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Policy Options for Prevention and Remediation

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WORK PACKAGE 4.2

POLICY OPTIONS FOR PREVENTION AND REMEDIATION

EXECUTIVE SUMMARY DOCUMENT OF WP 4.2

1. The first point to make is that this paper has focussed on activities that cause soil erosion and the policies to address this. Much work has been done on identifying agricultural and forestry activities, however, more work is required to identify other sectors, such as the construction industry, and explore the possible policies to protect soil within them.
2. Soil erosion is a common problem in the European Union. However, distinguishing geological and climatic features of each Member State often lead to distinct policy priorities for tackling soil erosion. In general, northern European countries are more concerned with the off-site impacts of soil erosion, which can cause eutrophication in water courses, while Mediterranean countries are more concerned with desertification. Therefore, although the aim to reduce soil erosion is common, the answers lie in national solutions adapted to each country's needs.
3. As far as soil protection is concerned, a common issue amongst most European countries is the lack of specific legislation to combat soil erosion. Isolated and dispersed regulations on this matter may be found within the framework of other regulations focused on different subjects, such as protection of water quality and highways and roads. Only Germany, Austria, Switzerland and Spain have a specific regulation for soil protection or conservation. Only in Switzerland, are there legal guide values for soil erosion (2 t/ha/yr and 4 ton/ha/yr for soil depths of < 70 cm and > 70 cm respectively). In Switzerland, the 'Law on Agriculture' provides a relatively high degree of soil protection, in particular (inter alia) against soil erosion. In Belgium, a Flemish Parliament Act on soil protection is under political discussion.
4. In most Member States, the principal instruments to tackle soil erosion are economic instruments in the form of cross-compliance (sanction) and agri-environment schemes (incentive). Member States are distinct in how they control soil erosion through these means. With regards to cross-compliance, some Member States have introduced specific environmental requirements targeted to soil protection. Most agri-environmental schemes have indirect measures - that is, their first purpose is targeted at conservation, landscape or biodiversity, not soil; a few schemes also have specifically targeted soil measures. Many Member States have voluntary Codes of Good Farming Practice (GFP) which give advice on soil conservation measures. GFP constitutes the baseline requirement for farmers wishing to join agri-environmental schemes. Only farming practices going beyond GFP may qualify for agri-environmental payments. These payments mainly cover the loss of farmers' income for adopting environmentally friendly practices. Measures related to less-favoured areas (LFAs) also require the respect of the codes of GFP. In general terms, good progress for soil conservation has been made in the agricultural sector through the agri-environment schemes and the introduction of codes of good farming practices. **We recommend that Member States should identify the soil resource more clearly as an objective of agri-environment schemes and increase the profile of soil within the codes of good farming practice. Agri-environment schemes need to be targeted on particular areas that are vulnerable to erosion and support in the form of advice and guidance to farmers is also important to ensure their effectiveness.**
5. A number of EU directives, regulations and agreements that have the provision to tackle soil erosion, have been identified in the text. The Water Framework Directive, the CAP and the Kyoto Protocol are among them. For example,

- Where "good status" in water bodies is not achieved by 2015, and the reason is identified as diffuse pollution, Member States will have to take action to control it. The links here between diffuse pollution, the WFD and soil erosion must be made.
 - As a result of the latest CAP reform in 2003 and the growing importance of environmental principles introduced by the establishment of cross-compliance, soil protection has been specifically addressed by the agricultural sector (i.e. good agricultural and environmental conditions in Annex IV to Regulation (EC) N° 1782/2003. Furthermore, rural development programmes foresee a large number of further specific measures to prevent soil erosion via agri-environment schemes, which should produce a higher level of soil protection over land in these schemes.
 - Through the Kyoto Protocol, there may be a possibility to encourage soil carbon sequestration which, as well as combating climate change by reducing atmospheric carbon, would have a beneficial effect on reducing soil erosion.
6. **The WG identified different steps towards a European policy on soil protection: 1) Member States take a closer look at what is currently available to them in the form of existing European directives etc. to address erosion; 2) Member States identify the gaps in current directives in order to define the need for new legislation; 3) The Commission develops a soil framework directive.** Where it is envisaged that new measures are to be implemented in the framework of other policies, Member States must be aware of the importance of farmer support, in order to succeed in reaching the environmental requirements. Given the limited financial and human resources, and the fact that national initiatives already exist, member states should be encouraged to **rearrange and optimise budgets**, rather than incurring additional expenses. Furthermore, costs, effects and benefits of the measures have to be monitored.
7. **We recommend that the Commission should stimulate the process of the promotion and establishment of technology transfer programmes, structure modernisation plans, training programmes and research and development actions.**
8. It will be important for Member States to identify the gaps in national policies that control soil erosion and consider the following new recommendations:
- **Raise awareness of soil erosion, and suggest activities to reduce the risk**
 - **Encourage measures to increase the soil water retaining capacity of the land in areas vulnerable to flooding**
 - **Provide economic incentives (such as tax benefits, subsidies, etc.) to farmers who use sustainable production systems**
 - **Set up a member state soil conservation service to ensure soil policies are implemented**
 - **Explore the merits of Integrated Farm Management, Organic Farming and Conservation Agriculture as systems that contributes to soil protection through sustainable farm management.**
 - **Introduce and practice the Integrated Coastal Zone Management approach.**

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This section attempts to outline current policy measures to tackle the issue of soil erosion in a number of European countries. We cover countries in northern Europe, the Mediterranean and Eastern Europe – areas which all have different issues associated with protecting the soil. The measures are divided into regulations, economic instruments, such as incentives, and social measures, such as advice and information. We then highlight European directives where soil erosion could be addressed, but is not widely done so, as a signpost to member states. Finally we identify the policy gaps to tackling soil erosion successfully in Europe and suggest some recommendations in these areas.

4.2.1 – IDENTIFICATION OF EXISTING POLICY INSTRUMENTS IN MEMBER STATES

Mandate: *consideration and better understanding of legislative, economic and social instruments currently applied in MS, taking into account regions and local situations. Attention should be paid to complexity and diversity of soil.*

Soil erosion is a very important issue in Europe which affects all European Union Member States. However, the range and concrete effects related to this subject depend on a large series of variables which refer to complexity and diversity of soil and climate all along our continent.

NORTHERN EUROPE

In **Norway**, there are no regulations that directly or indirectly cover soil erosion.

Land use changes have led to increased erosion, loss of the cultural landscape heritage and decreased biodiversity. As a result of this environmental crisis, the Norwegian government decided to prioritize the reduction of erosion and a soil mapping programme was established for the watersheds feeding into the North Sea and Skagerrak. Based on the soil maps, erosion risk maps were produced and an Agri-Environmental Scheme was established to support farmers in taking the right decisions to reduce erosion. The Environmental Scheme is voluntary.

As soil erosion in Norway mainly occurs in autumn and spring, the measures are targeted at reducing autumn ploughing in the areas with a high to very high erosion risk. Several environmentally friendly soil treatments are subsidized and the level of subsidizing is for some elements directly related to the erosion risk level. A specification of the support to a changed soil treatment and other measurements in 2002 is given in Table 1 in Annex A.

In 2002, nearly 20 million Euros divided over 11806 farmers and covering ca. 205,600 ha, was given as support for changed soil treatment. In the last few years the interest for catch crops has increased considerably. The part of the scheme dealing with changed soil treatment has been highly successful and model calculations show that Norway has nearly reached the targets of the North Sea Declaration.

Another element in the scheme is the change from cereal production to permanent vegetation cover on fields marginal for cereal production and having a high to very high risk of erosion. Support is given to change arable farming land into grazing land, land for grass production and production for bio-energy, seeds and other crops giving a good protection against erosion. No support is given for afforestation and the production of Christmas trees and Christmas decoration. The support for altering covers 70 % of the costs for the farmer with a maximum of 625 Euro/ha. After altering, a yearly support of 125 Euro/ha is given.

Municipalities and extension services give farmers support and advice on how they can reduce erosion on their farm. Extension services provide demonstration farms to show how different measures can reduce soil erosion.

In **Finland** there is an Environmental Scheme based on the EG Directive 1257/1999. Its main objective is to reduce the consequences for the environment by improved agricultural methods to protect biodiversity in the agricultural environment, to protect flora and fauna and to protect the cultural landscape. An objective is to increase the organic content of the soil and to keep soil productivity stable or to increase it. The farmers get support to stop autumn ploughing and to keep the soil covered with vegetation during wintertime. The support is not dependent on the soil type, the erosion risk or terrain form and is 140 Finnish mark/ha.

We have no information of any regulation or social instruments to reduce soil erosion.

Policy instruments concerning soil erosion in **Sweden** may be found in legislation, codes, regulations and guidelines from governmental authorities and standards. Most of these documents are harmonised with other EU member states. Normally, soil erosion issues are not described in detail but will often be a consequence of or a part of a more general aspect. Some policy instruments, which influence soil erosion, are listed below.

The Planning and Building Act (PBA) - supplies a framework within which the municipality can act. Soil erosion issues should be considered mainly in land use planning. One characteristic feature of the PBA is that it sets out a series of general requirements to be observed in the planning and design of building development.

National Environmental Objectives - The Swedish Parliament has established 15 environmental quality objectives to guide Sweden towards a sustainable society. The environmental objectives will function as benchmarks for all environment-related development in Sweden, regardless of where it is implemented and by whom.

The Swedish Forestry Act - general legislation for forestry issues, several aspects which may cause soil erosion are described. The focus is to provide a valuable yield and at the same time preserve biodiversity.

The Environmental Code - The aim of this code is to promote sustainable development based on the understanding that nature is worthy of protection in its own right, and that man's right to exploit nature carries with it a responsibility. The Environmental Code is further elaborated and specified in the form of ordinances, regulations issued by public authorities and decisions taken in individual cases.

We have no information on economic instruments.

In **Iceland** protection from grazing was an important part in early soil conservation measures and reclamation efforts. The Soil Conservation Service had an important role in that. Today emphasis is on the promotion of a sustainable land use and it has tried to involve individual land users. An important development is the recent agreement between sheep farmers and the government, where a part of the production subsidies are tied to “quality management” that includes sustainable land use.

In **Denmark**, policy is mainly based on protection of the environment, groundwater, surface water and types of nature.

There is no legislation for the regulation of agricultural practices in relation to soil erosion. However, subsidies can be obtained by farmers to prevent wind erosion, which is a major problem in Denmark. Farmers can participate on a voluntary basis, and receive a grant of 50 % for soil preparation, plants, planting and maintenance for 3 years if the hedges form part of a regional shelterbelt project. Despite the high investment costs, this policy resulted in the planting of 1000 km of shelterbelts per year (Veihe et al., 2003).

Furthermore, one piece of Danish legislation focuses on soil erosion, mainly protecting the coast and coastal zones. The general policy on coastal protection is based on natural development, and protection is only established if there is a risk of bigger loss of land or risk for human life. Both policies are summarized in Table 1.

Table 1: Legislation and arrangement to prevent soil erosion.

Legislation/arrangement	Type of arrangement	Effect	Administration by
Planting windbreaks	Subsidies	Slow down the wind.	National authorities
Dune preservation	Conservation		National authorities

Most legislation on the protection of land against soil erosion aims at preventing nutrient losses to the water environment, in order to protect surface water from pollution and conserve groundwater as drinking water. The legislation on environmental protection and planning regulates the use of land, for instance the discharge of wastewater, and might also have an effect on preventing soil erosion. Also the national river legislation has some rules about tillage free banks of the streams, which can prevent local erosion.

As far as farmland is concerned, there are several possibilities for the farmers to obtain subsidies for sowing persistent grass or planting new wood. The different arrangements are listed in Table 2 in Annex A. Over the last few years, there has been a tendency to keep green cover for a longer time as a consequence of the water environmental plan. The main purpose is to prevent nutrients from being washed out of the soil, but the measures may have a minor impact on preventing soil erosion. Future actions to change agricultural practices towards higher protection against soil erosion will be more focused on advisory on best practices than on legislation.

In **England and Wales** soil erosion is not covered by any specific law. The only piece of legislation that could be used directly to prevent erosion from occurring is the Anti-Pollution Works Notices detailed in Section 161 of Water Resources Act 1990 (as amended). The legislation gives the Environment Agency for England and Wales the powers to require action to be taken to prevent potential pollution where activities are likely to result in polluting material entering controlled waters. In practice Anti-Pollution Works Notices are seldom used.

However, there are additional pieces of legislation that can be used to deal with the impacts of erosion once it has occurred. In practice these pieces of legislation provide erosion prevention controls by both the disincentive of prosecution and by requiring measures to be put in place to prevent the problem occurring again. In summary:

- The Highways authorities, responsible for the roads in England and Wales, have powers under Section 151 of the Highways Act 1980 to serve notices on the owner/occupier of adjoining land requiring them to take action to prevent soil from that land being washed onto the road.
- Local Authorities can also serve notice under Section 80, Environmental Protection Act 1990 requiring measures to be put in place to prevent erosion from occurring where the soil deposited causes a nuisance (as defined in Section 79). An individual may also act under Section 82 of the Act on a complaint made by any person on the ground that he is aggrieved by the existence of a statutory nuisance.
- The Environment Agency for England and Wales can take legal action where a person causes or knowingly permits any poisonous, noxious or polluting matter to enter controlled waters under Section 85, Water Resources Act (1991). The courts can impose up to a three month prison sentence, or up £20, 000 fine or both.

- Similarly, the Environment Agency can also take action under Section 4, Salmon and Freshwater Fisheries Act 1974 where a person has caused, or knowingly permits any liquid or solid matter to enter into any waters containing fish to the extent that it causes the waters to be poisonous or causes injury to fish, fish spawning grounds, spawn or the food of fish.
- In Scotland, the Scottish Environmental Protection Agency (SEPA) also has Anti Pollution Works Notices under section 46, Control of Pollution Act 1974 (as amended) that can potentially be used to prevent soil erosion. SEPA also has powers under Section 33, Environment Act 1995, to prevent, minimise, remedy or mitigate the effects of pollution on the environment, and under Section 35, Environment Act 1995, which places a duty on SEPA to consider adverse effects of activities on SSSIs when undertaking pollution control duties.

UK statutory designated conservation sites do not explicitly require the control of soil erosion, however, they indirectly reduce erosion risk by controlling stocking rates to avoid over-grazing. Operations such as ploughing, reseeding and drainage are also likely to be precluded if they are likely to result in degradation of, or changes to the characteristics of the site.

