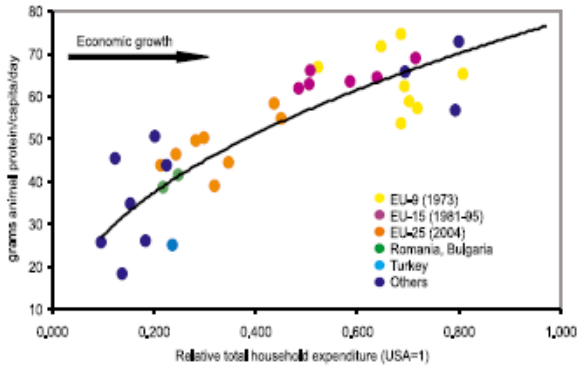
[76] ELME (2007) Baltic Sea, page 3
[77] HELCOM (2005) page 9
[78] Richartz, S. & Cocoran, E. (2004) page 11
[79] HELCOM (2005) page 6
[80] Cf. article by Carstensen J. (2006)

through two lifestyle drivers for the Baltic's eutophication problems: changes in diet choices through increased affluence, and growing intensity in agricultural production.

7.1. Diet Choices and Affluence

Studies have demonstrated that there is a clear relationship between average household expenditure and the per capita consumption of animal protein (including dairy products, meat and fish) for European countries.

Figure 6 – European Protein Consumption as Proportion of Household Expenditure



ELME "Joined-Up Thinking" page 1

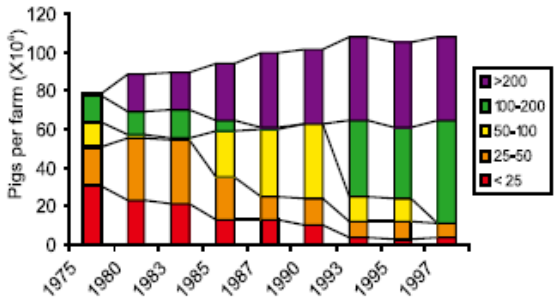
According to ELME, the New Member States are likely to follow in this trend, as they aspire to high and stable economic growth and become more affluent, their household expenditure and protein consumption increase. They quote the example of the per capita protein consumption in Portugal growing by 50 percent during the 13 years following accession to the EU, whereas that of Romania fell by 10 percent in the same period.

This additional consumption could be met by increasing the amount of land farmed, intensifying farming (e.g. greater use of fertilisers) or by importing animal products. If the increased production happens in the region, without major changes in agricultural practice, the ELME team believe that greater protein consumption will raise nutrient discharges to water bodies.

7.2. Intensification of Farming

In the EU-12 pig farming is a growing sector that is shifting towards fewer holdings with larger numbers of animals. Evidence is also beginning to emerge of major investments towards large scale animal production units in Eastern Europe. According to ELME, waste from large poultry and pig farms resulted in approximately 94,000 tonnes of ammonia released into the air in EU-25 countries in 2004, and much of this will eventually find its way into the aquatic environment.

Figure 7 – Trends in the Size of Pig Farms in EU-12 to 1997



ELME “Joined-Up Thinking” page 1

ELME believes there are legitimate concerns that nutrient discharges to the Baltic Sea will increase with intensification of agriculture and livestock production in Eastern Europe, coupled with increased consumer demand for animal protein (and also vegetable oils and fats). In their view, such an increase could accelerate eutrophication and reverse recent improvements resulting from both the economic recession that occurred in many Eastern and Central European countries following the collapse of communism, as well as the control of point source nutrient discharges.

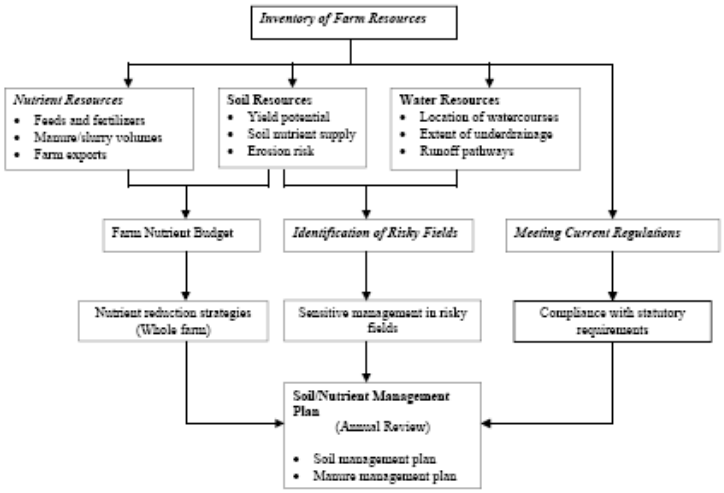
8. Approaches to Tackling DWPA

A strong note of caution must open this chapter. This report draws mostly from desk-based research, with some limited consultation with experts in EAFRD implementation, freshwater and marine issues. Furthermore, given the linguistic limits of the author and scale of the project, most of the literature surveyed was in English, mostly drawing from UK-based studies and experiences. Whilst the analysis offered is a useful starting point to think about the interface between land management choices and DWPA, and can also shed some light on the ways in which farming communities and administration often view environmental constraints and regulatory measures, the author does not suggest that these same responses would always be true everywhere across the Baltic catchment area.

The nature of diffuse pollution with its large spatial and temporal variability in particular across such a large catchment area as that of the Baltic environment, and the nonetheless site-specific nature of the measures that are required to control DWPA suggest the importance of a thorough planning process if DWPA is to be tackled effectively.

This planning process must reach down to the farm level if diffuse pollution is to be successfully controlled. Farm level planning starts by assessing the soil, nutrient and water status of the land, ideally field by field; and the management practices adopted by the farmer. Only then can alternative management options, and the specific measures needed to support them, be identified.

Figure 8 – Schematic Diagram of the Framework Components of the Basic Soil / Nutrient Management Plan



From Withers, P. et al. (2003) page 44

There is no single *silver bullet* measure that is always going to be the best to tackle DWPA. The range of EAFRD measures highlighted as potentially relevant in chapter 5 and Annex 1 are just that: potentially relevant. Their applicability at farm level will vary according to their complexity (level of skill required to implement), cost-effectiveness (cost per kg of pollutant saved) and acceptability (time, money and hassle necessary). Their relevance will be determined by the level of pollutant reduction required to achieve good ecological status of water-bodies and positive effects on the Baltic marine environment, the hydrological conditions of sites, and the types of pollutants (N, P, silt) causing DWPA

(because of differences between the pollutants in the processes of loss and transfer to water-bodies[81]).

Conceptually, according to Dwyer, J. et al. (2002) identifying which measures are best suited to a site includes assessing[82]:

- What the land is best suited to, in order to reduce environmental impact whilst remaining profitable;
- What levels of nutrient input are required to achieve the required production targets;
- How best to manage those inputs to ensure minimal loss in surface and sub-surface run-off; and
- What additional measures are required to minimise the risk of pollutants reaching the watercourse (i.e. run-off control).

For example, Withers, P. et al. (2003) note that the management options recommended to the twenty-one farms participating in their study (see box 1 below) contained a number of measures that were common to many farms, but that each farm ended-up with a different set of measures depending on the type of farming practiced (e.g. whether and which livestock), the relative risk of silt and P mobilisation in fields (the pollutants most relevant in the areas they studied), and the likelihood of reaching the watercourses in rapid run-off (e.g. slope, proximity to watercourses).

Of interesting note, the approach they decided to take: *"… was to allow farmers the opportunity to solve the problem by better management using current cropping / livestock numbers rather than recommending restrictive farming*[83]".

Whilst it is, therefore, not possible in this report to recommend which EAFRD measures to promote across the Baltic catchment area, it is possible to recommend measures that could be implemented via the EAFRD, and that can support a generic approach to tackling DWPA through effective planning as outlined above, as well as knowledge and capacity building. EAFRD measures can be used in this process, to guide and fund various necessary steps, as will be detailed below.

Box 1 – Developing a New Grant-Aid Package for DWPA in England

A two-tier grant aid package was proposed for England to help reduce the loads and concentrations of agricultural pollutants, and in particular silt and phosphorus, transported in run-off from agricultural land to water. Diffuse pollution of water is now a high priority policy issue in England following increasing concerns about siltation and eutrophication of surface waters, and agricultural land has been identified as the dominant (silt), or a significant (P) source.

