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**National Case Studies.
Addendum to the report:
The Kyoto Protocol and the Effect of Existing and Planned Measures in the Agricultural and
Forestry Sector in the EU25.**

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Executive Summary

This addendum provides an in-depth analysis of the role of agriculture and forestry in climate strategies in a number of selected Member States through specific case studies. In this way, FEEM's report on "The Kyoto Protocol and the Effect of Existing and Planned Measures in the Agricultural and Forestry Sector in the EU25", which for obvious reasons is not able to go into detail of the twenty-five EU Member States, can be completed by adding potential interesting insights from a national perspective. Some of the conclusions on the role of agriculture and forestry in the context of greenhouse gases (GHG) control drawn in the original report might therefore warrant slight modifications and most importantly obtain more weight through evidence on the national level.

The paper provides a brief premise on the motivation behind the specific case studies, explaining how we arrived at the final choice of three Member States (Italy, UK and Germany). Then, the three case studies are presented according to the same common outline which thereby facilitates a cross-comparison among the different countries. Special attention will be given to the specific role of agriculture and forestry in the Member States' overall approach to reduce GHG emissions, attempting to highlight whether the measures adopted are specifically for the purpose of climate change control or whether they would in any case have been implemented for other purposes

The analysis concludes that, although the situation among the three countries is quite different, the contribution arising from agriculture, forestry and land management is clearly important to enable a successful national strategy for GHG emission reduction. Over the last years, emissions from agricultural sector have significantly been reduced in the three Member States, especially in Germany and UK. This downward trend in GHG emissions is due to a range of policies and measures that have induced a more targeted input use and thereby led to decreasing animal numbers and fertiliser use, an expanded forest area and a tendency to less intensive agriculture. In addition, the analysis has shown that these sectors have increased their weight also due to the potential for carbon sequestration, especially in Italy where LULUCF might have a rather important role.

Climate change concerns were rarely the initial cause for these measures, but recent initiatives in the UK show that this Member State assigns an important role to the potential benefits of the agriculture, forestry and land management sector. All the three countries are adopting a number of innovative measures to develop and expand the use of bioenergy and biofuels as an important element towards a low-carbon economy, increasing the weight of the agriculture, forestry and land management sector as compared to the previous strategies. Still, also in particularly in Germany and Italy but even in the UK, important decisions still remain to be made about the way forward in rural development and other domestic policy.

1 Introduction

In this update we will analyse in more depth the role of agriculture and forestry in climate strategies in a number of selected Member States through specific case studies. The motivation to provide this in-depth information is based on the fact that the main report on "The Kyoto Protocol and the Effect of Existing and Planned Measures in the Agricultural and Forestry Sector in the EU25" for obvious reasons is not able to go into detail of the twenty-five EU Member States, omitting thereby potential interesting insights. In addition, the Third National Communications to the UNFCCC, which had served as the main input for the main report, although comprehensive, are not up to date (depending on the country they were released between 1999 and 2003), moreover they sometimes lack a clear distinction between prescriptions stemming from national, European and international legislation. As a consequence, we have contacted the Focal Points of all the twenty-five Member States in order to receive additional (more accurate and recent) information and supporting documentation, to improve this picture at national level, specifying that we are particularly interested in post-2003 documentation about GHG mitigation initiatives for the agriculture and forestry sector. Unfortunately, notwithstanding repeated e-mail contact as well as phone calls, only eight from the twenty-five contacted national Focal Points have replied to our request, and several of them provided only additional contact names or links to national websites (in the corresponding language)¹. Countries that appeared to be adequate for a deeper investigation after the feedback from the Focal Point investigation were Germany, Ireland and Denmark, as well as the United Kingdom after the new UK Climate Change strategy had been published in spring 2006.

In order to have as much as new material available for the present analysis, we have based the selection process of our case studies on a second criterion, the availability of a country's Fourth National Communications to the UNFCCC, which were due in January 2006. Yet, in June 2006, several countries still had not delivered their new National Communications to the UNFCCC (see Appendix I).

Combining the results from the Focal Point investigation, the overview on the state of art of the Fourth National Communications as well as a third criterion requiring a balanced representation of Member States, the following three countries have been chosen for case studies: United Kingdom, Italy, and Germany. The situation in these three countries is indeed quite different. The United Kingdom has launched its revised Climate Change Programme in March 2006, outlining measures that should bring the UK towards its domestic target. Shortly after, in May 2006, the UK has submitted its Fourth National Communication to the UNFCCC, taking stock of the progress made under the Kyoto Protocol. Italy instead has not yet submitted its Fourth National Communication to the UNFCCC. The analysis of its current situation is based on scientific papers and unofficial documents coming from the Ministries of Agriculture and Environment, taking account that after the first Climate Change Programme (2002) there wasn't any strategy review and the monitoring activities was very poor. Finally, also Germany still needs to submit its Fourth National Communication to the UNFCCC, but has published in August 2005 its National Climate Change Programme 2005, a continuation of its strategy launched in the National Climate Change Programme 2000, outlining measures to reduce GHG emissions primarily in the sectors and areas currently not covered by the EU Emissions Trading Scheme.

The general idea behind the case studies is to highlight the role of agriculture and forestry in climate strategies of the three selected Member States, structuring the analysis along the following four questions:

¹ In particular, Focal Points from Germany, Denmark, Ireland, Sweden and the United Kingdom (after the release of the new climate change strategy) have provided additional material while Hungary, Latvia, and Slovakia have indicated websites and additional contact names (which unfortunately have not reacted to a further round of e-mail investigation).

- Where do Member States expect to be able to reduce GHGs?
- What is specific role of agriculture and forestry?
- What is the strategy behind existing measures?
- Which measures would the Member States anyway do and thus just pretend to do specifically for the purpose of climate change control?

The next section will analyse in detail the three selected Member States. Then, we will compare the main findings from the case studies, attempting to identify potential trends and overall observations on the role of agriculture and forestry in the national climate strategies.

2 Case studies on role of agriculture and forestry in climate strategies of three Member States

2.1 Italy

2.1.1 Introduction

The ratification of Kyoto Protocol, approved by the 2002 n. 120 bill, commits Italy to a 6.5% reduction of greenhouse gases emissions (GHG) compared to 1990 values, a goal which should be achieved during the first commitment period 2008-2012. The 1990 emissions have been reckoned to a total amount of 521 MtCO₂ eq. The Italian goal is therefore to achieve a maximum emission of 487.1 MtCO₂ eq. between 2008 and 2012, calculated as the period's annual average, that is to reduce the emissions by 33.9 MtCO₂ eq. compared to 1990. Actually the reduction will have to be remarkably higher than 33.9 MtCO₂ eq., because since 1990 the average annual production of greenhouse gases emissions has shown a tendency to increase (+11,3% between 1990 and 2003). The reduction commitment will therefore be even heavier.

To understand the current situation the high energy efficiency and the low carbon intensity of the Italian economy shall be taken into consideration. In such respect, the marginal cost of national measures to further improve the performance of the Italian economy in terms of ratio between Gross Domestic Product and CO₂ emissions is higher than in other European countries. The positive performance of the Italian system is even more striking when considering that the country does not use nuclear energy to produce electricity, although electric power import from France is based on nuclear plant production. As showed in official documents, if Italy used a percentage of nuclear energy equivalent to the world energy average (17%), Italian GHG emissions would be 21 MtCO₂ eq. lower than the current levels.

As a consequence, national measures to reduce GHG emissions might undermine the competitiveness and efficiency of the Italian economy. To avoid the risk of undesirable negative effects on the domestic economic system, the national authorities are trying to take into account elements aimed at realigning diverging circumstances associated with differential use of nuclear power within the European Union, circumstances which in fact inhibit the creation of a levelled playing field within the European single market.

The importance of the Italian sink function is recognised in the national strategy. Specific attention should be given to a more efficient management of existing forests, the planting of new ones and the implementation of a new sinks inventory, with the objective not only to increase carbon storage, but to contribute at the same time to the enhancement of hydro-geologic stability and the increase of the availability of biomass for energy production.

