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The Kyoto Protocol and the Effect of Existing and Planned Measures in the Agricultural and Forestry Sector in the EU25.

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1. Introduction

Agricultural and forestry activities occupy the majority of the EU territory. Although their decreasing importance in the general economy, in terms of Gross Domestic Product, farming and forestry still play a key role in determining the health of the rural economy as well as the quality of the rural landscape and of the environment in general. According to the estimation of land use made by LUCAS survey, agriculture accounts for more than 41% of the territory, making it the leading type of land use in the EU15, while forestry comes second, with a percentage of 30% (Eurostat, 2003). In the new Member States, agriculture's share of the total national land area ranges from 30–60 % (EEA, 2004). The situation is extremely diversified, ranging from several countries where more than two third of the territory is used for farming to few countries where forestry accounts for over half the territory. However in all the countries there is an increasing awareness of the strong linkage exiting between agro-forestry systems and environment, both for the pressure on environment coming from the rural activities and for the environmental and recreational values entrusted to rural areas. So far land management has became an important priority in the Common Agricultural Policy (CAP), even in the new member countries where rural economy is still quite essential in the context of general economic development (IAMO, 2004).

The role of farming both as a source of and as a sink of GHG varies significantly because of the different agricultural practice adopted by farmers and of the diversified environmental condition of the agricultural areas in Europe. As stated by several studies the contribution of agriculture to GHG emissions is not negligible and, according to official estimates (Duchateau, Vidal, 2003; EEA, 2005), agricultural activities are responsible for 9 % of the total GHG emissions in EU25, mainly represented by nitrous oxide (56%) and methane (43%). Agriculture is a small emitter of carbon dioxide, if the use of fossil fuels for agricultural machinery, heating and drying is not considered (1.3% of total emissions). CO_2 emissions may arise from the conversion of existing forest and natural grassland to agricultural land use, but the trends in Europe about land use make very unlikely this hypothesis.

On the other hand agricultural and forest land can be a sink for carbon dioxide. Land use change from agriculture to forestry and conversion of arable land to permanent grassland are the main sources of carbon sequestration. Land abandoned process is relevant in Europe, although the natural transition from agriculture to forests/shrubs is very complex to be monitored. Other methods to increase the sink function are associated with specific farming and forestry management practices. Considering the complexity to monitor carbon storage, there is still considerable discussion about the feasibility of estimating the amount of CO2 absorbed by farming and forestry. The presentation of a Good Practice Guidance for Land Use, Land-Use Change and Forestry (LULUCF) have made more clear the procedure to estimate the carbon sinks (IPCC, 2003), but the effectiveness and security of such sequestration may be only temporary (EEA, 2003b).

An important feature of the climate change policy related to agriculture and forestry concerns the positive side-effects of policy measures aimed to promote the adoption of low-impact practices and the conversion of

intensive production systems to more sustainable systems. In particular, carbon sequestration is not independent from the other environmental effects of a change in land-use practice. Potential co-benefits can include wildlife habitat, water quality, soil conservation, energy savings and landscape aesthetics. Policy implications of co-benefit are relevant in terms of cost effectiveness of mitigation strategies.

In what follows, section 2 introduces the normative framework at the EU level that regulates and/or sets incentives for the adoption of these measures; section 3 focuses on the Member State level to describe country strategies; section 4 offers a quantitative evaluation of the effects of existing and planned measures, providing also a perspective picture analysing past and future trends in GHG emissions; finally section 5 provides some conclusive remarks.

2. The EU policy Framework

This section provides an overview on the framework that regulates the relationships between agriculture, forestry and GHG emissions at the EU level.

2.1. Climate change policy, agriculture and forestry

Since the beginning of the EU climate change policy - that can be dated back to 1991 when the first Community strategy to limit CO_2 emissions and improve energy efficiency was issued - reduction policies, limits and strategies were targeted not to agriculture and forestry, but to different sectors, mainly energy, industry and transportation. In 1999 the report "Key developments in the implementation of the 5th Environmental Action Program (EAP)", was released. It assessed strengths, weaknesses and accomplishment of that Program that devised priorities and strategies for the EU environmental policy from 1993 to 2001. The 5th EAP is of particular relevance for EU mitigation policies, as it was the first to devote a particular area of intervention to climate change. The report highlighted that agriculture and forestry had only a marginal direct influence on the phenomenon, and that regulation in those sectors focused more on the issues of acidification, inland water quality, coastal zones and biodiversity.

The 1998 signature of the Kyoto Protocol by the EU, did not substantially change this situation. By signing, the EU as a whole agreed a total emission reduction target of –8% compared to the 1990 emission level, to be accomplished within the 2008-2012 period (the Kyoto "First Commitment Period"). Country-specific targets were also set for each member state as part of the 'burden-sharing agreement' included in the EC's ratification instrument for Kyoto that was deposited with the UNFCCC in 2002. Finally, sector-specific emission targets at the country level were set in National Allocation Plans (NAP) under the framework of the European Emission Trading Scheme becoming operational in January 2005 (for a detailed description of NAP see Bosello and Buchner, 2004). In all this process, agriculture and forestry still remained marginally involved: interestingly, NAPs in their current "warm-up phase" (2005-2007) neither involve agricultural sectors nor cover GHGs different from CO2, accordingly no specific emission reduction targets are presently imposed to agriculture or to its major emissions: N2O and CH_4. Moreover very few member states presently have specific emissions reduction plans targeted to agriculture (see below). The marginal role attributed to agriculture and forestry in the area of climate-change mitigation is also demonstrated by the recent European

Environmental Agency Third Assessment Report (2003), whose conclusions on the role of agriculture and forestry in relation to the problem of GHG emissions are not too far from the above-mentioned 1999 report to the 5th EAP .

Nevertheless, there are good possibilities and signals that this situation will change.

This is due to a very practical fact: agriculture is one of the economic sectors to which EU and country commitment to reduce GHGs emissions applies. Due to the high "global warming potential" of N2O and CH_4 (310 and 21 times that of CO_2 over a 100-year horizon, respectively) and the differences in sectoral abatement costs, it can be conceivable that emissions of non-CO2 GHGs should be reduced by more than the overall country targets and CO2 emissions by less than the overall country targets to gain cost-efficiency. In the scientific community there is a wide consensus on the cost-saving opportunities offered by a multi-gas approach to GHG reduction strategies. For instance Manne and Richels (2004) show that a target imposing the stabilisation of total global warming potential to 3.5 watts per square meter will imply a loss of nearly 1% of world discounted consumption over the next century if only CO_2 is affected, whereas the loss would be reduced to 0.25% in the case non CO_2 gases and sinks were also involved. Similarly Klaassen et al. 2004, show that a 15% GHG emission reduction to be accomplished within 2020 will cost to the EU nearly 0.18% of 2020 GDP if mitigation tackled only CO_2, while the cost would drop to 0.038% of 2020 GDP if mitigation options for N_2O and CH_4 performed also by the agricultural sector (namely reduced enteric fermentation, improved efficiency in rice and soil cultivation) were considered. Similar conclusions were also drawn by Manne and Richels (2000), Jansen and Telle (2001) and Vielle et al. (2004).

These scientific findings are somewhat reflected by the EU initiative. Indeed, the recognised need to reinforce EU climate change strategies after the Kyoto signature, led the Commission to launch the European Climate Change Programme (ECCP) in June 2000. The goal of the ECCP was to identify and develop all the necessary elements of an EU strategy, in the form of proposal and recommendations, to implement the Kyoto Protocol. ECCP represents now the main framework for policy action in this field.

The "second phase" of the ECCP (2002-2003) was of particular relevance for agriculture and forestry. Firstly the 2001 "Proposal for a Directive on the Promotion and the Use of Biofuels for Transport" was translated into the Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport (see below). Secondly, different Working Groups (WG) studied and suggested a set of specific interventions in agriculture and forestry. WG7 on agriculture proposed a wide range of interventions with GHG reduction potential: in the case of N_2O the different measures focused basically on a more efficient use of the different kinds of N-fertilisers (e.g. the institution of fertiliser-free zones, optimisation of distribution geometry, improved fertiliser efficiency through precision farming etc.). These were estimated to provide a cost-effective reduction of the equivalent of 10 Mt of CO_2 during the first Kyoto commitment period. According to WG7 these results could be achieved with the proper implementation of the nitrate directive, water legislation and a constructive implementation of measures within the rural development policy. The conclusions on CH_4 were less optimistic: measures devised to reduce emissions from enteric fermentation

were estimated either to have a very small reduction potential (like e.g. the improvement in livestock lifetime efficiency), or a high potential, but low-cost efficiency (like anaerobic digestion).

The "Working Group on Sinks related to Agricultural Soils" identified a set of "most promising measures" to reduce CO_2 emissions from or enhance CO_2 storage in agricultural soils. These were: promoting the use of organic input on arable land, permanent revegetation of arable set-aside land (e.g. afforestation) or extensivation of arable production by introduction of perennial components, biofuel production with short-rotation coppice plantations and perennial grasses, promoting organic farming, promoting permanently shallow water table in farmed peat land and zero or reduced tillage. Carbon sequestration potential was estimated to be relevant - up to 60-70 Mt CO_2/year for the EU15 ranging from the 19%-20% of the EU15 commitment during the first commitment period - nevertheless a possible major limitation to the practical application of the measures was devised in regional differences imposing country or even site-specific ad-hoc strategies.

Finally, the "Working Group on Forest Sink", pointed out that afforestation, reforestation and deforestation activities in the EU could provide some contribution in terms of C-sinks to the GHG accounts for the first Kyoto Protocol commitment period. Still, during this first commitment period, their expected contribution is quite limited (19Mt CO_2 eq. representing 5.5% of the reduction required or 8% of 1990 emissions), even though potential improvements especially in the longer term were devised. The most promising measure in this case was identified in the short rotation tree plantations with possible substantial impact already in the first commitment period through direct substitution of fossil fuel for energy production. However, this would need to be supported by additional measures on the demand side (promotion of biomass for renewable energy, electricity and heat).

All the working groups highlighted two crucial aspects: first, the still high level of uncertainty surrounding all the quantitative analyses provided, calling for great caution in the interpretation of results; second, the necessity to consider all the measures proposed as interlinked and necessarily part of a broader and coherent strategy for GHG reduction.

The above-mentioned indications of the ECCP are now at the basis of legislative interventions at the EU level and also offer guidance to the design and implementation of policies at the Member State level. Accordingly, further future medium greenhouse gas emission savings could occur through either implemented and existing policies or additional regulatory, economic and fiscal measures inspired by the ECCP.

The insights from the ECCP formed an important contribution to the October 2001 Communication[1] on the implementation of the first phase of the European Climate Change Programme", converting the ECCP results into a clear political commitment from the Commission. In February 2005, the European Commission announced in its Communication "Winning the battle against climate change"[2] that the Commission "will

[1] European Commission (2001), COM (2001) 580 final
[2] European Commission (2005b), COM(2005) 35

review progress and explore new actions to systematically exploit cost effective emission reduction options in synergy with the Lisbon strategy", indicating that the launch of the Second European Climate Change Programme (ECCP II) that took effectively place in October 2005.

Currently, a Review of the ECCP is ongoing, including many stakeholders and a strengthened focus on agriculture and forestry, that will lead to an improved climate policy framework in the EU in form of the ECCP II. Five working groups have been established for the ECCP II, and agriculture and forestry is present in at least two of them, the first one (WG 1 on "ECCP I Review with 5 topical groups") and the second one (WG 2 on "Impacts and Adaptation with 10 sectoral groups"). In addition, agriculture and forestry have a crucial role in the third working group that focuses on "Carbon Capture and Geological Storage". The general objective of the first Working Group is "to review the implementation of climate change related EU-wide polices and measures, to assess their concrete implementation in the Member States, to assess the resulting actual and projected emission reductions, and on the basis of this analysis, to discuss the further development of EU climate change policies to achieve the EU's and Member States' obligations under the Kyoto Protocol, and beyond, in consistency with other policy areas." (Mandate WG 1: ECCP review)

The five Working Group were supposed to deliver a report by March 2006, and on the basis of these insights the Commission will present a policy paper on the review of the ECCP, which was supposed to be discussed under the Austrian Presidency (i.e., by June 2006). However, due to a delay of the Working Groups' reports, further indications by the Commission on the future role of agriculture and forestry in the context of the European climate policy are expected in some months.

Still, the final report of WG 1 - Topic Group Agriculture and Forestry[3] already stresses the additional opportunities of agriculture and forestry to further contribute to climate change mitigation by reducing GHG emissions, particularly by enhancing carbon sequestration and by producing renewable energies. The report underlines that this sector is also uniquely affected, in general and in its ability to reduce emissions, by the impacts on climate change. Given that climate change has been acknowledged as one of the priorities for EU agricultural and rural development policy, the report emphasises that the issue for the coming years is about "using the possibilities and options to contribute to climate change mitigation and tackling challenges to enhance the resilience of the sector against and adapt to the adverse impacts of climate change.[4] Finally, the report calls on Member States to implement the respective policies and measures now available to them in an efficient and comprehensive manner, in order to effectively contribute to the environmental objectives of the CAP, particularly the objectives to combat climate change.

In addition, the growing importance of agriculture and forestry in relation to environmental policy has also been confirmed by an Informal Meeting of Agriculture & Environment Ministers that took place in London in September 2005 under the UK presidency. At the meeting, the relation between agriculture and climate

[3] To be downloaded at http://forum.europa.eu.int/Public/irc/env/eccp_2/library

[4] Climate change adaptation needs in the agricultural and forestry sector are being considered in more detail in the ongoing ECCP II working group on adaptation;
http://forum.europa.eu.int/Public/irc/env/eccp_2/library?l=/impacts_adaptation&vm=detailed&sb=Title

change has been stressed, emphasising the need for both agriculture and environment Ministers to work together to help farmers and land managers face up to the challenges and opportunities which climate change presents. It was emphasised that the agricultural sector also needs to consider how it can contribute to reducing its own direct emissions of greenhouse gases, for instance through energy crop production and changing their management practices for fertiliser and manure application. Finally, adaptation to climate change has in general received increasing attention.

Before the release of the ECCP, emission reductions in agriculture often were not the response to a legislation expressly linked to climate-change priorities or to the Kyoto process itself, but to other pieces of legislation, aiming more generally to the improvement of air and water quality standards or to the implementation of "good agricultural practices".

Thus summarising, two situations may be devised: in a first case a range of interventions exists that regulates directly some kind of GHG emissions, irrespective of the source; thus agriculture is naturally involved when it is an emitter of those gases. Alternatively, directives and regulations act directly on agriculture and forestry management and practises, but to provide incentives to the implementation of environmental-friendly activities which can bring GHG reductions only as an indirect side benefit. It is worth emphasising that under the pressure of this "indirect" legislation GHG emissions reduction in agriculture has already been accomplished.

For instance between 1990 and 2001, EU nitrous oxide emissions from agricultural soils were estimated to fall by 8 % and EU methane emissions from enteric fermentation (by cattle) by 9 % (EEA 2003a). In the first case the result is mainly due to the 1991 Nitrate Directive aimed at reducing water pollution (see below), but also the consequence of the Common Agricultural Policy (CAP) reform (see below), in the second case the observed reduction depends on the reduction of the number of cattle which is also partly a consequence of "good agricultural practices" embedded in the CAP.

In the following section a brief overview of the directives that had relevance in promoting the adoption of mitigation strategies in the agro-forestry sector since the 90's is reported.

Directives directly targeted to climate-change mitigation with relevance for agriculture and forestry

Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport.

Description: This Directive aims at promoting the use of biofuels (liquid or gaseous fuels produced from biomass) or other renewable fuels to replace diesel or petrol for transport purposes in each Member State in order to contributing to meeting climate change commitments, environmental friendly security of supply and promoting renewable energy sources. Member States have to set national indicative targets to ensure that a minimum proportion of biofuels and other renewable fuels is placed on their markets.

Comments: the Directive gives concrete realisation to one of the proposal contained in the 2000 European Climate Change Programme. It is directly relevant for climate change as it should reduce the consumption of fossil fuels. Indirectly it regards agriculture as it promotes the cultivation of some kind of crops and the use of biomass.

Directives targeted to improved environmental quality with indirect effect on GHG emission reduction from agriculture and forestry

Council Directive 85/203/EEC of 7 March 1985 on air quality standards for nitrogen dioxide.

Description: To monitor and limit the quantity of nitrogen dioxide in the atmosphere.

The Directive specifies, for the concentration of nitrogen dioxide in the atmosphere:

- a limit value which may not be exceeded throughout the Member States during specified periods;

- guide values, designed to improve the protection of human health and of the environment.

On 19 July 2001, the Directive was partly repealed by Directive 199/30 (see below).

Comments: The Directive is directly relevant to air quality standards. It is indirectly relevant for agriculture as in some cases limits for NOx can foster specific control measures. Indirectly this is also beneficial to climate as N_2O is a greenhouse gas.

Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrate Directive).

Description: It consists in the following points:

- identification of vulnerable zones to nitrate;

- establishment of code of "good agricultural practices";

- establishment and implementation of actions programs including training;

- limitation to the land application of fertilisers and setting of specific limits to the application of manure;

- Monitoring of water to assess that the measures are effective.