Dwyer et al. (2002) concluded that such a grant-aid package was needed in order to expand the adoption of more environmentally-friendly farming practices beyond that possible under existing agri-environment schemes in England, both in terms of the range in measures available, and in the area targeted, for grant-aid.

The two-tier package was developed through a project which aimed to identify:

- the procedures and criteria through which such a grant-aid package could operate in the field,
- the extent to which it could be tailored into existing agri-environment schemes and future policy initiatives,

[81] Withers, P. et al. (2003) page 14
[82] Dwyer, J. et al. (2002) page 27
[83] Withers, P. et al. (2003) page 11

- the resource required to implementation the scheme and monitor compliance.

The project was implemented through five major work packages:

1. a planning framework, including a visit to a problem farm to define potential issues and requirements,
2. farm visits, to audit current farming practices and identify potential management options,
3. an economic assessment, to draw-up cost recommendations for action,
4. a farmer attitude survey, to assess farmer reactions to the options recommended and any barriers to up-take, the feasibility of self-assessment and the likely level of grant-aid required to adequately cover the cost of implementing the options,
5. an appraisal, to assess the compatibility of the management options with current policy initiatives and revisions to agri-environment schemes.

From Withers, P. et al. (2003)

8.1. Farm Planning Tools

As mentioned above, a number of assessments at farm level may be necessary to identify the status of soil and water resources at farm level, current practices and future potential management options. Indeed, the literature recommends whole-farm nutrient planning to identify the extent of overuse of nutrients at the farm scale, and individual field-level planning to identify where insensitive management practices are causing a problem.

The literature review highlighted a number of different instruments that have been used to collate information ahead of planning. These include:

1. Basic pro-formas[84] to collect general information about the farm, including: farm size, field location, livestock enterprises, manure/slurry handling facilities, crop rotations, soil management, existence of any previous farm management plans, location of watercourses and under-drainage systems, involvement in regulatory schemes (e.g. agri-environment, NVZs).

2. Pro-formas to collect information about the amounts of N and P imported, exported and recycled at the farm scale. This can be done by collating information about the precise number of animals on the farm, the specific crops grown, and then calculate N and P import / export based on average figures for the nutrient content of the excreta and crop products[85]. This information may be already collected, or pro-formas defined to collect it, in the framework of the implementation of the Nitrates directive in NVZs. There is also value in collecting this information at field scale, to identify the relative distribution of nutrients across the farm. However, this requires more time and better farm records.

3. Risk assessment methodologies, to assess the distribution of high-risk areas across the farm. Identification of the hydrological connectivity of farm soils to watercourses is key. Separation of fields which pose no risk from those which pose a medium to high risk is an essential first step in identifying the extent to which improved management options are required across the farm. Clearly, some measures can be usefully and cost-effectively adopted over a whole farm (e.g. nutrient reduction strategies) whilst others should be targeted to where they will achieve

[84] Ibid, page 7
[85] Ibid page 7

the best impact and/or be most cost-effective (e.g. reduced stocking densities). Several methodologies exist to assess the risk to DWPA of fields and farms and/or to manage nutrient flows. Some examples from the U.K. include:

a. Farm Waste Management Plan – a DEFRA set of guidelines designed to help farmers produce a plan for spreading livestock manures, slurries and organic wastes, whilst minimising the risk of water pollution. The guidelines are divided into five steps, enabling farmers to complete a farm mapping showing where manures can safely be spread, particularly in winter. The steps include, for example, identifying any existing restrictions, the land-volume ratios, and where further storage capacity may be needed on-farm. [http://www.defra.gov.uk/corporate/regulat/forms/agri_env/nvz/manureplan.pdf]

b. PSYCHIC – a DEFRA, English Nature and Environment Agency funded R&D project to develop a catchment based decision support system to control sediment and phosphorus loss from agricultural and involving identification of high-risk areas and appropriate mitigation options.
[http://www2.defra.gov.uk/research/project_data/More.asp?I=PE0207&M=KWS&V=PSYCHIC&SCOPE=0]

c. The indexing system used by the Withers, P. et al (2003) project, used to rate the potential vulnerability of a farm to soil and phosphorus loss in agricultural run-off (please see Annex 2).

d. MANNER – a DEFRA and ADAS computer package decision support system that can be used to accurately predict the fertiliser nitrogen value of organic manures on a field specific basis. MANNER can be used either in advance of applying manure to check the likely effect of a spreading policy, or to assess the actual fertiliser N value of a spread manure using manure application details and weather data.
[http://www.adas.co.uk/manner/frameset.html]

e. EMA[86] – Environmental Management for Agriculture, is a DEFRA funded software package that is designed to be used by farmers as well as advisors. It contain three systems:

   - A technical systems, with a range of databases and calculations programmes for fertilisers, pesticides and other chemicals;
   - An advisory system, with all Codes of Good Practice, legislation, assurance schemes information, and industry contacts;
   - An evaluation system, with an auditing programme for farm practices, reporting programme for environmental performance and an emissions inventory.

Despite the importance of planning at the farm scale, for the reasons explained above, it must be remembered that the effectiveness of farm level plans may depend upon group involvement across

[86] Dwyer, J. et al. (2002) page 54

several farms. With DWPA it is in fact very easy for the water quality improvements resulting from the efforts of one farmer to be undermined by pollution from other farms in the area[87].

8.2. Raising Farmer Awareness

The literature surveyed for this report suggests that farmers do not consider diffuse pollution to be a problem that affects them[88] or which is linked specifically to farming; and that therefore farmers need to be made more aware that diffuse pollution is closely connected to farming.

This lack of awareness may relate both to the specific causes of DWPA or to the environmental consequences of DWPA. For example, Withers, P. et al. (2003) found that farmers generally had an excellent awareness of areas on their farms where run-off and flooding was a problem (e.g. visible sediment on roads), but less appreciation of the extent to which rapid run-off was caused by poor soil or land management[89]. They found that many farmers were aware that soil compaction causes crop yield loss but not that it is a major cause of accelerated run-off generation, or that the amount of compaction needed to cause increased run-off is much less than that required for crop yield loss[90].

It is worth considering whether the lack of farmer awareness is a reluctance to admit to any problems, in case this precipitates the need for action. Or whether it is a general lack of understanding of how nutrients reach watercourse, and how land management practices affect DWPA.

Lack of awareness may also be linked to limited knowledge of the regulatory obligations in place to address DWPA, whether at EU or national level, which could result from limited information being put forward by national and local competent authorities.

Whilst a farmer may lack awareness of the broad impact farming practices may have on areas and environments remote from the farm itself, farmers often are best placed to know how to adapt their practices to optimise their own cost-efficiency with the resources at hand: *"The informed farmer is often best placed to come up with the most acceptable and cost-effective solutions[91]"*. Empowering farmers to identify and tailor their own solutions to DWPA, alongside raising their awareness of its causal link to farming and of their potential regulatory obligations, is likely to lead to greater acceptability and adoption of changes than any measures that are imposed through some remote decision-making process. Even when offering public funds, farmers should be allowed to retain as much flexibility as possible in the choice of farming system and of nutrient and soil management options based on their own experience and knowledge of their farm and area.

The farmers that took part in the Withers, P. et al. (2003) study largely endorsed three measures they thought would help empower them and increase their willingness to address DWPA. These were[92]:

[87] Dwyer, J. et al. (2002) page 32
[88] Withers, P. (2003) page i
[89] Ibid page 14
[90] Ibid page 15
[91] Ibid page 41
[92] Ibid page 31

- Covering the costs for farmers to consult an experienced adviser to help them learn about and identify practical solutions;
- Free training for farmers on DWPA and associated management measures, and funding to help them draw-up a new management plan;
- Funds to cover the costs of the time and effort required by farmers to understand diffuse pollution issues and identify what is needed on their farm.

Of potential interest is to note that Withers, P. et al (2003) found that, in their study, arable farmers were generally more skilled in nutrient and soil management than livestock farmers. This is because the rate and timing of fertilizer inputs and standards of cultivation have a direct impact on crop yields, and therefore, profitability. Livestock farmers are better cushioned from poor land management decisions through the ability to compensate by importing extra feed to achieve profitability[93].

Finally, as a general rule, farmers often report feeling overburdened with bureaucracy and paperwork when complying with EU regulatory obligations or applying to use EU measures and funds. Any measures promoted to farmers must be simple and straightforward with regards to paperwork or planning, if they are to be effectively embraced.