Italian agriculture has contributed in recent years by about 7% to GHG, exclusively represented by methane (42%) and nitrous oxide (58%), whereas no significant production of carbon dioxide (CO₂) has been detected. The trend of emissions in the period 1990-2003 highlights a significant reduction (-4,6%) even though lower than what has been observed at European level (-10%), mainly due to the reduction of cattle enteric emissions in the form of methane, whereas the contraction of nitrous oxide emissions coming from farming soil seems less effective. Besides, the 2003 inventory of net emissions has shown a remarkable contribution of Italy for the Land Use, Land Use Change and Forestry (LULUCF) categories: the Italian share corresponds to 27% of the whole carbon sink determined by LULUCF at European level, and represents 17% of the total net national GHG emissions. The net GHGs from this sector have been heavily dominated by net CO₂ removals in the Forest Land Remaining Forest Land category.

After the ratification of Kyoto Protocol in 2002, the no. 123 CIPE² Resolution of 19 December 2002 has defined the "Guidelines for the policies and national measures for the reduction of GHG emissions" which represent the strategies of the Italian Government in order to comply with the obligations deriving from the ratification of Kyoto Protocol. The data and information contained in the Resolution were presented in the "National Plan for the reduction of GHG emissions for years 2003-2010" which describes in greater detail the present situation and the future emission perspectives with the application of mitigation policies. The document is being presently revised and some of the data adjustments have been presented within the National Allocation Plan drawn in order to allow Italy to take part in the European allowance trading scheme.

Official information only come from the 2002 National Plan and the Third National Communication to the UNFCCC presented in October 2002. The Fourth Communication has not been submitted yet. Very few other documents can support the progress made in the recent years to reduce emissions in the farming and forestry sector.

2.1.2 Climate policies and measures related to agriculture and forestry – where are we?

The CIPE Resolution no. 123 has presented the emission levels for the basic year 1990 for the different sectors, the year 2000's levels and the future scenarios which may emerge with the application of different national policies for the first commitment period 2008-2012. The projections consisted of a) a trend scenario, b) a reference scenario and c) a scenario relative to the Kyoto goals for Italy. The trend scenario accounts for the measures already under way or appointed and for a moderate growth of the GDP, and envisages emission levels equal to 579.9 MtCO₂ eq. by 2010, corresponding to a 6% increase compared to the emissions in 2000, and a 11.3% one compared to the emissions in 1990. According to these projections the Italian reduction commitment would change from -6.5%, compared with 1990, to -17.8%. The reference scenario envisages two options. A first one accounting for the application of the measures identified on June 30th 2002 by the Ministry of Environment in the energy, transportation and urban sectors, and which assumes a reduction of the emissions of the trend scenario by about 9%. The second one adds to these measures the credits attainable thanks to the JI and CDM projects, already under way, for a global amount of -12 MtCO₂ eq. and the measures in the agriculture and forestry sectors (sink) which are attributed a carbon sink capacity of 10.2 MtCO₂ eq. This scenario envisages emissions of about 518 MtCO₂ eq. by 2010. The data presented attribute the agro-forestry sector a capital importance in the emission containment policies as they are ascribed about 11% in emission reduction between the trend scenario and the Kyoto targets.

The data so far presented regard the measures officially defined in 2002 by the first planning document of the sector. The document is being revised and, according to the first provisional data the projections of the trend scenario envisage an emission growth of 19.5% compared to 1990 values, shifting the Italian reduction target to -26% of the emissions in 1990. The data have been adjusted in consequence of the production and emissions increase. The reference scenario has been equally modified. Together with a decrease of the reduction potential in the transportation sector, the CO₂ sink value of agricultural and forestry measures has been increased to 11.2 MtCO₂ eq., with a rise of 1.0 MtCO₂ eq. in agricultural measures. Such variation is connected with the estimate of a higher potentiality of cumulative carbon in the soil in comparison with what previously calculated. In short, in order to reach the Kyoto goals according to the new values, a total emission reduction is requested, compared to the trend scenario of 132.7 MtCO₂. The already envisaged measures would diminish this commitment to 72 MtCO₂, with a contribution of the agro-forestry sectors equal to 11.2 MtCO₂, corresponding to about 8.5% of the total commitment. 72 MtCO₂ are however to be

² Interministerial Committee for the Economic Planning.

covered yet, which the Government means to compensate mainly by employing flexible mechanisms. Whether the mechanisms can this way be regarded as supplementary measures to the national internal actions is still to be established.

Measures in agriculture, forestry and land management

- **Emissions of nitrous oxide from agricultural soils**

Italy approved in 1999 a "Code of Good Agricultural Practice for the Protection of Water from Nitrates", under the provisions of EU Directive no. 676/91. By combining these recommendations with others specifically aimed at protecting the atmosphere and the climate, additional, limited reductions could be achieved in the consumption of fertilisers, on the order of 5% as of 2010, compared to the levels of 1990, thus resulting in an estimated decrease of 0.46 Mt. CO₂ equivalent.

- **Emissions of methane from manure management**

The proposed initiative involves the holding tanks used to store liquid animal waste and then conveying the resulting biogas to combustion or cogeneration plants. The primary focus of the activities would be pigs (between 10% and 40% of the animals) and, to a relatively limited degree, cattle.

Another measure oriented towards the same objective is Directive 96/61/EC (Integrated Pollution Prevention and Control, or IPPC), which calls for the introduction of licensing processes based on the adoption of the best possible technology available for large scale poultry and pig farms. In terms of structural initiatives for existing facilities, financial incentives could be drawn from within the Rural Development Plans financed by FEOGA.

- **Fiscal incentives for biomass energy from wood and agricultural crops**

Since 1993 there has been a fiscal incentive for the production of biodiesel, although covering a very limited quota of fuel production (from 125,000 ton per year at the beginning to the current 220,000 ton per year). In the case of bioethanol there were in the past some attempts to develop a specific fiscal measure but they were never approved. Only during last year there was an increasing pressure to promote biofuel and biomass use for other energy purposes, mainly due to the change of CAP support regimes and the urgent request from the EU Commission to adopt measures in order to fulfil the obligations related to the promotion of renewable energy sources.

A national law, approved in 2006, obliges the fuel industry to use 1% of biofuel on the total amount of fuel, adding one point every year within 2010. This measure should meet the target established by UE with the biofuel regulation. It is questionable if this measure could be positive effects on the farming sector: the first attempts to find a collective agreement on the price for vegetable oil were failed due to the low price proposed by the processing industry. The international price is more competitive and it explains the very low diffusion of the carbon credit foreseen by the 2003 CAP reform (around 300 hectares in 2005).

- **Afforestation (art. 3.3)**

The plantings performed under EEC Regulation 2080/92 covered 117,428 hectares. The cost to be sustained is their certification, which falls under the cost of the creation and management of the National Register of Agro-Forestry Carbon Storage pools. The carbon level for the first period of the commitment (2008-2012) is estimated at approximately 1.0 Mt CO₂

Under the Rural Development programme financed in the period 2000-2006, the new plantings to be made forecast at 40,000 hectares, for an average removal of 1 Mt CO₂ during the period 2008-2012 and of 20 Mt CO₂ at the maturity.

- **Reforestation (art. 3.3)**

The so-called "natural reforestation" includes the natural expansion of the forested area as a result of policies for the reduction of farming-pasture land area and for the protection of the environment. Eligibility for carbon certification for the period 2008-2012 is tied to providing proof that these areas were the result of agri-environmental policies (human induced). The cost to be sustained is that of certification, which falls within the cost of creating and managing the National Registry of Agro-Forestry Carbon Storage pools. The levels of carbon set for the first period of commitment (2008-2012) is estimated at 3 Mt CO₂;

- **Forest management (art. 3.4)**

In order to make eligible the forest management for the Kyoto Protocol, the National Forestry Inventory has to be updated and the system of forestry statistics is currently being revised. The National Forestry Inventory of Carbon (INFOCARB) has been created by 2005. This inventory must then be updated every 5 years, corresponding to the end of the period of commitment under the Kyoto Protocol.