Comments: the Directive is directly relevant to water quality standards. It tackles directly agriculture emissions of nitrates. Indirectly this is relevant for climate-change mitigation strategies as emissions of N_2O which is a greenhouse gas will be reduced.

Directive 96/61/EC (OJ L 257 of 10.10.1996) of the European Parliament and of the Council of 24 September 1996 concerning integrated pollution prevention and control

Description: This Directive on the inclusion of energy efficiency requirements and emission reduction requirements in the permit system for industrial and agricultural installations has been adopted in order comply with the 1996 Directive on Integrated Pollution Prevention and Control (IPPC), according to which major polluting industrial and agricultural installations in the EU (45,000 installations in the EU-15) must obtain a permit – based on the concept of Best Available Techniques (BAT) – from their national authorities to be allowed to operate. BAT is provided in sectoral BAT reference documents, which are agreed in a process involving all stakeholders and then adopted by the Commission. In order to further improve energy efficiency and reduce emissions, a 'horizontal' BAT reference document on energy efficiency is currently in preparation. In addition, authorities issuing permits to the installations falling under the scope of the Directive can impose GHG emission limits, except for those installations covered by the EU emissions trading scheme. New installations have been obliged to comply with IPPC permits since October 1999; existing installations must be brought into conformity by October 2007.

Comments: This Directive is directly relevant for air quality, nevertheless it is indirectly relevant for climate change as it aims at increased energy efficiency of agricultural installations.

Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

Description: Establishes the basic principles of a common strategy to define and set objectives for ambient air quality in order to avoid, prevent or reduce harmful effects on human health and the environment. To assess ambient air quality in the Member States and inform the public, notably by means of alert thresholds.

Tackles the definition of limit values and alert thresholds for the following pollutants:

- sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead;

- benzene and carbon monoxide;

- ozone;

- polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury.

Comments: the Directive is directly relevant to air quality standards. It is indirectly relevant for agriculture as in some cases alert thresholds and limitation specially for NOx can impose specific control measures. This indirectly is also beneficial to climate as N_2O is a greenhouse gas.

Council Directive 1999/30/EC of 22 April 1999 laying down limit values for sulphur dioxide, nitrogen

dioxide and oxides of nitrogen, particulates and lead in the ambient air.

Description: To maintain or improve the quality of the ambient air by establishing limit values for the concentrations of sulphur dioxide, nitrogen dioxide and nitrogen oxides, particulates and lead, together with alert thresholds for concentrations of sulphur dioxide and nitrogen dioxide in the ambient air by evaluating those concentrations on the basis of common methods and criteria, and by bringing together suitable information on such concentrations in order to keep the public informed.

Includes setting limits, monitoring and diffusion of information.

Comments: the Directive is directly relevant to air quality standards. It is indirectly relevant for agriculture as in some cases limit values specially for the concentration of NOx can stimulate the adoption of specific control measures. Limit to the concentration of NOx is also beneficial to climate as N_2O is a greenhouse gas.

Council Directive 1999/31/EC of 26 April 1999 on landfill of waste

Description: The Landfill of Waste Directive will reduce the amount of waste sent to landfill and the production of methane associated with its decomposition[5] . In particular, it requires Member States to reduce the amount of biodegradable waste that they landfill to 75% of the 1995 level by 2010, 50% of the 1995 level by 2013 and 35% of the 1995 level by 2020. Implementation in Member States was due by July 2001.

Comments: This Directive is directly relevant for air and water quality. Nevertheless it indirectly also touches climate change control, as it reduces the methane emissions that are partly responsible of global warming. However, it is only marginally relevant for agriculture.

Directive 2000/25/EC of the European Parliament and of the Council of 22 May 2000 on action to be taken against the emission of gaseous and particulate pollutants by engines intended to power agricultural or forestry.

Description: To reduce the atmospheric pollution caused by agricultural or forestry tractor engines by laying down, at Community level, standards for acceptable emissions that apply to those engines.

Comments: the Directive is directly relevant to air quality standards. It tackles directly the agricultural and forestry sectors. Indirectly it can be relevant for climate-change mitigation as reduction in some kind of emissions from engines used in agriculture and forestry can reduce also their greenhouse potential.

Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants.

Description: The aim of this Directive is to limit emissions of acidifying and eutrophying pollutants and ozone precursors in order to improve the protection in the Community of the environment and human health

[5] Biodegradable waste produces methane emissions, which currently account for around 8% of EU GHG emissions.

against risks of adverse effects from acidification, soil eutrophication and ground-level ozone. In addition the Directive aims at moving towards the long-term objectives of not exceeding critical levels and loads and of effective protection of all people against recognised health risks from air pollution by establishing national emission ceilings, taking the years 2010 and 2020 as benchmarks.

Comments: This Directive is directly relevant for air quality, nevertheless it is indirectly relevant for climate change as it provides for the introduction, by the end of 2010 at the latest, of national emission ceilings among others for sulphur dioxide (SO_2), and nitrogen oxides (NOx), which are partly responsible of global warming. It is also relevant for agriculture as nitrogen is emitted by agriculture.

Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

Description: The Renewable Electricity Directive requires Member States to promote electricity produced from non-fossil renewable energy sources with an indicative target to increase the proportion of the EU-25's electricity supplied by renewable sources to 21% in 2010 (14% in 1997). Specific indicative targets are imposed for each Member State, and implementation of this Directive was due by October 2003.

Comments: This Directive is directly relevant for climate change as it provides for a strong increase of electricity produced from non-fossil renewable sources. As a consequence, it is also highly relevant for agriculture and forestry, who play a key role in the supply of renewable energy sources.

Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport

Description: The Biofuels Directive requires Member States to promote bio-fuels (liquid or gaseous fuels used for transport and produced from biomass) with an indicative target of 5.75% in the share of fuels sold to be reached by 2010. Implementation in Member States was due by December 2004. In order to ease the way towards the target, the European Commission has adopted an EU Strategy for Biofuels[6].

Comments: This Directive is directly relevant for air quality and climate change as it provides for a strong increase of biofuels and other renewable fuels for transport. Given the key role of agriculture and forestry in the provision of these types of fuels, it is also highly relevant for this sector.

2.2. CAP reform and mitigation strategies

After three decades of public intervention in agriculture completely devoted to support farmers' income and increase factor productivity, CAP was subject to a key reform in 1992 and for the first time environmental protection was acknowledge as an objective of agricultural policy. Although MacSharry reform was largely aimed at restoring market balance and improving the competitiveness of EU agriculture, the promotion of

[6] See http://europa.eu.int/comm/agriculture/biomass/biofuel/com2006_34_en.pdf The strategy is structured along seven policy axes: stimulating demand for biofuels, capturing environmental benefits, developing the production and distribution of biofuels, expanding feedstock supplies, enhancing trade opportunities, supporting developing countries and supporting research and development.

less intensive production methods through price reduction was expected to reduce the pressure on the environment as well as to cut farm surpluses. For the first time on a large scale financial incentives were available through specific agri-environment schemes (reg. 2078/92) and afforestation schemes (reg. 2080/92). These measures represented the core of the emerging agri-environmental policy (Lowe, Baldock, 2000). GHG reduction was not an explicit objective of these first agri-environmental schemes and potential positive effects on the carbon balance could be seen as a by-product of strategies aimed to reduce pollution and to support farming in high nature value areas.

The implementation of the agri-environmental policy was not free from criticisms, due to the poor targeting of many schemes from an environmental perspective and even to the substantial lack of environmental benefits (European Commission, 1998). From the institutional point of view another objection raise from the marked different strategies formulated by the ministries of agriculture, responsible for the integration of environmental objectives in the CAP, and the ministries of environment responsible for the implementation of environmental directives. These last mandatory policy instruments, mainly justified under the polluter-pays principle, have generally found the opposition of agriculture ministries and of farming groups due to possible restrictions on farming practices (Lowe, Baldock, 2000). The case of Nitrate Directive, one of the less implemented directive among member states, is exemplary in this context. Although only indirectly affected by Nitrate Directive, GHG emission reduction has not been so substantial as in the case of a prompt implementation process.

Another round of the CAP reform process came into force with the approval of Agenda 2000 in 1999. In general the new reform followed the directions of the Mac Sharry reform, adding few additional resources directly to environmental supports and linking more clearly the agri-environment and afforestation measures to the rural development policy, the so-called "second pillar" of the CAP, where the "first pillar" is represented by the market policies (Lowe, Brouwer, 2000; Baldock, et al., 2002). From an environmental perspective, the most important change is the introduction of cross-compliance and environmental standards. Following the polluter-pays principle, farmers receive direct payments only if they respect basic standards in the production methods and can be compensated for agri-environment efforts beyond the so-called "good agricultural practices". Member States were left with considerable discretion over how to proceed, due to different relations between agriculture and environment by farming systems ad regions. The achievement of effective environmental benefits was not significant but the introduction of the cross-compliance concepts suggested a new course for the reform process.

In June 2003 a further fundamental reform was agreed following an undertaking to carry out a mid-term review of the application of Agenda 2000 CAP. This reform, which is expected to enter into force in 2005, represents a radical change in the way the EU supports its farm sector. Regulations 1782/03 and 1783/03 setting the normative framework for the mid-term CAP review define its key elements: de-coupling, modulation and cross compliance. These principles continue to back the Agenda 2000 priorities, but their scope has clearly widened.

Decoupling means the conversion of direct payments under the different schemes into a unique farm payment which is kept constant in time and is not depending on the land allocation among different crops. In practice this means that there is no direct linkage between a specific agricultural production and direct payments such that income support will depend less on price distortion and EU markets will be more open to foreign competition. The changes in market and price support could also have effects on the use of inputs and therefore encourage less intensive production methods with likely positive effects on environment.

Modulation, shifting from the present voluntary system to a compulsory one in 2005, is intended to partly correct the uneven distribution of direct payments and, at the same time to induce reallocation of funds from the direct payment in the first pillar of the CAP into the second pillar (rural development). More financial resources for rural development measures means more chances to expand the land management schemes, now joined in one of the three axis (general objectives) of the new regulation for rural development that will come into force in 2006.

More relevant under the environmental viewpoint is the strengthening of cross-compliance which emphasises the linkage between direct payments in the first pillar of the CAP and standards at the farm level, based on specified EU regulations (Regulation (EC) 1782/2003, Annex III), as well as the notion to maintain eligible agricultural land in good agricultural and environmental conditions (Annex IV of the Regulation). The new mechanism of cross-compliance seems to have a double objectives: on one hand to enforce the implementation of environmental directives at Member States level, on the other to cover neglected environmental aspects, such as soil conservation. It is worth to mention the recent document concerning a EU strategy for soil protection, where the Climate Change Convention is explicitly cited and specific carbon sequestration measures are signalled through the increase of soil organic matter (European Commission, 2002).

Because of its particular relevance for GHG emissions, a particular mention deserves here the content of articles 88 and 89 consisting in an aid of 45 Euro per hectare per year granted for areas sown under energy crops (biofuels and biomass for electric and thermal energy production).

Worth to note is the fact that the climate change issue and the mitigation of GHG emissions is explicitly mentioned in the preamble of new Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development) (EAFRD).

Similarly, the related Council Decision on Community strategic guidelines for rural development (programming period 2007 to 2013), in describing Axis 2 of rural development, on improving the environment and the countryside, goes more into the details in setting the Community's priorities and mentions climate change within the set of three priority areas, all together with water and biodiversity.

Combating climate change is also mentioned as one of the six key actions upon which MS's are encouraged to focus support and thus contribute to GHG mitigation through measures targeting bioenergy, carbon sink in soil and biomass and helping adapting to climate change. Development of integrated approaches to deal specifically with the contribution of agriculture to renewable energies and to combat climate change.

In summary, it seems clear that after the current reforms will have been implemented, the new CAP will respond better to the consumers' priorities and help both rural economies, the environment as well as farmers. The regulations covered by the CAP can contribute to the reduction of GHG emissions through a general improvement of the environmental conditions in agriculture and forestry.

This overview on the general normative framework in the EU has painted the broad picture of directive and regulations affecting the GHG emissions from agriculture and forestry. In order to highlight their implications, the next section will go into more detail by analysing the specific measures and policies implemented and/or planned in the EU Member States.

3. A qualitative assessment of measures applied to the agricultural and forestry sector.

3.1. A country description

The present survey updates the one provided by the report: "The Kyoto Protocol and the Effect of Existing and Planned Measures in the Agricultural and Forestry Sector in the EU25" (MEACAP document number WP2 D5, Bosello et al. 2004). It is conducted over the EU25 Member Countries always referring to the National Communications to the UNFCC (available on the website on July 11th 2006). Respect to the previous survey, information for 17 out of 25 Member Countries stem from their updated Fourth National Communications; in 5 cases these were not available thus the content of the Third National Communication is still reported. Finally in three cases (Cyprus, Luxembourg, Malta) no NC were available at all.

To allow comparability between this survey and the previous one, we kept the same structure in the presentation of country profiles, emphasising (when possible) the difference between strategies, interpreted as major goals pursued; policy framework, which is the direct recall to the relevant legislation, program or regulation that implements the strategy; type of policy, which highlights the mean by which the policy operates and finally - in the "comment" – the technical measures i.e. the kind of activities or practices affected. The aim is to distinguish as much as possible those measures directly aimed at the reduction of GHG emissions and accordingly more "Kyoto-driven", from those measures more closely related to CAP requirements.

The Strategies taken into account in the present release are following the ECCP classification which foresees 3 categories for the Agro-forestry sector: *GHG emission reduction*, *Carbon Sequestration* and *Bio-energy for carbon substitution*. Therefore the measures previously included in the 2005 release under *Expansion of Organic or Environmentally Sustainable Farming* are now under considered under *GHG emission reduction*. Moreover, each policy measure is now identified by a number that will be used in the final *Summary table* (Table 2) and in Annex I where 3rd and 4th NC are compared on a country by country basis. More details on the classification scheme used to report the Policy measures gathered throughout the 3rd and 4th NC are provided in Table 1.

A final remark before presenting country details: compared to the Third, Fourth National Communications not only add new information on what happened between the two releases, but also appear more precise and

detailed either in the qualitative description of strategies and policy frameworks or in assessing their expected effectiveness. This is particularly relevant respect CAP mitigation potential: indeed Third and Fourth National Communications should in principle include, in their "existing and planned measures" for the agricultural and forestry sectors, also the impacts of the CAP "Mid Term Review". Only Ireland did this in its Third National Communication.

Table 1: Summary of codes used to report the measures in the Member States

Category	**Code reported in the tables**	**Legend**
Numbering of the measure	Number	Information newly provided by the 4th National Communication
	Number followed by "*"	Information provided by the 3rd National Communication
	Number followed by "**"	Measure already reported in the 3rd National Communication, but with additional detail from the 4th National Communication
Strategy	GHG emission reduction	Measures directly targeted to GHG emissions reduction by setting explicit limitations or introducing/supporting specific livestock and crop production systems; Also includes: - Expansion of Organic or Environmentally Sustainable Farming: Measures concerned with the introduction of sustainable agricultural systems, directly or indirectly related to the agri-environmental measures of the Rural Development Plans, with expected positive side effects on GHG reduction - Energy efficiency: Measures inducing a reduction of GHG emissions, by reducing energy intensity of production processes basically through a more efficient use of energy.
	Carbon sequestration	Measures targeted to carbon sink improvement.
	Bio-energy for carbon substitution	Measures concerned with the reduction of GHG emissions, by introducing/supporting the production of biofuels/bioenergy, as substitutes of fossil fuels/energy.
Type of policy	Programme	Indicates a "set" of measures, but in the absence of a clearly identified or detailed policy framework.
	Economic	Refers to the general use of market based instruments (taxes, subsidies etc.), when no further detail is provided. When more information are available, measures are further classified into regulatory, promotive, voluntary, subsidies, taxes, information (see below)
	Regulation	Refers to "command and control" tools, typically: setting of compulsory quotas, quality standards and targets.
	Promotive	General support policy with no direct use of economic or regulatory instruments.
	Voluntary	Refers to voluntary agreements and commitments by firm or voluntary participation to programmes.
	Subsidies	Describes direct support to a specific initiative.
	Taxation	Refers to environmental taxes or tax exemption
	Information	Includes research, training and dissemination activities
GHG affected	CO_2 CH_4 N_2O	The code indicates the formula of the GHG gas targeted by the measure, respectively: Carbon Dioxide, Methane and Nitrous Oxide
Targets	CO_2 eq.	This entry considers only the quantitative targets of emissions to be avoided with reference to a specific timeline. Only in a few case, is the target reported as with a different unit, such as C eq. or % of present or past emissions.

Comments or details	-	- This entry reports as quotations the relevant details provided by the National Communications. - In other cases, a few additional comments were necessary; they are then indicated by the following annotation MEACAP>
All	n.r.	This annotation indicates that, for a particular entry, no information was recorded in the NC

3.1.1. Austria

1*	**Strategy**	**Carbon sequestration**
	Name of the measure	n.r.
	Implementing entity/ies	Federation, Länder
	Type of policy	Regulation Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	- Intends to maintain the present level of forest area of the country (nearly 47%) - Set of activities promoted: sustainable management and improved protection of forests from air pollutants, reduction of damage from deer and cattle, preservation and increase of biological diversity.