Box 2 – Tackling Farmers' Attitudes in the UK's *Catchment Sensitive Farming* Project

"There remains a mixed response from farmers to the question of whether farming contributes to diffuse pollution. Some accept that farming practices cause pollution others do not, or at least challenge the extent to which they do compared to other, usually fixed point, sources of pollution. Getting farmers to accept or realise that farming causes pollution – that it is by its day in and day out activities – remains a big problem, particularly if they feel they are observing best practice or if the impacts are off-farm. The CSF Delivery Project (CSFDP) is raising awareness and promoting voluntary activity and best practice to tackle this issue.

The key elements of our model for CSF delivery include the following:

- Prioritisation of catchments within river basin districts;
- Creation of a network of Catchment-Sensitive Farming Officers within a Natural England/Environment Agency partnership;
- Detailed knowledge of catchments and of farming activity within them;
- Shared understanding of practices which cause DWPA and of mitigating measures;
- Establishment of inclusive and dynamic catchment steering groups;
- Involvement of key stakeholders, in particular farmers;
- Targeting of farms for advice, including 1:1 farm visits;
- Support and incentives through enhanced uptake of agri-environment schemes, and possible capital grants. "

From Amin-Hanjani S. & Todd R. (2005) page 13

8.3. Technical Advice and Support

Developing and implementing farm management plans can be a challenging exercise, in terms of understanding the benefits of planning, assessing the impacts of current practices and identifying alternative practices. Given the low awareness of farmers of their role in causing, and therefore tackling DWPA, if farm management plans are tools to be promoted, then it is likely that they will need to be accompanied by technical advice and support.

[93] Ibid page 41

This approach has been adopted, for example, in Scotland. The advisory services of the Scottish Agricultural College working in co-operation with the local administration and non-governmental organisations like WWF and RSPB[94], have this year established a new Catchment Officer position. The Officer operates through the implementation of the WFD in East and South-West Scotland, working with farmers in high risk DWPA areas to raise their awareness of how farming drives DWPA, and empowering farmers to use the multitude of guidelines and measures that have been developed over the past decade to try and tackle the problem. In this example, the WFD's river basin management planning provides the regulatory framework for engaging farmers. The Catchment Officer does not offer solutions, but helps farmers understand they need to take responsibility, and helps them to learn how this can be done[95].

Plan preparation and implementation, and awareness of the technical tools available to help (such as those described in section 7.2.1.), may not be readily known or accessible to farmers. Even if they are nominally accessible, it is fair to consider that farmers may have limited interest in acquiring and using them until their benefits have been proven. Two potential paths may be considered to address this.

Advisers, whether linked to the public administration or farming bodies, can be trained in how to develop farm management plans and use a range of technical tools. Just as importantly, advisers may need to be trained in how to outreach to farmers and work with them in developing and implementing farm management plans. This will be of particular importance if the plans are to be supported through public funds, but not necessarily imposed through regulatory instruments, and thus remain voluntary measures for farmers. This would be the case if farm management plans were to be offered through EAFRD programmes. In some countries and regions advisers may already exist and offer such services. In others, there may be a need to recruit and train some. The EAFRD, as defined at EU level, can be used to fund advisory services and training for both advisers and farmers.

A second path to be considered is identifying, maybe by starting in high risk catchment areas, individual farmers to act as early adopters in implementing farm management plans. It may be possible to identify farmers who have greater environmental awareness, or who have been affected by the impacts of DWPA (e.g. siltation of roads, water pollution fines) and are willing to trial a management plan. Neighbouring farmers are more likely to be tempted into joining a scheme they can see to work and deliver benefits for a peer, than on the basis of governmental or non-governmental promotion.

However, even such early adopters are likely to need technical support from advisers. Furthermore, in the light of the vastness of the Baltic catchment area, range of countries involved between which marketing of good practice may be a challenge, and limited funds, investing in adequate advisory services may be more cost-efficient and may have a greater multiplier and transferability potential (e.g. the EAFRD nominally can cover the costs of setting-up and running advisory services, as well as their training across borders, or for example linked to river basin management plan authorities).

[94] RSPB : Royal Society for the Protection of Birds, one of the UK's best established conservation organisations
[95] Private conversation with WWF Scotland, June 13th.

The twenty-one farmers interviewed in the Withers, P. et al. (2003) study indicated they thought advisers were important to help them prepare farm management plans. None wanted to prepare the management plan entirely by themselves, though none wanted either to leave it entirely in the hands of advisers. They also indicated advisers could be useful in monitoring the implementation of the plans, and up-dating them, as greater knowledge becomes available. Finally, some suggested that having an independent adviser would help avoid potential future disputes with authorities over their eligibility for grant payments.

8.4. What Role for Funding

The funding available under the EAFRD, as mentioned in chapter 5.3., will not be sufficient as main vehicle for addressing DWPA across the range of countries in the Baltic catchment area. The reasons for this are varied and have been discussed: they range from lack of prioritisation of DWPA amid the range of possible priorities for EAFRD expenditure, to the national envelopes of funding allocated to EAFRD.

Some experts also believe that DWPA is a problem so widespread, and that any control measures would need to be so widely implemented, that grant aid such as that available under the EAFRD, will never be sufficient to fund the necessary changes[96]. Others believe that dedicated grant-aid schemes are needed precisely because the scale of the changes needed will never be achieved through the implementation of agricultural best practice and agri-environment measures alone[97].

From a practical perspective, it is also important to carefully consider the potential impacts of grant aid via the EAFRD on the finances of potential beneficiaries, and how this will shape their actions. Publicly funded measures can have different financial impacts. Sometimes the output or variable cost of a crop or livestock enterprise is affected and this affects the *gross margin*. Sometimes, there is an impact on the *fixed costs* or *overheads* (e.g. labour, machinery). There may be a requirement for one-off investments and *capital costs* may arise. Management measures may give rise to costs in more than one of the above categories. For example, temporary fencing involves the capital cost of the fencing and the operating cost of erecting, maintaining and dismantling the fence[98]. Therefore, if a decision were taken to offer grant aid to help farmers tackle DWPA it would be important to assess whether the measures offered add-up to a viable package for farmers, and whether the way in which the funding is disbursed is appropriate to address the type of expenses the farmers would incur.

For example, farmers might be persuaded to prepare simple farm plans through regulatory instruments, like the obligations ensuing from the Nitrates directive. However, serious and on-going commitment to use the measures adopted in a positive way is likely to require a financial incentive. This financial incentive may not be available to farmers, for example, if the eligible expenditure is only for one-off capital costs investments (e.g. slurry storage facilities).

[96] See, for example, Dwyer, J. et al. (2002) page 50 or Dworak T. et al. (2006) page 7
[97] Dwyer, J. et al. (2002) and Withers, P. et al. (2003)
[98] Withers, P. et al. (2003) page 15

It may also be undesireable to consider using financial incentives as the sole or primary instrument to tackle DWPA. For example, it may be desireable in a first instance to ensure all farmers actually meet with basic good agricultural practice (GAP), and that GAP measures throughout the Baltic catchment area countries all effectively include nutrient and soil management. Some measures incur a very low cost (though potentially also low benefit) and could be routinely adopted as good practice for widespread adoption nationally[99].

A carrot and stick approach can be envisaged whereby authorities make use of a combination of funds offered specifically for training and farm planning (the carrot) together with the use of regulatory instruments such as audits and effective prosecutions (the stick) to ensure effective take-up and use. A number of more restrictive or punitive measures also exist, notably fiscal measures such as levies on surplus manure production (e.g. in the Netherlands[100]) or pesticide taxes. Unsurprisingly, according the experiences of WWF Scotland, farmers discussing WFD implementation in Scotland have expressed their strong preference for voluntary measures over the imposition of fiscal ones[101].

8.5. The Role of the Agricultural Sector in Tackling Eutrophication in the Baltic Sea

This report has referred to a range of evidence that indicates the link between agriculture and the diffuse pollution of water bodies (chapter 3), and how this affects eutrophication of the Baltic Sea (chapter 7.1). The ELME study, set-up specifically to analyse the link between the lifestyles and socio-economic development of Europe and the sustainability of its regional seas, confirmed the link between the Baltic Sea's eutrophication problems and agricultural land management. The work of the Marine Ecology Department of the Danish National Environmental Research Institute has demonstrated that concerted action on reducing nutrients from diffuse and point sources in agriculture can lead to recovery of various types of Baltic waters (coastal, open, estuaries).