Within Less Favoured Areas (LFAs), farmers are obliged to abide by the Code of Good Farming Practice. The conditions do not explicitly refer to soil erosion but do refer to the Air (non-statutory), Soil (non-statutory), and Water (statutory) Codes that cover these issues

In **England** the agri-environment scheme is known as Countryside Stewardship (CSS). It is currently under review, and a new proposal is to add "protect the natural resources of water and soil" as an objective. Land managers that apply for the Scheme must follow "Good Farming Practice" conditions. Those which contribute towards reducing soil erosion include: avoiding overgrazing and supplementary feeding; not removing field boundaries; encouragement to follow soil and water codes of good agricultural practice; and protect hedgerows, rivers, streams and banks.

There are many measures in the Scheme that are aimed at improving habitats or enhancing the landscape but that also double to reduce soil erosion. These are laid out in Table 7 in Annex A along with payments that the schemes offers land managers, converted into euros (£1 = €1.4).

A base-level agri-environment scheme is expected in England in 2005. It aims to encourage a large number of farmers across a wide area of farmland to deliver simple yet effective environmental management on their farm. One of the areas of focus is diffuse pollution and soil erosion and the application for the ELS contains an erosion risk assessment that farmers must complete to identify those fields at high risk. They are then directed to the relevant options to tackle erosion if they wish to use ELS to address them. The land manager will receive a flat rate of €42 / ha if they can ascribe 30 points/ha for undertaking management practices, each of which are valued by points. Those measures relevant to tackling soil erosion are set out in Table 8 in Annex A, with the number of points attributable.

In **Wales** farmers in agri-environment schemes are expected to manage their land in accordance with the Air, Soil and Water Codes. Additional soil protection is provided by habitat protection measures within the Whole Farm and Voluntary Options sections of the scheme. Agri-environment schemes also protect traditional field boundaries, which are important in intercepting down slope run-off and so help reduce the extent of erosion. All agreement holders have to adhere to a set of general prescriptions applying to the entire holding. Those which contribute to reducing soil erosion are set out in Table 9 in Annex A. Payments are set out in Table 10 in Annex A.

In **Scotland** farmers in the agri-environment scheme must follow certain General Environmental Conditions and the Standard of Good Farming Practice, which apply over the whole of the land belonging to the farm. The conditions set out in the General Environmental Conditions that relate to erosion include: on some land you should avoid damaging the conservation interest by not undertaking new drainage works, ploughing, clearing, levelling, re-seeding or cultivating and ensure that livestock

are managed to avoid poaching; you should follow the guidance approved by Scottish Ministers for the avoidance of pollution, i.e. The Code of Good Practice for the Prevention of Environmental Pollution from Agricultural Activity (PEPFAA Code).

The Good Farming Practice guidelines also require that the whole farm is managed to ensure that livestock is managed to avoid overgrazing and poaching (compaction).

The RSS contains a number of agri-environment options that though not designed specifically for erosion control can provide some protection, which include: management options for grassland, heath and moorland for birds and biodiversity; and prescriptions for field margins and boundaries.

WESTERN AND CENTRAL EUROPE

In **Belgium**, existing instruments differ between regions (Flanders and Wallonia):

Flanders

A Flemish Parliament Act on soil protection has been prepared recently by the administration and is at present under political discussion. This act will provide the opportunity to lay down source and result oriented standards, to introduce protection measures and to demarcate soil protection zones. Hence, this act will be the first legal instrument for protecting the soil directly, for instance against soil erosion.

Until now, the protection of point and linear landscape elements such as hedgerows and sunken lanes through the Flemish Parliament Act on Nature Conservation, provides an indirect means of protecting the soil against excessive runoff. But there is no or hardly any legal way to impose erosion prevention measures to farmers, nor to punish them for damage or pollution by off-site sediments. Some municipalities set up police regulations, but these are restricted by the constitutional rights of land owners and land users, such as the right of ownership and the freedom to engage in professional activities.

In Flanders, both local authorities (municipalities) and farmers are being stimulated to take preventive and/or curative actions against soil erosion in high risk areas, for the sake of soil protection and protection of the environment in general (e.g. water quality). The most important trigger for the development of a real soil erosion policy, however, has been the numerous muddy floods causing a lot of damage to private properties and public infrastructure in Southern Flanders.

Subsidies for municipalities: Since December 2001¹, subsidies can be attributed to municipalities to draw up a municipal soil erosion action plan, and/or to carry out small-scale soil erosion prevention or combating works. The respective subsidies amount to € 12.5 per ha planning area, and 75 % of the total costs of the works, including compensations for the landowners and for the farmers.

Subsidies for farmers: Today, individual farmers can be subsidized for taking environmental measures that have a wider scope than soil erosion prevention. These are adopted in the 'Flemish Plan for Rural Development' in the framework of the European regulations 1257/99 and 1750/1999, such as cover crops (€ 50 ha⁻¹/year), afforestation (between € 850 ha⁻¹ for poplar and € 3700 ha⁻¹ for oak) and grass buffers strips along rivers and sunken lanes (€ 0.13 m² y⁻¹). Also set-aside can be beneficial for erosion prevention when it is applied to slopes prone to soil erosion. The set-aside subsidies vary between € 298 ha⁻¹ and € 424 ha⁻¹, depending on crop type and the agricultural area (in 2002). However, grants for specific soil erosion prevention or combating measures at the field scale have only recently been proposed to and approved (26/6/03) by the European Commission for adoption in the 'Flemish Plan for Rural Development'. The new grant system is expected to be operational from

¹ 'Besluit Vlaamse regering van 7 december 2001 houdende de subsidiëring van de kleinschalige erosiebestrijdingsmaatregelen die door de gemeenten uitgevoerd worden' or 'Erosion Decree'.

2004-2005. The measures are set out in Table 4 in Annex A. Fields that are eligible for these grants will be indicated in a municipal soil erosion action plan. In the absence of such a plan, the Flemish administration will make the decision.

Apart from subsidies via the 'Erosion Decree', a municipality can get subsidies for organizing awareness raising actions with the farming community, such as showing erosion prevention techniques through demonstration fields (€ 125 per field), excursions with farmers to an erosion prevention project (€ 250) and advisory courses (€50 per session). Furthermore, once soil erosion problems have been inventoried in a municipal soil erosion action plan, a municipality is supported to approach individual farmers in order to put the proposed actions into practice (€ 50 per farmer).

Wallonia

The Walloon authorities are now paying more and more attention to soil erosion (origin, consequences, prevention and remediation). Before developing legislative tools or detailed action plans, the Walloon Region tried to inventory the areas where soil erosion could be considered as a real problem, not only from an environmental but also from a social and an economic point of view. Walloon Research Centres are now working on methodologies for mapping such areas, using data from meteorology, pedology, topography and land use. Existing measures and erosion action plans are largely integrated in more general (agri-) and forest environmental programmes (water quality,...) as well as in regional action plans aimed at preventing floods.

Efforts are mainly concentrated in the loamy region where the farmers are financially encouraged to adopt anti-erosive practices². In forest zones, foresters are also encouraged to improve their practices (subsidies for replacing heavy machinery by horse-hauling for example³) and the management of the forest resources in order to reduce large-scale forest clear cuttings (< 3 ha), which are well known to favour soil erosion.

As in Flanders, Walloon farmers can be subsidised for taking agri-environmental measures - see Table 5 in Annex A. Farmers undertake to apply these measures for five years. In some cases, these measures are able to combat soil erosion. They involve for example cover crops, afforestation or grass buffers strips along rivers. Although these measures are within the orientations of the common agricultural policy (CAP), they are also part of actions mentioned in the Environmental Plan for sustainable development in the Walloon Region⁴ and the Contract for the Future of Wallonia⁵ (CAW). In 2002, agri-environmental measures concerned nearly 10 % of the farmers population and were applied to about 110 000 equivalents-ha (14.5 % of the Walloon utilised agricultural area).

With the introduction of the Federal Soil Protection Act in 1998 in **Germany** (Anonymous 1998), soil functions became the standard for the assessment of the soil conditions and the required level of its protection. This includes the prevention of harmful changes to the soil, rehabilitation of the soil and precautions against negative soil impacts. Article 2 of the Soil Protection Act defines three main soil functions i) natural soil functions (e.g. as a basis for life and a habitat for people, animals, plants and soil organisms; and as a medium for decomposition, balance and restoration as a result of its filtering, buffering and substance-converting properties, and especially groundwater protection), ii) functions as an archive of natural and cultural history and iii) functions useful to man (e.g. land for agricultural and silvicultural use). The Federal Soil Protection Act is based on the German concept of the precautionary principle, which comprises the protection or restoration of soils and their functions on a permanent

² Arrêté du Gouvernement Wallon du 11/03/1999 (modifié le 15/12/2000) relatif à l'octroi des subventions agri-environnementales. Mesures agri-environnementales en vigueur en Région wallonne (AGRENWAL).

³ Arrêté du Gouvernement Wallon du 14 novembre 2001 relatif à l'octroi d'une subvention aux propriétaires particuliers pour l'éclaircie et le débardage au cheval en peuplements feuillus et résineux.

⁴ Plan d'Environnement pour le Développement durable en Région Wallonne (PEDD), 1995.

⁵ Contrat d'Avenir pour la Wallonie

sustainable basis⁶. The precautionary principle requires the assessment of predicted incidents for the level of intervention, based on soil quality targets (e.g. permissible levels, trigger and action values).

Whenever the responsible party⁷ carries out *actions on a site that can lead to changes in soil characteristics*, they are *obliged to take precautions against the occurrence of harmful soil changes that could be caused by their uses of the site or in its area of influence* (Article 7). *Soil impacts shall be avoided or reduced where this is a reasonable requirement also with respect to the purpose of the use of the site*. The obligations for precautionary measures in agricultural soil use are specified in Article 17 which refers to the code of Good Agricultural Practice to preserve the soil functions specified in Article 2, which also includes yield potential.

If a hazard to soil occurs or becomes likely to occur, preventive measures (Article 4), orders for risk assessment and investigations (Article 9) and obligations for the remediation (Article 10) of the soil are required by law. Within the scope of preventive measures an investigation is carried out to assess if appropriate precautionary measures were applied to avoid the hazards. In the case that the hazard occurs as a previous lack of precaution, in accordance with the obliged measures specified in Article 17 of the Act, this will give rise to liability issues (see also Bergschmidt 2003, pp. 2). Preventive measures against hazards or orders for the remediation of the soil need to be ordered in compliance with the local farm advisory service.

The Federal Ministry of Consumer Protection, Food and Agriculture has set-up the fundamentals of professional agricultural practice in "Principles for the Application of Good Professional Practice in Agricultural Soil Use" (BMVEL 1999) and concretised the principles for the agricultural advisory bodies to be applied in practice (published in: Federal Law Gazette #220a, 21. November 1998). These have been substantiated by a joint working group of representatives at the national and federal states level (BMVEL 2001). No quantitative criteria have been set up, no indicators for control have been defined nor have any penalties been established (Bergschmidt 2003).

To safeguard the protection of soils and their functions several federal states (Länder) have set-up regional support schemes for soil conservation practices in arable land-use.

In Saxony (Sachsen) for instance approximately 60 % of the arable farm land (~ 450 thousand ha) is vulnerable to soil erosion through water. Another 20 % of the arable farm land (~ 150 thousand ha) is vulnerable to wind erosion. The erosion risk occurs mostly in areas with silty soils where sugar beet, maize, oil seed rape and winter cereals are grown.

Supportive payments are granted for conservation soil management (no-till policy), mulching and intercrops or undersown crops. Farmers have to commit to the programme for 5 years, the degree of participation is over 25 % of the arable farm land.

North-Rhine-Westfalia (Nordrhein-Westfalen) has just introduced a programme for assigned areas of erosion risk. In such areas support for the following measures is granted:

- Mulch- or direct drilling after intercrops or into mulched straw (no-till policy)
- Converting arable land into perennial grass land (no fertilizer, no pesticides and no pasture after 15th June).

Amount of annual allowance:

- Mulch- or direct drilling: 102 € /ha.
- Conversion into perennial grass land: 306 €/ha up to 35 Points "Ertragsmesszahl" (Product of area and a classification according to the German land appraisal (Acker- or Grünlandzahl))

⁶ This concept goes beyond the COMMUNICATION FROM THE COMMISSION (Brussels 2.2.2000) on the precautionary principle: *"The precautionary principle should be considered within a structured approach to the analysis of risk which comprises three elements: risk assessment, risk management, risk communication. The precautionary principle is particularly relevant to the management of risk."*

⁷ The property owner, the occupant over a site and the party who carries out, or has carried out by others, actions on a site [...].

divided by 100, higher numbers indicate higher yield potential), above this 7.5 €/ha per extra point (Etragsmesszahl), maximal 715 €/ha.

Other examples of anti-erosion measures taken by other regional authorities are given in Table 6 in Annex A.

In **Austria**, the protection of agriculturally used soils is defined in the soil protection laws of the different Austrian provinces. In these laws, the aim of protection, the “maintenance of natural soil fertility and of an ecological functioning of soils” is defined. Additionally, the way to reach this aim is defined: a particular conservation measure may be set into practice. However, no explicit rule is included to which extent soil loss is tolerable. Because of this lack of a definition of tolerable soil loss, in general no intolerable soil losses – in terms of legislation – are observed (Klaghofer, 2002). With the participation of Austria to the European Community in 1995, the Austrian Agri-Environmental programme (ÖPUL) was started. The main aims of this programme in general is to stimulate the introduction or maintenance of agricultural production technologies, which are compatible with the protection and improvement of environment, landscapes and their characteristics, natural resources, soils and genetic diversity (BMLFUW, 2000). To reach this aim, a huge variety of different measures for all aspects of agriculture are offered to farmers on a voluntary contract basis. Compensations for the implementation of these measures are offered per measure.

Explicit erosion control measures

Three different forms of measures are offered under the heading erosion control:

- *Soil erosion control in vineyards*

This measure includes covered soil using either mulching, straw or cover crops within each row from 1st of November – April 30, or terracing.

- *Soil erosion control in orchards*

Covered soil using either mulching, straw or cover crops within each row for at least 10 months/year, or terracing.

- *Soil erosion control in farmland*

Conservation tillage (either direct drilling or mulching)

Implicit erosion control measures

Beside these contracts, erosion reduction effects may also be expected by the contracts of ÖPUL 2000, which are not explicitly dedicated to erosion control but to other or to more general environmental aspects. Some of these measures are offered on a regional basis, some of them are offered for the whole of Austria. These measures and possible positive effects are:

- Biological farming: shift from intensive crop rotations to less intensive crop rotations
- Cover crops during winter: reduction of winter erosion
- Maintenance of small agricultural structures, introduction of new landscape elements: reduction of the length of overland flow pathways
- Regional project of eco-points: erosion reduction through maintenance of small structural elements within landscapes
- Regional project of the province of Salzburg to protect groundwater and maintain pastures: maintenance of grassland instead of arable land
- Regional projects for preventive water protection: cover crops during winter and therefore reduction of winter erosion

Participation and costs

Participation of farmers in measures which explicitly account for soil erosion control has increased from 1998 to 2002. In 2002, an area of about 150,000 ha was under contract. This corresponds to about 34% of the area with a potential high erosion risk (Strauss and Klaghofer, in press). Actually an amount of between 93 and 113 €/ha (different schemes exist) is given as a subsidy for implementation of the measure “soil erosion control in farmland”, between 2000 and 4000 €/ha (depending on slope)

is paid for the measure “soil erosion control in orchards” and between 2000 and 11000 €/ha (again depending on slope of the area) is paid for “erosion control measures in vineyards”. Adding up mean values for these contracts amounts to about € 143 million, which have been invested in 2001 into measures to reduce soil erosion risk on agricultural land. These numbers do not include measures which are detailed under heading “implicit erosion control measures”.