Measures in sectors other than agriculture, forestry and land management

- **Additional expansion of renewable sources**

The implementation of the "green certificates" - a mechanism which obliges electric power plants to produce at least 2% of electric power production exceeding 100 GWh from renewable sources - should increase the contribution of renewable sources to the national energy system, mainly by the hydroelectric sector, by the increased wind capacity and the thermo-valorisation of waste. Any additional expansion requires an increase of 0.35% each year of the mandatory 2% obligation, from 2005 to 2007, as approved by a national law in 2003. All the obliged operators can independently produce electric power from renewable sources or they must buy renewable electric power through a market system managed by a public authority.

- **Realisation of new import capacity**

It is assumed that additional imports from neighbouring countries should increase the total capacity by 2010. A remarkable emission reduction of 10.6 Mt, considering that the entire import capacity from abroad, supposedly from under-exploited plants, would cause a reduction in domestic emissions. an economic advantage on account of low wholesale prices of electric power abroad.

- **New incentives for the utilisation of renewable energy sources**

After various non-effective measures aimed to favour the realisation of photovoltaic plants, the last decree approved in 2005 provides incentives differentiated according to the plant scale and with chance to sell the exceeding electric power on the national electric power system. Other incentives are provided thorough regional schemes, mainly as investment aids.

- **The Italian Carbon Fund**

One of the important points of the Italian strategy is represented by programmes for buying carbon credits from "Joint Implementation" and "Clean Development Mechanism" project activities (both in the energy and forest sector). The promotion of such initiatives takes place through direct participation in energy and forest projects supported by Italian companies as well as through participation in the "Carbon Funds" established within international financial institutions or within national agencies of both developing countries or countries with economy in transition.

In fall 2003, the World Bank entered into an agreement with the Ministry for the Environment and Territory of Italy to create a fund to purchase greenhouse gas emission reductions from projects in developing countries and countries with economies in transition that may be recognized under such mechanisms as the Kyoto Protocol's CDM and JI. The Fund is open to the participation of Italian private and public sector entities and has a total capital of \$155.6 million. The World Bank has mobilized a new fund to demonstrate projects that sequester or conserve carbon in forest and agro-ecosystems. The Fund, a public/private initiative administered by the World Bank, aims to deliver cost-effective emission reductions, while promoting biodiversity conservation and poverty alleviation.

2.1.3 An analysis of the current situation – which strategy lies behind the existing measures?

The plan approved in 2002 envisages the almost exclusive resort to forestry (1% only of the fixative capacity is attributed to farming) In terms of financial investment afforestation and reforestation activities are given great attention: 95% of the expenditure for the primary sector is concentrated on the installation of new forest plantations. Considering that part of the envisaged public investment includes the aids aimed to interventions of rural development, they will very likely concentrate, as it already happened in the past, on rural areas in the plain. One might question the effectiveness of employing such large investments in contexts which are already strong, while other areas are neglected, such as mountain ones, where the support to forestry activities could have remarkable social and economic importance and where maintaining the continuity of the intervention would be easier. The areas with a strong agricultural vocation do indeed revert to their previous use rather easily, especially whenever farmers find no more advantage in maintaining forest land (Pettenella, Zanchi, 2006).

Moreover the permanence principle required by the Kyoto Protocol would not be fulfilled by this kind of measures. The cutting of trees, as envisaged by the current methodologies of evaluation of carbon balances in agro-forestry systems, leads to a straightforward loss of the carbon accumulated in the biomass and in the soil, and the consequent undoing of CO₂ sink effects. The return to farming land use is a possibility clearly provided for by the national and regional legislation aimed at favouring a large part of the new plantations, like in Regulation 2080/92 and in the measures of the Rural Development Plans.

Another measure envisaged by the Plan is natural reforestation. According to the Marrakesh Agreements it is possible to compute the conversion to forest land due to the natural propagation of land formerly assigned to other uses if it can be proved that they are human induced interventions. The spontaneous expansion of natural vegetation in marginal areas is a specially widespread phenomenon in Italy, mainly in mountain areas. Rural land abandonment in the mountains and in other marginal areas is certainly connected with the economic development and life-style changes. In terms of general principles, agricultural policies have explicitly opposed management abandonment phenomena, even though with rather poor operative results. The spontaneous expansion of bush and tree vegetation is therefore only an indirect effect of human behaviours and choices and could be computed in relation with Kyoto only under an extensive definition of intentionality. Besides, what the monitoring costs in conversion areas might be is to be established yet, as the informative basis is lacking, also because the processes under way are of many different types. The interested areas cannot always be classified as forest land and are therefore neglected both by forestry inventories and by the surveys in the agricultural sector. The greatest lack of data is connected with the effective carbon sink of the different vegetation typologies and the evolution of the vegetative phases (Pettenella, Zanchi 2006).

As to forest management, the Plan envisages a reduction potential of 4.1 MtCO₂, which, according to the Kyoto Protocol, had not been, until recently, subject to financial statement; actually, the

maximum ceiling for the presentation of financial statement in Appendix Z of the Bonn Agreement (COP6 bis) on the use of forest management activity was established at 0.67 MtCO₂. This figure reflects an apparent mistake in the negotiation process, in which Italy has not shown a great ability in asserting her rights. That is why a request of revision of the limit assigned to Italy has been advanced, which has recently been accepted. The new limit is 10 MtCO₂.

The new drafted Resolution also tries to outline the modalities for carrying out the *Kyoto forests* in Italy and defines the basic modalities and times according to which a Conference of the Parties should be required to approve a radical modification of the maximum limit value of sink connected with forestry management interventions. It also regulates the operation of a national Register of agro-forestry carbon sinks which will be used to record the carbon amounts absorbed and emitted in the areas referred to in the articles. 3.3 and 3.4 of the Protocol and for the outcoming issue of the relative carbon credits.

2.1.4 Conclusions

The Italian National Allocation Plan, communicated to the European Commission in July 2004, has been integrated because of the failed approval by the Commission and further revised in the "Scheme of decision of CO₂ allowance allocation" of November 25th 2005. The first draft only reported the general principles of permit allocation in the Italian strategy and the number of allowances allocated to each sector during the first market phase, however without indication of the number of allowances per plant. The lack of specific regulations did not actually oblige the firms to communicate the entity of their emissions and consequently the necessary data for allowance calculation were missing. The Plan shows that the Italian strategy regards the employment of credits deriving from projects applying flexible JI and CDM mechanisms as fundamental.

In spite of the economic advantages connected with these instruments, we should keep in mind that international and European legislations have more than once stressed that flexible mechanisms must be supplementary to the internal regulations aimed at complying with commitments in mitigation policies; it is moreover required that their supplementary quality be clearly documented and proved (Pettenella, Zanchi 2006).

The total amount of the definitively allocated allowances for the first period 2005-2007 was presented in the "Scheme of decision of CO₂ allowance allocation", with an average attribution of 222.2 MtCO₂ a year. The allowances have mainly been allocated to the energetic sectors (78%) and specially concentrated in the thermo-electric one (about 60% of total allowances). One of the fundamental criteria for allowance allocation has actually been a first apportionment between the thermo-electric sector and non-thermo-electric ones. The remainder of the allowances have been allocated according to the sector's growth ratio and the potential of emission reduction in the sector itself, applied to the sector's emissions in 2000. The allocated allowances are inclusive of the reserve for the new entrants in the period 2005-2007.

Allowance allocation produces only ephemeral and indirect effects on the agro-forestry sector, such as the induction of a greater attention to the use of renewable energy sources and therefore of biomass. It is not however sure that such attention can turn into an impact on the internal demand for the raw biomass employed in the large plants, which often depend - in this sector too - on import from abroad.