2*	**Strategy**	**GHG emission reduction**
	Name of the measure	n.r.
	Implementing entity/ies	Federation, Länder
	Type of policy	Promotive Information
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	- Include mainly awareness-raising voluntary programmes - Set of activities promoted: training Programmes for farmers on ecologically sound production methods, recommendation to offer biological meals in restaurants, schools, hospitals.

3*	**Strategy**	**GHG emission reduction**
	Name of the measure	Austrian Programme for Environmentally Compatible Agriculture (APECA) I and II.
	Implementing entity/ies	Federation, Länder, EU
	Type of policy	Programme Promotive Subsidies
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	- The main drivers of Austrian policy are the process of complying with Kyoto targets and the guidelines provided by CAP. The Federation, Länder and the EU gave compensation payments to organic farmers at a value of 64 millions Euro in 2000 - Set of activities promoted through direct Subsidies (not exaustive): improved manure management, limitation of livestock density, reduced use of mineral fertilisers.

4*	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	n.r.
	Implementing entity/ies	Federation, Länder

	Type of policy	Promotive Taxation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Liquid bio fuels have been entirely exempted from mineral oils taxes

3.1.2. Belgium

5**	**Strategy**	**Carbon sequestration**
	Name of the measure	Flanders Structural Town and Country Plan
	Implementing entity/ies	Flemish Region
	Type of policy	Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	- Implemented only in the Flemish region - Measures for encouraging reforestation and prohibition of deforestation of land outside residential and industrial areas unless a special exemption is obtained. When deforestation is permitted, moreover, compensation is required for afforestation in other area.

6**	**Strategy**	**Carbon sequestration**
	Name of the measure	The Rural Development Plan 2000-2006
	Implementing entity/ies	Wallon Region
	Type of policy	Promotive Subsidies
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Compensation for the lack of income for owners who practice forest conservation, through a policy of awarding allowances to private owners for setting up, managing and conserving private forest reserves.

7	**Strategy**	**Carbon sequestration**
	Name of the measure	Natura 2000
	Implementing entity/ies	Wallon Region
	Type of policy	Regulation Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Natura 2000 network now comprises 231 sites covering 217 000 hectares or 13% of Walloon territory.

8	**Strategy**	**Carbon sequestration**
	Name of the measure	Sustainable Forest Management (SFM) - Flemish forest legislation
	Implementing entity/ies	Flemish Region
	Type of policy	Promotive Subsidies
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Subsidies for SFM also includes financial compensation if certain general objectives and targets are met.

9**	**Strategy**	**Carbon sequestration**
	Name of the measure	Wood Energy Plan - March 2001.
	Implementing entity/ies	Wallon Region
	Type of policy	Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	- Implement a dozen projects for automatic wood heating, gas generation or other wood-use technologies designed to secure energy from wood in Wallonia - Actions will include information and awareness measure, feasibility pre-studies (evaluation of available resources, evaluation of energy needs, evaluation of RUE potential) and assistance with setting up projects.

10	**Strategy**	**Carbon sequestration**
	Name of the measure	- Decrees of the Flemish government of 27 June 2003 on sustainable forest management criteria - Subsidies - Management outlook for public forests
	Implementing entity/ies	Flemish Region
	Type of policy	Subsidies Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	n.r.

11	**Strategy**	**Carbon sequestration**
	Name of the measure	Promotion of Energy crops
	Implementing entity/ies	Flemish Region
	Type of policy	Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Investigation on the sales market and acceptability of energy crops as well as legal, economic, social, ecological and technical aspects of short-rotation forestry in Flanders.

12	**Strategy**	**GHG emission reduction**
	Name of the measure	Limitation/reduction of CH_4 and N_2O emissions
	Implementing entity/ies	Flemish Region
	Type of policy	Regulation Promotive
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	The Walloon Region will introduce by 2010 a set of measures to reduce the quantity of mineral nitrogen used in agriculture.

13	**Strategy**	**GHG emission reduction**
	Name of the measure	Agri-environmental measures - Moniteur Belge/Staatsblad of 31 March 1999
	Implementing entity/ies	Wallon Region
	Type of policy	Regulation

	GHG affected	CO_2 CH4 N_2O
	Targets	n.r.
	Comments or details	These measures are supported financially to the tune of 50% by the Walloon Region and 50% by the EU: - Introduction of extensive strips of meadow or grassland on the edge of crop fields along waterways - Introduction of seeded crops between other cultivated crops . Reduce the loss of nitrates by leaching or run-off by 50% - Avoid seepage of nitrogen and pesticides into surface water

14	**Strategy**	**GHG emission reduction**
	Name of the measure	Limitation/reduction of CO_2 emissions in agriculture and horticulture
	Implementing entity/ies	Flemish Region
	Type of policy	Voluntary Subsidies Taxation Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Intends to be able to connect 75% of glasshouse horticulture holdings to the natural gas network within a period of 10 years.

3.1.3. Czech Republic

15	**Strategy**	**Carbon sequestration**
	Name of the measure	Support for afforestation of unused agricultural areas
	Implementing entity/ies	Ministry of Agriculture
	Type of policy	Promotive Subsidies
	GHG affected	CO_2
	Targets	0.084 Gg CO_2 eq. by 2010
	Comments or details	It is a support Programme for afforestation of uncultivated agricultural areas including protection of established forest cultures, in the form of non returnable financial assistance provided by the Ministry of Agriculture.

16**	**Strategy**	**GHG emission reduction**
	Name of the measure	National Program to Mitigate the Impacts of Climate Change in the CR - 2004
	Implementing entity/ies	Ministry of the Environment and Ministry of Agriculture
	Type of policy	Regulation
	GHG affected	CO_2 CH_4 N_2O
	Targets	- Reduction of specific CO_2 emissions per inhabitant by 30% to 2020 compared to 2000 - Reduction of total aggregated CO_2 emissions by 25% to 2020 compared to 2000 - Provision for a continuation of this trend to 2030.
	Comments or details	Prepared measures or measures that came into force in 2005 should contribute to meeting the national quantitative targets as reported here above.

17**	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Use of landfill gas and biogas from wastewater treatment plants

	Implementing entity/ies	Ministry of the Environment, operator of landfills, and waste water treatment plants
	Type of policy	Programme
	GHG affected	CH_4
	Targets	n.r.
	Comments or details	n.r.

18**	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Act on Protection of the Air - Article 3 (10) to (12) of Act No 86/2002 Coll.
	Implementing entity/ies	Ministry of the Environment and Ministry of Agriculture
	Type of policy	Promotive Subsidies
	GHG affected	CO_2
	Targets	0.997 Gg CO_2 eq. by 2010.
	Comments or details	The fraction of renewable energy sources in consumption of primary energy sources should increase to 6% by 2010 and to 20% in 2030, and there should be a reduction on the energy intensity of production, distribution and final consumption of energy to a level of 60-70% of current consumption by 2030 and an increase in the fraction of use of biofuels to 5.75% in 2010 - According to the Program, the use of all alternative fuels in transport should reach a level of 20% in 2020 - The Ministry of the Environment and the Ministry of Agriculture are preparing the introduction of mixed fuels through Act No. 186/2004 Coll., amending Act No 86/2002.

3.1.4. Denmark

19**	**Strategy**	**Carbon sequestration**
	Name of the measure	Forestry Act 2004
	Implementing entity/ies	Danish Forest and Nature Agency, counties and Municipality
	Type of policy	Regulation Promotive Information
	GHG affected	CO_2
	Targets	0.262 Mill. Tons CO_2 eq. by 2010.
	Comments or details	- All thirteen Forestry Centres have compiled Regional Forestry Target Programmes. The Programme s contain an overall description of forests and forestry and of the needs and objectives for development. They also contain a description of the biological diversity of forests, needs for wood production, description of forestry enterprises and recommendations for promoting employment opportunities created by forestry. The Finnish Forest Certification System (FFCS) was finalised in 1999, and revised in 2003. All Regional Forestry Centres now possess a certificate for sustainable forest management according to the requirements of the new national FFCS. There are 22 million forest hectares now under the FFCS umbrella in Finland owned by a total of 311,500 forest owners. This measure intend: - To increase the forest industry's annual use of domestic oundwood by 5–10 million cubic metres by the year 2010 - To double the value of the wood industry's exports to EUR 4.2 billion per year - To increase the annual use of wood for energy production by 5 million cubic metres

		- To raise silvicultural and forest improvement investments to their former level of approximately EUR 250 million per year. Efforts will be focused particularly on forest planning and on advising and training forest owners

20**	**Strategy**	**Carbon sequestration**
	Name of the measure	Public Afforestation
	Implementing entity/ies	Danish Forest and Nature Agency
	Type of policy	Regulation Voluntary
	GHG affected	CO_2
	Targets	0.262 Mill. Tons CO_2 eq. by 2010.
	Comments or details	n.r.

21**	**Strategy**	**Carbon sequestration**
	Name of the measure	Planting of windbreaks - Statutory Order no. 1101 of 12/12/2002
	Implementing entity/ies	State
	Type of policy	Subsidies
	GHG affected	CO_2
	Targets	0.14 Mill. Tons CO_2 eq. by 2010.
	Comments or details	Support granted form EU Rural Districts Programme

22*	**Strategy**	**GHG emission reduction**
	Name of the measure	Ban on burning straw on fields
	Implementing entity/ies	State and county authorities
	Type of policy	Regulation
	GHG affected	CO_2 CH4 N_2O
	Targets	n.r.
	Comments or details	Intends to reduce air polution

23**	**Strategy**	**GHG emission reduction**
	Name of the measure	Ammonia action plan and the new statutory order on manure
	Implementing entity/ies	State and county authorities
	Type of policy	Regulation
	GHG affected	N_2O
	Targets	0.3 Mill. Tons CO_2 eq. by 2010.
	Comments or details	n.r.

24**	**Strategy**	**GHG emission reduction**
	Name of the measure	Action Plan for the Aquatic Environment I+II and Action Plan for Sustainable Agriculture
	Implementing entity/ies	State and county authorities
	Type of policy	Economic Regulation Information
	GHG affected	N2O
	Targets	- 2.2 Mill. Tons CO_2 eq. by 2010 - Reduction of N run-off from agriculture by 100,000 t/year
	Comments or details	The plan include: Re-establishment of wetlands, afforestation, agreements on environment friendly agricultural measures, organic farming on an additional 170,000 ha, improved use of fodder,

		reduced animal density, use of catch crops, reduced fertilisation norms and stricter requirements concerning the use of nitrogen in manure.

25	**Strategy**	**GHG emission reduction**
	Name of the measure	Action Plan for the Aquatic Environment III
	Implementing entity/ies	State and county authorities
	Type of policy	Economic Regulation Information
	GHG affected	N_2O
	Targets	- 0.2 Mill. Tons CO_2 eq. avoided by 2010. - Further reduction of N and P losses from agriculture
	Comments or details	n.r.

26**	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Biogas plant - Energy Policy Agreement of 29 March 2004
	Implementing entity/ies	State
	Type of policy	Subsidies
	GHG affected	CO_2 CH_4 N_2O
	Targets	0.5 Mill. Tons CO_2 eq. by 2010
	Comments or details	The meaure foresees the establishment of 40 additional joint biogas plants by 2008

3.1.5. Estonia

27*	**Strategy**	**Carbon sequestration**
	Name of the measure	Estonian Forestry Strategy
	Implementing entity/ies	Ministry of the Environment
	Type of policy	Programme
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The measure foresees the afforestation of nearly 100,000 ha of abandoned land

28**	**Strategy**	**Carbon sequestration**
	Name of the measure	Forest Act 2004
	Implementing entity/ies	Ministry of the Environment
	Type of policy	Regulation Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The Act provides also the legal bases for forest survey, forest management planning and forest management, and regulates the directing of forestry and organisation of forest management. The Act prescribes the obligation to prepare a forestry development plan at least in every ten years.

29**	**Strategy**	**Carbon sequestration**
	Name of the measure	Reforestation of Mining Areas
	Implementing entity/ies	Ministry of the Environment

	Type of policy	Regulation Voluntary
	GHG affected	CO_2
	Targets	20 Gg CO_2 eq. by 2012
	Comments or details	n.r.

30	**Strategy**	**Carbon sequestration**
	Name of the measure	Reforestation of out-of-use agricultural lands
	Implementing entity/ies	Ministry of the Environment
	Type of policy	Regulation Voluntary
	GHG affected	CO_2
	Targets	330 Gg CO_2 eq. by 2012
	Comments or details	n.r.

31**	**Strategy**	**GHG emission reduction**
	Name of the measure	Ambient Air Protection Act - 2004
	Implementing entity/ies	Ministry of the Environment
	Type of policy	Regulation
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	The Act harmonized Estonian legislation with the relevant EU acquis: - It sets the main principles for the control of ambient air quality, sets basis for emission standards, foresees measures for reduction of air pollution, etc. - The main objective of the Act is to maintain the quality of the ambient air in areas where the quality of the air is good and to improve the quality of the ambient air in areas where the quality of the air does not conform to the requirements.

32**	**Strategy**	**GHG emission reduction**
	Name of the measure	Organic Farming Act (2001)
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	A number of secondary legislative acts have been issued on the basis of this act for regulating various aspects of organic farming, as restrictions in the use of pesticides and eco-labelling

3.1.6. Finland

33*	**Strategy**	**GHG emission reduction**
	Name of the measure	Nitrate Statute
	Implementing entity/ies	Ministry of Agriculture and Forestry
	Type of policy	Regulation
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	Its first aim is to reduce N_2O emissions in agriculture

34	**Strategy**	**GHG emission reduction**
	Name of the measure	One part of the Programme is the agri-environmental support for 2000–2006 based on the Council Regulation (1257/1999).
	Implementing entity/ies	Ministry of Agriculture and Forestry
	Type of policy	Regulation Promotive Subsidies
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	- The objectives are to decrease nutrient load on the environment, especially on the surface and ground waters, and to maintain the biodiversity of animal and plant species and the rural landscape - The measures also aim at maintaining or improving the productive capacity of agricultural land.

35**	**Strategy**	**Carbon sequestration**
	Name of the measure	National Forest Programme
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	- Includes: forest certification, increase wood use, extend the area of forest management, increase investment in forestry protection and improvement, and in research and training in the field of forestry and silviculture - Objectives for 2010 include: - to increase the forest industry's annual use of domestic roundwood by 5–10 million cubic metres - to double the value of the wood industry's exports to EUR 4.2 billion per year - to increase the annual use of wood for energy production by 5 million cubic metres.

3.1.7. France

36*	**Strategy**	**Carbon sequestration**
	Name of the measure	Plan National pour la foret francaise - 1999
	Implementing entity/ies	n.r.
	Type of policy	Promotive
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	30.000 hect. per year of new forestry before 2007

37	**Strategy**	**Carbon sequestration**
	Name of the measure	Structure of offer of the wood-ernergy branch
	Implementing entity/ies	Agence de l'environnement et de la maîtrise de l'énergie, Regional Councils
	Type of policy	Economic Promotive
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Developement and biomass' energy valorisation (wood). Lasting of the plan wood-energy 2000-2006 till 2010.

38*	**Strategy**	**GHG emission reduction**
	Name of the measure	Programme de Maitrise des Pollutions Agricoles (PMPOA-1994)
	Implementing entity/ies	Ministry of Agriculture and Fishery (Map)
	Type of policy	Programme Regulation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	Includes: decrease in cattle density, limitation on use of fertilisers, increase efficiency and environmental sustainability of manure management, increase manure stockage in sensible periods

39*	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	n.r.
	Implementing entity/ies	n.r.
	Type of policy	Promotive
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	- 400.000 hect. presently devoted to this activity with reduced emissions equal to 1 $MtCO_2/y$ - Biofuel in this case refers to ethanol and methilester from vegetal oil.

40	**Strategy**	**GHG emission reduction**
	Name of the measure	National campaign for the Regulation of tractors and agricultural machine
	Implementing entity/ies	Agence de l'environnement et de la maîtrise de l'énergie
	Type of policy	Economic
	GHG affected	CO_2
	Targets	0.5 Gg CO_2 by 2010
	Comments or details	n.r.

41	**Strategy**	**GHG emission reduction**
	Name of the measure	Information Programme on Enrergy consumption
	Implementing entity/ies	Agence de l'environnement et de la maîtrise de l'énergie
	Type of policy	Programme Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	n.r.

3.1.8. Germany

42*	**Strategy**	**Carbon sequestration**
	Name of the measure	n.r.
	Implementing entity/ies	Federal Government, Federal Lander, Forestry Sector
	Type of policy	Economic Regulation Voluntary
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Includes: Management and protection of existing forests, initial afforestation, expansion of use of wood products

43*	**Strategy**	**GHG emission reduction**
	Name of the measure	Fertiliser Ordinance
	Implementing entity/ies	Federal Government
	Type of policy	Promotive
	GHG affected	CH_4 N_2O
	Targets	Reduce nitrogen input into the soil from 174 kg/ha in 1990 to 160 kg/ha in 2005
	Comments or details	Provides for biogas use in liquid-manure-treatment systems built primarily for manufacturing fertiliser products for precision nitrogen fertilisation and for fertiliser use in keeping with proper practice

44*	**Strategy**	**GHG emission reduction**
	Name of the measure	n.r.
	Implementing entity/ies	Federal Government, Agriculture
	Type of policy	EconomicVoluntary
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	n.r.