Work linking agricultural and land management practices to the ecological state of seas does not seem to be widespread. Integrated research like that of ELME, which concludes with policy recommendations spanning various policy and economic sectors (e.g. fisheries, agriculture, environment, industry) are not the norm. Interested stakeholders should recommend, and where possible foster, such research at both the academic and governmental levels.

This report has endeavoured to illustrate that there exists a wealth of knowledge on how to assess and tackle DWPA; a range of EU-level legal instruments requiring the reduction of DWPA; and a range of measures and funds to implement such obligations, including –notably, the EAFRD.

In the author's view, there is sufficient knowledge available both of the science of DWPA and eutrophication, and about the policy instruments that can be used to address DWPA. One of the great challenges that remains may be making the case that eutrophication in the Baltic Sea can only be effectively addressed if there is the determined and active political will to use agricultural and land use

[99] Ibid page 54
[100] Dwyer, J. et al. (2002) page 66
[101] Private conversation with WWF Scotland, June 13th.

policies to reduce DWPA. Without such political will, it is unlikely that measures will be developed, funded and implemented in such a way and on such a scale to reverse the Baltic Sea's eutrophication problems.

From this perspective, the ideas for grant aid schemes presented in the previous chapter must be accompanied by recommendations to be made at the policy level, to political decision-makers.

1. *Agriculture is the most significant source of diffuse pollution and so is the most important focus for any attempt to reduce levels of diffuse pollution*[102]*.*

   The above statement does not necessarily relate exclusively to the Baltic Sea, but evidence from the work of HELCOM confirms this statement hold true also for the Baltic (cf. for example, ref. HELCOM 2005). This evidence needs to be brought to the attention of agricultural policy makers at the outset of any discussion, making clear that: "*The way we produce our food is critically important for the future state of Europe's seas*[103]*"*. This reality needs to be captured in political strategies before it is likely to be implemented through either dedicated policies or integrated in sectoral policies (e.g. EAFRD). The EU's EAFRD has taken a first step in this direction, when recommending in its Strategic Guidelines that Member States consider implementing rural development programmes consistently with thematic environmental strategies such as the up-coming Marine Strategy. However, EU-level recommendations must be accompanied by strong political will from national and regional political powers, if practitioners at national level are to feel compelled to operate by them.

4. *Reducing eutrophication in the Baltic Sea requires concerted action across countries.*

   The fact that HELCOM exists is a recognition of this. However, there is little evidence of how this recognition has been translated into concerted approaches in agricultural and land-use policies. Concerted action is needed because efforts concentrated on reducing the impacts of DWPA in the Southern Baltic countries are more likely to lead to significant changes than efforts dispersed across the region, given the significantly higher rates of DWPA reaching the Baltic Sea from the South compared to the Northern Baltic (cf. figure 4). Concerted action can only occur once political consensus has been reached on the importance of addressing agriculture and land use policies. Collective responsibility can then be a means to help countries take action, by providing for example, financial or technical assistance.

   The up-coming EU Marine Strategy Directive may do little to support collective action if, as environmental NGOs fear, it will not require Member States to act collectively in defining strategies for assessing and reaching GES for their regional seas, or for implementation of the Marine Strategy to be carried-out in conjunction with the WFD[104]. Ensuring these principles are enshrined in the Marine Strategy Directive is a priority so long as it is still being negotiated. Furthermore, as river basin authorities are set-up, and PoMs defined for river basin management plans, relevant

[102] Dwyer J. et al. (2002) page 19
[103] ELME (2007) « Joined-Up Thinking » page 1
[104] Greenpeace et NGOs (2006)

agricultural, environmental and coastal authorities should be required to work together with practitioners on identifying joint strategies to address DWPA.

5. *Tackling DWPA is a legal obligation.*

   As chapter 4 illustrated, there exists a wealth of legislation that Member States have adopted since the 1970s that relate to DWPA. Since, Member States have also agreed to make compliance with a number of these legal texts (nitrates and sewage sludge) a requirement to receive CAP payments. Member States have also pursued legislation to protect freshwater and marine environments. The EAFRD offers many opportunities to implement measures in favour of these legal obligations, as illustrated in chapter 5. Political will and prioritisation is needed at national level to use these opportunities.

6. *Tackling DWPA can deliver broad sustainability benefits.*

   The report has illustrated various ways in which tackling DWPA can lead to broader sustainability benefits. These include:

   6.1. The inter-linkages between land management practices and the integrity of soil and water resources, as well as the links between freshwater and marine ecosystems;

   6.2. The nature of DWPA, which requires concerted action from farmers across a broad territory, as well as tailored on-site action;

   6.3. The nature of many of the measures that can usefully be taken to address DWPA (cf. chapter 4) and how they can also affect other environmental (e.g. biodiversity), social (e.g. flood protection) or economic objectives (e.g. productivity).

   Options for diffuse pollution should not, therefore, be considered in isolation, but in terms of their multiple benefits[105]. Farmers too, may have a strong interest in seeing any measures implemented to address DWPA work in synergy with other schemes addressing environmental issues (e.g. agri-environment schemes or assurance schemes like organic, integrated farming), and in ensuring that multiple environmental benefits arise from any practice adopted; as this is likely to strengthen their perception of the benefits of engaging in DWPA measures. Again, working jointly across administrations can only be significantly improved if there is a strong political mandate to do so.

7. *Tackling DWPA should be integrated with other relevant EU policies*

   Chapter 4 outlined a range of EU policies which all interface with agriculture and water. A key to the success of any measures and funding allocated to address DWPA will be the capacity for such measures to be integrated into the planning processes and implementation of the range of policies identified in that chapter.

   Integration with –and between, the Water Framework Directive, the Marine Strategy Directive and agricultural and land-use policies are particularly important. Their on-going negotiation (marine)

[105] Private conversation, WWF Scotland, June 13th.

and planning (freshwater and CAP) processes offer timely opportunities to be able to achieve this (see chapter 2 and Annex 4).

Though not the subject of this report, it will also be important to monitor and –where relevant engage, the up-coming EU policies for floods, droughts and adaptation to climate change.

8. *Tackling DWPA can lead to beneficial financial impacts.*

   This statement holds true for farmers and governments alike. Financial benefits can include, for example:

   - more rational expenditure on inputs for farmers;
   - farmers saving time and human resources in implementing integrated measures (e.g. a single management plan for soil, water and biodiversity), especially if well designed;
   - if governments define assurance schemes linked to DWPA, then farmers can benefit from a value added market, providing them with greater guarantees of sales through differentiation;
   - reduced costs on potential impacts management, such as recovering silted water reservoirs, or fines for contamination of drinking water from DWPA (though countries differ on who is responsible for bearing such costs).

9. *Tackling DWPA may be more efficient than tackling eutrophication at sea.*

   Politicians need to consider the most economically and environmentally efficient ways to address freshwater and marine eutrophication, and whether it is better to try to tackle the problem at source, instead of trying to resolve it along or at the end of the chain. This is certainly the view offered by ELME. It is also the view of other economic players, like England's OfWat. OfWat is the economic regulator for the water and sewerage industry in England and Wales. Their response to DEFRA's 2004 consultation on catchment sensitive farming, for example, states that there should be limits to how much water companies (and thus consumers) should pay to off-set pollution caused by farmers[106].