The target of carbon sink established in the 2002 Plan should be achieved through measures not to be approved yet, although the debate on the new "Plan for the agroforestry sector" are already ongoing since two years. The drafted Plan envisages the realisation of a "National Register for agroforestry carbon sinks" which allowed for the certification of the sequestered carbon and with the consequent creation of a credit market. The foreseen activities concern afforestation and

reforestation, the enhancement of forest management and revegetation processes (Tedeschi, Lumicisi 2006). As far the management of agricultural land and permanent pastures there is great uncertainty on the possibilities to get positive results in the balance between carbon emissions and sequestrations compared with the high costs of inventory and monitoring. The options to start the market are theoretically valid - above all if associated production chains prevail - but the concrete starting point is still a long way off, due to the lengthy policy debate about the Plan (Ciccarese, Pettenella 2006).

2.2 The United Kingdom

2.2.1 Introduction

In 2004, greenhouse gas emission sources in the UK were responsible for around 179 MtC³, making it the second largest emitter of greenhouse gases (GHGs) in Europe. Given its Kyoto target represented through the European Burden Sharing Agreement, the UK is committed to reducing emissions of all six Kyoto GHGs by 12.5 percent below its 1990 emissions by the first Kyoto commitment period. In addition to its international commitments, the UK has adopted a more demanding national target for 2010 to reduce emissions of CO₂ alone by 20 per cent below 1990 levels, and to put itself “on a path towards” a 60 percent reduction in CO₂ emissions by 2050.⁴

As a result of a wide range of policies designed to reduce GHG emissions⁵ and national trends, the UK significantly reduced its GHG emissions during the 1990s. In 2004, GHG emissions were 14.6 percent lower than in the base year. A major factor contributing to this development was substantial fuel-switching in the electric power sector from coal-fired to gas-fired generation, facilitated by the liberalisation of the UK’s electricity market and by the availability of natural gas from the UK’s North Sea oil and gas reserves. Indeed, the UK is currently one of the top ten global producers of oil and gas and is expected to remain an important producer for many years. Yet, the production of oil and gas is gradually declining and the UK was a net importer of gas on an annual basis in 2004 and 2005 and, based on current trends is expected to become a net importer of oil by about 2010. The UK is therefore likely to rely more on imported natural gas, possibly implying higher gas prices, which in turn may affect the country’s GHG emissions, since more coal use and thus greater carbon dioxide emission could be induced.

The agriculture and forestry sector accounts for 7 per cent (or 14 MtC) of the UK GHG emissions, including net emissions and removals from LULUCF. The main share derives from non-CO₂ gases: in 2004, this sector has contributed to the UK total 46 percent of methane and 66 percent of nitrous oxide emissions, but only 1 percent of carbon dioxide. Annual emissions from agriculture and forestry have fallen significantly during the last decade, by around 22 percent between 1990 and 2004. The main reason for this trend – which is expected to continue – is the decreasing animal numbers and fertiliser use, plus expanded forest area and a tendency to less intensive agriculture.

In March 2006, the UK’s revised Climate Change Programme has been launched, outlining measures that should bring the UK towards its domestic target. Shortly after, in May 2006, the UK has submitted its Fourth National Communication to the UNFCCC, taking stock of the progress made under the Kyoto Protocol. The next section will provide a brief overview on the actual situation of existing and planned climate policies in the UK that interact with the agriculture, forestry and land management sector, to verify the causes for the reduced contribution of this sector to the UK’s total greenhouse gas emissions..

2.2.2 Climate policies and measures related to agriculture and forestry – where are we?

In March 2006, the UK Government and the devolved administrations published a new Climate Change Programme, announcing a wide range of measures that should help to take the UK closer to

³ GHG emissions are expressed as million tonnes of carbon equivalent (MtC). One tonne of carbon is contained in 3.67 tonnes of carbon dioxide which is the ratio of the molecular weight of carbon dioxide to the atomic weight of carbon (i.e. 44/12). Other gases are expressed in terms of carbon equivalent by multiplying their emissions by their global warming potential (GWP) and dividing by 3.67.

⁴ DTI Energy White Paper, “Our Energy Future – Creating a low carbon economy.” February 2003.

⁵ Collectively known as the UK Climate Change Programme (2000), or CCP, revised in spring 2006. The CCP includes policies with relatively limited scope as well as policies that apply to very broad collections of GHG-emitting activities.

its domestic targets. In this programme, as well as in the recent Fourth National Communication to the UNFCCC, the agriculture and forestry sector has been identified as an important factor towards a low carbon economy through the production of bioenergy. Indeed, already since 2000, the UK has introduced a number of measures related to agriculture, forestry and land management meant to contribute to coping with the challenge of climate change. Let us now go into more detail of these measures and outline also further policies that have been indicated by the Government.

Measures in agriculture, forestry and land management

- **Support to research**

Continuation of research funding to improve the **inventory of emissions from agriculture** and to improve the overall environmental performance of different farming systems, including organic, to improve our understanding of, and their ability to optimise their contribution to climate change objectives.

Continuation of research funding on **impacts and adaptation responses for land managers**.

Cooperation of Government with Carbon Trust's programmes available to businesses to identify new opportunities for action that could support the agriculture, forestry and land management sector.

- **Awareness raising**

The Government is currently developing a **communications strategy** to raise awareness and communicate climate change issues to land managers.

Amongst others, the Government set up the **Rural Climate Change Forum** as a high level forum for discussion, input into policy development, and communication with land managers on climate change mitigation and adaptation.

- **Impacts of reforms of the Common Agricultural Policy**

The UK agriculture has substantially felt the impact of the CAP over the past thirty years. The CAP reform agreement reached in June 2003 broke the link between production and direct payments, and is expected to lead to a reduction in livestock numbers and an associated decrease in methane in the UK, estimated at 0.68MtC per year in 2010.

- **Reducing nitrous oxide emissions**

Given the fact that the use of inorganic nitrogen as a fertiliser is a major source of nitrous oxide, which can also arise from manures during storage, these emissions are mostly reduced when trying to address also other negative impacts of the use of nutrients. Therefore, the Government aims at encouraging action that will maximise the multiple benefits (i.e. water quality benefits and GHG reductions), and to simplify the messages to land managers about the change in behaviour required.

The main measures in this context are investigated as part of the **Catchment Sensitive Farming (CSF) Programme** and the **Nitrate Action Plan (and its Nitrate Vulnerable Zones Action programme)**, both aimed at tackling water pollution to help meet the objectives of the EU Water Framework Directive. The goal of the Government is to ensure that policy measures developed under these two programmes also support the climate change goals.

The Government indicates that there might be need for further action on NO_x if the currently investigated measures do not deliver sufficient change or whether the uncertainty as to their effect on GHGs continues. For this reason, a broader approach to resource efficiency in agriculture will be explored, as part of future work on delivering the **Sustainable Farming and Food Strategy**.

- **Reducing ammonia emissions**

A further measure will contribute to the reduction of nitrous oxide emissions, even though its main focus is on ammonia reductions: the **UK Integrated Pollution, Prevention and Control (IPPC)** will apply to large intensive pig and poultry producers in the agricultural sector.

- **Reducing methane emissions**

Defra's research portfolio is examining a range of options for decreasing emissions from dairy cows in a programme costing some £5.5m in 2005–06. Yet, some of the potential options might be inappropriate given the Government's wider goals for sustainable agriculture and need therefore to be assessed for compatibility.

- **Reducing carbon dioxide emissions**

Even though the main GHG emissions from the agriculture, forestry and land management sectors are non-CO₂ emissions, the Government indicates that agricultural practices can help to mitigate CO₂ emissions from other sectors, through **carbon sequestration** in soil and timber, and by **substituting for fossil fuels and fossil fuel-based products**.