45*	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Renewable raw materials Programme - Renewable energy sources act - Biomass ordinance - Biogenic fuels and lubricants Programme
	Implementing entity/ies	Federal Government, Agriculture
	Type of policy	Programme EconomicVoluntary
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	n.r.

3.1.9. Greece

46**	**Strategy**	**Carbon sequestration**
	Name of the measure	Agricultural Land Forestation Progamme
	Implementing entity/ies	Ministry of rural development an Food
	Type of policy	Programme
	GHG affected	CO_2
	Targets	0.7 Gg CO_2 by 2010
	Comments or details	Includes reforestation, construction, maintenance and improvements in the forests' road network, economic development on mountainous communities, private forestry, control of forest fires, national forest parks, inventory of forests, studies, afforestation of agricultural land, settlement of the various streams in mountainous areas.

47**	**Strategy**	**GHG emission reduction**
	Name of the measure	Second National Climate Change Program
	Implementing entity/ies	n.r.

	Type of policy	Programme
	GHG affected	CH_4 N_2O
	Targets	0.15 Mt CO_2 eq. per year
	Comments or details	GHG reduction is performed thanks to manure management systems and organic farming.

3.1.10. Hungary

48**	**Strategy**	**Carbon sequestration**
	Name of the measure	Act LIV of 1996 on the forests and their protection
	Implementing entity/ies	n.r.
	Type of policy	Regulation Promotive Subsidies
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The quantitative targets of the policies are based on the National Afforestation Programme drafted in 1997: 778 thousand hectares was the estimate of the quantity of agricultural land suitable for afforestation, raising the forest rate of Hungary to the optimum level of 27%. Due to limited resources available, changes of land ownership and lack of information for the new land owners, however, the set targets were not met - The policy is implemented through the National Rural Development Plan (2004) and thanks to a set of support schemes: - Direct support for the afforestation of agricultural land, and, in justified cases, supplementary aid for certified additional activities performed in conjunction with the plantation - Protection of the afforestation against grazing animals, game and trampling damage, against inundation/ flood damage and against fire - Maintenance (machine weeding, hoeing, sickle cutting, removal of young shoots, etc.) of forests along with their pest protection and the ploughing and cleaning of fire protection strips - Compensatory payment to farmers for the loss of revenue

49	**Strategy**	**GHG emission reduction**
	Name of the measure	Nitrate Action Programme Government Decree 49/2001
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	The Action Programme was launched on 1 January 2002 and extends to 31 December 2013. Along with nitrate sensitivity, its priorities include the requirements applicable to the manure storage systems of animal keeping sites that use semi-liquid manure technology

50**	**Strategy**	**GHG emission reduction**
	Name of the measure	The SAPARD Plan of Hungary (2000 - 2006) - Decree No. 53/2001.
	Implementing entity/ies	Ministry of Agriculture and Rural Development
	Type of policy	Programme

	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	The SAPARD Plan of Hungary draws inspiration from the National Agri-environment Programme (1999) objectives which were integrated into the agri-environmental measures of the National Rural Development Plan (NRDP) in 2004. - The plan include: the reduced, optimised use of fertilisers and pesticides, the considered (limited) application of dangerous substances and other accompanying benefits for the environment are among the main priorities for agricultural practice

3.1.11. Ireland

51*	**Strategy**	**Carbon sequestration**
	Name of the measure	National Climate Change Strategy – Government Forestry Program: "Growing for the Future"
	Implementing entity/ies	n.r.
	Type of policy	Promotive
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	An afforestation rate of 20,000 ha/year is current policy, to reach a national forest cover of 17% by 2030.

52*	**Strategy**	**GHG emission reduction**
	Name of the measure	National Climate Change Strategy – setting priorities 2000-2010
	Implementing entity/ies	n.r.
	Type of policy	Promotive Subsidies
	GHG affected	CH_4
	Targets	n.r.
	Comments or details	Include a set of incentives all inducing a decrease in livestock density: Extensification premia, Special Beef Premium, Disadvantaged Areas Compensatory Allowances, Suckler Cow Premium, Lower Age at Slaughter Premium.

53*	**Strategy**	**GHG emission reduction**
	Name of the measure	Rural Environmental Protection Scheme
	Implementing entity/ies	n.r.
	Type of policy	Voluntary
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	Environmental standards for manure management and fertiliser use higher than those of "good agricultural practices".

54*	**Strategy**	**GHG emission reduction**
	Name of the measure	Application of 2001 "Good Farming Practice Rules"
	Implementing entity/ies	n.r.
	Type of policy	Regulation Taxation
	GHG affected	CH_4 N_2O
	Targets	n.r.

	Comments or details	n.r.

3.1.12. Italy

55*	**Strategy**	**Carbon sequestration**
	Name of the measure	n.r.
	Implementing entity/ies	n.r.
	Type of policy	n.r.
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Natural reforestation includes the natural expansion of the forested area as a result of policies for the reduction of farming-pasture surface area and for the protection of the environment - Certification of carbon removal - Creation of National Forestry Inventory of Carbon (2005).

56*	**Strategy**	**GHG emission reduction**
	Name of the measure	National law implementing EEC Regulation 2080/92
	Implementing entity/ies	n.r.
	Type of policy	n.r.
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Afforestation plantings performed total 117,428 hectares

57*	**Strategy**	**GHG emission reduction**
	Name of the measure	National law implementing EU Directive no. 676/91
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	Rationalisation of fertiliser use through implementation of Good Agricultural –Practice, Improved manure management.

58*	**Strategy**	**GHG emission reduction**
	Name of the measure	Incentives provided under EU Regulation s no. 2078/92
	Implementing entity/ies	n.r.
	Type of policy	Promotive
	GHG affected	CO_2 N_2O
	Targets	0.337 Mt CO_2 in 2010
	Comments or details	n.r.

59*	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Enhance Use of biogas
	Implementing entity/ies	n.r.
	Type of policy	Regulation Promotive
	GHG affected	CO_2

	Targets	n.r.
	Comments or details	Use of biogas to combustion or cogeneration plants: Technical Regulation s (IPPC) for new plants, regional financing for existing plants

3.1.13. Latvia

60**	**Strategy**	**Carbon sequestration**
	Name of the measure	Latvian Forest Policy - 1998
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The SAPARD SubProgramme 1.2 "Afforestation of Agricultural Lands", amounts to more than 6 million EUR and can be used to cover 50% of afforestation 4 thousand ha of land approximately. - Experts believe that the implementation of these principles would provide for an increase of the share of forest land to 48–52% of the territory of Latvia within the next 20–25 years, correspondingly increasing CO_2 removals.

61	**Strategy**	**Carbon sequestration**
	Name of the measure	Forest Development Fund
	Implementing entity/ies	n.r.
	Type of policy	Programme Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Scientific research and various activities to raise public awareness and educate forest owners

62	**Strategy**	**GHG emission reduction**
	Name of the measure	Improving and construction of manure storage facilities
	Implementing entity/ies	n.r.
	Type of policy	Regulation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	It includes improvement of the existing manure storage facilities and construction of new ones that conform with environmental protection requirements: the capacity of the storage facilities must be sufficient to ensure storage of collected manure corresponding to at least six months' operation for dung storages, and seven months – for storages of liquid manure

63	**Strategy**	**GHG emission reduction**
	Name of the measure	- Regulations of the Cabinet of Ministers No. 531 "On Water and Soil Protection Against Pollution Caused by Nitrates from Agricultural Activities" (18.12.2001.) - Regulation of the Cabinet of Ministers No. 484 "Statutes of the Council for Especially Sensi

	Implementing entity/ies	n.r.
	Type of policy	Regulation Subsidies
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	In order to fulfil the requirements of legislative acts in this field, Latvian agricultural and environmental protection specialists in cooperation with the specialists of Danish Agriculture Consultations Centre have developed "Good Agriculture Practice Conditions". It includes use of progressive methods suggested by GAP, for livestock feeding (rationing and controlling the amount of proteins), using closed facilities for the storage of organic and mineral fertilisers, and correct application of fertilisers to the soil taking into account the weather conditions.

64	**Strategy**	**GHG emission reduction**
	Name of the measure	Rural development plan
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	In the second half of 2005, the government has provided from the Regional Fund more than 460 thousand LVL for the co-financing of projects in the "National Programme for Specially Supported Territories" in order to promote activities in aimed at modernisation of agricultural equipment, development of biological agriculture, extension and establishment of production units, etc.

65	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Production and Use of Biofuel in Latvia (2003 – 2010)
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Measures to realise the priorities stated in the Programme are described in the Action plan for the implementation of the Programme , "The Law on Biofuel" and "The Programme of Agricultural Development for 2003".

3.1.14. Lithuania

66*	**Strategy**	**Carbon sequestration**
	Name of the measure	Afforestation of agricultural land within the Rural Development Plan
	Implementing entity/ies	n.r.
	Type of policy	Regulation
	GHG affected	CO2
	Targets	n.r.
	Comments or details	Intends to meet the targets set in the Lithuanian Forest Increase Program 2003-2020 (MEACAP>n.r.)

67**	**Strategy**	**GHG emission reduction**
	Name of the measure	State Programme for Reduction of Waters' pollution from Agricultural sources (Gvt resolution n 176 - 26/08/2003)
	Implementing entity/ies	Ministry of Agriculture and Ministry of the Environment
	Type of policy	Information
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	The Programme prepares the full implementation of the Nitrate directive: - Research activities and Competence building (farmers will be trained, demonstration projects will be implemented, and legals acts will be prepared) - Manure Management (eliminate pollution casued by big livestock farms and reduce the one produced by small farms.) - Dvt of Sustainable agricultural system (Reduce run-off of nitrogen, especially nitrates from agricultural fields) - Monitoring of pollution from agricultural sources

3.1.15. Poland

68*	**Strategy**	**Carbon sequestration**
	Name of the measure	- National Programme of Increasing Forest Cover - State Forestry Policy Description
	Implementing entity/ies	n.r.
	Type of policy	n.r.
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	To enhance 45 forest cover in Poland up to 30% by 2020 and up to 33% by 2050: this means that 700 thousand hectares have to be afforested by 2020 and further 1.5 million hectares within next 30 years.

69*	**Strategy**	**GHG emission reduction**
	Name of the measure	n.r.
	Implementing entity/ies	n.r.
	Type of policy	n.r.
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	Includes litter rearing of ruminants and adjustment of livestock volume to the market needs.

70*	**Strategy**	**GHG emission reduction**
	Name of the measure	n.r.
	Implementing entity/ies	n.r.
	Type of policy	n.r.
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	Inludes optimisation of fertilising combined with crops production efficiency:

		- improved efficiency of nitrogen fertilisers use - improved techniques of feeding animals - improved systems of breeding livestock.

71*	**Strategy**	**GHG emission reduction**
	Name of the measure	Programme for Development of Environmental Agriculture (1997)
	Implementing entity/ies	n.r.
	Type of policy	Programme Regulation
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	Intends to improve and modernise the area structure of farms and establish the conditions for sustainable development, includes: - Programme s for soil protection - Programme for improvement of agricultural economy on the hydrogenic soil areas - Programme for adaptation of mineral and organic fertilisation techniques and technologies to meet environmental protection requirements - Programme for adaptation of plant protection to meet environmental protection requirements and needs of agricultural production - Production technologies on grassland, and a Programme of adapting them to meet environmental protection requirements - Programme for adjustment of animal production techniques and technologies to improve environmental quality of foodstuffs - Programme for promoting good practice in farming - Programme for enhancement of environmental education in rural communities.

3.1.16. Portugal

72	**Strategy**	**Carbon sequestration**
	Name of the measure	Evaluation and promotion of carbon sequestration in agricultural soil
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	500 Gg CO_2 by 2010
	Comments or details	n.r.

73	**Strategy**	**Carbon sequestration**
	Name of the measure	Programme for the Sustainable Development of Portuguese Forests (in the context of IIIFSP)
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	3743 Gg eq. CO_2 by 2010
	Comments or details	n.r.

74	**Strategy**	**Carbon sequestration**

	Name of the measure	Promotion of carbon sink capacity of forests
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	800 Gg eq. CO_2 by 2010
	Comments or details	n.r.

	Strategy	**Bio-energy for carbon substitution**
	Name of the measure	Treatment and energy recovery of livestock waste
	Implementing entity/ies	n.r.
75	**Type of policy**	Programme
	GHG affected	CO_2
	Targets	429 Gg eq. CO_2 by 2010
	Comments or details	n.r.

3.1.17. Slovakia

	Strategy	**Carbon sequestration**
	Name of the measure	Act 217/2004 on Forest Reproduction Material
	Implementing entity/ies	n.r.
76	**Type of policy**	Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Rules for utilisation of genes materials in forest management and viability of future carbon sequestration

	Strategy	**Carbon sequestration**
	Name of the measure	Act 326/2005 on Forests
	Implementing entity/ies	n.r.
77	**Type of policy**	Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Framework to protect forests and for forest management

	Strategy	**Carbon sequestration**
	Name of the measure	Soil Stock Protection, Regulation of timber extraction, Afforestation of Non-forest area
	Implementing entity/ies	Ministry of Agriculture
78*	**Type of policy**	Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	MEACAP> In the 4th NC, it is explicitely stated that all measures listed in the 3th NC are currently implemented.

79	**Strategy**	**Carbon sequestration**
	Name of the measure	Medium term Agriculture policy for 2004/2006 - Forest

		Management
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Creates the framework for the implementation of measures aimed to sustainable management of the forest

80	**Strategy**	**GHG emission reduction**
	Name of the measure	Act 555/2004 on Manures
	Implementing entity/ies	Ministry of Agriculture
	Type of policy	Regulation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	- Replaces Act 136/2000 reported in 3rd NC - The act stipules requirements for the application of manures, including registration, storage and certifications procedures. - MEACAP> Targets are not clear: see Table 4.3 of the 4th NC.

81	**Strategy**	**GHG emission reduction**
	Name of the measure	Act 364/2004 on water, on protection against pollution by nitrates form agricultural sources
	Implementing entity/ies	Ministry of Agriculture
	Type of policy	Regulation
	GHG affected	N_2O
	Targets	n.r.
	Comments or details	Inlude framework for the protection against pollution by nitrates from agricultural sources, manipulation and application of manures and fertilisers

82	**Strategy**	**GHG emission reduction**
	Name of the measure	Act 220/2004 on Protection and utilisation of Agriculture soil
	Implementing entity/ies	Ministry of Agriculture
	Type of policy	Regulation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	- Replaces Act 83/2000 reported in 3rd NC - Intends to protect soils from degradation, erosion and risk substances and minimise the impact of activities on the enviornement

83	**Strategy**	**GHG emission reduction**
	Name of the measure	Act 425/2002 on Ecological agriculture and production of bio-foods
	Implementing entity/ies	n.r.
	Type of policy	Regulation
	GHG affected	CO_2 CH_4 N_2O
	Targets	n.r.
	Comments or details	- Replaces Act 224/1998. - To support eco-farming till 2010. - A code of good agricultural practices was adopted in 1996, and

		amended in 2000 and 2001

84	**Strategy**	**GHG emission reduction**
	Name of the measure	Act 188/2003 on Application of sludge and bottom sediments on the soil
	Implementing entity/ies	Ministry of Agriculture
	Type of policy	Regulation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	- Indicates the application procedures of sludges and sediments. - MEACAP> Targets are not clear: see Table 4.3 and 4.4 of the 4th NC.

3.1.18. Slovenia

85**	**Strategy**	**Carbon sequestration**
	Name of the measure	Sustainable forest management
	Implementing entity/ies	- Ministry of Agriculture, Forestry and Food - Slovenian Forest Service
	Type of policy	Regulation
	GHG affected	CO_2
	Targets	1320 Gg CO_2 eq. by 2010
	Comments or details	Preserving the biodiversity, productivity, regeneration ability, volume and vitality of forests

86	**Strategy**	**GHG emission reduction**
	Name of the measure	Rural development Programme
	Implementing entity/ies	Ministry of Agriculture, Forestry and Food
	Type of policy	EconomicVoluntary
	GHG affected	CO_2 CH_4 N_2O
	Targets	>9 Gg CO_2 eq. by 2011
	Comments or details	n.r.

87	**Strategy**	**GHG emission reduction**
	Name of the measure	Good agricultural practice in fertiliser use
	Implementing entity/ies	- Ministry of Agriculture, Forestry and Food - Ministry of the Environment and Spatial Planning
	Type of policy	Regulation
	GHG affected	N_2O
	Targets	11 Gg CO_2 eq. by 2010
	Comments or details	The Reduction will take place through lower fertiliser application

88	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Promotion of biogas use for electricity and heat production
	Implementing entity/ies	Ministry of the Environment and Spatial Planning
	Type of policy	Economic Regulation
	GHG affected	CO_2

	Targets	20 Gg CO_2 eq. by 2010
	Comments or details	The Planned measure intends to reduce GHG emissions through the use of animal and agricultural waste for energy.

89	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Incentives for cultivating biodiesel crops
	Implementing entity/ies	Ministry of Agriculture, Forestry and Food
	Type of policy	Economic Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The Planned measure intends to: - Reduce consumption of fossil fuels in transport, conserving humus in the soil and soil fertility - Reduce use of fertilizers.