[106] OfWat (2004)

Annex 1

Systematic Review of EAFRD Measures with the Potential to Address Diffuse Pollution from Agriculture

Direct Measures to Address DWPA through the EAFRD		
EAFRD Measure	**Explanatory Notes**	**EAFRD Ref.**
Modernisation of agricultural holdings	Investments to improve the overall performance of a farm and to meet Community standards related to the investments supported. For example **up-grading of farm equipment** for animal slurry collection, transport or on-site processing units or for the collection and usage of manure.	Art. 26
Adding value to agricultural and forestry products	For the purposes of this article, **adding value** should be understood to apply in the widest sense, and not just to the final products, e.g. by adding value to the production processes, adding value by adopting new standards or adding value for intangible investments such as for technical capacity building, for example. Micro-enterprises can also use this measure to meet new (< 36 months) Community standards related to the investments supported.	Art. 28
Infrastructure related to the development and adaptation of agricultural and forestry measures	Investments related to *inter alia* water management infrastructure.	Art. 30
Meeting standards based on Community legislation	A fixed-rate sum for a maximum of five years of financial support to cover for the costs incurred or income foregone by farmers in complying with a range of Community standards, including the WFD. Grant aid can be given to help farmers invest in measures such as **infrastructure investments** (e.g. slurry storage, animal housing, pesticide handling facilities) or **non-productive investments** (e.g. physical works like recreating drainage and paths in eroded soils).	Art. 31
Participation in food quality schemes	Support for farmers entering either national or Community food quality schemes aimed at providing a higher level of control and respect of compulsory standards. This could include schemes such as **organic** and integrated pest management (IPM) production methods.	Art. 32
Agri-Environment Forest Environment	Off-sets the income foregone by farmers or the costs related to voluntary commitments to **deliver specific environmental objectives** that go beyond the obligations of Community or national standards, such as for example minimum requirements for fertiliser and plant protection product use.	Art. 39 & 47
Non-productive investments	Supports investments that can help to achieve agri- & forest-environment commitments or other commitments in high nature value areas, and which do not lead to any significant increase to the value or profitability of the holding.	Art. 41 & 49
First afforestation of agricultural and non-agricultural land	**Flood, erosion & pollution management**: target afforestation on river margins to reduce effects of diffuse pollution or to manage water flows and control soil erosion.	Art. 43 & 45
Less Favoured Areas (LFAs)	**Land management**: support to maintain and adapt systems of agricultural land management in areas affected by water handicaps AND where land management should continue in order to conserve or improve the environment (e.g. habitat type or biodiversity), preserve tourist potential or in order to protect the coastline.	Art. 37 (payment system) & Art. 50 (2)-(4) (designation)

Indirect Measures to Address DWPA through the EAFRD		
EAFRD Measure	**Explanatory Notes**	**EAFRD Ref.**
Vocational training and information actions	**Capacity building** for **land managers and others involved in the farming**, forestry and food sectors –and their advisers; on the role of agriculture in diffuse pollution and the socio-economic benefits to them, their communities and ultimately the Baltic sea, of tackling diffuse pollution.	Art. 21
Use of advisory services	Supporting the capacity building (i.e. knowledge) of agricultural stakeholders about **management requirements** and the good environmental (and agricultural) conditions **statutorily** required under the CAP, rural development, but also –for example, in river basin districts and in co-operation activities with river basin authorities.	Art. 24
Setting-up of management, relief and	**Establishing water management bodies** compatible with the WFD (and potentially, though not referenced as pre-dates it, the Marine Strategy). Investments could include start-up funding, feasibility studies, the	Art. 25

advisory services Conservation and up-grading of the rural heritage	development of river basin or coastal management plans and / or their link to local development plans. Water related actions linked to conservation of the rural heritage in areas of high nature value can include environmental **awareness** actions, studies and **investments** associated with maintenance, restoration and up-grading.	Art. 57
Training and information	**Capacity building** of all rural economic stakeholders involved in axis III actions and of people involved in developing and implementing local development strategies; to improve their understanding of diffuse water pollution and sustainable water and soil management. This can help reduce the impacts of actions but also to integrate environmental issues into rural and on-farm land management and wider development.	Art. 58
Skills acquisition, animation and implementation	**Management planning and implementation**. This support could be directed towards providing information (studies, inventories, mapping, information material and publications) for participatory processes in river basin / coastal districts, and their links to local development strategies. **Awareness raising campaigns** can also be funded, as can promotional events. Communications could be targeted on the role of agriculture in diffuse pollution and the environmental, as well as socio-economic benefits of tackling it.	Art. 59
The Leader approach	**Targeted action based on Leader local development strategies** could be a very suitable basis for integrating measures across administrative districts, river basins or indeed trans-national co-operation projects between territories in several Member States. Funding **public participation** in the development and implementation of river basin / coastal / local development management plans, and their inter-linkages.	Art. 61 - 65
National rural network	Each Member State is obliged to establish a national rural network, bringing together the organisations and administrations involved in rural development. The networks should aim to develop action plans to identify and share good practice across the country and transfer experience and know-how also trans-nationally. Training programmes are also eligible.	Art. 68

Further Measures to Address DWPA through the EAFRD		
EAFRD Measure	**Explanatory Notes**	**EAFRD Ref.**
Partnership	The EAFRD shall be **implemented in partnership** between the European Commission, the Member State and the authorities and bodies designated by the Member States (according to national rules and practices), including: • Competent public authorities (including national, regional or local environmental or water administrations); • Economic and social partners; • Any other appropriate body representing civil society, NGOs – including environmental organisations. The Member States shall create the conditions for a broad and effective involvement of all appropriate bodies.	Art. 6
Monitoring committees	Including the above-mentioned partners, the role of the monitoring committee is to check the effectiveness of the implementation of the RDP, and progress towards achieving the specific targets of the programme by means of financial, output and result indicators. The committee may also propose to the Managing Authority any adjustment they feel would be necessary to the RDP, and shall consider and approve any proposal to amend the RDP.	Art. 77 – 79
Indicators	Beyond the common monitoring and evaluation framework drawn-up with the Commission, each RDP shall specify a limited number of **indicators specific to that programme** to measure –against the baseline situation (described in the *ex ante* evaluation & national strategy plan) the outputs, **results and impact** of the programme.	Art. 81
Evaluation	RDPs are subject to *ex ante*, mid-term and *ex post* evaluations that aim to assess the impact of the programmes in relation to the Community Strategic Guidelines and, inter alia, sustainable development requirements, environmental impact and meeting the requirements of relevant Community legislation.	Art. 84
Payments linked to the Water Framework Directive and to Natura 2000	**Off-sets** through compensation, economic disadvantages to farmers and land-managers whose activities are constrained, or must be adapted; due to the implementation requirements of the WFD.	Art. 38

Adapted from Regulation 1698/2005, WWF et al. (2005) pages 43-44 and Ecologic (2005) page 21 and personal research

Annex 2

The Indexing System Used by Withers, P. et al. (2003) to Rate the Potential Vulnerability of a Farm to Soil and Phosphorus Loss in Agricultural Run-Off

Site factor	**Vulnerability to P loss class (score value)**			
Low	**Moderate**	**High**		**Very high**
(1)	**(2)**	**(4)**		**(8)**
Soil PP detachment				
Soil test P (mg/l)	<25	26-45	46-70	>70
Slope °	<3 (5%)	3-7 (5-12%)	7-11 (12-19%)	>11 (19%)
Soil texture	C, SC, ZC	SCL, CL,	SZL, ZL, ZCL	S, LS, SL
Rainfall (mm)	<600	600-800	800-1000	>1000 mm
Land use	Well managed long-term grassland	Early-drilled winter cereals, oilseed rape, short-term grass, winter cover crops	Spring cereals, potatoes, sugar beet, poached or badly-managed grassland	Late drilled winter cereals, maize stubble, bare land over-winter
Soil SP release				
Soil test P (mg/l)	<25	26-45	46-70	>70
Land use	**Arable rotations**	**Grassland 3-5-years**	**Grassland 6-10 years**	**Grassland >10 years**
Incidental P loss				
Amount (kg P/ha)	<25	25-50	50-100	>100
Type of manure or fertilizer	Treated biosolids	Cattle FYM Rock phosphate	Broiler litter Acidulated phosphate	Cow/pig slurry Soluble fertilizer
Method/timing	Spring Incorporated	Winter incorporated	Spring broadcast	Winter broadcast
Rapid flow risk	**Green**	**Yellow**	**Orange**	**Orange**
Surface condition	Uncompacted well-managed soils	Plough pan trafficked grassland	Cultivation pan capped soils poached grassland	Hard smooth surface tramlines
Site permeability	<3 ° (5%) freely draining	3-7 ° (5-12%) Freely draining, or <3 ° (5%), slowly permeable	>7 ° (12%), freely draining, or 3-7 ° (5-12%) slowly permeable	>7 ° (12%) slowly permeable
Underdrainage	No underdrainage	Partial underdrainage	Underdrained	Intensively underdrained
Flood risk	Very rare	Rare	Occasional	Frequent
Annual rainfall (mm)	<600	600-800	800-1000	>1000 mm
Connectivity to the stream (m)	>100 m indirectly connected	50-100 m indirectly connected	<50 m indirectly connected	Riparian field directly connected

Annex 3

Collection of Case-Studies Addressing Water Pollution from Agriculture

The following selection of case studies have not been edited by the author. The have been copied, as presented, from the referenced reports.