- **Anaerobic digestion**

The Government considers anaerobic digestion an important area for further work, as it is widely used in treatment of waste waters, and can be applied to the treatment of animal manures. In particular, the **Biomass Taskforce** recently recommended that options to pursue anaerobic digestion technology and biogas production were explored.

The Government is also committed to identifying solutions as part of the international **Methane to Markets Partnership**, co-chairing the new Agriculture Sub-committee of the Partnership. A high level international seminar of experts will be organised before the end of 2006.

- **Rural Development Regulation and Environmental Stewardship**

The Government is currently exploring how **Environmental Stewardship** can make a greater contribution to achieving the UK's climate change objectives, verifying also whether the new **EU Rural Development Regulation** could be a vehicle for providing support for land managers to establish energy crops and develop biomass and woodfuel supply chains.

In particular, a new strategy for England is being prepared for expenditure under the new **EU Rural Development Regulation** for 2007–13, of which **Environmental Stewardship** will be a key part. Building on the first phase of Environmental Stewardship, the Government will review progress in 2007–08 to ensure that expenditure is effectively directed to policy priorities (e.g. support for agri-environment schemes, forestry and energy crops), including the potential for Environmental Stewardship to contribute to climate change objectives, and to improve the understanding of the contribution that improved land management practices can make to climate change mitigation.

Also Scotland is currently developing the **Rural Development Programme** for 2007–2013, in which Land Management Contracts are seen as a primary vehicle for supporting land management. One of Scotland's national priorities is Climate Change.

Similarly, Wales is preparing a new **Rural Development Plan** for 2007–13, indicating that climate change will be a key element in the plan.

- **Energy efficiency**

A number of energy intensive businesses have been identified by the Government as crucial in improving the energy efficiency of the agriculture, forestry and land management sector.

Since 2001, the intensive pig and poultry farming sectors have been involved in climate change agreements, committing to targets to reduce their CO₂ emissions by some 100k tonnes over their baselines.

In addition, the horticulture sector is now eligible for a climate change agreement, and has agreed challenging energy reduction targets. Members of the horticulture sector of the National Farmers' Union received a 50 per cent discount from the climate change levy until the end of March 2006.

- **Non-food crops**

In 2000, the **Energy Crops Scheme** has been introduced to support farmers growing energy crops. The existing scheme will finish in 2006, and plantings until this year are expected to lead to carbon savings of around 11ktC by 2010. The Government is consulting on further measures to apply from 2007 under the new EU Rural Development Regulation.

In November 2004, the Government has launched the **Strategy for Non-Food Crops and Uses**, aimed to promote and develop the use of renewable raw materials as energy crops or to substitute renewable products for those based on fossil fuels⁶. Each year, funding of around £2m is provided for research on non-food crops.

The **Biomass Taskforce**, established to help Government and industry to optimise the development of biomass energy in support of renewable energy targets and sustainable farming, forestry and rural objectives, published its final report in October 2005⁷. In its formal response in April 2006, the Government recognised that biomass is an important contributor to renewable energy with potential applications in heat, electricity, combined heat and power and transport and indicated that it 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 **Bioenergy Infrastructure Scheme** to help further the development of biomass supply chains.

- **Sustainable forestry policy**

The **UK Forestry Standard** represents the practical framework for the delivery of sustainable forestry in the UK and has been endorsed by the administrations of England, Scotland, Wales and Northern Ireland and built into their separate forestry policies.

Amongst these forestry policies, England has for example launched the **England Woodland Grant Scheme**. Woodland established through this measure will remove 3.5MtC between 2006 and 2020, assuming planting continues at current levels. Also Northern Ireland recognised the value of trees in removing CO₂ from the atmosphere and indicated that the Forest Service would work with others to pursue opportunities for carbon sequestration⁸. Already since 2004, the Forest Service has run a **Challenge Fund for Short Rotation Coppice Energy Crops** to encourage the establishment of short rotation willow coppice for renewable energy generation.

Currently, a revision of the **Forests and Soil Conservation Guidelines** is ongoing, meant to provide also updated guidelines on good management practices that help to maintain the important carbon reserves contained in forest soils.

The Government is committed to ensure that the current and future reviews of the England Forestry Strategy will take full account of the opportunities and risks for forestry from climate change. In addition, it will continue to develop **biomass and woodfuel supply chains**, increasing the

⁶ Strategy for Non-Food Crops and Uses, November 2004: www.defra.gov.uk/farm/acu/pdf/nfc-strategy.pdf

⁷ Biomass Task Force Report 25 October 2005: www.defra.gov.uk/farm/acu/energy/biomass-taskforce/btf-finalreport.pdf

⁸ For more details, see the Northern Ireland Department of Agriculture and Rural Development's consultation paper Options for Forestry.

operationally available resources and focusing on local capabilities under the **Regional Forestry Frameworks**. The Government is also committed to promote the role of **wood as a renewable material** in sustainable development through schemes such as “wood for good” that transfers knowledge of timber systems to the construction industry. Finally, the Government indicated to **improve adaptation strategies** to make woodlands more resilient against the impact of climate change.

- **Soil management**

The Government supports a programme of work to increase the knowledge on which soils are vulnerable to carbon loss and to identify and encourage land management practices that help conserving soil resources (for instance through erosion control and cultivation practices). The **Strategy for Sustainable Farming and Food** includes targets to encourage practices to halt the decline of soil organic matter caused by agricultural practices in vulnerable soils by 2025. A number of policies are currently in place to implement these measures. Yet, more knowledge on the underlying mechanisms and specifically on that of **carbon sequestration** in soils is needed. Indeed, in order to be viable, carbon sequestration requires a long-term commitment to consistent land management. The Government has indicated to commission further research on the reasons for soil carbon decline, and will host a conference to address the state of knowledge and solution concepts⁹.

- **Market-based mechanisms**

Finally, the Government has indicated its interest in examining the scope and feasibility of a **market-based mechanism**, compatible with the EU ETS and the UK Emissions Trading Scheme, to facilitate trading of GHG reductions from agriculture, forestry and other land management sectors.

Summarising, the key policies in the agriculture, forestry and land management sector introduced by the UK since 2000 include the **Energy Crops Scheme** and an overarching **Non-Food Crops Strategy**. Together with the **Bioenergy Infrastructure Scheme**, a reduction of about 0.1MtC is expected from these key policies by 2010. In addition, an important element of the Government’s approach is the **promotion of resource efficient farm management**, including making the best use of the latest research findings and technology, in order to reduce nitrogen and other inputs which contribute to GHG emissions.

In addition to the measures specifically introduced in the agriculture, forestry and land management sector, a number of additional (current or planned) measures in other sectors have directly or indirectly highlighted the potential of agriculture and forestry to contribute to a low carbon economy. Renewable energies obviously play a main role in this context.

Measures in sectors other than agriculture, forestry and land management

- **Energy sector**

To push electricity from renewables, a **Renewables Obligation** has been introduced that works in the following way: For each megawatt hour of renewable electricity generated, Ofgem who administers the scheme issues a tradable certificate called a Renewables Obligation Certificate (ROC). Suppliers can meet their obligation either by acquiring ROCs or by paying a buy-out price, set at £33.23/MWh in 2006/7 and indexed by inflation, or by a combination of both. Money paid

⁹ Under Action 30 of the First Soil Action Plan for England, Defra and UKCIP have already funded initial work on the impacts of climate change on soil functions

into the buy-out fund is recycled to ROC holders at the end of the 12-month Obligation period. The level of the Obligation in England, Wales and Scotland is 6.7 per cent for 2006/7 rising to 15.4 per cent by 2015/16.

To assign a greater weight to renewable energies, improvements on the **network infrastructure for renewables** have been started. Indeed, the development of distributed generation including renewables will require the upgrade or reinforcement of parts of the transmission or distribution system. The Government is working with the electricity regulator Ofgem to ensure that these upgrades happen in a timely manner. In December 2004, Ofgem approved additional investment of £560m to strengthen electricity transmission networks in Scotland and the North of England.