3.1.19. Spain

90	**Strategy**	**Carbon sequestration**
	Name of the measure	Increase in wood biomass
	Implementing entity/ies	Ministero de Agricoltura, Pesca y Alimentacion, Communidades Autonomas
	Type of policy	Economic Regulation
	GHG affected	CO_2
	Targets	- 1.04 Mt CO_2 in 2005 - 1.69 MT CO_2 in 2010
	Comments or details	MEACAP> Target reported is a cumulative figure for Measures n 90, 91,97 and 101

91	**Strategy**	**Carbon sequestration**
	Name of the measure	Set aside of cultivated land following CAP agroenvironmental requirements
	Implementing entity/ies	Ministero de Agricoltura, Pesca y Alimentacion, Communidades Autonomas
	Type of policy	Economic Regulation
	GHG affected	CO_2N_2O
	Targets	- 1.04 Mt CO_2 in 2005 - 1.69 MT CO_2 in 2010
	Comments or details	MEACAP> Target reported is a cumulative figure for Measures n 90, 91,97 and 101

92**	**Strategy**	**Carbon sequestration**
	Name of the measure	Plan Forestal Espagnol 2003-2032
	Implementing entity/ies	Ministero Medio Ambiente, Communidades Autonomas
	Type of policy	Regulation
	GHG affected	CO_2
	Targets	23.7 Mt CO_2 in the period 2003-2032
	Comments or details	General plan of forestry restoration and sustainable forestry management

93	**Strategy**	**Carbon sequestration**
	Name of the measure	Measures against wild fire
	Implementing entity/ies	Ministero Medio Ambiente, Communidades Autonomas
	Type of policy	Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	n.r.

94*	**Strategy**	**Carbon sequestration**
	Name of the measure	- National forestry inventory - National soil erosion inventory - National forest mapping
	Implementing entity/ies	Ministero Medio Ambiente
	Type of policy	Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Includes the inventory of byomass and carbon sink, identification and quantification of erosion processes, mapping of carbon sink in woodland and forest.

95	**Strategy**	**Carbon sequestration**
	Name of the measure	Byomass in forestry, carbon capture and release in woodland
	Implementing entity/ies	Ministero Medio Ambiente
	Type of policy	Information
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	Includes: research and development Programme s to increase knowledge on natural processes

96	**Strategy**	**GHG emission reduction**
	Name of the measure	Ban on burning of agricultural residues following CAP agroenvironmental requirements
	Implementing entity/ies	Ministero de Agricoltura, Pesca y Alimentacion, Communidades Autonomas
	Type of policy	Economic Regulation
	GHG affected	CH_4 N_2O
	Targets	0.06 Mt CO_2 eq. in 2005
	Comments or details	n.r.

97	**Strategy**	**GHG emission reduction**
	Name of the measure	Programas de Accion en Zonas Vulnerables a la Contaminacion por nitratos
	Implementing entity/ies	- Ministero de Agricoltura, Pesca y Alimentacion - Ministero Medio Ambiente
	Type of policy	Regulation Information
	GHG affected	CO_2 N_2O
	Targets	- 1.04 Mt CO_2 in 2005 - 1.69 MT CO_2 in 2010
	Comments or details	MEACAP> Target reported is a cumulative figure for Measures n

		90, 91,97 and 101

98	**Strategy**	**GHG emission reduction**
	Name of the measure	Substitution of mineral fertilizers with organic compounds
	Implementing entity/ies	- Ministero de Agricoltura, Pesca y Alimentacion - Ministero Medio Ambiente
	Type of policy	Economic Regulation Information
	GHG affected	CO_2 CH_4 N_2O
	Targets	1.3 Mt CO_2 in 2005
	Comments or details	n.r.

99	**Strategy**	**GHG emission reduction**
	Name of the measure	Intesifying cattle feeding
	Implementing entity/ies	Ministero de Agricoltura, Pesca y Alimentacion
	Type of policy	Information
	GHG affected	CH_4
	Targets	n.r.
	Comments or details	n.r.

100	**Strategy**	**GHG emission reduction**
	Name of the measure	Plan de Accion 2005-2007: Subsector Agrario
	Implementing entity/ies	- Ministero de Agricoltura, Pesca y Alimentacion - Ministry of Industry, tourism and Commerce
	Type of policy	Economic Regulation Information
	GHG affected	CO_2
	Targets	0.17 Mt. CO_2 in the period 2005-2007
	Comments or details	n.r.

101	**Strategy**	**GHG emission reduction**
	Name of the measure	odes of good agricultural practices
	Implementing entity/ies	- Ministero de Agricoltura, Pesca y Alimentacion - Communidades Autonomas
	Type of policy	Voluntary Taxation
	GHG affected	CO_2N_2O
	Targets	1.04 Mt CO2 in 2005, 1.69 MT CO_2 in 2011
	Comments or details	- Intends to improve the use of manure as a substitute for mineral fertilizer - MEACAP> Target reported is a cumulative figure for Measures n 90, 91, 97 and 101

102	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	n.r.
	Implementing entity/ies	Ministry of Industry Tourism and Commerce, Ministero de Agricoltura, Pesca y Alimentacion
	Type of policy	Economic
	GHG affected	CO_2
	Targets	7.3 Mt CO_2 in 2010
	Comments or details	n.r.

3.1.20. Sweden

103	**Strategy**	**Carbon sequestration**
	Name of the measure	Forestry Act
	Implementing entity/ies	National Board of Forestry
	Type of policy	Programme Regulation
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The measure includes: - Another 400 000 hectares of forest to be protected by 2010 in comparison with the 1998 level of approximately 850 000 hectares of productive forest land - Provisions on forest stewardship

104	**Strategy**	**Carbon sequestration**
	Name of the measure	Environmental code
	Implementing entity/ies	Swedish EPA and County administrative boards
	Type of policy	Programme Regulation
	GHG affected	CO_2CH_4
	Targets	n.r.
	Comments or details	- Applications for permits and exemptions for drainage are mandatory and are considered by the county administrative board - Provisions on nature reserves and habitat protection are also reported in the Environmental Code as well as nature conservation agreements.

105	**Strategy**	**GHG emission reduction**
	Name of the measure	Swedish board of agriculture action Programme for reduced losses of crop nutrients
	Implementing entity/ies	Swedish board of agriculture
	Type of policy	Programme EconomicInformation
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	Reduce eutrophication by a set of measures including: Covering of slurry tanks - Measures to reduce the supply of nitrogen to agricultural soil - Establishment of wetlands - Increased grazing on nitrogen-poor soils

106	**Strategy**	**GHG emission reduction**
	Name of the measure	Swedish environment and rural development Programme 2000 - 2006
	Implementing entity/ies	Swedish board of agriculture
	Type of policy	Economic
	GHG affected	CH_4 N2O
	Targets	n.r.
	Comments or details	Includes targeted environmental payments

3.1.21. The Netherlands

107	**Strategy**	**Carbon sequestration**
	Name of the measure	National Ecological Network
	Implementing entity/ies	Provincial governments
	Type of policy	n.r.
	GHG affected	CO_2
	Targets	n.r.
	Comments or details	The measure foresees the creation of 728,500 of NEN ha by 2018 means, adding approx. 275,000 ha. (Not all area of the NEN will be afforested)

108	**Strategy**	**GHG emission reduction**
	Name of the measure	Milk quota
	Implementing entity/ies	State
	Type of policy	n.r.
	GHG affected	CH_4 N_2O
	Targets	0.15 Mill. Tons CO_2 eq. by 2015.
	Comments or details	n.r.

109	**Strategy**	**GHG emission reduction**
	Name of the measure	Manure Application norms and Nitrogen norms
	Implementing entity/ies	State
	Type of policy	Regulation
	GHG affected	CH_4 N_2O
	Targets	- 0.3 Mill. Tons CO_2 eq. by 2015.
	Comments or details	Intends to reduce nitrates in soil and emissions of NH3

110	**Strategy**	**GHG emission reduction**
	Name of the measure	Orders in Council Greenhouse Agriculture
	Implementing entity/ies	State and Greenhouse Horticulture sector
	Type of policy	Regulation Voluntary
	GHG affected	CO_2
	Targets	- 0.8 Mill. Tons CO_2 eq. by 2015. - Increase Energy efficiency by 65% (1980-2010)
	Comments or details	n.r.

3.1.22. United Kingdom

111	**Strategy**	**Carbon sequestration**
	Name of the measure	UK forestry standards
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CO_2
	Targets	3.5MtC between 2006 and 2020
	Comments or details	n.r.

112	**Strategy**	**GHG emission reduction**
	Name of the measure	Catchment Sensitive Farming (CSF) Programme
	Implementing entity/ies	n.r.
	Type of policy	Programme
	GHG affected	CH_4 N_2O
	Targets	n.r.
	Comments or details	n.r.

113	**Strategy**	**Bio-energy for carbon substitution**
	Name of the measure	Strategy for Non-Food Crops and Uses (2004)
	Implementing entity/ies	Biomass task force group
	Type of policy	Programme Information
	GHG affected	CO_2
	Targets	11Gg C by 2010
	Comments or details	The Government plans to stimulate biomass heat through a series of measures including new five-year capital grant scheme for biomass boilers and a second round of the Bio-energy Infrastructure scheme.

3.2. Comparative analyses and discussion

Concerning the comparison of between the contents of the 3rd and 4th NC's, in terms of qualitative insights, the two sets of reports are very similar, but the new one presents an increased comprehensiveness of the reporting of policy framework or measures. As before, their contents are not always perfectly clear, as sometimes the description is not sufficiently detailed, or includes complex mechanisms targeting more than one objective or applying more than one policy instruments.

Indeed the present study identifies 113 policy measures: strategies implemented and GHG affected are always reported while the other chosen categories are not always detailed, depending on the quality of the NC. Namely, the *Policy instrument* is almost always described, even if sometimes it is not perfectly clear or alternatively many measures are aggregated under one entity; in this last case, our choice was to report it under the *Programme* category. For the other entries of our survey, 68% of the *Implementing entity/ies* are reported and only 35% of the quantitative *target/s*. When other information on the measure was available, they have been reported as such in the *Comments or details box*, adding a dedicated comment only when necessary.

30 out of 113 measures are described identically as previously being, they still referred to Third National Communication or reported identically by Fourth National Communication. But updated or additional information is given for 25 measures even though already introduced by Third National Communications, while 58 measures are newly reported. It is important to note that this does not necessarily mean that they are also newly introduced: often they are policy measures already in place but not reported by previous Communications.

Given all the limitations deriving from the sources of information (poor technical contents, little details, etc.), to some extent compensated by the fact that National Communications (NC's) are official and rather homogeneous documents, a general picture of the situation in Europe can be derived and a preliminary comparative analysis attempted, with reference to the information available before July 2006.

As mentioned before, the agricultural and forestry policies relevant for the scope of the present analysis at the EU level, as reported at the MS level, have been categorised into three main groups of measures according to the ECCP classification (ECCP 2006).

Some general trends and distinctive features can be derived by analysing the contents of Table 2, updated with the information reported in the 4th NC.

The table below provides an overall picture of the measure typologies as they are distributed within the three groups.

	Carbon sequestration								GHG emission reduction								Bio-energy for carbon substitution							
Type	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I
Number	11	5	21	9	4	6	0	10	12	11	28	7	6	5	3	11	5	4	3	4	1	2	1	1
% per type	39	25	40	45	36	46	0	45	43	55	54	35	55	38	75	50	18	20	6	20	9	15	25	5

Measures belonging to the **first group** "GHG emission reduction" are typically voluntary and based upon the financial resources of the CAP for providing incentives or subsidies to the farmers. The vast majority of MS's have included a much diversified set of measures in the National Communications. The link of such measures with the expected benefit in terms of combating global change is in general very vague. Expected positive effects are related to a plethora of different, usually indirect, effects, such as the sequestration of CO_2 in soils as a consequence of reduced tillage, which is expected to limit the mineralisation of soil organic matter. In many cases enhanced management techniques in the livestock production sector are listed as a means for limiting CH4 emissions from livestock rearing plants and/or from the utilisation of manures as fertilisers for crop production. Benefits in the emissions of N_2O are expected from the improvement of fertilisation in general and the management of livestock wastes, which is a crucial aspect concerning the role of agricultural activities and GHG emissions also, and in particular, for what concerns methane, the main contribution to global change from the primary sector. At this regard, it must be remembered that quite often in the past strategies for combating water pollution from nutrients released from manures and chemical fertilisers have produced detrimental effects on air pollution and GHG emissions.

Measures of the **second category** "Bio-energy for carbon substitution" are more directly related to GHG emission reduction, since they target more specifically the emissions from agricultural sources and the potential benefits from the substitution of fossil fuel with biofuel and biogas. In the case of measures targeted to increase biofuel and biogas production, present in half of the NC's, mainly from central and northern Europe, CO_2 emissions are usually targeted through incentives or tax exemption mechanisms aimed at the increased use of renewable energy sources. Biodiesel produced by energy crops such as rape seed, or short rotation coppice as a direct source of energy are typical solutions, which may provide tangible and

measurable effects on GHG budgets at the national scale. More complex is the assessment of the expected benefit of the broad set of options targeting in particular CH_4 and N_2O emissions, with promotive/voluntary approaches aimed in general at providing increased energy efficiency in the primary sector. The approaches adopted usually focus on manures and their treatment. Synergic positive effects are expected in the case of biogas production, since the utilisation of biogas substitutes the use of fossil fuels and, at the same time, limits the emissions of CH_4 and N_2O from agricultural sources. Those measures attempt to introduce multi-objective optimised approaches capable to cope with both problems, but whose effects are very difficult to estimate.

The **third category** includes those measures targeted to increase "carbon sequestration" by forest, to be planted, improved or differently managed. CO_2 is the GHG targeted, through measures to be implemented both through regulative and voluntary measures supported by incentives. The assessment of those measures is relatively easy and consolidated whenever they produce a measurable surface area of new forest. More debatable is the quantification of the changes in forest management. This category seems to be the most consolidated approach for combating GHG emissions from the primary production side and all MS's, apart from Ireland, have adopted policies of this type.

In general the categories of measures and instruments are coherent with the policy framework outlined in section $_2$ of this document. Diversified strategies are implemented by the various MS's, but the overall criterion seems to be the reassessment of existing policies (?? CAP, water, etc…??) for benefiting from their side effects in terms of contributions to the obligations of the Kyoto Protocol.

For details on the legend used, please refer to table 1, keeping in mind that only the Initials of the Policy instrument used is reported here.

Table 2: Summary matrix of measures per category and Member States.

		GHG affected			GHG emission reduction								Bio-energy for carbon substitution								Carbon sequestration							
Country	N	CO2	CH4	N2O	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I
Austria	1*	X																					X					X
	2*	X	X	X				X				X																
	3*		X	X	X			X		X																		
	4*	X														X			X									
Belgium	5**	X																					X					
	6**	X																						X		X		
	7	X																					X					X
	8	X																						X		X		
	9**	X																										X
	10	X																								X		X
	11	X																										X
	12		X	X			X	X																				
	13	X	X	X			X																					
	14	X							X	X	X	X																
Czech Republic	15	X																						X		X		
	16**	X	X	X			X																					
	17**		X										X															
	18**	X														X		X										
Denmark	19**	X																					X	X				X
	20**	X																					X		X			
	21**	X																								X		
	22*	X	X	X			X																					
	23**			X			X																					
	24**			X		X	X					X																
	25			X		X	X					X																
	26**	X	X	X														X										
Estonia	27*	X																						X				
	28**	X																					X					X
	29**	X																					X		X			
	30	X																					X		X			
	31**	X	X	X			X																					
	32**	X	X	X	X																							

		GHG affected			GHG emission reduction								Bio-energy for carbon substitution								Carbon sequestration							
Country	N	CO2	CH4	N2O	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I
Finland	33*			X			X																					
	34	X	X	X			X	X		X																		
	35**	X																			X							
France	36*	X																						X				
	37	X																				X		X				
	38*		X	X	X		X																					
	39*	X														X												
	40	X				X																						
	41	X			X							X																
Germany	42*	X																				X	X		X			
	43*		X	X				X																				
	44*	X	X	X		X			X																			
	45*	X											X	X			X											
Greece	46**	X																			X							
	47**		X	X	X																							
Hungary	48**	X																					X	X		X		
	49			X	X																							
	50**	X	X	X	X																							
Ireland	51*	X																						X				
	52*		X					X		X																		
	53*			X					X																			
	54*		X	X			X				X																	
Italy	55*	X																			n.r.							
	56*	X																			n.r.							
	57*		X	X	X		X																					
	58*	X		X				X																				
	59*	X													X	X												

		GHG affected			GHG emission reduction								Bio-energy for carbon substitution								Carbon sequestration							
Country	N	CO2	CH4	N2O	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I
Latvia	60**	X																			X							
	61	X																			X							X
	62		X	X			X																					
	63			X			X			X																		
	64	X	X	X	X																							
	65	X											X															
Lithuania	66*	X																					X					
	67**		X	X								X																
Poland	68*	X																			n.r.							
	69*		X	X	n.r.																							
	70*			X	n.r.																							
	71*	X	X	X	X		X																					
Portugal	72	X																			X							
	73	X																			X							
	74	X																			X							
	75	x											X															
Slovakia	76	X																					X					
	77	X																					X					
	78*	X																					X					
	79	X																			X							
	80		X	X			X																					
	81			X			X																					
	82		X	X			X																					
	83	X	X	X			X																					
	84		X	X			X																					
Slovenia	85**	X																					X					
	86	X	X	X		X			X																			
	87			X			X																					
	88	x												X	X													
	89	X												X	X													

		GHG affected			GHG emission reduction								Bio-energy for carbon substitution								Carbon sequestration							
Country	N	CO2	CH4	N2O	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I	Prg	E	R	P	V	S	T	I
Spain	90	X																				X	X					
	91	X		X																		X	X					
	92**	X																					X					
	93	X																					X					
	94*	X																										X
	95	X																										X
	96		X	X		X	X																					
	97	X		X			X					X																
	98	X	X	X		X	X					X																
	99		X									X																
	100	X				X	X					X																
	101	X		X					X		X																	
	102	X												X														
Sweden	103	X																			X		X					
	104	X	X																		X		X					
	105		X	X	X	X						X																
	106		X	X		X																						
The Netherlands	107	X																				X						
	108		X	X		X																						
	109		X	X			X																					
	110	X					X		X																			
United Kingdom	111	X																			X							
	112		X	X	X																							
	113	X											X							X								

4. A quantitative assessment of measures applied to the agricultural and forestry sector

In what follows, we will report quantitative information about the expected effect of the existing and additional GHG reduction measures that the EU 25 member countries are adopting or are going to adopt in the next future. After presenting a general picture for the whole EU 25 economy, we will focus on the agricultural and forestry sector.