Nitrate Sensitive Areas (NSA) Scheme - England

The aim of the project was to reduce the nitrate pollution of drinking water supplies. The project was implemented in 32 different areas in England, and participation was voluntary. The NSA framework covered approximately 35 thousand hectares of eligible agricultural land. These activities were separate from the mandatory Action Programme measures which implemented the Nitrate Directive (91/676/EC). The NSA offered farmers three different schemes of measures:

- **Premium Arable Scheme (PAS)**. Under this scheme, farmers were required to convert arable land to extensive grass under one of six' agriculture management systems;
- **Premium Grass Scheme (PGS)**. Under this scheme, the extensification of existing intensively managed grasslands was supported;
- **Basic Scheme (BS)** under which two different options of low nitrogen cropping were supported.

Compensation was paid to participants in these schemes for a 5 year period. Payment rates were based upon level of income foregone, and they varied according to farming systems in the different areas. Typical payable rates (pounds/ha) were as follows:

- PAS 440 – 590 (depending on options),
- PGS 250,
- BS 65 – 105.

Total expenditure varied from 1,5 million pounds to 6,2 million pounds per year (between 41 - 185 pounds/ha of total project area).

Results have shown that NSA schemes have resulted in a reduction of nitrate concentration in water as well as in a reduction of nitrate leaching from the soil root zone. The nitrate concentration in water resources decreased from 125 mg/l in 1995/96 to 72 mg/l in 2000/01.

From Dworak T. et al (2005) page 36

The Baltic Agriculture run-off Action Programme - Poland

Between 1945 and1990, economic development in Poland, as was the case with many other CEE countries, took little account of environmental protection. As a result, the natural capacity of ecosystems was exceeded, and regional ecological disasters occurred. Since the end of the socialist regime in 1989, greater efforts have been taken to improve the state of the environment. Some of the projects intend to improve the state of water resources polluted from agricultural sources.

One of these projects was the Baltic Agriculture run-off Action Programme (BAAP), implemented between 1994 and 1997 in two regions of Poland. It was a Swedish-led initiative that aimed to improve the quality of the Baltic Sea and covered Polish water resources. The overall goal of the project was to create a social, economic and political climate that would encourage both the recognition of agriculture-related water quality problems and the development of the specific solutions.

In both areas, 8 farms were selected where liquid manure tanks or organic manure slabs were built. The cost of the construction have been estimated on the level of 5 000 – 10 000 Euro/farm. Fifty percent of the investment costs were provided by BAAP project funds, approximately 15 – 30% of the cost have been covered by farmers. The successful implementation of the demonstration component of the project and a high level of interest by farmers in both regions resulted in the extension of the project, thanks to financial support from the regional environmental funds. As a result, several additional manure tanks or slabs have been built. Due to the success of the project, several new initiatives have been undertaken across Poland. This has helped to ensure that nitrate levels in surface and underground water in these regions do not exceed 50 mg/l.

From Dworak T. et al (2005) pages 36-7

Protection of mineral water resources in the Vittel Catchments - France

The aim of the programme was to ensure that concentration of nitrate in water stayed at a level below 10 mg/l and that the pesticide level did not exceed 0 mg/l in the catchment for Vittel mineral water extraction.

The area is occupied mostly by dairy farms based on corn feeding. In the 70's. and 80's,. because of the

intensification of milk production, the nitrates content in the small watercourses and in surface sources increased. Fortunately, the contamination did not reach the deep water-bearing levels. In order to protect mineral water resources, Vittel Corporation negotiated a contract with the farmers in order to ensure that their practice will not negatively influence the water quality. The main requirements were as follows:

- Total suppression of the corn crop,
- Composting of all animal waste,
- Limited load to 1 LAU/ha of areas designated for animal grazing,
- Ban on the use of phytosanitary products,
- Priority for natural fertilisers, rationalisation of nitrogen fertilisation,
- Introduction of new crop rotation system with alfalfa,
- Standardisation of breeding holdings.

Since 1987, the Vittel Corporation has offered to buy the agricultural lands and land working rights at a price of 3000 Euro/ha. In the 1990s, the company attained ownership of over 50% of the cultivated land of the catchment (1800 ha). The monitoring showed that in a large number of control points the limit of 10 mg of nitrates/l was reached. Only the return of the temporary grassland, especially of alfalfa, resulted in an increase of nitrate concentration above 10 mg/l. Nevertheless, further analysis shows that there are many options and possibilities to improve the grassland management for better water protection.

From Dworak T. et al (2005) page 37

Upland restoration and management: Protecting Drinking Water Supplies - England

Location and Background:

Whitendale Farm is one of a number of upland farms in the North West of England owned by United Utilities Water Company. These landholdings encompass the catchments of United Utility water supply reservoirs. Typically the farms are tenanted and grazed, although Whitendale has been unoccupied since 1999 and a new tenant will be appointed in early 2006 to implement the management plan. United Utilities are proposing to re-negotiate tenancy agreements and make around 9 million pounds of capital investment in order to secure statutory biodiversity objectives and protect/improve raw drinking water quality. Annual farm incomes could be supported by agri-environment payments and investment in farm infrastructure and operations.

Measures:

United Utilities will pay for a range of measures, including the blocking of drains (also known as “grips”) in blanket bog, establishment of hillside woodland along water courses and re-vegetation of bare, eroding peat.

Stocking density is controlled and restricted to sheep.

Whitendale Farm management plan relies on a range of agri-environment payments (Environmental Stewardship) and English Woodland Grant Scheme, which have yet to be secured.

Table 3: Cost of Measures (Whitendale Farm)

Scheme	Option	Ha	Payment rate (£)	Total (£)
EWGS	Creation of broad leaved woodland	64	60	3,840
ES	Creation of species-rich, semi-natural grassland	2.6	280	728
ES	Supplement for hay making	2.6	75	195
ES	Management of permanent grassland with very low inputs	20.7	60	1,242
ES	Two-metre buffer strips on intensive grassland	2,200 m	6 per 100 m	132
ES	Supplement for small fields	20.7	35	724
ES	Restoration of rough grazing for birds	54.9	80	4,392
ES	Raised water level supplement	26.9	80	2,152
ES	Creation of successional areas and scrub	25.8	100	2,580
ES	Restoration of moorland	873	40	34,920
ES	Moorland re-wetting supplement	280	10	2,800
ES	Maintenance of heather moorland	128	40	5,120
ES	Shepherding supplement	1,001	5	5,005
TOTAL				63,830

Note: the measures listed in this table are those applied for under the ES and EWGS schemes, but the final figures are subject to negotiation with the government agencies responsible for allocation of grant aid payments.

Synergies:

- Blocking grips has the potential to restore the blanket bog ecosystem (a Natura 2000 habitat) and to reduce oxidisation of peat and thus slow, or reverse, the deterioration in water colour, a problem that requires expensive and complex treatment contrary to Art. 7 WFD.
- Agri environment scheme measures to limit grassland inputs and create buffer strips will reduce nutrient load to watercourses and potentially reduce drinking water treatment costs associated with eutrophication.
- Tighter controls of livestock, grazing pressures and absence of cattle reduce risk of cryptosporidium pollution, an issue for drinking water treatment.

- Reduction of stocking density, blocking of drains and re-wetting of moorland has potential to reduce run-off and mitigate the effects of drought.
- Upland catchment restoration will reduce erosion and thus the sediment load entering rivers, an issue which has knock on effects for river morphology, fish spawning, macro-invertebrates and macrophytes.
- The fencing out of 5km of water course from livestock helps reduce the risk of pathogens such as cryptosporidium as well as suspended solids and diffuse pollution.

From Dworak T. et al (2005) pages 38-9

Integrate River Basin Management Plan for the Odense Fjord – Denmark[107]

In the Odense Fjord River Basin, land use is dominated by agricultural exploitation. Farmland thus accounts for 68% of the basin. In 2000, there were approximately 1.870 registered farms in the Odense River Basin, of which approx. 960 were livestock farms. The dominant crop type in Odense River Basin is cereals (2/3 winter cereals), while only 10% is accounted for by grass/green fodder.