Since 1993 in **Switzerland**, there have been several legal regulations dealing with the protection of soil, rivers and lakes, hopefully leading to a reduction of soil erosion. The most important laws are listed in the following.

- In the Law on Agriculture (German abbreviation: LwG), the so called ecological subsidies are described (LwG, Art. 76): “With ecological subsidies the Federation encourages natural agricultural production forms, which are respecting the environmental and animal welfare, as well as their expansion.” The supported agricultural practices are described in the Ordinance on Direct Payments. For example a regulated crop rotation is prescribed (Art. 8): “The share of crops and the crop rotation have to be chosen in a way to avoid erosion, soil compaction and soil decline as well as leaching and losses of fertilizers and pesticides due to surface runoff as much as possible.” In Art. 9, soil protection is regulated: “The avoidance of erosion and of chemical soil pollution is an integral part of soil protection. Soil protection is promoted by an optimal soil coverage, measures against thalweg (concentrated runoff) erosion and by using soil friendly fertilizers and pesticides.” These measures are specified in the technical annex of this Ordinance: “Farms with more than 3 ha arable land must have on its arable acreage an average area-weighted soil protection index of at least 50 points for arable crops and 30 points for vegetables respectively.” The calculation of this soil protection index is explained in detail in the technical annex. Moreover: “No noticeable soil losses are allowed on areas where suitable measures to control erosion are missing. Suitable measures are considered to be in particular grass strips at least 3 m wide along ways on inclined arable fields or surface measures to drain off or to pass by water in order to avoid thalweg erosion.”

Farmers must participate in this programme (so-called “ecological performance”) in order to receive these direct payments. In 2003, 88% of all farmers participated. 329,886,000 SFr. were disbursed to ecological direct payments 2001.

- In the Law on the Protection of Rivers and Lakes there is an article concerning soil management, as well (Art. 27): “Soils have to be managed according to the state of art in agricultural techniques, in order to avoid adverse effects on rivers and lakes, in particular by losses due to surface runoff and leaching of fertilizers and pesticides.”
- In the Law on the Protection of the Environment measures against soil pollution are regulated in Art. 33: “The soil may be physically affected only to the extent that its fertility is not permanently degraded; such shall not apply to building areas. The Federal Council may issue regulations or recommendations on measures against physical impacts on the soil such as erosion or compaction.” The “Ordinance relating to impacts on the soil” (German abbreviation: VBBo) specifies measures against soil compaction and erosion in Art. 6: “A person who constructs an installation or who exploits the soil shall choose and utilise vehicles, machines and tools such that compaction and other changes in soil structure which may threaten its long-term fertility can be prevented, taking into account the physical characteristics of the soil and its level of humidity. A person who intends to carry out modifications of the terrain or exploits the soil shall ensure that appropriate kinds of building and exploitation are used, in particular through anti-erosion building or cultivation techniques, rotation and adaptation of crop cultivation, so that the fertility of the soil is not threatened in the long term by erosion. If protection of the soil against erosion so requires, the cantons shall order measures to be taken jointly by several

enterprises, particularly in the case of erosion caused by concentrated runoff (thalweg erosion).” In the annex to this ordinance the following guide values for soil erosion on arable land are formulated:

Guide values for erosion on arable land according to VBBo

<i>Depth through which roots can penetrate</i>	<i>Total mean erosion¹ (in tonnes dm per hectare and year)</i>
Up to 70 cm	2
More than 70 cm	4

dm = dry matter

¹ total mean erosion = sum of soil losses by sheet and linear erosion

These guide values were not only defined regarding onsite effects (soil loss), but also relating to potential offsite effects (ecological side effects).

Additionally to these national laws there are still different regulations by the different cantons. In order to promote and subsidize conservation agriculture, an “incentive programme” was adopted by the Bernese Office of Agriculture for regions susceptible to soil compaction, soil erosion, or nitrate leaching. Farmers willing to give up ploughing and to apply reduced or zero tillage techniques on their fields, can undertake a five-year contract with the Bernese Office of Agriculture. According to the contract, they will get yearly contributions which depend on the applied cultivation technique and on the crops they grow (cf. Table 12 in Annex A). Afterwards, a connecting contract, of which the conditions are stricter (payments will only be guaranteed for direct seeding) can be undertaken for a second five-year period.

The number of farmers participating in the programme has quadrupled since its beginning in 1996 (cf. Table 13 in Annex A). Usually when a farmer is successful in direct seeding, this will encourage his neighbours to try out this new zero tillage technique as well ("snowball effect"). Table 13 indicates that in 2002, 5.4 % of the arable land in the canton of Bern was under contract, including 3.4 % with zero tillage, 1.2 % with mulch tillage and 0.8 % under temporary ley. For financial policy reasons, no more new contracts could be made for 2003.

In **France**, government support encourages the development of individual anti-erosive installations or of innovating agricultural practices through the law of 30 July 2003 with respect to 'the prevention of technological and natural risks and the repair of damage'. Article 49 of this law completes the rural code with a chapter on the delineation of erosion zones, i.e. zones where soil erosion on agricultural land may cause significant downstream damage.

The decree implementing this law defines the modalities of the delineation of soil erosion zones and de criteria for working out an action plan to be carried out for each of these zones. The action plan specifies the (agricultural) measures to reduce erosion risks, some of which can be made obligatory. Amongst the agricultural measures are:

- periodic or permanent vegetative cover;
- grass strips along river sides;
- hedges, taluds or low stone walls;
- infiltration ditches and infra-structural measures to decrease runoff rates and volumes;
- soil management techniques reducing runoff;
- application of natural organic material to improve soil structure.

Territorial Exploitation Contracts (Contrats Territoriaux d'Exploitation: CTE) are 5 year contracts between a farmer and the state. This contract is in theory coherent with the environmental provisions of the CAP (Common Agricultural Policy). In compensation of financial support given by the state, the farmer commits to install economic and environmental devices. On the basis of a diagnosis of his exploitation, the farmer defines a total exploitation project which details the actions and the objectives. This project comprises an aspect devoted to engagement of the farmer in the field of arrangement, of the rural development of space and environment.

Other instruments are River Contracts. These contracts aim to improve the quality of water and to develop the river. They are signed by the departments or areas concerned and the ministry of environment. They lay down collective objectives which can integrate anti-erosive measures within the catchment basin. Subsidy rates vary from 10 to 40% (circular of the 24/10/1994).

The *Schéma d'Aménagement et de Gestion des Eaux* (SAGE) instituted by the article 5 of the law n° 92-3 of the 03/01/1992, lay down the general objectives for utilisation, development, quantitative and qualitative protection of surface water and groundwater resources, water ecosystems and wetlands. The interest of this SAGE is that it is a global and concerted solution, at the scale of the catchment basin, which integrates the protection and the economic uses. The control of soil erosion can form part of the objectives of the SAGE or of the River Contract, concerned with the reduction of the turbidity of surface waters and of their eutrophication related to diffuse pollution of agricultural origin.

The reduction of agricultural sources of water pollution is one of the objectives of this program. Other actions are envisaged within the same framework. They can also have a favourable impact on the control of soil erosion, in particular on the improvement of protection and management of fauna. This programme is established on the basis the EEC regulation n°2078/92 of the council of 30/06/1992 which envisages help to farmers applying environmentally respectful practices. A circular of the ministry of agriculture of the 26/03/1993 organises its setting up. Within this framework, objectives of protection of water are established and can result in the following measures:

- The protection of watercourses by the installation of grass buffer strips.
- The fight against erosion in areas with crops that are sensitive to this phenomenon.
- The conversion of arable lands into grasslands or the maintenance of non-productive meadows, aimed at the long term withdrawal through engagements of 20 years. In both cases, the level of support is 380 €/ha/year (data from 2002).
- The reduction of inputs, particularly nitrogen and plant protection products.

These measures considered also have an impact on soil erosion and its consequences.

Finally, the EEC regulation n° 2080/92 of the council of 30/06/1992 institutes a community system of support for forest measures in agriculture, to contribute to a management of the space more compatible with the equilibrium of the environment. The decree n° 94-1054 of the ministry of agriculture specifies the objectives of this support and fixed the conditions of its attribution. Among these objectives defined in the article 4 of this decree appears "the protection of the environment, in particular of water resources and the reduction of soil erosion".

Approximately 4% of the surface of **the Netherlands** is affected by wind and/or water erosion. Wind erosion involves some 97,000 ha (2.6%) in the Netherlands. The areas mainly occur in:

1. the coastal dunes,
2. sandy arable soils in South-Brabant and the North of Limburg,
3. central sections of the Netherlands (Veluwe) and
4. the arable raised peat bog soils in the North (Groningen and Drenthe).

Quantitative data on soil loss rates are lacking, mainly due to the nature of wind erosion. Economic costs are therefore difficult to estimate. There are no policy instruments to prevent wind erosion.

About 61,000 ha. (1.6%) is affected by water erosion, which occurs for the most part in the southern part of the province of Limburg. Regulations acting in the Netherlands are the following:

In July 2003, a *new erosion regulation* was enforced, which combines all the previously existing regulations. It obliges farmers to signpost occurrences of soil erosion on their farms to official authorities and to aim their farming activities at preventing erosion. In this regulation the agricultural commission (LLTB) firstly encourages farmers to prepare a farm erosion prevention plan on the basis of a set of guidelines or erosion prevention measures of the LLTB. . In this plan farmers have to take measures in order to attain 40 erosion control points per hectare. Each measure has a specific number of erosion control points (e.g. conversion into pasture 100 points per hectare, contour tillage 25 points per ha, non inversion tillage 35 points per hectare, etc.). If they do not prepare such a plan, the following regulations become obligatory.

The slope gradient, land use and the slope length determine which erosion control measures are necessary. Areas can be considered as sensitive to soil erosion if they have a high slope gradient and/or an unfavourable land use.

Table 2: The combination of slope length and gradient together determine the landuse allowed by the erosion-act 2003.

Slope gradient	landuse	Slope length
slope < 2°	Free	Free
2< slope <5°	Limited	Max. 400 m.
5< slope <18°	Limited	Max. 300 m.
18°< slope	Pasture	-

A limited land use means farmers have to apply cover crops in combination with f.i. direct-drilling.. Measures are only necessary if the land use consists of erosion sensitive crops, which are maize, potatoes, sugar beet and a few other less common row crops. Farmers are also restricted to transform existing grassland into cropland in a 100 m zone around build-up areas and infrastructure. These measures have mainly been taken to prevent muddy floods that cause damage to private properties and public infrastructure.

To conclude, it has been observed that the involvement of farmers in preventing erosion is (voluntarily or obligatory) generally increasing.

SOUTHERN EUROPE

In **Italy**, the policy options for prevention and remediation of desertification are put into effect through the correct use of the soil, for which an information data resource is necessary.

Currently, within the Interregional Programme "Agriculture and Quality" "soil" Measures 5, the Regions have resources to finance the production of the soil map of Italy in scale map 1:250.000. The Experimental Institute for the Study and the Soil Defense coordinates the plan "Soil Survey Methodologies" to the goal to conform criteria for the realization of a National soil map.

This map is a first step to characterize more vulnerable areas of desertification and soil erosion risk: it is currently limited to some pilot areas (Sardinia, Sicily and Puglia).

The main legislative references for protecting the soil from desertification are:

- Law n. 36/94, which governs the use of water resources and establishes that water use must be directed towards saving and resource renewal, so as not to harm available water resources, environmental liveability, agriculture, aquatic wildlife and flora, geomorphological processes and hydrogeological balances.

- Legislative Decree n. 152/1999, which generally reorganized the topic of protecting water from pollution by subdividing jurisdiction among the State (and within individual ministries), the Regions and the local authorities.
- Law n. 183/89, which led to the establishment of the river basin authorities and which calls for the drafting of hydrographic basin plans in order to implement a policy to prevent phenomena of hydrogeological instability, to protect soils, for water purification, and for the organisation, use and management of water resources. The hydrographic basin is defined by the law as a “unitary ecosystem”, that is to say a complex environment with its own homogeneity, where co-ordination and harmonisation of many functions related to different sectors of soil conservation can be put into practice, along with quantitative and qualitative management of water. The establishment of the “Basin Authorities”, at national, regional and interregional level is one of the major innovations brought about by the soil conservation reform. As for all aspects affecting control of soil erosion, the “Basin Authorities” are responsible for: stabilisation and consolidation of soils by means of both agrarian and forest hydraulic conservation structures; protection and consolidation of slopes against landslides and avalanches; prevention of both soil subsidence and sea-water intrusion in water table and rivers.
- The “Code of Good Agricultural Practices” approved in 1999 by the Ministry of Agricultural and Forestry Policies, putting the EC regulation 1257/99 into effect. The code contains standards and directions valid nation-wide, that could be integrated by regions and self-governing provinces to suit their local requirements. This regulation calls for agri-environmental measures to be taken in such a way as to finance actions which go beyond the Good Agricultural Practice defined as “normal” (GAPn), where the term “normal” stands for the whole of traditionally widespread agricultural practices considered rational from both a technical and an environmental point of view. The regions defined the local GAPn and came up with very detailed directions in order to prevent the risk of soil erosion. These directions can be put into practice mainly through a reduction in soil tillage and mouldboard ploughing, along with rotations that can ensure the soil covering during the rainy seasons.
- Law n. 97/1884, enforced in 1994, which determined the conditions to enhance soil protection in mountain areas through the development of farming activities effective to avoid soil erosion and to maintain the landscape and natural resources.
- The National Programme to Combat Drought and Desertification (NAP) of November 1999, which encourages Regions and Basin Authorities to identify areas vulnerable to desertification and the measures to fight this phenomenon, including the prevention and remediation of soil erosion and salinisation; the slope protection through low-impact environmental actions; the fire prevention actions and the adoption of farming, livestock and forestry management systems aimed at preventing physical, chemical and biological degradation of soil. Of the total 146.26 m. Euro to implement the NAP, 30 % of funding is devoted to soil protection actions; 15 % to reduction of the impact of production activities and 20 % to restore soil equilibrium. NAP measures will be mainly adopted through already existing funding instruments, such as rural development plans; water protection plans; river basin management plans; forest and reforestation program; EU Structural funds (2000-2006) and CAP measures.