The bulk of information is based on the Fourth (or Third) National Communications of the EU25 member countries to the UNFCCC (released from 2001 to 2006). It is important to clarify that these data do not allow a fully consistent and homogeneous inter-country comparison. Indeed, National Communications are often based on different underlying assumptions about the evolution of the key variables that drive the socio-economic scenario and on different timeline and this is particularly important when projections are concerned. In order to facilitate the reader, to go deeper in the understanding of the data and their background, more information is provided in Annex II.

Accordingly, to offer a comparison and a consistency check to our calculations, we are also reporting, whenever appropriate, information from the EU Wide Projections (EEA, 2003a; 2003b, 2005) in which problems of internal consistency and comparability should be less severe.

4.1. The General picture

Table 3 offers a first global comparison between data reported by the Third National Communications and the EU Wide Projections (EEA, 2003 and 2005).

Table3: GHG emissions in the EU 25 in 2010 and their relation to the Kyoto target

	MEACAP D5 - 2nd Release				MEACAP D5 - 3rd Release	
	Kyoto Target in Absolute Terms (Mt. CO_2 eq.) [a]	**2010 GHG Emission Projections With Existing Measures (Mt. CO2 eq.) [b]**	**2010 Required Additional Reduction in % of Target (??) [c]**	**2010 Required Additional Reduction in % of Target [d]**	**Kyoto Target in Absolute Terms (Mt. CO_2 eq.) [e]**	**2010 Required Additional Reduction in % of Target [f]**
Austria	67.3	86.05	27.86	24	67.5	21.7
Belgium	133.7	171.18	28.03	23	133.2	10.6
Cyprus	na	na	na	na	na	na
Czech Republic	176.7	128.29	-27.40	-23	176.8	-17.3
Denmark	54.7	80.42	47.02	38	55.0	na
Estonia	40	18.86	-52.85	-49	40.0	-48.6
Finland	77.1	89.9	16.60	16	70.5	13.2
France	549.3	582.5	6.04	10	545.0	9.0
Germany	965.9	812.08	-15.93	1	986.2	1.2
Greece	131.1	147.21	12.29	11	139.6	9.7
Hungary	79.4	65.91	-16.99	0	95.6	0.0
Ireland	60.2	74	22.92	27	60.4	20.4
Italy	486.7	540.1	10.97	10	476.3	20.4
Latria	25.6	12.81	-49.96	-50	23.3	-38.1

Lithuania	na	na	na	na	46.9	-42.6
Luxembourg	7.9	na	na	6	9.2	5.6
Malta	na	na	na	na	na	na
Poland	435.3	394	-9.49	-9	468.6	-6.1
Portugal	82.5	95.2	15.39	14	75.5	25.1
Slovakia	67.1	53.19	-20.73	-19	66.3	-11.7
Slovenia	18.6	22.15	19.09	18	18.6	12.9
Spain	240.3	307.4	27.92	33	238.1	33.0
Sweden	73.4	70.88	-3.43	-3	75.1	-5.0
The Netherlands	203.9	256	25.55	12	200.1	9.5
United Kingdom	649.7	630.67	-2.93	-3	657.7	-7.8
EU 25 TOTAL	4626.4	4638.8	0.27	3.95	4725.5	2.8

Source and calculations:
[a]: UNEP/GRID-Arendal
[b]: Third National Communications to the UNFCCC
[c]= (([b]-[a])/[a])*100
[d]: EEA 2003 "Europe's Environment, the Third Assessment"
[e] and [f]: EEA 2005 "Greenhouse gas emission trends and projections in Europe"

Columns b and c summarise the values reported by the Third National Communications, column d shows those reported by the European Environmental Agency (2003a). Columns e and f lastly report the data updated by the EEA in 2005 (2005). It was not possible to update this general picture with information coming from the 4th NC as data are even less homogenous if compared to the 3rd NC and to the EEA communication. Therefore, the comparative valuation will focus on differences between the 3rd NC and the two releases of EEA projections.

Generally speaking, emissions target for 2010 have slightly been updated during the period, as emissions for base year have always been recalculated in the meanwhile. More importantly, 2010 Required Additional Reduction in % of Target have changed considerably for certain countries, although the overall assessment of EU25 commitment as a group countries did not change much (from 3.95% to 2.8% over the commitment).

The comparison of columns [c] [d] and [f], all showing the gap between projected emissions and the Kyoto target in percentage, highlights big discrepancies (greater than 5% versus the target) for Belgium, Denmark, Germany, The Netherlands, Spain and Hungary. As a consequence, by effect of existing mitigation measures, in 2010 total GHG emissions in the EU were estimated to be only 0.27% higher than the total reduction target according to the summary of National Communications, while the difference was 3.95% according to EU-wide projections. Germany is mainly responsible for this difference: according to its National Communications, by exploiting the GHG reduction policies already in place, in 2010 it should be able to present a GHG reduction over delivery of 15% compared to its Kyoto commitment, while according to 2003 and 2005 EU Wide estimates it will present a shortfall, albeit small, of 1%.

Bearing this in mind, the following results are consistently highlighted by all sources considered:

1) Existing measures are not sufficient to bring the EU 25 to full compliance with Kyoto commitments. Additional reductions are required (in the range of 0.27% to 3.95%).

2) The gaps between projected emissions and Kyoto targets are unevenly distributed. Notwithstanding existing measures, former EU 15 countries are projected to emit more than their Kyoto target (notable exceptions are the UK and Germany). On the contrary, Acceding Countries are projected to decrease their GHG emissions below their respective Kyoto commitments as an effect of current and planned mitigation measures coupled with the economic restructuring that started during the first half of the 1990s (the exception here is Slovenia).

3) In 2001, GHG emissions in the EU 15 were 2.3 % below the base-year level, taking the EU 15 little more than a quarter of the way towards its greenhouse gas emission target (-8%). This result was due to France, Germany, Luxembourg, Sweden and the United Kingdom being on track to reach their burden-sharing targets with domestic policies and measures. The remaining ten Member States were not on course, whereby in particular Ireland, Portugal and Spain headed towards exceeding their targets by more than 20 index points.

4) In 2001, GHG emissions in the 10 Accession Countries (now new member countries) were below the base-year level (respectively - 36% and -46% according to EEA 2003 and 2005 projections).

4.2. Agriculture and Forestry

The tables from 3 to 6 reported in the previous version of the deliverable have been merged into table 4 in order to facilitate cross comparison between GHG emissions in all sectors and the ones in Agriculture and Forestry sector in the EU25. They summarize the data reported extensively in the statistical annex to this report (Annex II) built on information provided by Third and Fourth National Communications. Readers can also refer to this Annex to find indication on the major assumptions driving projection results.

According to the 3rd national communications, in 2010 GHG emissions from the agriculture and forestry sectors will amount to nearly 2.5% of total EU GHG emissions (see Table 4). The difference between the "with measures" and the "with additional measures" cases is negligible. If these data are cleared from the sink effect provided by the forestry sector, agriculture emissions are estimated to represent nearly 7%-8% of total GHG emissions. The forestry sector in turn is estimated to supply a carbon storage service quantifiable in the range of 5.5% of total GHG emissions.

A comparison of the projected 2010 emissions with the 2001 data shows a decreasing contribution of the joint agricultural and forestry sectors to GHG emissions in the EU25. In particular, emissions decline from the historical 3.69% to the projected 2.5%.

As shown, this reduction is entirely due to lower emissions from agriculture and not to an increased sink potential provided by the forestry sector (LUCF sinks in fact slightly decline from nearly 6% in 2001 to 5.1%-5,6% in 2010). This means that the decline can basically be imputed to a reduced production of CH_4 and N2O.

Three important remarks should be remembered: firstly here sink potential is considered with respect to total GHG emissions. Accordingly if both emissions and sink increase, but the first increases more than the

second, sink capacity decreases. Secondly what is being shown is the EU 25 data, in some countries sink potential does increase (see statistical appendix). Thirdly and most importantly, all the consulted sources agree on the fact that the estimation of sink potential is particularly uncertain, and large inconsistencies have been found for example comparing historical data with projections. Thus information about sinks should be regarded just as an indication.

Table 4: GHG emissions in the EU 25 in the 3rd NC: a focus on agriculture and forestry

	1990	**2001**		**2010 With Measures**		**2010 With Additional Measures**	
	Mt CO2 eq.	Mt CO2 eq.	% of total GHG emissions (**)	Mt CO2 eq.	% of total GHG emissions (**)	Mt CO2 eq.	% of total GHG emissions (**)
All Sectors GHG Emissions	4857.06	4842.13	100	4638.8	100	4256.15	100
Agriculture GHG Emissions (Without Sinks)	418.94	456.98	9.44	347.71	7.49	344.73	8.09
Agriculture and Forestry GHG emissions (With Sinks)	104.29	178.22	3.69	110.15	2.37	105.72	2.48
Sink Potential (*)	-314.65	-278.76	-5.75	-237.56	-5.12	-239.01	-5.61

Source: Our computation based on Third National Communications to the UNFCCC.
(*) The minus sign as reported quantities are removals.
(??) Reported figures are percentages of total GHG emissions in the reference years – 2001 and 2010 (with measures and with additional measures) - which are set equal to 100.

Tables 4 analyse the effect of existing and planned measures in a longer-term perspective, comparing the estimated figures for 2010 with the historical observation in 1990. The data confirm the general finding that both emissions from agriculture and sink potential of the forestry sector are projected to decline. The former are estimated to be reduced by nearly 17% in the 1990-2010 period while the latter by 25%.

Considering agriculture and forestry together, the net effect is a slight increase of GHG emissions in the 1990-2010 period that is estimated to range between 1%-5%.

As previously mentioned, the decreased emissions of N2O within the 1990-2001 period are mainly imputable to the reduced and more efficient use of fertilisers fostered by the Nitrate Directive. CH4 emissions follow a drop in the number of cattle also in response to CAP reform. These seem to remain the main causes of GHG emissions reductions also in the 2001-2010 period, even though CAP reform provisions (we recall that sources here report the effect of measures linked to the process of CAP reform starting from the 1992 Mac-Sharry reform to the "Agenda 2000" CAP reform and not to the last "Mid Term Review") will probably be increasingly important in inducing GHG reduction.

More insights in the comparison of these results with those reported by EEA (2003) may support some preliminary conclusions, as follows.

Historical information (data for 1990, 2001 and trends) is in line: both sources highlight that between 1990 and 2001, N2O and CH4 emissions in the EU15 agriculture sector fell roughly by 8%. As expected, a sharp difference can be observed when comparing projections. In particular, our finding that CH4 and N2O emissions from agriculture in the 1990-2010 period dropped by 17% is based on National Communications, and is remarkably higher than the 11% figure reported by EEA.

Differences between the National Communications and the EEA (2003) report can also be found in estimating the sink potential. At page 28, the EEA summary states: "The same eight Member States [Austria, Belgium, Finland, Netherlands, Portugal, Spain, Sweden] that have provided information on their plans to use the Kyoto mechanisms have also done it for their intended use of carbon sinks to achieve their targets. [...] there are plans to remove, by 2008–12, around 10 million tonnes CO2 per year through forestry activities and an additional 3 million tonnes CO2 per year through agricultural activities. These removal estimates represent almost 4 % of the total EU reduction required. The European climate change programme estimates that potentially 93–103 million tonnes CO2 could be sequestered through the enhancement of sink activities in the agricultural and forestry sectors" (EEA, 2003a).

In fact, according to official GHG emissions inventories in 2001, the total sink potential provided by the forestry sector in the same 7 Member States (Spain excluded) was roughly equal to 60 million tonnes of CO2 equivalent. According to National Communications, in 2010 this figure is projected to decrease to 41 million tonnes that in any case is much higher than the sink estimates provided by the EEA (13 million tonnes).

Lastly, although a comprehensive analysis between 3rd and 4th NC is not possible for the reasons pointed out before, an attempt can be made. Table 5 below reports almost the same information as in table 4 updated thanks to the 4th NC, but only for the 14 countries (among the EU25) which submitted both versions of NC and only with reference to the "With measures" scenario. This allow to perform a comparative analysis on estimations and projections between the two NC without excluding a priori countries which submitted both NC without discussing the "With Additional Measures" scenario in one of the two.

Table 5: Comparison of GHG emissions in the 14 EU25 countries which submitted 3rd and 4th: a focus on agriculture and forestry

Year	1990 - All sector	2010 - All sector	2010 - Agri	2010 - Sink	2010 - Agri - %	2010 - Sink - %
[a] Current measures 4NC	2452	2642	233	-96	8.8	-3.6
[b] Current measures 3NC	2420	2391	216	-115	9.0	-4.8
[c] Comparison 3rd/4NC	1.0	0.9	0.9	1.2	0.9	1.2

Source: Our calculation based n 3rd and 4th NC
[a]: Third National Communications to the UNFCCC
[b]: Fourth National Communications to the UNFCCC
[c]= b/a

The disaggregate data reported in Annex II show that almost all these 14 countries revised their estimations and projections of GHG emissions since last NC, in some cases there are doubts about the coherence between the two releases. However, the impact on the overall sum reported in Table 5 is limited, and the same trends as described in the first part of this chapter can be observed.

5. Concluding remarks to the 2006 release of D5

Since the 1992 Mac Sharry reform, the relevance of environmental issues in the development of a Common Agricultural Policy raised in importance and nowadays the protection of the environment in the form of an improved environmental quality and of the adoption/development of environment-sustainable agriculture and forestry is a recognised key target in the European CAP. The majority of measures promoting "green" agriculture and forestry work indirectly to decrease the negative impact of these sectors on climate change as they usually rely on lower emission technologies or induce an increase in the sink potential.

As a completion of this policy, some EU Directives have been specifically targeted to the direct reduction of GHG from different agricultural practices to respond both to the need of improving the general environmental quality of the production and of contributing to the EU policy towards the implementation of the Kyoto Protocol on GHG reductions.

Given this framework, the Member States are allowed to set targets and define strategies.

Apart from country-specific bans and quotas on GHG emissions, common to all countries is the support to environmentally-sustainable farming activities. In addition, a number of very diverse policies are applied: forest protection and afforestation, incentives of the use of wood products, increased development and use of biofuels, monitoring and/or inventorying activities, research and development of "green" production methods, information and educational programmes.

It is important to highlight that even though measures at the country level still respond mainly to CAP requirements or to the improvement of air and water quality standards, especially after year 2000 the issue of climate change has become increasingly prominent in the design of agro-forestry development strategies.

The overall effect of these policies can be summarised in the following points:

1) Considering the general effect of EU strategies to curb GHG emissions, the EU as a whole is still projected to emit more than its Kyoto commitment in 2010. This general data hides strong differences at the member state level: in general EU Acceding Countries (except Slovenia) are expected to emit below their binding targets, while the opposite applies to the EU 15. Regarding the EU15, France, Germany, Luxembourg, Sweden and the United Kingdom are on track to reach their burden-sharing targets whereas the remaining ten Member States are not in line with particularly large shortfalls of Ireland, Portugal and Spain.

2) Within this picture, agriculture and forestry, on the basis of existing and planned sector-specific measures, are estimated to contribute only the 2.5% to total GHG emissions in 2010, showing thus a neat decline respect to the 3.7% of 2001. This positive effect is the compound of two trends: a strong decline in

non-CO2 emissions (-17% in 1990-2010) that is partially offset by a similar decline (even if this data is surrounded by a high uncertainty) in the sink potential (-25% in the same period).