To provide higher incentives for biomass heat supplied from indigenous sources, a support scheme for biomass heat in the industrial, commercial and community sectors are to be introduced to lower its infrastructure cost compared to conventional systems. The scheme will run for five years and will be worth at least £10–15m in England over the next two years. This scheme is expected to save 0.1 MtC by 2010 as an additional measure.

- **Transport sector**

The transport sector includes one of the key policies from the perspective of the agriculture sector, the introduction of the Renewable Transport Fuel Obligation to increase the uptake of biofuels.

The **Renewable Transport Fuel Obligation (RTFO)** was announced in November 2005 and will be effective from 2008. The RTFO requires transport fuel suppliers to ensure that a certain percentage of their sales are from a renewable source. Starting with an obligation set at 2.5 per cent in 2008–09, it will then be increased to 5 per cent in 2010–11¹⁰. The RTFO will also be used to encourage the development of advanced biofuel production techniques. The cleanest biofuel production plants will be eligible for Enhanced Capital Allowances from 2007 (subject to State Aid agreement).

2.2.3 An analysis of the current situation – which strategy lies behind the existing measures?

Based on the information of existing and planned policies and measures to reduce GHG emissions in the agriculture and forestry sector, let us now analyse the current situation in order to identify the UK's underlying strategy. In particular, we will try to identify the specific role of agriculture and forestry in the UK's overall approach to reduce GHG emissions, attempting to highlight whether the measures adopted are specifically for the purpose of climate change control or whether they would in any case have been implemented for other purposes.

The UK emphasises in its revised Climate Change Programme the **importance of agriculture, forestry and land management**, asking for more explicit recognition of their contribution as most UK and EU agricultural, forestry and land management policies thus far have not included GHG mitigation or climate change adaptation as specific goals. The **high policy relevance of this sector** is also visible through the establishment of the Rural Climate Change Forum in March 2005, a high level forum for discussion, input into policy development, and communication with land managers on climate change mitigation and adaptation. In addition, the UK hosted in September 2005 the first ever Joint Informal Meeting of EU Agriculture and Environment Councils, where international experts underlined that sustainable agriculture and land-use can play a significant role in addressing climate change and still provide the economic and social benefits rural areas need.

¹⁰ The Fourth National Communication to the UNFCCC states that the RTFO is expected to lead to additional reductions of 1.6 MtC by 2010. This figure uses the international agreed methodology to avoid global double counting of emissions and does not take into account emissions from the production of those biofuels that are produced abroad and used in the UK.

The UK thus assigns **special weight to the sector of agriculture, forestry and land management**, and this approach is visible throughout the measures adopted or proposed for this sector. In particular, the UK stresses the goal of climate change efforts in the context of land management, by promoting resource efficient farm management and the adoption of a specific communications strategy (as part of its wider Climate Change Communication Initiative). From a broader perspective, the Government intends to ensure that future policies affecting land managers are 'climate change proofed', delivering thus, directly or as an ancillary benefit, positive climate change outcomes. Action to address climate change issues in the land management sector also forms a key part of the Strategy for Sustainable Farming and Food. The UK emphasises that these measures are crucial for a shift to a low carbon economy, providing also incentives for innovation of all kind.

It goes without saying that a **certain number of existing measures are still motivated by reasons other than climate change**, as most importantly concerns about water quality. Also the influence of the CAP reform is evident, and the UK specifies in this context the importance of ancillary benefits deriving from cross-compliance measures. Finally, current difficulties in the energy supply and transport sectors have awarded the agriculture, forestry and land management sector a major importance. In particular, the renewable energy targets play a role in the design of the UK strategy, evidenced by the Energy Crops Scheme, the Bioenergy Infrastructure Scheme and the adoption of the overarching Strategy for Non-Food Crops and Uses. Along the same lines, a Renewable Transport Fuel Obligation aimed to increase the uptake of biofuels has been introduced.

However, it is important to underline that the UK Government is conscious about the fact that a variety of causes generate measures affecting the agriculture, forestry and land management sector and its impact on climate change control. Yet, the UK attempts to maximise the multiple benefits that can be achieved from a range of measure to comply both with climate change objectives and with other environmental goals. Summarising, the underlying strategy clearly indicates that UK intends to ensure that climate change and the agriculture, forestry and land management sector are considered in a linked approach in the future, to benefit also from this sector's potential towards climate change control.

2.2.4 Conclusions

The UK has submitted its Fourth National Communication to the UNFCCC in May 2006, emphasising that it is on track to meet its Kyoto commitment, given that GHG emissions are projected to be about 19.4 per cent below base year levels in 2010, with current policies and measures. Additional policies and measures to reduce emissions, announced in the UK's revised Climate Change Programme published in March 2006, are expected to move the UK even towards its more challenging domestic goals. Yet, the government has indicated that additional measures may be necessary if it is to actually meet its more ambitious national targets for CO₂ emissions. The domestic target has become more challenging due to higher than anticipated levels of economic growth and the recent rise in global energy prices, altering the relative prices of coal and gas.

As regards the agriculture and forestry sector, a clear downward trend in GHG emissions can be identified over the last decades. A range of policies and measures that have induced a more targeted input use and thereby led to decreasing animal numbers and fertiliser use, an expanded forest area and a tendency to less intensive agriculture have contributed to this overall situation. Climate change concerns certainly were rarely the initial cause for these measures, but recent actions show that the UK assigns an important role to the potential benefits of the agriculture, forestry and land management sector. Most importantly, the Government has adopted a number of innovative measures to develop and expand the use of bioenergy and biofuels as an important element towards a low-carbon economy.

In general, the agriculture, forestry and land management sector has increased its weight in UK climate change control as compared to the previous Climate Change Programme. The UK both emphasises the need of this sector to adapt to the threats and opportunities caused by climate change, and to preserve a sustainable strategy in the sector. A variety of measures is proposed to better respond to this challenge, and the UK clearly highlights that agriculture, forestry and land management will play an important role in the design of an successful future approach to climate change control, considering the linkages and potential multiple benefits between these two areas.

However, as has been outlined in a recent study by the Institute for European Environmental Policy (Boywer et al. 2006), important decisions still remain to be made about the way forward in rural development and other domestic policy. A number of policies proposed in the recent Climate Change Programme appear to be vague and lack the provision of real and clear incentives towards climate change control through agriculture and forestry. Overall, the direction taken through the renewed policy strategy is promising as regards the exploitation of this sector's potential, but some further emphasis on the specific details of its domestic and European approach could make the UK even a significant leader in this area.

Looking at the whole picture proposed by the renewed Climate Change Programme, it appears that despite the wide range of existing and proposed measures domestic climate change action lags behind international action, an area where UK clearly has taken a leadership role. Yet, in relation to other domestic sectors (especially as concerns energy supply and households), the UK has given agriculture an important weight in its climate change efforts. This development is to be considered as a positive signal for the role of agriculture, forestry and land management in the climate strategy of a Member State that is crucial to achieve the overall EU Kyoto target.

2.3 Germany

2.3.1 Introduction

Germany is a key player in Europe's efforts to cope with climate change. Indeed, among the 25 Member States of the European Union, it is the country with the highest GHG emissions in absolute terms. In 2003, the total GHG emissions of Germany represented a 20.7 % share of the total volume of GHG emissions of the EU-25. From the perspective of per capita emissions, Germany was both above the average of EU-15 as well as of EU-25.

Still, Germany can look back to a decade of successful developments as regards the trends of its GHG emissions. Within the European Burden Sharing Agreement for the Kyoto Protocol, Germany has committed itself to a GHG reduction target equal to 21 %. By the end of 2003, the greenhouse gases included in the Kyoto Protocol have been reduced by about 18.5 %, indicating that Germany is already relatively close to achieving its target. In addition, the German Government has committed itself to a reduction of 25 percent by 2005 and 30 percent by 2012 compared to 1990.