In **Spain**, due to the special significance of the agricultural sector in most regions, both from a socio-economic and environmental point of view, the main measures to control soil erosion have recently been set up in the framework of the agricultural policy.

Since joining the European Community, Spanish agricultural policy has been dominated by the Common Agricultural Policy (CAP). However, CAP implementation in southern Mediterranean

European countries, and particularly in Spain, has had contradictory effects on soil erosion. One example is the set-aside policy, the main objective of which is to withdraw land from agricultural use to reduce production and diminish financial costs. The original regulation stated that abandoned land should not be used for any other purpose for five-years. Spontaneous vegetation had to be removed by tillage and other physical methods, excluding agrochemicals, to avoid weed invasion and phytopathogen blooms. The main consequence was a dramatic increase in the extent of bare soils, which were very vulnerable to erosion.

The reform of the CAP in the context of Agenda 2000 has signified the passage to a new era of integrated development of rural areas including soil protection and erosion control. In application of Council Regulation (EC) No 1259/1999 of 17 May 1999, the Spanish government has established environmental requirements to payments granted directly to farmers under CAP support schemes, financed in full or in part by the “Guarantee” section of the EAGGF. The ‘*eco-conditionality*’ principle was adopted by Royal Decree 1322/2002. The following environmental requirements are compulsory for all CAP payments beneficiaries:

- Incorporate soil conservation practices to protect fallow land from erosion, including minimum tillage and maintaining an appropriate plant cover in order to minimise erosion risk;
- Avoid stubble burning; and
- Prohibition of tillage along maximum slope lines.

These requirements may be developed by Autonomous regions once special territorial situations have been taken into account. Furthermore, Autonomous regions may set a percentage of reduction for CAP payments without exceeding 20 per cent of the whole agricultural payments. Grants are reduced in accordance with the environmental risk or damage that may cause the inappropriate practice.

Soil protection from erosion is addressed in *agri-environmental schemes*. In application of Regulation (EC) No 1257/1999 of 17 May 1999, on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF), Spain has adopted a voluntary grant system for agricultural production methods designed to protect the environment and to maintain the countryside, and developed a Code of Good Farming Practices, through the National Decrees 4/2001 and 708/2002.

Agri-environmental measures aimed at soil protection are:

- Promote conservationist practices such as contour tillage and minimum tillage (see Annex A);
- Extensification of cereal production with use of traditional fallow periods and crop rotation;
- Establish maximum livestock rates to avoid overgrazing;
- Maintenance of isolated patches of natural vegetation for landscape protection and biodiversity conservation; and
- Planting woody crops on slopes in order to avoid soil losses caused by excessive tillage;

A public investment of € 1207 million (€ 827 million are covered by EU contribution) has been committed for funding the agri-environmental measures programme during the 2000-2006 period.

Moreover, beneficiaries of agri-environmental grants must fulfil for the whole of their exploitations with the requirements laid down by the Code of Good Agricultural Practices. These include, inter alia, *soil conservation and fight against erosion* measures, which involve

- Ban of tillage following maximum slope;
- Ban of straw burning;
- Restrictions of tillage (to be developed by regional governments).

Autonomous regions may establish slope limits and fix geometrical characteristics of plots to be excluded of the application of these practices according to soil, climatic or socio-economical factors of each area.

The *agricultural land forestation*, which establishes an Aid Programme for the afforestation of former agricultural lands, also purposes to enhance long-term forest resources and to combat soil erosion and desertification, by promoting forestry as an alternative use. The programme includes three types of aid: a) funding of afforestation costs, b) annual subsidy according to the forested surface for the first five-years, and c) compensatory subsidy for up to 20 years. Programme implementation is the

responsibility of Autonomous Communities, but it is co-financed by Central Administration, Autonomous Communities and the EC (EAGGF). The total afforested area until 1998 was 400,893 ha, comprising predominantly slow growing rangelands (34.44%), herbaceous cropland (22.70%), pastures (14.58%) and fallow lands (9.87 %), as stated by Ministry of Environment (MIMAM, 2000). For the 2001-2006 period, the quantitative goal is set at 150000 ha of agricultural land been afforested with a total cost of € 880m (73% financed by EAGGF Guarantee).

Most responsibility for forest resources and nature conservation has been transferred to the Autonomous Communities. However, Central Government (through General Directorate for Nature Conservation (DGCONA) of the Ministry of the Environment) co-ordinates plans and programmes related to soil protection and desertification control, including:

1. Forest planning, Spanish Forestry Strategy and National Forest Plan, and Autonomous Forest Planning. The Spanish Forestry Strategy (EFE), which was drawn up in 1999, is a document discussing new Spanish forestry policy according to international resolutions on forest resources and aims to harmonize forestry responsibilities between Central and Autonomous administrations. Objectives include the design of new forestry policies, emphasizing multiple use of forests; organisation of forestry resources responsibilities within Central Administration, co-ordination with Autonomous administrations and renewal of forest activity as a means of generating employment and economic activity. EFE promotes a mixed body formed by representatives of the Autonomous Communities, the State Secretariat for Water and Coasts, the Water Boards and the Directorate General for Nature Conservation, to prepare and apply the National Forest Hydrology Plan, whose priority shall be infrastructure initiatives in the territory when erosion is causing clear catastrophic effects, such as flooding in the cities, for example, soil degradation tending towards desertification or massive loss of work as the land has lost the capacity to regulate the water cycle, according to a system of duly agreed objective indicators. This Plan is included as part of the National Hydrological Plan, or within the Programme of National Action against Desertification.

In 2001, the Forestry Strategy was developed at national level by means of the National Forest Plan (NFP). Among other priority objectives, the NFP identifies the following: the reforestation of degraded plant covered areas, the wildfire protection and the application of silviculture treatments to improve forest quality. The Plan foresees the reforestation of 3.8 m ha affected by soil losses greater than 5 t/ha/y and the construction of 6.9 m m³ of control structure to stabilize torrential water courses. In order to address the application of the programmes and actions to control soil erosion and combat desertification the NFP includes, as an Annex, the National Plan of Prioritised Actions to Hydrological and Forest Restoration, Soil Erosion Control and Combat Desertification (see below).

At regional level, some 13 Autonomous Communities have drawn up documents on forest policy and forestry master plans, of which seven have promulgated regional forest resource laws. Most documents point to the restoration of degraded lands affected by soil erosion by the means of revegetation and the need for sustainable forestry to control soil erosion and its off-site effects.

2. The National Plan of Prioritised Actions to Hydrological and Forest Restoration, Soil Erosion Control and Combat Desertification (MIMAM, 2001), was promoted by DGCONA in 1991 and its last version was included as Annex V in the NFP. The Plan aims to control soil erosion and establishes the location and priorities for land rehabilitation in degraded river basins, according to both the use of the river basin as the operational unit and the severity of soil erosion problems. Target areas with high erosion rates (35,000 km²) are prioritized. The Plan incorporates selected restoration measures: reforestation of degraded lands (11,00 km²); construction of check dams and channel stabilization structures (10 m m³); implementation of soil conservation practices in 8,000 km² and silvicultural treatments to improve forest quality (4,000 km²). The required investment is estimated to exceed €2,404 m for the first 20-years.

Despite these data, the Hydrological and Forest restoration activities developed under Co-operation Conventions with Autonomous Government over 1997-2001 period shows that the Plan is far from

reaching its initial goals. In future, the National Plan of Prioritised Actions to Hydrological and Forest Restoration, Soil Erosion Control and Combat Desertification will be integrated in the National Actions Programme to Combat Desertification.

The National Action Programme to Combat Desertification (NAPD)

In 1996, Spain signed the UN Convention to Combat Desertification (CCD), which commits Spain to establishing a National Action Programme to Combat Desertification (NAPD). This NPAD is being prepared by a working party group co-ordinated by DGCONA, the main objective of which is the sustainable development of Spain's arid, semiarid and dry subhumid areas and, particularly, the prevention and reduction of land degradation, the rehabilitation of partly-degraded land and the reclamation of desertified areas.

In accordance with CCD (Article 1) or explicitly considered in the Regional Implementations Annex for the Northern Mediterranean, the NAPD will include the following desertification mitigation actions: a) Prevention and reduction of soil erosion, soil property degradation and long-term loss of natural vegetation; b) Rehabilitation of land affected by soil erosion and soil and vegetal cover degradation; c) Prediction of droughts and reduction of social and natural system vulnerability to water resource deficits; d) Sustainable water resources management; e) Protection against wildfires.

In **Portugal**, the National Rural Development Plan includes several agri-environmental measures to improve soil conditions and fight against soil erosion including Direct Drilling – see Table 14 in Annex A for more details; Minimum tillage – see Table 15 in Annex A; Cover crops in orchards – see Table 16 in Annex A.

The National Development Plan also includes the 'Afforestation of Agricultural Lands'. One objective of this measure is to “Contribute to the rehabilitation of degraded lands and desertification mitigation, with benefits to soil fertility and hydrological resources regulations.”

The afforestation of agricultural lands in areas highly susceptible to desertification, will have a maintenance support of € 175/ha.

The National Programme to Combat Desertification was approved in 17 June 1999 with the following specific objectives:

- Regional, rural and local development, as a determining factor in fixing the population in regions more susceptible to desertification and drought, and in reducing human pressure on more densely populated areas;
- Organisation of the agents for economic and social development around their professional, economic, cultural, sporting environmental interests, as way forward to active participation in decisions affecting the local population and in enhancing and improving the territory;
- Improvement of the conditions for an environment-friendly agricultural activity;
- Expansion and improvement of forests and their management, in order to reinforce the role of forestry in conserving soil and water;
- Identification of the areas most affected and allocation of the resources necessary to recover degraded areas;
- Water resources management policy designed to ensure its territorial integration, combining different water uses with the protection of the environment and the conservation of natural resources;
- Concerted research into phenomena which lead to desertification and how to fight them, experimentation and practical application of results;
- The creation of centres and demonstration fields to illustrate good techniques for soil and water conservation;
- Permanent information and public awareness campaigns aimed at different sections of the population, inhabitants and decision-makers, on the question of the fight against desertification and drought, and the contribution they make to the defence of Life on Earth.

In **Greece**, through the code of Good Agricultural Practice (Ref. No: 100949/2478/9.10.00) the Greek Ministry of Agriculture contributes to the implementation of the European Directives 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources and action plans for four areas have been adopted. The Ministries of Environment and Agriculture are also promoting relevant measures in the framework of the Habitats Directive 92/43/EEC. Moreover, in the frame of the European Regulations 1257/99, 1259/99, 92/43/EEC and 91/676/EEC, guidelines are given about irrigation practices, rotation management of natural ecosystems, biodiversity, and the protection of the soil from compaction and erosion processes, as well as guidelines to avoid overgrazing.

A National Desertification Action Plan for Combating Desertification has also been drafted and it describes the main guidelines and mechanisms to be followed in an effort to deal with the dangers and effects of desertification, both in agricultural and forestry land. This plan has been proposed by the National Committee of Greece, approved for application by a ministerial decree and adapted by the Ministers of Foreign Affairs, Finance, Agriculture, Environment and Development. More financial support is needed though, as well as basic institutional and legislative measures.

Apart from monitoring the compliance with these measures, it is necessary to be decided by the European Commission and incorporated in the environmental policies of the CAP subsidies to farmers who follow practices protecting the environment. Subsidies should be given to farmers as enhancing measures to follow techniques, which mitigate erosion.

The Ministry of Agriculture, as mentioned in the Rural Development Programming (2000-2006) Document, in the framework of agro-environmental measures, intends to implement the following actions:

1. Sustainable Management of Pastures
2. Extensification of Animal Husbandry
3. Sustainable Management of lakes and lagoons and protection of sensitive areas under the network of NATURA 2000
4. Preservation and reconstruction of terraces for the protection of soil erosion

The Ministry of Environment is promoting the harmonization of the Water Framework Directive 2000/60 in collaboration with the Ministries of Agriculture and Development. Moreover, the Ministry for the Environment has completed the General Framework for Spatial Planning in the framework of which natural environment protection and specifically desertification and soil erosion represent challenges to be taken into account.

EASTERN EUROPE

Bulgaria

The Forests Act and the Regulation on its Enforcement - this act arranges relations between forest owners, forest management, reforestation and forest protection. It addresses, inter alia, forest protection (soil protection facilities, combat soil erosion, forest prevention facilities, forest roads building, measures against insects, weeds).

The Agriculture Lands Preservation Act and the Regulation on its Enforcement - this act arranges prevention of agricultural lands, restoration and improvement of land fertility, and condition and order of land use changing. It addresses:

- ✓ Protection of agricultural lands from damages – land use, fertilizers and pesticides use and restriction for using, quality of water for irrigation usage, crop rotations and cultivation schemes, soil erosion prevention techniques;
- ✓ Land re-cultivation – re-cultivation projects, humus moving and storage; and

- ✓ Land purpose change and fees – methods and rules for change of land categories in connection with land fertility.

Ordinance for combating soil erosion and landslide in forest areas - with this ordinance are regulated:

- ✓ Conditions and sequences for implementation to combat soil erosion and landslide in forest areas;
- ✓ Projection of fortifications and forest shelter belts in areas with high erosion risk, and afforestation measures in burnt out areas accounting of completed hydrotechnical measures for soil protection.

Main action directions for afforestation are (i) the sustainable ratio between natural and unnatural forest reproduction; (ii) afforestation with priority of areas with high soil degradation risk. In order to combat soil erosion, build up a high erosion risk places data base and maintenance of fortification equipments are main actions taken.

National forest policy and strategy – Sustainable Development of Forest State in Bulgaria 2003-2013
Forest management – Increase of forest stability with cultivation of local deciduous species in natural places. Adaptation of forest cultures to climate aridity. Prevention of soil erosion.

Table 3: Overview of inventoried national policies.