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Annex I

A country by country comparison between Third and Fourth National Communications to the UNFCCC for Agricultural and Forestry Sector Policies

Austria

Still reported only 3rd National Communication

Belgium

- Carbon Sequestration:
  - N°5, n°6, n°9, are the same measure as in the 3rd NC but a few more details are provided, such as name and date of the measure.
  - N°7 on Natura 2000 network is newly reported but it is not really a strategy for GHG reduction
  - N° 8 (Sustainable Forest Management (SFM) - Flemish forest legislation) was not mentioned in 3rd NC: the related measure N°10 has been approved in 2003.
  - N°11 on Energy crops is as well a new measure
- GHG emission reduction
  - N°12 and 13 on seems to aggregate in one measure several ones previously mentioned in the 3rd NC for the two counties, but no real comparative assessment can be performed.
  - N°14 on connecting 75% of glasshouse horticulture holdings to the natural gas network was not mentioned in the 3rd NC

Czech Republic

- Carbon Sequestration:
  - The afforestation measure n° 15 was already mentioned in the 3rd NC but more details are provided including name of the measure and targets
- GHG emission reduction
  - N° 16 already mentioned in the 3rd NC but more details are provided here: the measure started to be implemented in 2005.
  - Measures 17 and 18 were mentioned in the 3rd NC aggregated with n° 16. Now, more details are provided including targets

Denmark

- Carbon Sequestration:
  - The afforestation measures n° 19, 20, 21 were mentioned all together in the 3rd NC with no details; now name of the measures, targets and comments are explicit.
- GHG emission reduction
  - N° 22 was already mentioned in the 3rd NC.
  - N° 23 was already mentioned in the 3rd NC but more details are provided in the 4th: name and target
  - Measure N°24 was already reported in the 3rd NC but now targets are detailed
  - Measure n° 25 was not reported in the 3rd NC: it is a new measure
- Bio-energy for carbon substitution
  - Measures 26 was mentioned in the 3rd NC but now, more details are provided including name and targets.

Almost all the measures were mentioned in the 3rd NC but now more details are provided including targets; the only new one is measure n°25 on *GHG emission reduction* , which is fact an extension of measure n° 24.

Estonia

- Carbon Sequestration:
  - Besides measure n° 30 (Reforestation of out-of-use agricultural lands), all the other afforestation measures (27,28, 29) were already mentioned in the 3rd NC but now targets are explicit.
- GHG emission reduction
  - More details on measure n°31 and 32 are provided

The only new measure is n° 30 on *Carbon Sequestration* and concern Reforestation of out-of-use agricultural lands.

Finland

- Carbon Sequestration:
  - The measure n° 33 was already mentioned in the 3rd NC.

- GHG emission reduction
  - Measure N°34 Nitrate Statute is a new measure
  - Measure N°35 was already reported in the 3rd NC but more now more details are provided

France

- Carbon Sequestration:
  - N° 36 reported in the 3rd NC: Plan National pour la foret française – 1999
  - N° 37 (Structure of offer of the wood-energy branch) newly reported

- Both measures (38, 39) concerning *GHG emission reduction* and *Bio-energy for carbon substitution* were already reported in the 3rd NC.

- Measures n° 40 and 41 under *GHG emission reduction* both concern energy saving and are newly reported.

Germany

Only 3rd NC

Greece

Both measures (46 and 47) concerning *Carbon Sequestration* and *GHG emission reduction* were reported in the 3rd NC and now a few more details are provided, including targets.

Hungary

- Both measures (49 and 50) under *Carbon Sequestration* and *GHG emission reduction* were reported in the framework of the National Climate Change Strategy (2000) in the 3rd NC. In the 4th one, both measures now include details on the name of the measure and implementing entities.

- A new measure n° 48 (*Nitrate Action Programme*) under *GHG emission reduction* approved in 2001, launched in 2002, and therefore newly reported in the 4th NC.

Ireland
Only 3rd NC

Italy
Only 3rd NC

Latvia
- Carbon Sequestration
  - Measure n° 60 (*National forest Policy*) was already reported in the 3rd NC, now a few more details are provided
  - Measure n° 61 (Scientific research and various activities to raise public awareness and educate forest owners) is a new measure.

- GHG emission reduction
  - The 3 measures listed in the 4th NC were already reported in the 3rd one but more details are now available, including legislative framework and comments.

- Bio-energy for carbon substitution
  - New measure approved in 2003

Lithuania
- Carbon Sequestration
  - Same measure as in 3rd NC

- GHG emission reduction
  - Measure n° 67 now listed under this category may aggregate several measures already reported in the 3rd NC; but due to the scarce available information, a true Comparative Assessment is not possible.

Portugal
- Carbon Sequestration
  - Due to the scarce available information, a true Comparative Assessment is not possible; however targets are now reported

- Bio-energy for carbon substitution
  - New measure

Slovakia
- Measure on Energy saving (1992) is missing between 3rd and 4th NC

- GHG emission reduction :
  - Measure 80 is an amendment (2004) of the corresponding measure reported in the 3rd NC
  - Measure 81 is a new measure (2004)
  - Measure 82 is an amendment (2004) of the corresponding measure reported in the 3rd NC
  - The other measures (83 and 84) under this strategy are new (2003 and 2004)

- Carbon Sequestration
  - Two new measures (76 and 77) are new (2004 and 2005)
  - The measures for forestry reported in the 3rd NC are here aggregated under measure 78 and are currently implemented

Generally speaking, the 4th NC reports 5 new measures and 3 amendments and a more detailed legislative framework for the ones already reported in the 3rd.

Slovenia

- Carbon Sequestration
  - N° 85 *Sustainable forest management* is the same measure as in the 3rd NC but it now includes details including targets to be reached.

- GHG emission reduction
  - Two measures (86 and 87) are now detailed (the only one was not in the 3rd NC) including implementing entity and targets

- Bio-energy for carbon substitution
  - This strategy was not reported in the 3rd NC and therefore the two associated measures can be considered to be new.

Generally speaking, details are now provided for all the measures, including targets, and a new strategy has been set.

Spain

- Carbon Sequestration
  - Measure n° 92 and 94 were both reported in the 4th NC as they were in the 3rd one, btu now measure n°92 include targets
- The 4 other measures are new (or newly reported) concerning GHG emission reduction and *Bio-energy for carbon substitution* but not many details are included.

No additional measures seems to have been added between 3rd and 4th NC even though no consistent Comparative assessment can be performed, as the details included in both communications are scarce (for instance dates of the measures are not provided). However all targets are now reported.

Sweden

- Carbon Sequestration
  - Both (103 and 104) measures were not reported in the last D5:
    - The *forestry act* existed before and targets for 2010 have been updated.
    - Specific aspects of the environmental code related to nature conservation are reserves are now reported.

- GHG emission reduction
  - The two other strategies reported in the 4th NC report the same aim of the measures reported in the 3rd NC but legislative framework is now clearer.

The Netherlands

- Carbon Sequestration
  - The measure on *forest certification* is no long more reported in the 4th NC
  - Now, only the *National Ecological Network* is mentioned with its target in terms of area to be afforested.

- GHG emission reduction
  - Here, as an exception along the whole set of countries, the *Milk quota* measure is mentioned and the impacts of the foreseen reduction in livestock is detailed as a targeted reduction in CO2.
  - The other measure is new, or newly reported and concern *Manure Application and Nitrogen norms*
  - Measure n°110 was already mentioned in the 3rd NC, now new details are included, including targets and legislative framework

UK

- Carbon Sequestration
  - Concerning the *UK forestry standards (1998)*, targets have been updated to 3.5MtC from 3.4MtC

- GHG emission reduction
  - A new measure aiming at tackling water pollution to help meet the objectives of the EU Water Framework Directive is mentioned

- Bio-energy for carbon substitution
  - The measure on *energy crops*, already forecasted in the 3rd NC, have been approved in 2004 and targets to 2010 are now available.

Annex II

Summary table for ALL COUNTRIES with 3rd and 4th NC

Mt CO2 eq.	Current measures 4NC						Current measures 3NC					
Country	1990 - All sector	2010 - All sector	2010 - Agri	2010 - Sink	2010 - Agri - %	2010 - Sink - %	1990 - All sector	2010 - All sector	2010 - Agri	2010 - Sink	2010 - Agri - %	2010 - Sink - %
Belgium	144	145	11	-3	8	-2	79	171	15	-2	9	-1
Czech Republic	190	141	8	-4	5	-3	192	128	8	-3	6	-3
Denmark	69	71	9	-1	13	-2	71	80	11	-1	13	-1
Finland	50	79	5	-5	6	-6	70	90	5	-5	5	-6
France	535	660	93	-58	14	-9	568	577	85	-59	15	-10
Greece	112	150	12	-5	8	-3	109	145	10	2	7	1
Hungary	70	86	12	-1	14	-1	122	98	2	-5	2	-5
Latvia	25	14	2	-8	12	-61	25	13	2	-10	16	-76
Portugal	56	85	9	-4	10	-4	59	86	12	-2	14	-2
Slovakia	70	55	3	0	5	-1	72	53	6	-2	11	-3
Slovenia	20	19	2	-1	12	-7	20	22	2	-6	11	-26
Sweden	52	58	8	-13	14	-23	72	71	7	-24	10	-34
The Netherlands	212	216	17	6	8	3	212	225	14	-1	6	-1
UK	847	863	42	2	5	0	748	631	37	3	6	0
SUM	2452	2642	233	-96	9	-4	2420	2391	216	-115	9	-5

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC - In Mt CO2 eq. when not reported

Summary table for ALL COUNTRIES with 3rd and 4th NC –Comparison between 3rd and 4th NC values: relative values

	Comparison 3rd/4NC			
Country	**1990 - All sector**	**2010 - All sector**	**2010 - Agri**	**2010 - Sink**
Belgium	0.5	1.2	1.3	0.5
Czech Republic	1.0	0.9	1.0	0.8
Denmark	1.0	1.1	1.1	1.0
Finland	1.4	1.1	1.0	1.0
France	1.1	0.9	0.9	1.0
Greece	1.0	1.0	0.8	-0.4
Hungary	1.7	1.1	**0.1**	**5.2**
Latvia	1.0	0.9	1.3	1.2
Portugal	1.1	1.0	1.4	0.6
Slovakia	1.0	1.0	2.1	**4.1**
Slovenia	1.0	1.2	1.0	**4.2**
Sweden	1.4	1.2	0.9	1.8
The Netherlands	1.0	1.0	0.8	-0.2
UK	0.9	0.7	0.9	1.4
SUM	1.0	0.9	0.9	1.2

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC – Computed as (a) value / (b) value of previous table

NB: All values are in Gg Co2 equivalent

Austria

NC	Measures	GHG	1990	2001	2005	2010	2015	2020
3	WM	CH4	4566.0	4060.9	3887.1	3771.6	3664.5	3560.8
3	WM	CO2	-92210.0	-7633.4		-7633.4		
3	WM	N2O	3718.0	3541.0	1001.3	988.9	982.7	973.4
	SUM		**-83926.0**	**-31.5**	**4888.4**	**-2872.9**	**4647.2**	**4534.2**
3	WAM	CH4			3813.4	3643.5	3482.9	3330.4
3	WAM	CO2				-7633.4		
3	WAM	N2O			992.0	976.5	961.0	945.5
	SUM				**4805.4**	**-3013.4**	**4443.9**	**4275.9**
	DIFFERENCE	WAM-WM			-83.0	-140.5	-203.3	-258.3

Source: Our Calculations Based on Third National Communications to the UNFCCC

Belgium

NC	Measures	GHG	1990	2000	2001	2005	2010	2015	2020
3	WM	CH4	8252.0		7038.1	7838.0	7700.0		
3	WM	CO2			-1814.4				
3	WM	N2O	7822.0		5455.6	7416.0	7281.0		
3	**SUM**		**16074.0**		**10679.4**	**15254.0**	**14981.0**		
4	WM	CH4	7162.0	7011.0		6638.0	6499.0	6361.0	6179.0
4	WM	CO2	-3103.0	-3137.0		-1996.0	-3306.0	-3300.0	-3300.0
4	WM	N2O	5617.0	5348.0		5034.0	4997.0	4930.0	4851.0
4	**SUM**		**9676.0**	**9222.0**		**9676.0**	**8190.0**	**7991.0**	**7730.0**
3 4	**DIFFERENCE**	**3NC-4NC**	**-6398.0**			**-5578.0**	**-6791.0**		

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Czech Republic

NC	Measures	GHG	1990	2001	2003	2005	2010	2015	2020
3	WM	CH4	4284.0	2371.4		2410.7	2646.6	2694.2	
3	WM	CO2	-2281.0	-4363.0		-3444.0	-3487.0	-3531.0	
3	WM	N2O	620.0	5220.4		5315.6	5314.3	5313.1	
3	**SUM**		**2623.0**	**3228.7**		**4282.3**	**4473.9**	**4476.2**	
4	WM	CH4				2152.1	2169.7	2184.7	2206.7

4	WM	CO2			-3800.0	-4131.0	-4176.0	-4297.0	-4354.0
4	WM	N2O				5524.5	5534.1	5542.2	5542.2
4	**SUM**					**3545.6**	**3527.8**	**3429.9**	**3394.9**
4	WAM	CH4				2152.1	2169.7	2184.7	2206.7
4	WAM	CO2			-3800.0	-4131.0	-4176.0	-4297.0	-4354.0
4	WAM	N2O				5524.5	5534.1	5542.2	5542.2
4	**SUM**					**3545.6**	**3527.8**	**3429.9**	**3394.9**
3 4	**DIFFERENCE**	**3NC-4NC**				**-736.7**	**-946.1**	**-1046.4**	
4	**DIFFERENCE**	**WAM4-WM4**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Denmark

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020	2025	2030
3	WM	CH4	4095			3633		3348	3199	3133			
3	WM	CO2	-3118			-3531		-1063	-1202	-1357			
3	WM	N2O	10230			8060		7501	7553	7553			
3	**SUM**		**11207**			**8162**		**9786**	**9550**	**9329**			
4	WM	CH4	3850		3810		3710	3680	3590	3440	3360	3280	3310
4	WM	CO2	158	-234	-1782	-1158	-1204	-953	-1195	-1472	-1781	-1963	-2315
4	WM	N2O	8990		6760		6190	6110	5860	5640	5510	5410	5410
4	**SUM**		**12998**		**8788**			**8837**	**8255**	**7608**	**7089**	**6727**	**6405**
3 4	**DIFFERENCE**	**3NC-4NC**						**-949**	**-1295**	**-1721**			

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Estonia

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020	2025	2030
3	WM	CH4	1470.0			446.9		819.0	924.0	945.0			
3	WM	CO2	-6320.0			-739.5		-7400.0	-7200.0	-7000.0			
3	WM	N2O	961.0			322.0		465.0	465.0	496.0			
3	**SUM**		**-3889.0**			**29.5**		**-6116.0**	**-5811.0**	**-5559.0**			
3	WAM	CH4						504	609	651			
3	WAM	CO2						-8060	-8290	-8490			
3	WAM	N2O						372	372	372			
3	**SUM**							**-7184.0**	**-7309.0**	**-7467.0**			

3	**DIFFERENCE**	**WM3-WAM3**						**-1068.0**	**-1498.0**	**-1908.0**			

	SUM		**0.0**			**0.0**		**-8252.0**	**-8807.0**	**-9375.0**			
4	WM	CH4	1463.7	749.7	432.6	447.3	464.1						
4	WM	CO2	-6319.0	-7782.0	-8364	-9415.0	-8717.0	-8554.0	-7684.0	-6815.0	-5946.0	-5076.0	
4	WM	N2O	976.5	368.9	375.1	322.4	266.6						
4	WAM	CO2						-8907.0	-9118.0	-9367.0	-9615.0	-9860.0	
4	**SUM**		**-3878.8**	**-6663.4**	**-7556.3**	**-8645.3**	**-7986.3**						
3 4	**DIFFERENCE**	**3NC-4NC**	**10.2**			**-8674.8**							
4	**DIFFERENCE**	**WM4-WAM4**						**353.0**	**1434.0**	**2552.0**	**3669**	**4784**	

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Finland

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020
3	WM	CH4	2000.0			1769.2		1600.0	1600.0		1600.0
3	WM	CO2	-18800.0			-14904.9		-800.0	-5100.0		-18100.0
3	WM	N2O	5000.0			3736.1		3600.0	3300.0		3300.0
3	**SUM**		**-11800.0**			**-9399.6**		**4400.0**	**-200.0**		**-13200.0**
3	WAM	CH4						1600.0	1500.0		
3	WAM	CO2						-800.0	-5100.0		
3	WAM	N2O						3600.0	3300.0		
3	**SUM**							**4400.0**	**-300.0**		
3	**DIFFERENCE**	**WAM3-WM3**						**0.0**	**-100.0**		
NC	**Measures**	**GHG**	**1990**	**1995**	**2000**	**2001**	**2003**	**2005**	**2010**	**2015**	**2020**
4	WM	CH4	2150				1870		1550		1550
4	WM	CO2	-21439	-15407	-16324	-19062	-17880				
4	WM	N2O	4960				3880		3160		2750
4	**SUM**		**-14329.0**				**-12130.0**		**3810.0**		**3400.0**
4	WAM	CH4						1787	1557	1512	1555
4	WAM	CO2									
4	WAM	N2O						3617	3161	2869	2755
4	**SUM**							**5404.0**	**4718.0**	**4381.0**	**4310.0**

4	**DIFFERENCE**	**WAM4-WM4**							**908.0**		
3 4		**WM4-WM3**	**-2529.0**								
3 4		**WAM4-WAM3**						**1004.0**	**5018.0**		