Agriculture and forestry contribute mainly through non-CO₂ gases to the accumulation of greenhouse gases. Nitrous oxide and methane emissions from digestive processes of animals, animal wastes, and fertiliser use as well as to a certain extent carbon dioxide from agricultural practices (use of fossil energy, soil management). During the last decade, emissions from agriculture and forestry have fallen significantly, by 16.6 percent between 1990 and 2003. As a consequence of decreasing animal numbers, methane emissions have been reduced by 27 percent in the context of digestive processes of animals and animal wastes, and by 15 percent in the context of fertilisers. Nitrous oxide in soils has been reduced by 16 percent through improved fertilisers, and energy-induced carbon dioxide emissions have even been lowered by 50 percent. Agriculture and forestry activities thus release greenhouse gases, but they also absorb and store them. Currently, these two activities lead to a more or less balanced GHG situation as regards the overall contribution by agriculture and forestry.

On the whole, the current GHG situation in Germany is strongly influenced by a number of national circumstances. In particular two of them are important for an in-depth understanding of Germany's climate strategy:

- A fundamental restructuring and modernisation process took place in East Germany's industry since 1990, and considerable renovation investments are imminent in the old Federal States in the next few years (Matthes and Ziesing 2003).
- Germany is characterised by a particularly prominent role of the electricity industry and, above all, coal-powered electricity plants. As is evidenced also by recent policy decisions, energy and environmental policy regulations on the use of hard coal and lignite constitute a highly sensitive political matter. Indeed, since 2000, CO₂ emissions from the energy sector have started to rise again, amongst others due to an intensified use of coal and gas.

In August 2005, Germany has published its National Climate Change Programme 2005, a continuation of its strategy launched in the National Climate Change Programme 2000, outlining measures to reduce GHG emissions primarily in the sectors and areas currently not covered by the EU Emissions Trading Scheme. Yet, by 19 July 2006, Germany has not submitted its Fourth National Communication to the UNFCCC, supposed to give a complete picture on the progress under the Kyoto Protocol. The next section will provide an overview on the existing and planned climate policies that interact with the agriculture and forestry sectors

2.3.2 Climate policies and measures related to agriculture and forestry – where are we?

In the national Climate Change Programme 2005, the German Government emphasises the success regarding the significant reduction of non-CO₂ emissions, expecting also a continuation of this trend. A main role in this development obviously is played by agriculture and forestry. Indeed, since its National Climate Change Programme 2000, Germany has introduced a number of measures related to agriculture, forestry and land management meant to contribute to coping with the challenge of climate change.

Both a number of cross-cutting as well as sector-specific measures have been launched meant to increase climate change efforts in all relevant areas. Minimum reduction requirements for the first Kyoto commitment period have been established for a number of policies, but no specific contribution by agriculture and forestry has been decided. Yet, several climate policies initiated outside of the agriculture and forestry sector have implications for the sector, as most importantly a strong focus on renewable energy as well as other measures in the energy and transport sectors. Let us now go into more detail of all these measures and outline also further policies that have been indicated by the Government.

Measures in agriculture, forestry and land management

- **Impacts of reforms of the Common Agricultural Policy**

Germany expects from the CAP reform agreement reached in June 2003 a preference for extensive forms of land management, inducing decreases in livestock numbers and in fertiliser use. In addition, positive impacts are expected from the direct link between payments and the compliance with the existing standards of the Nitrate Directive.

- **Ecological land management**

The Federal Programme Ecological Land Management 2002 (“Bundesprogramm Ökologischer Landbau”, BMVEL 2002) has been launched to create the framework for ecological land management and organic farming, and to support a higher market share of ecological products. In 2003, about 0.7 M ha agricultural land area has been managed in a ecological manner by 16500 businesses.

- **Soil management**

According to the **Federal Soil Protection Law** (“Bundes-Bodenschutzgesetz”), agriculture shall apply land management practices that help conserving soil resources and the carbon stored within. The **Federal Environmental Protection Law** (“Bundesnaturschutzgesetz”) encourages according to the same lines practices to halt the decline of soil organic matter by prohibiting certain agricultural practices in specific areas.

- **Agricultural environmental measures**

In the context of the common task “**Improvement of the Agricultural Structure and the Coastal Protection**” (“Gemeinschaftsaufgabe ‘Verbesserung der Agrarstruktur und des Küstenschutzes’, GAK”) the Federal Government in cooperation with the Länder have launched a number of measures aimed among others to reduce GHG emissions deriving from agriculture and at substituting fossil energies. In particular, the support of extensive production agricultural practices, extensive use of “Gruenland”, ecological land management practices as well as a several years’ shut-down have positive impacts on climate change control. In 2002, about 4 M ha agricultural environmental measures have been supported by the Federal Government and the Länder.

- **Agricultural investment subsidies**

The **Agricultural Investment Support Programme** (“Agrarinvestitionsförderungsprogramm”, AFP) provides financial assistance of investments that lead to the reduction of GHG emissions from natural processes (e.g. biogas installations, storage and distribution of manure) and of energy-induced GHG emissions (e.g., change of heating technologies). To be able to use this measure, a limit of livestock numbers must be met, which leads to a decrease if animal numbers.

- **Renewable energies in agriculture**

The revision of the **Renewable Energies Law** (see below for a more detailed description) in August 2004 **improved the incentives for electricity from biomass** due to a higher basic guaranteed support (11.5 Cent/kWh) plus a bonus between 2.5 and 6 Cent/kWh for electricity from biomass deriving from agriculture and forestry.

In addition, the so-called “**Market Incentive Programme to support renewable energies**” (Marktanreizprogramm für die Förderung erneuerbarer Energien, MAP, see below), provides the possibility for a contribution to investment costs, loans at favourable conditions, or reductions of charges. A large share of proposals accepted for support regarded biomass installations (1216 out of 1435). According to a EU provision, so-called energy plants (e.g. maize) planted on inactive areas can be used in internal biomass installations, substituting thereby fossil fuels and eventually methane emissions deriving from fertilisers if the installations are run with animal wastes. In particular the development of **biogas** has experienced a boom during the last years, rising from 600 installations in 1998 to about 2000 in 2004.

The guaranteed price for electricity from biomass, the MAP measure as well as the support of biogas installations through the AFP are expected to lead to a further increase in bioenergy installations based on resources deriving from agriculture and forestry.

- **Biofuels**

A reduction of carbon dioxide is induced through the exemption of biogenic fuels from the so-called mineral oil tax (“Mineralölsteuer”). Over the last five years, biodiesel has increased its production from 250000 tonnes to 1000000 tonnes. Bioethanol has for the first time been used in 2004 to an extent of 65000 tonnes for fuels, and more installations with capacities of about 500000 tonnes/year are envisaged.

- **Sustainable forestry policy**

A number of measures in Germany focus on the **protection of carbon stored in forest soils**, aiming on one hand at the maintenance of forestry area and on the other hand at a sustainable forestry management.

The guidelines from land planning, the forestry laws of the Federal Government and of the Länder as well as the law on the environmental impact assessment (?Umweltverträglichkeitsprüfung?) require significant administrative permissions to change a forestry area into another way of use. As a consequence, **deforestation without an appropriate afforestation does not take place**. In addition, the Federal Government and the Länder support since 1997 primary (?) afforestation, since 1995 this measure is co-financed by the European Union.

To protect existing forests from damages, a number of measures have been adopted (see BMVEL). The Federal Government furthermore supports through the so-called “**Charta for Wood**” the increase of wood supply by 20 percent over the next 10 years. This measure highlights the importance of wood and the correct manufacturing of wood to store carbon in the best way. The

Government is also committed to promote the role of **wood as a renewable material and substitution of fossil energies** in sustainable development.

In addition to the activities on the federal level, a number of measures on state (Länder) and city level reinforce Germany's overall strategy to cope with climate change. Special attention is devoted to raise awareness and support renewable energies, also in the context of agriculture (for instance, a study on "Photovoltaic for the farmer" in Mecklenburg-Vorpommern). As regards the future, the Government has indicated that new incentive measures able to encourage the positive performances of agriculture and forestry for climate change purposes are to be examined, but currently no specific measures additional to the ones discussed above are envisaged.