Country	Legislation	Economic instruments	Social Instruments (awareness raising / education & training)	Other
Austria	S ⁽¹²⁾	AES (ns + s)	0	
Belgium – Flanders – Wallonia	S (in prep.) N	AES (ns + s ⁽⁷⁾) / S ⁽⁸⁾ AES (ns)	M / GAP 0	PLUIES ⁽²²⁾
Bulgaria	NS + S ⁽²¹⁾	AES ⁽²⁴⁾ (s)	0	
Denmark	NS + S ⁽¹⁾	AES (ns) / S ⁽²⁾	0	
Finland	0	AES (s)	0	
France	S ⁽³⁵⁾	AES ⁽¹⁶⁾ (ns) / NS ⁽¹⁷⁾	0	
Germany	S ⁽⁹⁾	AES ⁽¹¹⁾ (s)	GAP ⁽¹⁰⁾	
Greece	0	AES (ns)	GAP ⁽¹⁹⁾	NDAP ⁽²⁰⁾
Hungary	NS ⁽²⁶⁾ / GAP ^(26bis)	AES (ns + s in prep.)	SCS	
Iceland	0	CC	SCS	
Italy	NS ⁽²⁷⁾ + S ⁽²⁸⁾ / GAP ⁽⁶⁾	AES (ns + s)	0	NAP ⁽²³⁾
The Netherlands	S	0	0	
Norway	N	AES (s)	M & ES	
Portugal	0	AES (ns + s)	0	NPCD ⁽¹⁸⁾
Slovakia	S (in prep.)	AES (ns + s ⁽⁷⁾)	0	
Spain	NS ⁽²⁹⁾ / GAP ⁽⁶⁾	CC / AES (ns + s)	0	NAPD ⁽³⁰⁾ / INES ⁽³¹⁾ / EFE ⁽³²⁾ & PFE ⁽³³⁾ / MIMAM ⁽³⁴⁾
Sweden	NS + GEC	N	NS	
Switzerland	NS ⁽¹³⁾ + S ⁽²⁵⁾	NS ⁽¹⁴⁾ / AES ⁽¹⁵⁾ (s)	ES ⁽¹⁵⁾ & SCS ⁽¹⁵⁾	
UK – England – Wales – Scotland	NS / GFP ⁽³⁾ NS / GFP ⁽³⁾ GEC ⁽⁶⁾ + GFP ⁽⁶⁾	AES (ns ⁽⁴⁾ + s ⁽⁵⁾) AES (ns) AES (ns)	0 0 0	

Legend

0 = Lack of data.

N = No instrument available.

S = Specific instrument available, directly dealing with soil erosion.

NS = Non-Specific instrument available, with an indirect effect on soil erosion.

AES = Agri-Environment Scheme with specific (s) or non specific (ns) measures.

CC = 'Cross Compliance': production subsidies tied to environmental requirements.

GFP / GAP = Code or Standard of Good Farming / Agricultural Practice.

GEC = General Environmental Conditions.

SCS = Soil Conservation Service.

ES = Extension Services.

M = Municipalities.

The following categories are used:

- **Legislative**
e.g. Soil Protection Act (Germany), Water Resources Act (England), Code of Good Agricultural Practice (several countries), etc.
This legislation may deal with soil erosion either specifically or non-specifically.
Legislative means BINDING.
- In some cases, it is not clear whether a Code of good agricultural practice is legally binding or not. If not, it can be considered as a social instrument (to be checked by members of the AF).*
- **Economic:**
e.g. agri-environmental scheme (several countries); subsidies for small scale erosion prevention and combating measures (Belgium);...
- **Social:**
To what extent member countries support extension services or specific awareness raising actions with respect to soil erosion (or less specific)?

Specifications

- ⁽¹⁾ Specific legislation focused on coastal erosion.
- ⁽²⁾ Subsidies for windbreaks.
- ⁽³⁾ Obligatory in Less Favoured Areas and conditional to be eligible for grants from the AES.
- ⁽⁴⁾ Countryside Stewardship.
- ⁽⁵⁾ Entry Level Stewardship, expected by 2005.
- ⁽⁶⁾ Conditional to be eligible for grants from the AES.
- ⁽⁷⁾ Expected to be operational from mid 2004.
- ⁽⁸⁾ Subsidies for municipalities through the Erosion Decree of December 2001.
- ⁽⁹⁾ Federal Soil Protection Act.
- ⁽¹⁰⁾ Principles for the Application of Good Professional Practices in Agricultural Soil Use (BMVEL, 1999).
- ⁽¹¹⁾ Different schemes for several Federal States.
- ⁽¹²⁾ Soil Protection Laws of the different Austrian provinces.
- ⁽¹³⁾ The 'Law on Agriculture' and the 'Law on the Protection of the Environment' provide a high degree of soil protection, in part, against soil erosion.
- ⁽¹⁴⁾ Ecological subsidies, i.e. direct payments through the 'Law on Agriculture.
- ⁽¹⁵⁾ Different schemes for the different cantons, e.g. Berne.
- ⁽¹⁶⁾ 'Shéma d'Aménagement et de Gestion des Eaux'.
- ⁽¹⁷⁾ Territorial Exploitation Contracts (farmers - state) and River Contracts (departments - state).
- ⁽¹⁸⁾ National Program to Combat Desertification, 1999.
- ⁽¹⁹⁾ Status not known.
- ⁽²⁰⁾ National Desertification Action Plan for Combating Desertification.
- ⁽²¹⁾ Ordinance for combating soil erosion and landslides in forest areas.
- ⁽²²⁾ 'Prévention et Lutte contre les Inondations et leurs Effets sur les Sinistrés': a regional plan for preventing floods and erosion in Wallonia.
- ⁽²³⁾ National Program to Combat Drought and Desertification.
- ⁽²⁴⁾ Agri-environment pilot actions within the SAPARD program.
- ⁽²⁵⁾ Ordinance relating to impacts on the soil. Guide values for erosion on arable land.
- ⁽²⁶⁾ Act on arable land.
- ^(26bis) Good Agricultural Practice under the Gov. Decree transposing the Nitrate Directive.
- ⁽²⁷⁾ Law n. 36/94 and Decree n. 152/1999.
- ⁽²⁸⁾ Law n. 183/89 and Law n. 97/1884.
- ⁽²⁹⁾ Forest Law (Ministry of Environment, 2003).
- ⁽³⁰⁾ National Action Programme to Combat Desertification (in preparation, Ministry of Environment).
- ⁽³²⁾ National Inventory of Soil Erosion (Ministry of Environment).
- ⁽³²⁾ Spanish Forest Strategy (Ministry of Environment).
- ⁽³³⁾ Spanish Forest Plan (Ministry of Environment).

⁽³⁴⁾ National Plan of Prioritised Actions to Hydrological and Forest Restoration, Soil Erosion Control and Combat Desertification (Ministry of Environment).

⁽³⁵⁾ Law of 30 July 2003 with respect to 'the prevention of technological and natural risks and the repair of damage'.

4.2.2 COMMUNITY POLICIES WHICH CAN BE USEFUL TO PROTECT SOIL AGAINST EROSION

***Mandate** – to consider existing community policies for the implementation of soil erosion measures, being able to address and recognize the rights of use of land owners, as well as the protection of a common resource – e.g. integration of soil thematic strategy into the CAP, Structural and Cohesion funds and the Water Framework Directive.*

WATER FRAMEWORK DIRECTIVE

The Water Framework Directive (WFD) requires the "good status" of all waters in the EU by 2015 in terms of both ecological and chemical status. Good status has yet to be defined but it is clear that diffuse pollution (pollution arising from urban and rural land-use activities that are dispersed across the catchment, and do not arise as a point source effluent) adhering to soil particles must be adequately managed to achieve "good status" in water. Diffuse pollution is closely linked to land use and management - e.g. construction of new roads, agricultural and forestry activities, and the increasing extent of impermeable surfaces in urban areas. In cases where (contaminated) soil is eroded from the land and reaches a water course, the implementation of the WFD should go a fair way towards controlling soil erosion and sediment delivery.

Sediment derived from diffuse sources such as soil erosion and erosion of rivers banks is relevant to the implementation of the WFD in two main ways.

- (1) **Sediment QUANTITY.** Rivers need a certain amount of sediment naturally to function in a sustainable way. They also need this for good ecological functioning. For example, salmonids need a certain amount of sediment in order to create redds for breeding. Similarly a lot of riverine habitats (wetlands etc) are constructed of sediment. Thus sediment is good for habitat diversity and biodiversity. So a certain amount of sediment within a river (derived from soil erosion, channel bank erosion etc.) is needed. However, too much sediment can be detrimental to how a river behaves (for example, excessive channel migration across its floodplain, degradation of the channel bed etc) and detrimental to ecology by, for example, blocking pores in the channel bed gravels with fine-grained sediment, which is bad for salmonids.
- (2) **Sediment QUALITY.** Sediment in rivers may be contaminated when it is derived from the erosion of contaminated soil, or may become contaminated after entering the water course by fixation of dissolved pollutants. Contaminated sediment is likely to be problematic for achieving good chemical status, and will also have effects on stream ecology. The report on "Link between soil erosion and the diffuse contamination of water and air" by the STS working group on soil erosion describes this in more detail. Although a certain amount of nutrients, metals etc are needed within the river, the problem is having these chemicals in excess, above a certain threshold.

Therefore, there is a very clear and real link between soil management and water quality (quality in the broadest sense – chemical, ecological, aesthetic, health, recreation etc). The implementation of the WFD implies that all impacts on water quality (chemically and ecologically) will have to be analysed. If necessary, actions will have to be taken within river basin management plans, including soil erosion prevention and combating measures (i.e. source reduction measures). Thus there is an important link between the WFD and the STS. The connection seems obvious when probably > 90% of the surface area of most river basins in Europe is land and therefore mainly soil; < 10% is surface water. As such, **sediment quantity and quality issues (and the link to soil erosion and soil management) must**

play a significant role in both the STS and WFD. However, at the moment these issues are not being given the appropriate consideration, especially in the WFD. If sediment quantity and quality issues are not addressed through effective soil management (and especially the reduction of excessive soil erosion), then it is likely that rivers (and lakes etc.) may not achieve good chemical and ecological status by 2015. It is, therefore, important that the STS and WFD address these needs.

Furthermore, soil functioning has important implications for flooding issues covered within the WFD. Compaction can result in reduced infiltration, increased runoff, and an increased potential for flooding. Consequently, **soil protection is needed in order to minimise the risk of flooding.**

Currently, however, the implementation of the WFD seems to be problematic, and the holistic approach, which potentially includes the tackling of soil erosion, is not being translated into national laws. Therefore, there is still a long way to go. Also, it is difficult to see how effectively the WFD would deliver all its benefits to other environmental policies. But to start from other policies demanding deliveries from the WFD could bring about the necessary push to move in a better direction.

In theory, the WFD could deliver:

- 1) Hydrological and morphological data on rivers, lakes and coastal waters (substrate conditions, structure and condition of the riparian zone, flow regime, chemical quality of the substrate); and
- 2) Environmental Quality Standards (EQS) for the 33 priority substances, partly for the water, sediment and/or suspended particulate matter.

In reality, current focus is on things which have always been used to assess water quality – invertebrates in rivers and chlorophyll in lakes. There is a huge lack of hydromorphological data, which would be needed to assess good status, and the resistance to include wetlands/floodplains into the assessment is strong. Furthermore, it seems difficult to set EQS for suspended particulate matter or sediment, with quite a number of MS resisting.

Thus, all the data and standards, which would be useful for the development of soil policies, are difficult to get moving at the moment. On the other hand there is no legal way to escape the collection of data under point 1. Therefore it would be justified and supportive if the soil policy developers would assume that this data will be available from Dec 2006 on when the monitoring programmes must be operational. **The soil strategy should:**

- i) **identify the relevance of WFD data for soil protection measures** – E.g. data on suspended sediment transport in rivers could provide information on soil erosion; and data on diffuse contaminants could give an indication on soil quality, etc.;
- ii) **identify which soil data are important but not delivered by WFD (to be delivered by SFD)** – E.g. data on soil erosion status and risk, diffuse sediment and contaminant delivery from land to rivers, soil compaction, and soil hydrological parameters;
- iii) **identify which soil data, soil functions and measures are important to support the achievement of the WFD objectives** – Thus any soil data/functions (compaction, structure, hydrological parameters, erosion potential, soil quality etc) that determines the fluxes of water, sediment, and dissolved and particulate contaminants and nutrients from the land to waters is relevant for implementation of the WFD.

An interdisciplinary evaluation of land use (agriculture and forestry), soils, geosphere, and hydrosphere is needed to properly implement the WFD. Agreement with respect to nomenclature and methodology is needed, particularly in the last three fields. A considerable amount of information that can be used for this purpose is available in the national soil and geological surveys and institutes of the MS. For example, maps of erosion rates provide information about the vulnerability of soil to erosion. River-basin management plans and measures programmes often require site evaluations. The German Geological Surveys, for example, have extensive experience with such evaluations. Thus, in Lower Saxony, management measures for water protection are carried out in co-operation with others. These measures are monitored in a soil monitoring programme. The experiences from these could be used as

an example for the implementation of the programmes of measures conducted within the framework of the WFD. On the other hand, the WFD could make available data on suspended solids as well as morphological data, that could be integrated into a soil erosion monitoring programme, as described in the recommendations on monitoring soil erosion in Europe by the Working Group on Soil Erosion.

HABITATS DIRECTIVE

The Habitats Directive is particularly relevant for the protection of some terrestrial habitats that depend on specific soil characteristics, such as dunes, peat lands, calcareous grasslands and wet meadows. In Denmark, for instance, coastal protection is ensured by a Nature Protection Law, including rules about sand-dune preservation and lower sand drift. An area of 300 m by the water's edge is included in the dune protection to prevent sand drift. The National authorities in Denmark have the obligation of achieving this protection. It might give sudden limitations in the use of land for the owner. Coastal protection cases are administrated by the counties and the state authorities function as advisers.

ENVIRONMENTAL IMPACT ASSESSMENT DIRECTIVE (97/11/EC)

Applies to those private and public projects that are likely to have significant environmental impacts. One of the potential impacts to be examined is the impact on soil. Given that soil erosion is an important threat, the assessment could be focussed, inter alia, to soil degradation by erosion processes.

In particular, there are provisions for protecting “uncultivated land or semi-natural areas”, including those posed by intensive agriculture.

STRATEGIC ENVIRONMENTAL ASSESSMENT DIRECTIVE (2001/42/EC)

Requires the assessment of certain plans and programmes, such as land use development plans, to ascertain potential significant environmental effects. This will include impacts on fauna, flora and soil.

In the next phase of the Working Group activities, a more extended analysis of concrete possibilities to integrate soil erosion control measures in the different directives will be carried out.

COMMON AGRICULTURE POLICY (CAP)

The CAP reform agreed in 2003 (Council Regulation 1282/2003) will have substantial impacts on farming in Europe, mostly resulting in benefits for the environment. A summary of the main elements of the reform is given in Annex B.