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

France

NC	Measures	GHG	1990	1995	2000	2001	2003	2010	2015	2020
3	WM	CH4	34256.0			43838.5		32000.0		32000.0
3	WM	CO2	-52019.8			-58968.0		-58968.0		
3	WM	N2O	56147.0			54547.9		53200.0		53000.0
3	**SUM**		**38383.2**			**39418.4**		**26232.0**		**85000.0**
3	WAM	CH4						31000.0	31000.0	
3	WAM	CO2						-58968.0		
3	WAM	N2O						53200.0	51200.0	
3	**SUM**							**25232.0**	**82200.0**	
3	**DIFFERENCE**	**WAM3-WM3**						**-1000.0**		

NC	Measures	GHG	1990	1995	2000	2001	2003	2010	2015	2020
4	WM	CH4	44700.0			42700.0		40100.0	39200.0	40100.0
4	WM	CO2	-27102.0	-30792.0	-36872.0	-42763.0	-53111.0			
4	WM	N2O	63000.0			58400.0		52400.0	52000.0	51500.0
4	**SUM**		**80598.0**			**58337.0**		**92500.0**	**91200.0**	**91600.0**
4	WAM	CH4						39400	40100	38900
4	WAM	CO2								
4	WAM	N2O						52400	51700	51200
4	**SUM**							**91800.0**	**91800.0**	**90100.0**
4	**DIFFERENCE**	**WAM4-WM4**						**-700.0**	**600.0**	**-1500.0**

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Germany

NC	Measures	GHG	1990	2001	2005	2010
3	WM	CH4	39949	25393.2	25930	21850
3	WM	CO2	-33719	-23694.82	-30000	-30000
3	WM	N2O	26350	39840.11	23362	22090

3	**SUM**		**32580**	**41538.49**	**19292**	**13940**

Source: Our Calculations Based on Third National Communications to the UNFCCC

Greece

NC	Measures	GHG	1990	1995	2000	2005	2010	2015	2020
3	WM	CH4	3748.0		3729.8	3799.0	3786.0		3774.0
3	WM	CO2	1441.0		-1327.9	1776.0	1776.0		1776.0
3	WM	N2O	6842.0		6347.1	6192.0	6136.0		6047.0
3	**SUM**		**12031.0**		**8749.0**	**11767.0**	**11698.0**		**11597.0**
4	WM	CH4	3454.0	3456.0	3483.0	3499.0	3518.0	3542.0	3570.0
4	WM	CO2	-3193.3	-4368.7	-2958.93	-4702.2	-4773.4	-4509.2	-4264.1
4	WM	N2O	10060.0	9033.0	8848.0	8627.0	8747.0	8887.0	9036.0
4	**SUM**		**10320.7**	**8120.3**	**9372.1**	**7423.9**	**7491.6**	**7919.8**	**8341.9**
3 4	**DIFFERENCE**	**WM4-WM3**	**-1710.3**		**623.1**	**-4343.2**	**-4206.4**		**-3255.1**

Source: Our Calculations Based on 3rd NC and 4th NC to the UNFCCC

Hungary

NC	Measures	GHG	1990	2001	2005	2010	2015	2020
3	WM	CH4	2432	2200		1500		
3	WM	CO2	-2363	-4514		**-4514**		
3	WM	N2O						
3	**SUM**		**69**	**-2314**		**-3014**		
4	WM	CH4			2075	2266	2393	2509
4	WM	N2O			7960	9597	10169	10671
4	WM	CO2			-76	**-867**	-2555	-4850
4	WAM	CO2			-379	**-4336**	-12832	-23733
4	**SUM WM**				**9959**	**10996**	**10008**	**8331**
4	**SUM WAM**				**9656**	**7527**	**-270**	**-10553**
3 4	**DIFFERENCE**	**3NC-4NC**				**14010**		
4	**DIFFERENCE**	**WAM-WM**			**-304**	**-3469**	**-10277**	**-18883**

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

The difference in estimation between 3rd and 4th NC mainly concern the Net carbon sequestration: it appears that the overall effect of sinks has been overestimated in the 3rd NC. Moreover, the foreseen effects of Additional measure in the 4th NC is able to meet the gap between these two values. It is also important to note that different afforestation scenario are presented in the 4th NC: see page 86 for details
The rest of the gap pointed out in the summary table n°6 is given by the value of N2O emissions, which was lacking in the 3rd NC.

Ireland

NC	Measures	GHG	1990	2001	2005	2010	2012
3	WM	CH4	**10440.99**	**11072.67**	**10571**	**6352**	**9106**
3	WM	CO2	**-65.66**	**-629**	**na**	**-628.72**	**na**
3	WM	N2O	**7495.8**	**8097.20**	**7405**	**6618**	**6478**
3	**SUM**		**17871.13**	**18541.15**	**17976**	**12341.28**	**15584**

Source: Our Calculations Based on Third National Communications to the UNFCCC

Italy

NC	Measures	GHG	1990	2001	2005	2010
3	WM	CH4	19166.7	18292.14	18024.30	17648.40
3	WM	CO2	-23532	-18654.92	na	-18654.92
3	WM	N2O	24180	24242.58	23963.00	23405.00
3	**SUM**		**19815**	**23879.79**	**41987.3**	**22398.48**

Source: Our Calculations Based on Third National Communications to the UNFCCC

Latvia

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020
3	WM	CH4	2370.3			770.5		669.5	710.6	765.9	
3	WM	CO2	-10825.6			-9256.3		-9603.0	-9664.0	-9919.5	
3	WM	N2O	3001.1			683.3		1178.0	1370.2	1444.6	
3	**SUM**		**-8455.3**			**-7802.5**		**-7755.5**	**-7583.2**	**-7709.1**	
4	WM	CH4	2336.7	937.4	642.6		655.2	680.4	708.1	744.7	766.5
4	WM	CO2	-18389.7	-14511.8	-8526		-8186.8	-7736.9	-8323.5	-12663.2	-13141.6
4	WM	N2O	2830.3	930.0	818.4	926.9	976.5	926.9	954.8	976.5	1023.0
4	**SUM**		**-13222.7**	**-12644.3**	**-7065.0**		**-6555.1**	**-6129.6**	**-6660.6**	**-10942.1**	**-11352.1**
4	WAM	CH4						706.4	743.0	774.3	816.3
4	WAM	CO2						-7798.5	-8210.6	-13263.0	-13875.5

4	WAM	N2O						951.7	995.1	1029.2	1004.4
4	**SUM**							**-6140.4**	**-6472.5**	**-11459.6**	**-12054.8**
3 4	**DIFFERENCE**	**4NC-3NC**	**-4767.4**					**1625.9**	**922.5**	**-3233.0**	
4	**DIFFERENCE**	**WAM-WM**						**-10.8**	**188.1**	**-517.5**	**-702.7**

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

Lithuania

NC	Measures	GHG	2005	2010	2015	2020
4	WM	CH4	1728.9	1507.0	1481.3	1464.3
4	WM	CO2	-5821.0	-6417.0	-6875.0	-7150.0
4	WM	N2O	257.3	229.4	226.3	226.3
	SUM		**-3834.8**	**-4680.6**	**-5167.4**	**-5459.4**

Source: Our Calculations Based on 4th National Communications to the UNFCCC

Poland

NC	Measures	GHG	1990	2001	2010
3	WM	CO2	-44663	-53639.35	-59003.29
3	WM	CH4	17850	9464.93	8707.74
3	WM	N2O	12710	16373.18	18041.25
3	**SUM**		**-14103**	**-27801.25**	**-32254.30**

Source: Our Calculations Based on Third National Communications to the UNFCCC

Portugal

NC	Measures	GHG	1990	2000	2001	2010	2020
3	WM	CH4 + N2O	12300.0		11755.5	12200.0	12700.0
3	WM	CO2	-3751.0		-2151.6	-2151.6	
3	**SUM**		**8549.0**		**9603.8**	**10048.4**	**12700.0**
4	WM	CH4	4225.2	4491.3		4653.1	4476.4
4	WM	CO2	-3362.0	-4230		-3743.0	-4325.0
4	WM	N2O	3822.3	4042.4		3995.9	3896.7
4	**SUM**		**4685.5**	**4303.7**		**4906.0**	**4048.1**
3 4	**DIFFERENCE**	**4NC-3NC**	**-3863.5**			**-5142.4**	**-8651.9**
4	WAM	CH4				4241.2	3988.7
4	WAM	CO2				-3743.0	-4325.0

4	WAM	N2O				3995.9	3896.7
4	**SUM**					**4494.1**	**3560.4**
4	**DIFFERENCE**	**WAM-WM**				**-411.9**	**-487.7**

Source: Our Calculations Based on 3rd NC and Portugal's Demonstrable Progress Report to the UNFCCC

Slovakia

NC	Measures	GHG	1990	2001	2005	2010	2015
3	WM	CH4	2838.2	1311.9	1504.7	1503.6	1433.7
3	WM	CO2	-2345.0	-5264.4	-1825.0	**-1807.0**	-2290.0
3	WM	N2O	5022.0	2871.3	3971.1	**4243.9**	4197.4
	SUM		**5515.2**		**3650.8**	**3940.5**	**3341.1**
3	WAM	CH4			1472.7	1434.1	1266.5
3	WAM	CO2			-2171.0	-2169.0	-2673.0
3	WAM	N2O			3574.3	3394.5	2824.1
	SUM				**2876.0**	**2659.6**	**1417.6**

Source: Our Calculations Based on 3rd NC to the UNFCCC

NC	Measures	GHG	1990	2003	2005	2010	2015	2020	2025
4	WM	CH4	2838.2	1197.2	1136.3	881.6	777.6	736.3	712.5
4	WM	CO2	-2407.0	-4833.0	-2098.0	**-443.0**	-555.0	-1059.0	-1688.0
4	WM	N2O	5022.0	2817.9	1636.8	**1804.2**	1860.0	1953.0	2058.4
	SUM		**5453.2**	**-817.9**	**675.1**	**2242.8**	**2082.6**	**1630.3**	**1082.9**
4	WAM	CH4			1118.5	835.0	699.9	630.8	604.8
4	WAM	CO2			-2089.0	-508.0	-653.0	-1245.0	-1908.0
4	WAM	N2O			1636.8	1497.3	1429.1	1401.2	1382.6
	SUM				**666.3**	**1824.3**	**1476.0**	**787.0**	**79.4**

	DIFFERENCE	**WAM3-WM3**			**-774.7**	**-1280.9**	**-1923.5**		
	DIFFERENCE	**WAM4-WM4**			**-8.8**	**-418.5**	**-606.6**	**-843.2**	**-1003.5**
	DIFFERENCE	**4NC-3NC WM**			**-2975.6**	**-1697.7**	**-1258.4**	**1630.3**	
	DIFFERENCE	**4NC-3NC WAM**			**-2209.8**	**-835.3**	**58.4**	**787.0**	

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

Slovenia

According to the 4th NC, both estimations for sinks as well as those for GHG emissions in the agri-forestry sector have severely been updated, as it can observed from the data in red above. See page 63 and 64 of the 4th NC for details.

Slovenia

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020
3	WM	CH4	1041.6					896.7	896.7	896.7	896.7
3	WM	CO2	-4334.0						**-5560.0**		
3	WM	N2O	1435.3					1407.4	1407.4	1407.4	1407.4
3	**SUM**		**-1857.1**					**2304.1**	**-3255.9**	**2304.1**	**2304.1**
3	WAM	CH4						865.2	848.4	831.6	812.7
3	WAM	CO2							-5560.0		
3	WAM	N2O						1364.0	1357.8	1339.2	1314.4
3	**SUM**							**2229.2**	**-3353.8**	**2170.8**	**2127.1**

NC	Measures	GHG	1990	1995	2000	2001	2003	2005	2010	2015	2020
4	WM	CH4	1001.1	919.0	887.3	842.9	809.1	891.0	924.0	914.0	915.0
4	WM	CO2	-4338.6	-5675.1	-5561.42	-5561.4	-5561.4				
4	WM	N2O	1252.4	1202.8	1205.9	1187.3	1156.3	1250.0	1275.0	1269.0	1265.0
4	**SUM**		**-2085.1**	**-3553.3**	**-3468.3**	**-3531.2**	**-3596.0**	**2141.0**	**2199.0**	**2183.0**	**2180.0**
4	WAM	CH4						891.0	903.0	893.0	894.0
4	WAM	CO2							**-1320.0**		
4	WAM	N2O						1250.0	1246.0	1240.0	1236.0
4	**SUM**							**2141.0**	**829.0**	**2133.0**	**2130.0**
3	**DIFFERENCE**	**WAM3-WM3**						**-74.9**	**-97.9**	**-133.3**	
4	**DIFFERENCE**	**WAM4-WM4**						**0.0**	**-50.0**	**-50.0**	**-50.0**
3 4	**DIFFERENCE**	**4NC-3NC WM**	**-228.0**					**-163.1**	**5454.9**	**-121.1**	**-124.1**
3 4	**DIFFERENCE**	**4NC-3NC WAM**						**-88.2**	**4084.9**	**-37.8**	**2.9**

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

The values pointed out in red are highly inhomogeneous between the 3rd and 4th NC. See page 86 of 4th NC for details.

Spain

NC	Measures	GHG	1990	2000	2005	2010	2015	2020
4	WM	CH4	19160.0	23047.0	25875.0	28483.0	31090.0	33698.0
4	WM	CO2	-9032.9	-31149.2				
4	WM	N2O	14878.0	16719.0	16003.0	15046.0	14089.0	13132.0
4	**SUM**		**25005.1**	**8616.8**	**41878.0**	**43529.0**	**45179.0**	**46830.0**
4	WAM	CH4	19160.0	23047.0	23105.0	23468.0	23889.0	24321.0
4	WAM	CO2	-9032.9	-31149.2				
4	WAM	N2O	14878.0	16719	14158.0	13004.0	12755.0	12510.0
4	**SUM**		**25005.1**	**8616.8**	**37263.0**	**36472.0**	**36644.0**	**36831.0**
	DIFFERENCE	WAM4-WM4	**0.0**	**0.0**	**-4615.0**	**-7057.0**	**-8535.0**	**-9999.0**

Source: Our Calculations Based on 4th National Communications to the UNFCCC

Sweden

NC	Measures	GHG	1990	2001	2003	2005	2010	2015	2020
3	WM	CH4	3473	3286			3194		3194
3	WM	CO2	-20292	-33083			-24305		
3	WM	N2O	4518	5581			4175		4175
3	**SUM**		**-12301**	**-24216**			**-16936**		**7369**
4	WM	CH4	3400		3300	3200	3000	3000	3000
4	WM	CO2	-20300		-21500	-13900	-13400	-10200	-7100
4	WM	N2O	6200		5400	5300	5100	5100	5100
4	**SUM**		**-10700**		**-12800**	**-5400**	**-5300**	**-2100**	**1000**
3 4	**DIFFERENCE**	**4NC-3NC**	**1601**				**11636**		**-6369**

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

The Netherlands

NC	Measures	GHG	1990	2001	2003	2005	2010	2015
3	WM	CH4	10647	8622		8379	7518	7287
3	WM	CO2	-1500	-1413			-1413	
3	WM	N2O	6820	7167		7440	6510	6200
	SUM		**15967**	**14376**		**15819**	**12615**	**13487**

3	WAM	CH4	10647	8622		8379	7518	
3	WAM	CO2	-1500	-1413			-1413	
3	WAM	N2O	6820	7167		6820	6200	
	SUM		**15967**	**14376**		**15199**	**12305**	

Source: Our Calculations Based on 3rd National Communications to the UNFCCC

NC	Measures	GHG	1990	1995	2003	2005	2010	2015	2020
4	WM	CH4	10300	10100	8500	8500	8300	8200	8000
4	WM	CO2	5400	5600	5200	6800	6400	5700	5300
4	WM	N2O	11600	12600	9400	9500	8900	8600	8200
	SUM		**27300**	**28300**	**23100**	**24800**	**23600**	**22500**	**21500**

4	WAM	CH4				8500	8300	8200	8000
4	WAM	CO2				7300	6800	6000	5600
4	WAM	N2O				9500	8900	8600	8200
	SUM					**25300**	**24000**	**22800**	**21800**

3	**DIFFERENCE**	**WAM3-WM3**				**-620**	**-310**		
4	**DIFFERENCE**	**WAM4-WM4**				**500**	**400**	**300**	**300**
3 4	**DIFFERENCE**	**4NC-3NC WM**				**8981**	**10985**	**9013**	
3 4	**DIFFERENCE**	**4NC-3NC WAM**				**10101**	**11695**		

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC

United Kingdom

NC	Measures	GHG	1990	1995	2000	2001	2010	2015	2020
3	WM	CH4	21781.2			19194.9	10710.0		11130.0
3	WM	CO2	8791.2			3220.3	2800.0		1900.0
3	WM	N2O	31133.3			27185.5	26352.0		26718.0
3	**SUM**		**61705.7**			**49600.7**	**39862.0**		**39748.0**
4	WM	CH4	21506.2	21286.0	20038.2		16184.7	16184.7	16184.7
4	WM	CO2	11725.7	9108.9	6899.6		2036.9	3948.9	6066.5
4	WM	N2O	32663.0	31195.0	29360.0		26057.0	26057.0	25690.0
4	**SUM**		**65894.9**	**61589.9**	**56297.8**		**44278.6**	**46190.6**	**47941.2**
3 4	**DIFFERENCE**	**4NC-3NC**	**4189.1**				**4416.6**		**8193.2**

Source: Our Calculations Based on 3rd and 4th National Communications to the UNFCCC