Due to the intensive agricultural activities in the Odense River Basin, the environmental authority proposed the following set of measures in order to reduce agricultural losses of nutrients:

- **Technological types:**
  - Improvement of manure and slurry: biogas, separation techniques;
  - Limitation of ammonia evaporation: application of acid to slurry, improvement of stables.
- **Fertiliser related types:**
  - Standards for utilisation and maximum use of manure and slurry;
  - Reduced fertiliser quota.
- **Land use related types:**
  - Demand of utilisation of catch crops
  - Set a side areas: reduced application of fertiliser, catch crops, selection of agricultural areas for wetlands, forests and riparian areas free of cultivation
  - Cultivation without ploughing
- **Measures effecting both the water environment as well as the terrestrial environment:**
  - Stop rotation cultivation along river valleys;
  - Stop cultivation along riparian areas;
  - Reduction of ammonia emission;
  - Organic farming.
- **Economical measures:**
  - Fees on fertilisers, quotas
  - Subsidies to environmental improvements – CAP (voluntarily): reduced application of fertiliser, catch crops, selection of agricultural areas for wetlands, forests and riparian areas free of cultivation.

The Danish Ministry of the Environment and the Danish Ministry of Food, Agriculture and Fisheries developed the Action Plan for the Aquatic Environment II (Vandmiljøplan II – VMP II), which covers the period from 1998 until 2004. Within the implementation process of the plan, one working group carried out a project which aims at defining a set of measures for protecting the aquatic environment against nitrogen and phosphorus pollution. For the Odense Fjord catchment, this project defines three different scenarios on agricultural measures to meet environmental objectives:

- Scenario 1: Mixed type of measures,
- Scenario 2: “Set-aside” based measures,
- Scenario 3: Most cost effective measures.

The following tables give an overview of the specific measures for each scenario and the related reduction of nitrogen loading in the Odense Fjord. In addition, the tables give information on the cost effectiveness of each measure (in DKK per kg N).

Scenario 1: Mixed types of agricultural measures

[107] For more information : http://www.odenseprbuk.fyns-amt.dk/

Measure	Area involved Hectare (percent of agricultural area)	Cost 1.000.000 DKK *(EURO)*	Reduced Nitrogen leaching		Reduced Nitrogen loading Odense Fjord (50% retention)	
			ton N	Cost effectiveness DKK/kg N	ton N	Cost effectiveness DKK/kg N
Better utilisation of animal fodder	70.000 (100%)	0	45	0	23	0
10% higher utilisation of animal manure	70.000 (100%)	2,4	142	17	71	34
Catch-crops: Optimised utilisation of catch-crops on areas with manure	3.200(4,6 %)	0	38	0	19	0
Catch-crops: Increased use	5.000(7,1%)	1,3	185	7	93	14
Set aside for wetlands. – Wetlands in river valleys.	4.000(5,7%)	11,6	400	29	400	29
Set aside for new forest. - New forests on cultivated areas.	5.000 (7,1%)	14,1	214	66	112	125
Reduced N-fertiliser quota (20%)	70.000 (100%)	9,0	508	17	254	34
Reduced livestock production (10.000 AU)	70.000 (100%)	16,2	108	150	54	300
Agri-environmental schemes * Voluntary measures – EU subsidies (CAP)	2.000 (2,8%)	2,2	18	122	9	244
Organic farming – increased area	2.500 (3,6%)	7,2	50	144	25	287
Total cost DKK *(EURO)*		63,9 *(8,44)*				
Total reduction - leaching, loading			**1 684**		**1 048**	
Cost effectiveness - average (DKK/kg N removed) *(EURO/kg N)*				**38**		**61** ***(8,1)***

* This calculation on effects of implementing extra 2000 hectare measures within agri-environmental schemes (voluntary measures subsidised by EU) presumes the same distribution of types of voluntary measures as used today. The average effect is 9 kg N/hectare, which is relatively low because the use today of the measures "set aside","Establishment of wetlands" and "40 pct reduction of Nitrogen fertiliser" are low. These types of voluntary measures are the most efficient to reduce nitrogen losses.

As the above table shows, the agricultural measures of scenario 1 lead to a reduction of ca. 1048 tons nitrogen in the Odense Fjord catchment, while the total cost of all scenario 1 measures amounts to 63.9 million DKK corresponding to approx. 8.44 million Euro. Thus, the cost effectiveness rests with 8.1 Euro per kg nitrogen removed.

Scenario 2: Set aside" based agricultural measures

Measure	Area involved Hectare (percent of agricultural area)	Cost 1.000.000 DKK. *(EURO)*	Reduced Nitrogen leaching		Reduced Nitrogen loading Odense Fjord (50% retention)	
			ton N	Cost effectiveness DKK/kg N	ton N	Cost effectiveness DKK/kg N
Wetlands in river valleys – Set aside for wetlands	5.400(7,7%)	15,7	540	29	540	29
New forests on cultivated areas located in areas vulnerable for groundwater contamination (nitrate). Set aside for new forest	25.000 (35,7%)	64,5	974	66	487	132
Erosion protection – buffer zones. Set aside for erosion protection	250 (0,4%)	0,7	13	54	13	54
Erosion protection – remaining risk areas. Set aside for erosion protection	1000 (1,4%)	2,8	38	74	19	148
Total cost DKK *(EURO)*		83,7 *(11,0)*				
Total reduction - leaching, loading			**1 565**		**1 059**	
Cost effectiveness - average (DKK/kg N removed) *(EURO/kg N)*				**53**		**79** ***(10,4)***

With regard to scenario 2 (Table 6), the set of defined agricultural measures lead to nearly the same amount of nitrogen reduction as in scenario 1. However, the cost of the measures (11 million Euro) is higher than in the first case, which results in an average cost effectiveness of around 10.4 Euro per kg nitrogen removed.

Scenario 3: Most cost effective agricultural measures

Measure	Area involved Hectare (percent of agricultural area)	Cost 1.000.000 DKK *(EURO)*	Reduced Nitrogen leaching		Reduced Nitrogen loading Odense Fjord (50% retention)	
				Cost effectiveness		Cost effectiveness
			ton N	DKK/kg N	ton N	DKK/kg N
Better utilisation of animal fodder	70.000 (100%)	0	45	0	23	0
10% higher utilisation of animal manure	70.000 (100%)	2,4	142	17	71	34
Catch-crops: Optimised utilisation of existing catch-crops on areas with manure	3.200(4,6 %)	0	38	0	19	0
Catch-crops: Increased use	5.000(7,1%)	1,3	185	7	93	14
Reduced N-fertiliser quota (20%) *	70.000 (100%)	9,0	603	15	301	30
Total cost DKK *(EURO)*		28,4 *(3,82)*				
Total reduction - leaching, loading			**1 553**		**1 099**	
Cost effectiveness - average (DKK/kg N removed) *(EURO/kgN)*				**18**		**26** ***(3,4)***
Wetlands in river valleys –Set aside for wetlands	5.400(7,7%)	15,7	540	29	540	29
New forests on cultivated areas. Set aside for new forest	5.000 (7,1%)	14,1	214	66	112	125
Reduced N-fertiliser quota (20%) *	70.000 (100%)	9,0	603	15	301	30
Total cost DKK *(EURO)*		28,9 *(3,82)*				
Total reduction - leaching, loading			**1 553**		**1 099**	
Cost effectiveness - average (DKK/kg N removed) *(EURO/kgN)*				**18**		**26** ***(3,4)***

*1) The effect of reduced N fertiliser quota are higher in this scenario 3 compared to the scenario 1 because voluntary measures based on EU-subsidies are not included in this scenario

Scenario 3 combines the different agricultural measures from the cost effective perspective (see 3rd Table). Through these agricultural measures, which cost a total of 3.82 million Euro, the nitrogen loading of Odense Fjord can be reduced by 1 099 tons. The cost per kg nitrogen amounts to 3.4 Euro, which is only half the average cost effectiveness of scenario 1. This cost is low compared to the present cost of total sewage treatment in the catchment. The cost of the latter treatment is around 40 million Euro/year. Hereby around 1200 tonnes of N is removed from the sewage produced in the catchment, (equals around 33 Euro/kg N removed).