The main element of the reform package is that CAP payments will no longer be based solely on levels of production. The support will be an income support and not a production support. This is known as ‘decoupling’. Farmers will receive a single farm payment (SFP) on the condition that they:

- ✓ meet certain regulatory standards based on specified environmental, food safety and animal welfare legislation (“*statutory management requirements*” as laid out in Annex 3 of Council Regulation 1782/2003: 18 current Directives - those which could have an influence on soil erosion include the Birds and Habitats directive).
- ✓ maintain their land in “*Good Agricultural and Environmental Condition*” (GAEC) by addressing issues relating to soil erosion, soil structure, declines in organic matter and biodiversity across the agricultural landscape (as set out in Annex 4 of in Council Regulation 1782/2003, see Table 1 in Annex B of this report). According to Art. 5, “Member States must define, at national or regional

level, minimum requirements for GAEC, taking into account the specific characteristics of the areas concerned, including soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices and farm structure."

If farmers do not meet these standards they risk losing payments (otherwise known as 'cross-compliance'). Decoupling should be good news for the environment because there should be less incentive to have intensive production. This is expected to reduce over-stocking of livestock and over-production of crops – both of which can be associated with an increase in soil erosion. In addition, soil management as the basis of GAEC provides a tool for managing erosion risk and the soil degradation processes that can lead to erosion. GAEC also aims to prevent land abandonment, which it is feared could be quite widespread in Mediterranean regions following CAP reform, because land abandonment in these areas could lead to even worse soil erosion and degradation problems.

Additionally, the CAP agreement requires that Member States maintain the area of *permanent pasture*, which should prevent the wide-scale ploughing up of land for arable cultivation and potential problems with soil degradation often associated with arable farming in some areas.

The agreement also fixes a ceiling of 5% *modulation*, i.e. a 5% transfer of funds from direct farm payments to rural development and this should provide additional funds for agri-environment schemes, some of which could be used to address soil management and resource protection issues.

There is also an option to use set aside (Art. 54). The text states that "*Set aside areas shall not be less than 0.1 ha in size and 10 m wide. For duly justified environmental reasons, member states may accept areas at least 5 metres wide and 0.05 ha in size.*" There is a possibility that set aside strips could be used along the borders of water courses and across fields which have a high risk of erosion.

Finally, Member States are required to introduce a *farm advisory system* by 2007. At a minimum, this system must provide advice for farmers on cross-compliance and could be used to improve farmer knowledge and understanding of soil management issues.

Within the second pillar of the CAP, rural development programmes foresee a large number of further specific measures to prevent soil erosion via agri-environmental commitments, which sets up a voluntary and higher level of soil protection at the farm level. **Recommendation: to promote resource protection, especially direct specific measures to tackle soil erosion in agri-environment schemes.**

Effect of CAP reforms on soil protection

The latest CAP reforms and the growing importance of environmental criteria through the establishment of cross-compliance appear to offer considerable potential for soil protection measures. No other existing community policy implies such a high degree of soil awareness. There remains, however, some uncertainty as to the exact nature and extent of these measures in the different Member States.

Whilst the proposed reforms will deliver environmental benefits in the medium to long term, the implications for farming, and hence, for the environment in the short term are still far from clear. This is because some Member States are not fully decoupling in 2005 and, also, there will be a degree of variation in the way the different member states pay the SFP, implement cross-compliance and use modulation. In the short term, there may be sudden structural change in farming that could have negative effects but it is clear that the impacts of decoupling on the whole pattern of European land use will be significant and difficult to predict.

For example, if payments will be based on historic receipts (2000-02) and farmers will be paid for their entire cultivated area, regardless the type of crops grown, the production of the more profitable and formerly not subsidised crops will tend to increase. In Flanders, for instance, this would cause an increase of the area with vegetables and potatoes, and a decrease of the area with small grains, silage

maize and protein crops. Economically, this would lead to distortion of competition between farmers receiving payments and farmers who always produced these profitable crops without subsidies and are therefore excluded from payments under the reformed CAP. The potential environmental effects of such evolution with respect to soil protection could be detrimental, given that both potatoes and vegetables are highly sensitive to soil erosion. The economic benefits of these crops would trigger farmers to extend their production into the less suitable and/or the more erodible areas (erodible soils, steep/long slopes). This would highly increase erosion risks in certain regions. In order to avoid mainly the economic effects, Flanders decided to grant payments only to the area grown with formerly subsidised crops, hence excluding potatoes and vegetables. This will equally avoid the damaging environmental effects of a rapid increase in production of these highly erosion sensitive crops. In MS where payments are not restricted to formerly subsidised crops, more guidance of farmers and perhaps stringent regulations regarding the allocation of land to certain crops (sensitive to soil erosion) would be needed in order to fulfil the cross compliance requirements with respect to soil erosion.

It is clear that **the reforms offer the real opportunity to make improvements, but relies on Member States to take advantage and introduce meaningful controls under cross-compliance.** The WG on Soil Erosion recommends that **MS investigate, prior to the implementation of the reformed CAP, potential impacts on the environment of the different policy options.**

In order to succeed in reaching the environmental requirements laid down by actual and future CAP regulations, MS should be aware of the importance of farmers' support when implementing new measures in the framework of this policy. **The Commission should stimulate this process of change by the promotion and establishment of technology transfer programmes, structure modernisation plans, training programmes and research and development actions.**

CARBON SEQUESTRATION

There is a gap here for proposals, possibly through the Kyoto Protocol, for policies to encourage soil carbon sequestration which would have a beneficial effect on reducing soil erosion. One of the measures to reduce soil erosion is to improve soil structure and increase organic matter in the top soil. In this, the role of agriculture coincides with the role agriculture can have in reducing the impact of climate change, by binding the carbon to the soil. Improving soil structure and increasing organic matter is stimulated by reduced soil tillage methods including conservation agriculture (need to cross reference to Commission climate change soil working group). A special problem is the management of peat soils in Europe. Intensification of agriculture and drainage systems causes the breakdown of peat soils and the release of carbon into the atmosphere. A land management system could be devised to prevent further breakdown or even simulate building up new peat areas.

INTEGRATED COASTAL ZONE MANAGEMENT

The European Commission adopted this document (COM(2000)547) in September 2000 based on the results and conclusions of the EC Demonstration Programme on Integrated Coastal Zone Management (ICZM).

The EC Coastal Strategy highlights the importance of coastal zones acknowledging that *our coastal zones are facing serious problems of habitat destruction, water contamination, coastal erosion and resource depletion*⁸ but also recognising that an important factor which is affecting coastal zones can be identified in socio-economic and cultural problems, including damage to property due to erosion.

⁸ Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe

The Coastal Strategy also includes a proposal for European Parliament and Council Recommendations where eight principles of good coastal zone management have been identified (more details will be given in the Communication document).

Principles of Integrated Coastal Zone Management ⁹:

- A Broad “Holistic” Perspective (Thematic and Geographic)
- A Long Term Perspective
- Adaptive Management
- Local Specificity
- Working with Natural Processes
- Participatory Planning
- Support and Involvement of all Relevant Administrative Bodies
- Use of Combination of Instruments

In the EC Coastal Strategy, coastal erosion is specifically tackled. The Commission states: “The basic bio-physical problem in the coastal zones is that development is not kept within the limits of the local environmental carrying capacity. Some of the most common manifestations of this problem are: Widespread coastal erosion, often exacerbated by inappropriate human infrastructure and development too close to the shoreline; Loss of property and development options, as the coast erodes; Coastal erosion is locally perceived as the most significant threat to maintaining income in many areas that live from tourism.”¹⁰

4.2.3 –OTHER POLICY OPTIONS TO PREVENT/ REMEDIATE SOIL EROSION

Mandate – *Identification of policy options specifically designed for the prevention and remediation of soil erosion and its consequences. For these policy instruments, the most appropriate level of intervention (local, regional, national, EU) should be assessed. Different policy options should be recommended and accompanied by a justification, estimates impacts and costs and timelines.*

RECOMMENDATION TO DEVELOP A SOIL FRAMEWORK DIRECTIVE

Justification

To reach a more coherent and a more visible soil policy, a soil framework directive could be developed, rather than linking soil items up with several other policies. Such a soil framework directive should be as flexible as possible as regards the criteria that will be developed or applied to reach or maintain soils of good quality, such as soil type, climate and land use. In addition, local conditions should be taken into account.

To develop coherent policies and soil management practices, the following steps are recommended:

1. Develop a concept to determine the optimal soil quality and to assess soil threats, taking into account soil type, climate, land-use and local conditions at the local or sub-national level (subsidiary principle)
2. Determine the state of the soil (quality, threats)
3. Develop a policy framework

For soil erosion, the quality and amount of data on the state of the soil are sufficient, and can facilitate the development of a soil protection policy.

⁹ European Commission: Proposal for a European Parliament and Council Recommendation concerning the implementation of Integrated Coastal Zone Management, (Brussels: 08.09.2000, COM(2000) 547 final

¹⁰ Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe

This policy option is recommended by the majority of the members of the WG on Soil Erosion, however not necessarily supported by all stakeholders. Some stakeholders do not see the need to develop a SFD at this stage, given that current policies can be identified that already deliver effective soil protection, and further linking of Strategies can be undertaken to reinforce soil protection.

Impacts

- MS need to make regulations, but are free to make a choice in the way they want to develop regulations and/or Environmental Schemes. Regulations could be obligatory in exposed areas.
- Information for farmers and landowners needs to be written which is relevant to local circumstances. Measures against soil erosion and land degradation may vary from technical measures to changes in the agricultural production system.
- Educational programmes need to be developed to update Extension Services.

RECOMMENDATION TO ENCOURAGE EROSION ACTION PLANS IN AREAS AT RISK OF SOIL EROSION

Justification

In areas at risk of soil erosion, every farmer, group of farmers or local authority should be encouraged to write an Erosion Action Plan for their farm(s). Active prevention of erosion and land degradation should be an important part of the Plan. This means that the farmer is made aware of their role in preventing erosion/ land degradation and that they need instruments to be able to do this. Every farmer should get access to existing information on soil and land quality from their farm (via internet and/or via the municipality) and support – advice and information.

MS should be free to decide whether the plans are to be drawn up by individual farmers, e.g. in MS with large farms, or by groups of farmers or by local authorities. Later on, technical guidance can be provided to assure comparable working methods and levels of accuracy.

The challenge is to let the farmers realise that they have an economic interest in preventing land degradation and erosion.

To best use these initiatives there is need for:

- ✓ Development of maps based on land and soil quality showing the possibilities for sustainable production systems and for the best soil treatment (for example the introduction of direct drilling).
- ✓ Making available local/regional results from trials by the Extension Services. These results may also be of interest for other regions/countries and should be made widely available (for example via internet).
- ✓ Gathering experiences with new methods for soil treatment (for example direct drilling).

In other words: existing and future policy options could be used much more effectively if the farmers are able to access information about the possibilities that are available to them and if local networks are established.

RECOMMENDATION TO PROVIDE A POLICY MEASURE TO ADDRESS IMPROVED SOIL WATER RETAINING CAPACITY OF SOILS IN AREAS PRONE TO FLOODING

Justification

There is a link between soil quality and structure and the risk of downstream flooding. The potential for flooding is not only dependent on the amount and intensity of precipitation but is also dependent on the extent and type of land cover and soil properties such as soil structure. Today, agricultural and forestry activities are characterized by a high degree of mechanization and the structure of fields and forests has been adapted to the use of large machinery. In many areas, stonewalls and vegetation strips

(such as hedges) have disappeared. Furthermore, the drainage of fields has been artificially improved and the overall hydrological system of the land has changed considerably, with a tendency for water to be transferred from the land to rivers as fast as possible. The use of heavy machinery, often under wet conditions (overhead watering), also causes soil compaction, which further exacerbates the situation. All of these developments can lead to an increase in downstream flooding. Land-based options to reduce the risk of flooding include:

- ✓ Improve the soil structure by using the most appropriate soil treatment and equipment. Direct drilling is friendlier for some soils in relation to structure and organic matter content and the soil is often able to absorb more water. Investment in the right equipment for superficial soil treatment is expensive. Buying of this equipment could for instance be stimulated by **tax reduction** (VAT freedom) or by **direct subsidizing**. Improvement of soil structure has also a direct positive effect on the amount of soil erosion. *Research is needed to establish the relation between soil type, soil structure and soil hydrology.*
- ✓ Forest vegetation is generally capable of holding water for long periods. Today, forest logging operations are more efficient and mechanized. The cutting area has increased and the forest road network is extensive. During logging, both during thinning and clear felling of wood, the deep tracks made by the heavy logging machinery (e.g. harvesters and forwarders) change water flow paths and can accelerate run-off. Clear cuts especially can dramatically decrease the amount of transpiration from vegetation in an area, and hence can increase surface run-off, a rise of the groundwater level and an increase in pore water pressure. The impact of these changes is that the water retaining capacity of forests is reduced. To change this situation, it is necessary to get an overview of which forested areas in Europe are vulnerable to downstream flooding, and to give **support** (e.g. direct subsidizing, tax reduction, VAT freedom) **to forestry** in these areas to reduce the cutting area and adapt the forest road network so as to improve the hydrological system. Furthermore, support could be given to forest management plans highlighting these elements. Forest planting to improve the hydrological situation and reduce erosion/land degradation should also be assessed. In very vulnerable areas it should be possible to develop integrated land management systems to keep water on the land for as long as possible without causing detrimental effects downstream. This approach will also have a positive effect on landscape structure and biodiversity.

Policy measure – regulations /economic instruments

These should identify the parts of river basins that are likely to cause downstream flooding in sensitive areas (such as important environmental and agricultural land, towns, cities etc.) and concrete measures should be formulated to address this, including support. Support options include the subsidising of forest and land management methods and equipment.

Impacts

- MS should be encouraged to develop their own regulations to stimulate farmers and foresters to buy equipment for better soil quality and structure in basins prone to flooding.
- Information is needed to inform farmers/forest owners about the importance of improving soil structure and how they can contribute.
- Education programmes need to be developed to update Extension Services and Forest Organizations.
- Costs are related to the reduced VAT for buying equipment in designated areas.

RECOMMENDATION TO GIVE ECONOMIC INCENTIVES TO FARMERS TO USE SUSTAINABLE PRODUCTION SYSTEMS

Justification

A development, which can have a negative impact on erosion and land degradation, is the role of the retail industry in the choice of production systems at farm level. More and more, the retail industry is making contracts with farmers about market products. A consequence of this development is that the farmer can start growing the most profitable crops, which may not be adapted to the local soil and climate conditions. This development can be decreased by giving economic incentives to the farmers if they use sustainable production systems, such as tax benefits or subsidies, etc. This requires the development of an information system at European, national and regional levels indicating which production system should be considered as sustainable (see part above under CAP) and this should be part of both EU and national regulations. Member States can develop their own policy to encourage sustainable production systems at a national or regional level, making use of economic incentives adapted to the local conditions.

In Spain, there are tax benefits for farmers practicing certain farming techniques such as organic farming. Given the importance of soil degradation processes, incentive practices that allow protection of the soil are also needed.

Impacts

- Development of a system dividing Europe in ecological land management zones (agro-ecological zones) giving an indication which land management systems are sustainable under the given soil and climate conditions. Within the recognized regions, MS should develop subregions in which more specific land management practices can be applied.
- Farmers/Forest owners in areas especially exposed to land degradation /soil erosion should get an economic incentive to introduce sustainable systems. MS should be free to develop incentive programmes adapted to the local situation.
- Education programmes need to be developed as well as local advisory bodies.
- Costs are related to the support given to farmers and foresters in designated areas.

RECOMMENDATION FOR ALL MEMBER STATES TO HAVE A SOIL CONSERVATION SERVICE

Justification

Today Iceland and Hungary are the only European countries having a Soil Conservation Service. Slovenia has an organisation with similar tasks. Every MS should be obliged to establish a (small) Soil Conservation Service to ensure that soil policies are fully addressed. MS should have the freedom to organise this in a way adapted to their local situation, for example, regional competence. Furthermore, this entity can be an independent “service” or can be part of a ministry, an administration, an agency, a research institute.

The task of the national Soil Conservation Services should be:

- ✓ To investigate in which areas soil erosion and land degradation are a problem.
- ✓ To develop national/regional strategies as to how this situation can be improved.
- ✓ Be responsible for developing/supporting regulations to avoid soil erosion / land degradation.
- ✓ The investigation of the best land management practice and technical measures to reduce soil erosion and land degradation.
- ✓ The development of information and education material for land users.

The establishment of a European Soil Conservation Service would be desirable. A European Soil Conservation Service should be in charge of co-ordinating the national Soil Conservation Services: the implementation of the EU soil protection policy and related directives and programmes needs harmonised information, harmonised concepts and methods and an operative network.

The functions of the potential European Soil Conservation Service, would be:

- ✓ To provide a bridge between EU political decisions and the practical execution of soil survey and soil protection programmes on national and regional levels.
- ✓ To provide a harmonized methodology for soil survey, data collection and problem evaluation.
- ✓ To provide the co-ordination of the development of conservation programmes and practices as well as information, advice and technical guidance (through training programmes, published guidelines and brochures).
- ✓ To provide a bridge between scientific results and practices.

Impacts

- Both on national and European level the Conservation Services should be kept small and effective. Costs are primarily related to salary of the involved officials.

RECOMMENDATION TO IDENTIFY THE SOIL RESOURCE MORE CLEARLY AS AN OBJECTIVE OF THE AGRI-ENVIRONMENT SCHEMES, UNDER THE RDR.

Justification

Soil is addressed in agri-environment schemes in many European countries. However it is not directly addressed, as it is often an indirect consequence of a measure to create a habitat food source. For soil protection to be addressed seriously in these schemes it requires stand-alone measures and to be an objective of the schemes.

Impacts

- MS should include the soil as a specific chapter in existing and new Agri-Environmental Schemes. For forest owners separate schemes should be developed.
- Education material needs to be developed.

RECOMMENDATION TO EXPLORE THE MERITS OF IFM, ORGANIC FARMING AND CONSERVATION AGRICULTURE AS A WAY TO PROTECT SOIL THROUGH SUSTAINABLE FARM MANAGEMENT..

IFM - integrated farm management is a whole farm policy providing the basis for efficient and profitable production which is economically viable and environmentally responsible. IFM integrates beneficial natural processes into modern farming practices using advanced technology. It aims to minimize environmental risks while conserving, enhancing and recreating that which is of environmental importance."

Many of the principles of Integrated Farm Management can help to reduce soil erosion. They are:

- ✓ a commitment to good husbandry and animal welfare
- ✓ efficient soil management and appropriate cultivation techniques
- ✓ the use of crop rotations
- ✓ minimum reliance on crop protection chemicals and fertilizers
- ✓ careful choice of seed varieties
- ✓ maintenance of the landscape and rural communities
- ✓ enhancement of wildlife habitats
- ✓ a commitment to team spirit based on communication, training and involvement.

Soil conservation measures should be included in the protocols of IFM, including conservation agriculture techniques, as they have been included in the National Regulation in Spain (*Real Decreto 1201/2002*)

Organic Farming - Organic farming provides a whole set of management measures and factors besides those for production directly. The farm is part of the ecosystem and is taking advantage of natural processes and a dynamic ecological balance. Organic farming does not only mean omitting chemical-synthetic pesticides and fertilisers, but also optimising the whole farm with respect to interactions of the crop and its natural environment. Since the 1970's organic farming has developed special soil tillage techniques in order to reduce the problems linked to ploughing, and to overcome problems with weeds. Through the use of diverse crop rotations, including grass-clover, legumes and legume mixtures, intercrops and intracropping, organic farming provides a more permanent plant cover, thus conserving the soil. The potential role of organic farming in reducing soil erosion should be further investigated and improved where possible.

Conservation agriculture (CA)- CA is an effective way to prevent soil erosion. The main strength of CA is that the soil is permanently covered with living or dead plant material through a variety of techniques, such as no-till, non-inversion tillage, etc (see also report on WP 4.1). Secondly, where intensive soil tillage is detrimental to soil structure and therefore induces soil erosion, CA can provide an alternative soil management system that contributes to the development of a proper soil structure. Soil structure formation is enhanced by

- the presence of soil organisms, taking advantage of the increased OM content of the upper soil layer and of not disturbing the soil;
- the continuous development of plant roots;
- the lower number of passes by heavy farm machinery (reducing subsoil compaction)

Impacts

- Actions to include soil as an implicit element in IFM and Organic Farming protocols
- Research or an objective compilation of existing science on the application potential of CA in different agro-ecological zones and on the overall environmental effect of CA (including the use of herbicides and pesticides, greenhouse gas production, nitrate leaching, etc.). These results should be used by regional or local authorities as a sound policy basis.
- Development of related information and education material at national level for farmers and landowners.

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José-Fernando Robles

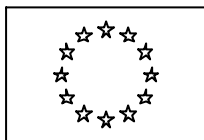
Joint leaders WP4.2

March 1st, 2004

Liesbeth Vandekerckhove

Joint chair of the WG on soil erosion and mentor of WP 4.2

May 14th, 2004



EUROPEAN COMMISSION
DIRECTORATE-GENERAL ENVIRONMENT

Multi-stakeholder Working Group Reports
Soil Thematic Strategy

Working Group on Soil Erosion

Task Group 4.2 on

Policy Options for Prevention and Remediation

ENCLOSURES

Final Report

May 2004

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DETAILS OF EUROPEAN AGRI-ENVIRONMENT SCHEMES**NORWAY****Table 1: Support to a changed soil treatment in Norway in 2002**

Treatment	Support Euro/ha
Direct drilling autumn wheat	50
Superficial autumn harrowing	38
Autumn wheat after superficial autumn harrowing	38
Stubble during winter:	
Little erosion risk	50
Medium erosion risk	75
Large erosion risk	138
Very large erosion risk	175
Catch crops	138 / 88 ¹
Grass covered waterways	5 ²
Spring ploughing in areas exposed for flooding	75
Spring ploughing in areas exposed for wind erosion	75

¹ depending on the region ² support in Euro/metre.

The following technical measurements are part in the Environmental Scheme: construction of sedimentation ponds and riparian buffer zones and taking hydro-technical measurements on fields. The amount of support is related to the costs for the farmer. In the period 1994 – 2001 the cumulative subsidy for sedimentation ponds was 1.2 million Euro divided over 53 ponds; for riparian buffer zones the cumulative subsidy was in the same period 0.18 million Euro divided over 245 units.

DENMARK**Table 2: Legislation and arrangement in the Farmland in Denmark to prevent loss of nutrient to the environment.**

Legislation/arrangement	Type of arrangement	Effect	Administration by
Stream law	2 meter of tillage free riverbanks.	Less loss of soil to the stream.	The stream authority, mainly the municipalities and counties.
Water Environment Plan	65 % of the fields must be wintergreen. 6 % successive grow.	Reduces water erosion. Minor effect on wind erosion.	National authorities
Environmentally friendly land use	Subsidies of • Permanent grass • Set-aside • Catch crop • Buffer strips	Vegetation during the winter period reduces soil erosion. The roots stabilise the soil particles.	County authorities
CAP	Subsidies of set-aside	Permanent vegetation cover prevents soil erosion and improves soil structure by increasing C content. The roots stabilise the soil particles.	National authorities
Forestation	Subsidies to plant new forests		National authorities

BELGIUM

Flanders

The 'Erosion Decree':

A **municipal soil erosion action plan** is drawn up according to a code of good practice, provided by the Flemish Ministry. Such a plan identifies both actual and potential problem areas, and proposes scenarios for the prevention and combating of soil erosion and related problems. During the planning process, intensive communication with all stakeholders (esp. farmers) is required in order to create broad public support to the plan. The subsidy amounts € 12.5 per ha planning area. The planning area can be the entire municipality or can be limited to an area with high erosion risk within the municipality. In the case that problems related to soil erosion go beyond municipality borders, an inter-municipal co-operation is stimulated. Planning areas are usually between 1000 ha and 10,000 ha.

Small-scale erosion prevention and combating works should be designed to control runoff to reduce erosion rates and/or to temporarily retain runoff on the field parcels, as close to its source area as possible. This can be achieved by implementing or restoring linear landscape elements such as hedges, banks, shoulders, grass buffer strips and grassed waterways. Water can be stored and sediment can be trapped behind a small dam with a natural buffer zone or in a retention pond. The subsidy amounts 75 % of the total costs, including compensations for the landowners and for the farmers.

Table 3 gives an overview of the subsidies allocated in 2001- 2002, and requested in 2003 for drawing up municipal erosion action plans and for carrying out erosion prevention and combating works. For 2004, the subsidy requests are being processed at the moment of writing and a new shortage in available budget is expected. It is clear that the subsidy system is increasingly popular as it becomes known, showing the urgent need of intervention to cope with muddy floods in erosion sensitive areas.

Table 3: Overview of the subsidies allocated in 2001- 2002, and requested in 2003.

	PLANS				WORKS		TOTAL	Available	% Subsidy
Year	Number	Area (ha)	% of *	Subsidy (€)	Number	Subsidy (€)	SUBSIDY (€)	budget	of budget
2001/2002	39	150,634	31	1,882,924	15	1,812,739	3,695,663	3,727,201	99
2003	23	77,013	16	962,663	23	1,473,223	2,435,885	1,927,539	126
Total	62	227,647	46	2,845,586	38	3,285,962	6,131,548	5,654,740	

*Total area of Flemish municipalities with 'moderate' to 'severe' soil erosion on arable land: 489,855 ha = 36% of Flanders (Total area of Flanders: 1,358,908 ha).

Agri-environmental measures:

Table 4: The new agri-environmental measures for the prevention and combating of soil erosion at the field scale in Flanders.

Measure	Financial support
Grass buffer strips at any field border or in the field	0.13 €/m ²
Grassed waterways	0.16 €/m ²
Small dams with retention pond:	depending on the height of the dam (between 0.3 and 1 m high):
- in arable land	- between 1 and 4.4 €/m
- in grassland	- between 0.7 and 3.4 €/m
Conservation tillage (non-inversion tillage)	80 €/ha
No till (direct drill)	200 €/ha
Preservation of grassland on strategic locations, i.e. on steep hillsides where it prevents erosion, or below arable hillsides where the grass functions as a sediment trap	200 €/ha

All values are on an annual basis. The farmer makes a contract with the Flemish authorities for five years. An additional compensation of maximum 30 % by the municipality or by the province can be granted.

Wallonia:

Agri-environmental measures:

Table 5: Overview of the subsidies allocated in 2002 for agri-environmental measures that can contribute to combat erosion in the Walloon Region.

Measures	Financial support	Approximate area (2002)	Subsidies allocated (2002)
a) Grass buffer strips at any field border or in the field.	900 €/ha/yr or 450 €/ha/yr if extensive	34,000 ha	2,700,000 €
b) Grassed waterways and banks protection	1,250 €/ha/yr	2500 ha (500 km along watercourses)	250,000 €
c) Planting and conservation of hedges and trees	50-1000 €/ha/yr according to the length of the hedge	36,000 ha	1,500,000 €
d) Ray-grass seeding between maize rows	150 €/ha/yr	180 ha	27,000 €
e) Soil coverage during winter period	100 €/ha/yr	20,000 ha	2,000,000 €
f) Reduction of seeding density for cereals and of tillage intensity	90 €/ha/yr if less than 200 grains/m ²		
g) Reduction of overgrazing	50 €/ha/yr if UGB/ha of permanent grassland is between 0.6 and 1.4		
h) Late or very late grasses mowing	125-250 €/ha/yr according to the time of mowing		

A regional plan for preventing floods and erosion in Wallonia:

Soil erosion is also partly responsible of numerous floods recognised as public disasters in 207 of the 262 Walloon municipalities between 1992 and 2001. A 'PLUIES'¹ plan aimed at preventing floods and minimising their effects was adopted in January 2003 by the Walloon Ministry. One of the objectives of this plan is to reduce and slow down at the watershed level water runoff to the stream. This plan proposes several actions to be taken for reducing soil erosion and amounts of sediments in watercourses (plantation and restoration of hedges, banks and groves, improvement of agricultural practices (reduction of autumn ploughing,...), coverage of agricultural soils during winter, construction of sedimentation ponds and riparian buffer zones.....

¹ Prévention et Lutte contre les Inondations et leurs Effets sur les Sinistrés. Notification du Gouvernement wallon du 9 janvier 2003 sur le plan de lutte contre les inondations et leurs effets sur les sinistrés.