Finally, it can be concluded that it will be necessary to reduce the nitrogen loading by about 50% (1000 tons N/year or 9.5 kg N/ha) in order to achieve the WFD's objective (good ecological status) in the Odense Fjord. The yearly expenses related to agriculture amount to 4-8 million Euro. The most cost effective measures (1.9-5.4 Euro per kg N) include extended use of catch crops, establishment of wetlands, higher utilisation of nitrogen in manure and reduction of total nitrogen use. Measures such as the establishment of wetlands and buffer zones along rivers and lakes, and afforestation give added bonus in the form of more nature in the basin.

From Dworak T. et al (2005) pages 42-6

The Morsa Catchment – Norway

The Morsa catchment, located in the South-East part of Norway between the Oslofjord and the Glomma river, provides an appropriate example for identifying the potential contents of the programmes of measures and agricultural activities. For the Morsa catchment, a river basin management plan (RBMP) was prepared. The catchment area is dominated by agriculture (16%) and forest (80%) land use. The RBMP includes (i) an assessment of reference conditions and required reductions in nutrient inputs to meet the quality targets defined on the basis of specific user standards, (ii) an analysis of possible measures and quantification of potential reductions in nutrient inputs, including the cost of these measures, as well as (iii) the implementation of these measures.

The RBMP comprises a number of measures primarily linked to diffuse agricultural sources and scattered dwellings. The following table shows the measures and the related impacts of these measures on the reduction of phosphorus discharge and losses in the periods of 2002-2005 and 2006-2008.

Quantified effects for reduction of P discharges/losses in the Morsa catchment

Measures	Reduction of P discharges/losses in tons	
	Period I (2002-2005)	Period II (2006-2008)
Agriculture		
Conservation tillage	3.6	0.4
Constructed wetlands	0.8	0.7
Grassed waterways	0.2	–
Vegetation zones	0.2	–
Other measures	0.4	0.85
Wastewater treatment		
Private	1.0	0.8
Public	0.3	0.25
Total reduction of P in tons	**6.5**	**3.0**

The results of the measures implemented on farms in the Morsa catchment in 1999 and 2003 can be taken from the following Table:

Measures	1999	2003/2004
Reduced tillage systems	20-30% (in stubble over winter)	ca. 60% (in stubble over winter)
Constructed wetlands	4	32 built > 10 planned
Vegetation zones/buffer strips	0	100 km (7.5m) / 0.8 hectares
Planting on riverside	0	15 000 m
Grassed waterways	< 1 000 m	5 000 m
Farms with environmental plan	0	nearly 100%
Calculated discharge of P from agriculture	11 tons	7 tons

The cost of the implemented measures in agriculture in the period 1999-2003 amounts to 35m Norwegian Crowns (NOK). The cost for the remaining measures is about 40m NOK. An additional compensation of 5m NOK per year is needed. For the period of 2002-2008, the investment cost for the wastewater treatment plants amounts to 270m NOK.

From Dworak T. et al (2005) pages 46-7

Annex 4

The Water Framework and Nitrates directives

Water Framework Directive

The implementation of the WFD consists of several planning cycles. The first extends for fifteen years (from 2000 to 2015) with subsequent cycles taking place every six years. During these cycles, River Basin Authorities – which are set-up to manage the WFD's individual River Bain Districts will have to develop and implement a series of tasks including programmes of water management measures (PoMs), and the establishment of appropriate and effective monitoring systems. Each cycle culminates in the production of a River Basin Management Plan, which must include all the measures needed to prevent the deterioration and achieve "good status" of river basins. Table 3 provides an indication of the DWPA-relevant measures that Member States are currently considering to include in their PoMs. They provide a useful insight into some of the actions that could also be relevant to address through EAFRD measures[108].

DWPA-Relevant Measures Indicated by Member States for Potential Inclusion in their River Basin Management Plans "Programme of Measures"

Basic Measures	Supplementary Measures
• Manure storage (e.g. supplying non-leaking storage) • Manure spreading (e.g. ban in winter months / on saturated soils; supply of transportation and spreading equipment) • Reduction in nitrate leaching • Placing plant protection products on the market • Pesticides use • Reduction of excess phosphorus • Reduction of discharge of phosphorus • Fertiliser spreading (e.g. prohibition of application to steep slopes) • Buffer zones for fields • Buffer zones around groundwater inlets • Limit for sewage sludge use • Cultivation restrictions on land liable to erosion • Technical soil conservation measures • Organisation soil conservation measures • Drainage system measures • Grassing and afforestation • Change of structure of forestry • Initiatives for organic farming • Management of Natura 2000 sites • Buffer zones around protected areas (Natura 2000) • Streamside vegetation management • Licensing irrigation • Environmental permits (IPPC) needed for large scale agricultural polluters • Advice to farmers • Natural resources tax payments	• Rules for land under vegetative cover • Buffer strips • Catch crops and spring tillage • Taxes on nitrogen content in fertilisers • Taxes on pesticides • Training and education for farmers • Testing of sprayers • Regional plant protection centres • Waste water and waste taxes • Environmental licensing • Authorisation needed for certain substances • Waste water treatment plants • Training for farmers • Awareness campaign • General binding rules to farmers on diffuse pollution

Adapted from WFD & Agriculture Progress Report (2006) pages 9 - 10

[108] WWF et al. (2005) page 42

The first River Basin Management Plans should be finalised by 2009, with the first set of measures applying from 2012. This offers the opportunity for the relevant actions identified to be considered for adoption by RDP monitoring committees as rural development measures already at their mid-term evaluations in 2010, thus providing the means for an earlier start to some actions than if implemented solely through River Basin Management Plans.

Nitrates Directive

In its annexes II (codes of good practice) and III (action programmes) the Nitrates directive explicitly promotes a range of actions identified as relevant in limiting the loss of nitrates from farming. Member States are obliged to develop voluntary codes of good practice, accompanied if necessary by advisory and training services; to ensure a general level of protection from nitrate pollution for all waters. Furthermore, Member States must designate Nitrate Vulnerable Zones (NVZs) for coastal and surface waters and develop targeted action programmes for them. Beyond their immediate purpose, the actions outlined in the annexes to the Nitrates directive also provide a useful starting point for authorities responsible for designing rural development measures and programmes, as they indicate very concrete practices that can be included either as specific rural development measures (e.g. modernisation of agricultural holdings for appropriate manure storage) or as criteria within measures (e.g. nitrogen spreading calendars under agri-environment). The actions recommended include, for example:

- periods when the land application of fertilizer is inappropriate;
- the land application of fertilizer to steeply sloping ground;
- the land application of fertilizer to water-saturated, flooded, frozen or snow-covered ground;
- the conditions for land application of fertilizer near water courses;
- the capacity and construction of storage vessels for livestock manures, including measures to prevent water pollution by run-off and seepage into the groundwater and surface water of liquids containing livestock manures and effluents from stored plant materials such as silage;
- procedures for the land application, including rate and uniformity of spreading, of both chemical fertilizer and livestock manure, that will maintain nutrient losses to water at an acceptable level;
- land use management, including the use of crop rotation systems and the proportion of the land area devoted to permanent crops relative to annual tillage crops;
- the maintenance of a minimum quantity of vegetation cover during (rainy) periods that will take up the nitrogen from the soil that could otherwise cause nitrate pollution of water;
- the establishment of fertilizer plans on a farm-by-farm basis and the keeping of records on fertilizer use;
- the prevention of water pollution from run-off and the downward water movement beyond the reach of crop roots in irrigation systems.

Acronyms

CAP	Common Agricultural Policy
DEFRA	Great Britain Department for the Environment, Food and Rural Affairs
DWPA	Diffuse Water Pollution from Agriculture
EAFRD	European Agricultural Fund for Rural Development
EU	European Union
EU-12	Member States of the EU that joined in 2003 and 2007
EU-15	Member States of the EU prior to the 2003 enlargement
EU-25	Member States prior to the 2007 enlargement (i.e. no Romania and Bulgaria)
EU-27	Current Member States of the EU
GES	Good Environmental Status under the Marine Strategy Directive
K	Potassium
N	Nitrogen
NGOs	Non-Governmental Organisations
NrdSP	National rural development Strategy Plan
NVZ	Nitrates Vulnerable Zone under the Nitrates Directive
P	Phosphate
PoMs	Programmes of Measures under the Water Framework Directive
R&D	Research and Development
RDP(s)	Rural Development Programme(s)
WFD	EU Water Framework Directive
WWF	World Wide Fund for Nature

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