GERMANY

Table 6

Federal State	Measure	Support
Brandenburg	Promotion of conservation tillage and no-tillage for reduction of sediment and nutrients run-off.	25 € ha ⁻¹ y ⁻¹
Nordrhein-Westfalen	Promotion of conservation tillage and no-tillage for reduction of soil erosion	102 € ha ⁻¹ y ⁻¹
Rheinland-Pfalz	No inversion tillage / mulch tillage after cereals before seeding of maize and sugarbeets a) with cover crops b) without cover crops	115 € ha ⁻¹ y ⁻¹ 45 € ha ⁻¹ y ⁻¹
Bayern	Mulch tillage including cover crops for row crops	100 € ha ⁻¹ y ⁻¹

ENGLAND

Table 7: England agri-environment scheme measures

Landscape Type and Feature	Payment €/ hectare (unless stated)
<i>Arable</i>	
Recreating grassland	394
Managing arable field margins (6m alongside fields and water courses)	45
2 m grass margins	11/100 m
2 m beetle banks	17/100 m
Overwinter stubbles: followed by a spring crop; low input spring crop; spring/summer fallow	56;176;731
Conservation headland (strip along edge cereal crop 6-24 m wide); unfertilised	127; 380
Recreating chalk and limestone grassland on cultivated land	394
<i>Field boundaries</i>	
Hedge laying/planting	4.2
Stonewall restoration	17
Bank restoration	14
Tree planting and management	1/tree
Buffer strips 4-12 m	8.4/100 m
Wildlife strips (e.g. along water courses suffering erosion)	22.5
<i>Uplands - target restoration and management of heather moorland</i>	
Upland hay meadows	210
Upland grazed pastures	84
Upland rough grazing	28-63
Regenerating heather on agricultural improved land	99
<i>Waterside land</i>	
Recreating waterside grassland on cultivated land	394
<i>Capital items</i>	
Fencing and gates	Average 1.1/m

Wooden gate	150
-------------	-----

Table 8: England Entry level Stewardship Scheme measures

Option	Points gained / ha
Soil management plan - only acceptable where at least 10% of fields are identified as being at risk from soil erosion	2
Buffer strip: 2 m, 4 m, 6 m	10, 20, 30/100 m
Uncropped cultivated margin: 2 m, 4 m, 6 m	10, 20, 30/100 m
Uncropped margin on intensive grassland: 2 m, 4 m, 6 m	10, 20 30/100 m
Overwinter stubble	70
Conservation headland in cereal fields; no fertiliser	80; 220
Management of maize crops to reduce soil erosion	15
Management of high erosion risk cultivated land	15

WALES

Table 9: Agri-Environment Scheme measures in Wales

Prescriptions
Retain all existing traditional boundaries (eg stone walls, earth banks, hedges and slate fences) and maintain those that are stock proof.
Retain a buffer strip 1 metre wide from the base of the field boundary (on each side) without using any cultivations, fertilisers, lime, herbicides or other pesticides
All ponds, streams and rivers must be protected by a 1 metre wide buffer strip (extended to a width of 10 metres when using farmyard manure, slurry or other organic manures
Agree a whole farm stocking rates that avoids overgrazing or undergrazing. Overall stocking rates should not exceed 2.4 livestock units/ha
Agreement holders are expected to manage their land in accordance with the Codes of Good agricultural Practice for air, soil and water
The entire holding must be managed in accordance with the Good Farming Practice.

Table 10: Agri-environment payments in Wales

Measure	€ per ha
Winter stubbles (after a conventional crop; after an unsprayed crop)	112; 168
Rough grass margins	490
Uncropped fallow margins	630
Wildlife cover crop	490
Conversion of arable land to grassland	133-308
Streamside corridors	434
Hedging (planting, laying and coppicing)	2.8/m

ITALY

The National Programme to Combat Drought and Desertification (NAP)

National level:

- ✓ approved by the Inter-ministerial Committee for Economic Programming on 21 December 1999;

- ✓ identifies areas at the national level that are vulnerable to desertification and the criteria for implementing the fight against desertification;
- ✓ its purpose is to encourage Regions and Basin Authorities to identify areas vulnerable to desertification and to identify mitigation and adaptation measures that can be implemented within the context of the legislative framework. This action includes the politics of erosion prevention.

Resource Mobilization and Coordination to Combat Desertification in Italy:

The primary mechanisms for financial interventions are:

- ✓ specific funds (under the national budget) in order to finance activities for UNCCD implementation
- ✓ mobilisation of resources to finance projects or activities in the framework of environmental, agricultural or infrastructural policies

Most frequently recurring issues:

- **recovery of soils degraded by processes such as erosion and salinisation;**
- improvement in the efficiency of water distribution;
- sustainable management of forest resources;
- **slope protection and water control through low environmental impacts actions.**
- **fire prevention and fighting**
- irrigation measures planning and sustainable management;
- **complete soil mapping;**
- adoption of farming, livestock, forestry management systems aiming at the prevention of physical, chemical and biological soil degradation.

Table 11: NAP financial estimations (in Millions of Euro):

	Plans, programmes, studies and monitoring	Field activities	TOTAL
1. Measures already funded	38.26	799.61	835.67
2. Fundable measures	9.09	2012.57	2021.66
3. Pending additional request	94.91	673.29	768.20
TOTAL	142.26	3485.47	3625.73

The project proposals (Table 11) are subdivided in four issues:

Soil protection	30%
<i>Sustainable management of water resources</i>	35%
<i>Reduction of the impact of productive activities</i>	15%
Restoring soil equilibrium	20%

Two overall types of initiatives were identified:

- A. actions aimed at expanding knowledge, planning and information (programmes, plans, studies and monitoring, creation of databases, mapping)
- B. infrastructural and mitigation field actions

The NAP implementation relies especially on already existing funding instruments:

- ✓ rural development plans;
- ✓ water protection plans;
- ✓ waste management plans;
- ✓ river basin management plans;
- ✓ forest and forestation programme;
- ✓ EU Structural funds (2000-2006);
- ✓ CAP, etc.

SWITZERLAND

Table 12: Contributions for the transitional stage (Canton of Berne)

1 Euro = sFr. 1.55

Crops	mulch tillage (transition) Euro per ha & year	zero tillage (target) Euro per ha & year
1 winter grain	97	194
2 spring grain	97	194
3 winter/ spring rapeseed	194	323
4 strip tillage corn	290	
5 corn(silage/grain)	194	323
6 potatoes	323	387
7 sugar/fodder beets	226	355
8 peas, soya/ field beans	161	258
9 sown meadow, green fallow	0	129
10 sunflower	194	323
11 further crops as agreed with the Department of Environment and Agriculture		

Table 13: Contract area and financial costs for mulch tillage and zero tillage, time period 1996 – 2002 (Canton of Berne).

year	farmers with contract	area under contract	main crops zero tillage	main crops mulch tillage	temporary ley ¹	payment total	payment only zero tillage	payment only zero tillage
			[ha]	[ha]	[ha]	[Euro]	[Euro]	[%]
	[-]	[ha]						
1996	92	337 ²	38	144	27	83,565	8345	10
1997	151	710 ²	276	298	20	171,575	62,695	37
1998	205	865	491	349	25	178,405	107,100	60
1999	265	1253	801	382	70	207,350	147,330	71
2000	355	1720	1081	501	138	265,975	191,335	72
2001	446	2289	1473	536	280	355,100	280,955	79
2002	446	2433	1563	533	337	388,935	317,300	82
Total 1996 - 2002			5723				1,115,060	

¹ Temporary leys are compensated only in the first year.

² The contract area does not correspond to the sum of direct tillage and mulch tillage and temporary ley, since in the two first years part of the fields are plowed and seeded in autumn.

The total area of arable land (without temporary leys) amounts to 290,222 hectares. The arable land in the canton Berne amounts to approximately 45,350 hectares.

FRANCE

The specification of CTE can include measures to reduce the problems related to erosion, for example:

- the creation and maintenance of ditches, ponds and hedges;
- the reduction of surfaces of bare soils in winter;
- the modification of agricultural practices: replacement of spring crops by winter crops;
- the rehabilitation and maintenance of low walls and terraces;
- the subdivision of arable fields by the implementation of grass buffer strips;

- the application of structuring elements in the soil to limit crusting (soil conditioners); spreading of bark on inter-lines of vineyard;
- the conversion of arable lands into meadows.

SPAIN

At the national level, there are two agri-environmental measures concerning soil erosion (*Real Decreto 708/2002*):

- ✓ Measure 4.1. Fight against erosion in perennial crops: reduced tillage and cover crops (132.22 €/ha)
- ✓ Measure 4.2. Fight against erosion in annual crops: minimum tillage and direct drilling (54.09 €/ha)

The concrete requirements and the amount of the grant differ between the autonomous regions, since they can lay down an application regulation of the grant regime adapted to the special agricultural and environmental features. Nevertheless, the duration of commitments is approved for a five year period for all beneficiaries in Spain.

In Andalusia, for instance, the main measure is addressed to the fight against erosion in olive tree plantations in those with plots with a minimum surface of 0.2 ha, and a slope percentage higher than 8%. Main commitments undertaken by beneficiaries refer to several agronomical practices, such as not ploughing on plots with a slope equal or higher than 8%, providing cover crops or keeping the cover crops until autumn.

OTHER INSTRUMENTS TO COMBAT SOIL EROSION IN SPAIN

Direct Instrument:

INES: National Inventory of Soil Erosion (Ministry of Environment)

Indirect and Sectorial Instruments:

EFE: Spanish Forestry Strategy (Ministry of Environment)

PFE: Spanish Forest Plan (Ministry of Environment)

Forest Law (Ministry of Environment, 2003)

NAPD: National Action Programme to Combat Desertification (in preparation, Ministry of Environment)

National Research, Development and Innovation Plan (2004-2007) (Ministry of Science and Technology). It includes programmes dealing with the study of soil erosion processes and their control in agricultural and natural systems.

PORTUGAL

Direct drilling: Applying conditions:

- At least 1 ha of sown crops; Crop rotations must include annual crops; Plant residues cannot be burn including straw and stubble; The area under no-tillage or reduced tillage cannot be grazed from 1st of October to 1st of March.

Specific commitments that farmers must assume (5 year period):

Farmers must use no-tillage systems in all the area occupied by the crop rotation, with the following exceptions:

- a. In the first year, if the soil is manifestly compacted, vertical implements (subsoiler, chisel or harrow) can be used;

- b. During the first contract (5 years), and in what concerns sunflower and beet, minimum tillage systems can be used.

There is also the possibility to increase the subsidy with additional commitments: stubble conservation, cover crops and straw conservation on the soil surface.

Table 14: Support level of direct drilling (€/ha)

	Cash crops (basic subsidy)	Irrigated cash crops (basic subsidy)	*Stubble conservation	*Cover crops	*Straw conservation on the soil surface
<20 ha	45	75	59	61	69
20 – 100 ha	36	60	47	49	55
100 – 200 ha	18	30	24	25	28

* Only one of the options marked with (*) can accumulate with.

Minimum tillage: Applying conditions:

- At least 1 ha of sown crops; Crop rotations must include annual crops; Plant residues cannot be burn including straw and stubble; The area under no-tillage or reduced tillage cannot be grazed from 1st of October to 1st of March.

Reduced tillage is defined as tillage systems that only use implements that interact vertically with the soil. The use of the plough or horizontally rotating implements is forbidden. Disk harrow may be used once for the installation of the cover crop or if the straw was left on the field.

Table 15: Support level of minimum tillage (€/ha)

	Cash crops (basic subsidy)	Irrigated cash crops (basic subsidy)	*Stubble conservation	*Cover crops	*Straw conservation on the soil surface
<20 ha	26	42	59	61	69
20 – 100 ha	20	34	47	49	55
100 – 200 ha	10	17	24	25	28

* Only one of the options marked with (*) can accumulate with.

Cover crops in orchards: Applying conditions:

Farmers must present the following conditions to receive this compensation:

- A minimum area of 1 ha under permanent crops.
- The crop must be irrigated.
- The terrain cannot be flat, as it occurs in irrigation perimeters or at the lowlands.

The most representative perennial crops vineyards and olive groves are excluded from these measures

Table16: Support level of cover crops in orchards (€/ha)

	Cover crops in orchards
<5 ha	104
5 to 10 ha	63
>10 ha	42

BULGARIA

SAPARD programme, Measure 1.3. - Development of Environmentally Friendly Agricultural Practices and Activities

The selection of the activities included in this measure was based on the activities proposed in the draft National Agri-environment Programme and the sector analysis prepared under the Phare project No.BG9810-02-01 "Preparation of detailed measures for the National Rural Development Plan under the SAPARD Programme in Bulgaria". They reflect the agri-environment situation and needs in the country and are listed as priority activities in the National Biodiversity Conservation Strategy. These activities fall within the scope of the agri-environment pilot actions as defined by the Guidance on "Agri-environment pilot actions within SAPARD Programmes".

Eligible beneficiaries

Beneficiaries of this measure could be farmers, natural or legal entities (including municipalities and non-governmental organizations) that own, lease or rent land for at least a 5 year period in the selected pilot areas, and correspond to the requirements listed below.

Preservation of soil resources in areas threatened by severe erosion processes. Subject to support are agricultural lands, which are damaged by water erosion, or territories with high risk of potential erosion. Agri-technical and biological activities aiming at decreasing or limiting the active erosion processes will be supported.

SUMMARY OF THE CAP REFORM AGREEMENT OF 26 JUNE 2003

Single Income Payment

In principle all major farm subsidies will be replaced by a single income payment (SIP) from January 2005. This will greatly simplify the CAP payment mechanisms and break the link between subsidies and production – a process known as decoupling. Ministerial decisions on the basis of the payment are imminent. The options are

- ✓ A payment based on historic receipts in the period 2000-02
- ✓ A payment based on land area
- ✓ A payment based on a hybrid of the two options

Member States will have the option to retain 10% of payments to establish a national envelope to address the negative impacts of decoupling.

Cross-compliance

From 1st January 2005 any subsidies paid will be explicitly linked to compliance with EU standards covering the environment, public and animal health and animal welfare. Farmers will also have to maintain land in Good Agricultural and Environmental Condition (see Table 1) as defined by Member States. GAEC is principally concerned with maintenance of soil condition. Member States will have to inspect a sample of farm each year to ensure standards are met.

Table 17: Issues that have to be addressed under GAEC

Issue	Standards
Soil erosion: <i>Protect soil through appropriate measures</i>	Minimum soil cover Minimum land management reflecting site-specific conditions Retain terraces
Soil organic matter: <i>Maintain soil organic matter levels through appropriate practices</i>	Standards for crop rotations where applicable Arable stubble management
Soil structure: <i>Maintain soil structure through appropriate measures</i>	Appropriate machinery use
Minimum level of maintenance: <i>Ensure a minimum level of maintenance and avoid the deterioration of habitats</i>	Minimum livestock stocking rates or/and appropriate regimes Protection of permanent pasture Retention of landscape features Avoiding the encroachment of unwanted vegetation on agricultural land

Modulation

The reduction of direct payments and transfer of money to the Rural Development budget (pillar 2) will start in 2005; earlier than originally proposed (2006). The rate of modulation will start at 3% in

2005 rising to 5% by 2007. The first 5,000 euros of direct payments to each farmer will be returned to the farmer, so in effect there is no modulation to that element of the subsidy. Part of the receipts from modulation will be redistributed amongst Member States on the basis of criteria related to the relative share of agricultural land, agricultural employment and GDP per capita. However there is now a guarantee that every Member State will get back at least 80% of what it pays in.

Farm Advisory System

By 2007 Member States must set up a farm advisory system that will be available to farmers to help them meet their cross-compliance obligations. There is some flexibility to implement this in line with existing schemes that may already be in place.

National Envelopes

A new feature of the regulations is the option of using 'National Envelopes' to reduce the negative impacts of decoupling. National Envelopes are a system whereby up to 10% of direct payments to farmers are diverted into sector-specific schemes to protect the environment or improve the quality and marketing of agricultural products.

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