As already indicated in the context of the measures specifically introduced in the agriculture, forestry and land management sector, a number of additional (current or planned) measures in other sectors have directly or indirectly highlighted the potential of agriculture and forestry to contribute to a low carbon economy. Renewable energies is clearly at the centre of Germany's climate strategy.

Measures in sectors other than agriculture, forestry and land management

- **Energy sector**

To improve the impact of the energy sector on climate change, the Government supports since years **research on energy efficiency and on renewable energy**, both key elements of its overall National Sustainability Strategy. Research on fuel cells, hydrogen, photovoltaic, wind energy and biomass continues to receive funding through various programmes.

Particular emphasis is given to measures that develop and expand the use of renewable energy. In 2003, biomass, wind, solar and geothermal sources represented 3.1 percent of the primary energy use and about 8 percent of the electricity. The importance of renewables is also increasing in the context of fuels. The main reason for this tendency is the **law on renewable energy** (Erneuerbare Energien Gesetz, **EEG**), which has been adopted on 1 April 2000 and revised on 1 August 2004, in order to achieve the challenging **national renewable energies targets** that have been adopted to support the general climate targets and increase the medium- and long-term competitiveness of these energy sources to assign them a fundamental role in the future. Renewable energy should contribute at least 12.5 percent to electricity supply in 2010, and at least 20 percent in 2020. In addition, the contribution of renewable energy o primary energy use should be increased to at least 4.2 percent by 2010, encouraging further increases afterwards. To continue its path towards these targets, Germany wants to devote more resources to improve the framework for **offshore wind energy** in Germany. Germany also wants to engage more strongly in **international cooperation** to learn from the experiences related to renewables of other countries and to share its own experiences with others.

A further element that highlights Germany's focus on renewables is the so-called "**Market Incentive Programme to support renewable energies**" (Marktanreizprogramm für die Förderung erneuerbarer Energien, MAP), aimed to support solar collectors and biomass installations to produce heat. This policy has been launched in the context of the Ecological Tax Reform (Ökologische Steuerreform, April 1999). The financial assistance has been increased from 2002 to 2003, enabling that the granted requests for solar collectors have more than doubles from one the other year (in 2003: 145000). In 2005, the Government has devoted Euro 193 M to this measure in order to continue the market penetration of heating technologies based on renewables, focussing on solar collectors, biomass installations as well as geothermal applications. Currently, an evaluation of the policy measure is ongoing in order to further increase its efficiency in the future.

By 1 January 2007, the **EU Energy Tax Directive** needs to be implemented in Germany, influencing also Germany's **Ecological Tax Reform**, with certain direct and indirect impacts on agriculture and forestry. In particular, coal is likely to be taxed on the heat market (?thermo-electric market?) and the preferential treatment of agriculture and forestry needs to be adapted to the requirements of this directive.

The **increase in energy efficiency** is equally a important element in Germany's overall strategy, and by 2020 a doubling of the energy and resource productivity compared to 1990 is aimed at. Germany indicates that past activities have led to considerable improvements, but emphasises that further action is needed to raise the economy's energy efficiency in order to comply with its targets.

- **Buildings sector**

The potential of renewable heating technologies based on solar collectors and biomass has also been used to improve the CO₂ intensity of buildings. The **revision of the buildings law in 2004** (Baugesetzbuch 2004) has in addition also facilitated the establishment of certain biomass installations in the context of agricultural, forestry, horticultural or animal management organisations.

Further measures in the building sector are expected to lead to additional carbon dioxide reductions, for instance the continuation of the **CO₂ Buildings Rehabilitation Programme** ("CO₂-Gebäudesanierungsprogramm"), providing further Euro 720 M until 2007.

- **Transport sector**

Measures to support alternative fuels are an important element of Germany's future strategy. Indeed, in the context of the National Sustainability Strategy 2004, the Government has found consensus with all key actors on a strategic overall concept up to 2020 ("Kraftstoffstrategie der Bundesregierung"), that supports the market introduction of such alternative fuels and technologies in Germany (given that they appear to be ecologically and economically reasonable).

Germany's emphasis on renewable energies has assigned a particular role to the **use of biofuels**, which has been increasing over the last years. In 2004, 1.8 percent of the used fuels were of biogenic origin, inducing a reduction of carbon dioxide by about 2.7 M tonnes, a significant improvement compared to previous years.

The Government has re-affirmed that the technical optimisation of transport and fuels and the support of alternative fuels remains a critical action point to reduce GHG emissions from transport in the future. Both "conventional" biofuels like biodiesel, bioethanol and gas, as well as synthetic biofuels and hydrogen are crucial, the latter will play a fundamental role in the longer term. The **Ecological Tax Reform** exempts biofuels from the mineral oil tax until 2009, and the Government has also decided a preferential tax treatment of natural gas until 2020. Germany hopes that this preferential treatment of natural gas represents an intermediate technology towards the objective of regenerative hydrogen.

- **Cross-cutting measures**

The **commitment by the Government** to set an example for Germany ("Selbstverpflichtungserklärung") has applied various of the measures proposed for the energy, buildings and transport sectors, putting again particular weight on renewable energies and energy efficiency measures. The Government re-affirmed its intentions to continue this strategy with more emphasis in the future.

In addition, the Government has launched and still introduces a number of measures to **increase the knowledge and the awareness** on climate change in different areas. Germany is also committed to

monitoring and extensive reporting on the national situation, climate change efforts and their implications.

Finally, in its National Climate Change Programme 2005 Germany also highlights the importance of **adaptation**, indicating that support for adaptation strategies and for more research on this topic is a critical issue in the challenge posed by climate change. Such measures are expected to have implications both on agriculture and forestry.

Summarising, the key policies in the agriculture, forestry and land management sector introduced by Germany include the **increases of the energy efficiency** and the strong **support of renewable energies**, both important elements to achieve the targets adopted in the **National Sustainability Strategy**.

2.3.3 An analysis of the current situation – which strategy lies behind the existing measures?

Based on the information of existing and planned policies and measures to reduce GHG emissions in the agriculture and forestry sector, let us now analyse the current situation in order to identify Germany's underlying strategy. In particular, we will try to identify the specific role of agriculture and forestry in the UK's overall approach to reduce GHG emissions, attempting to highlight whether the measures adopted are specifically for the purpose of climate change control or whether they would in any case have been implemented for other purposes.

Germany emphasises in its revised **National Climate Change Programme 2005** the **importance of renewable energies and energy efficiency** in order to achieve the Kyoto and domestic targets. **Agriculture, forestry and land management make part of the overall strategy, primarily indirectly** through the emphasis on renewable energy, but in itself they do not play a significant role in Germany's climate change strategy. Their role is also acknowledged in the context of non-CO₂ gases, which experience a successful decline over the last years. Livestock numbers have been reduced, decreasing methane emissions related to digestive processes of animals, animal wastes and fertilisers. Measures aimed at improved fertilisers have lowered nitrous oxide in soils, and a more targeted production has significantly reduced energy-induced carbon dioxide emissions.

Still, most measures related to climate change and agriculture and forestry are **motivated by reasons other than climate change**, as most importantly related to demanding renewable energy targets that have caused also the launch of biofuel strategies and enforced electricity based on renewable sources.

Overall, the specific role of agriculture and forestry in Germany's climate change strategy is still relatively small, despite signs that it's role could improve in the future (also due to the recent role assigned to adaptation). In reality, Germany benefits in various aspects from the potential of agriculture and forestry, as is evidenced by its role in the context of renewable energies. Yet, Germany does not yet attempt to maximise the multiple benefits that can be achieved from a range of measure to comply both with climate change objectives and with other environmental goals adopted by agriculture and forestry. However, Germany's underlying strategy and its concentration on renewable energy sources suggests that this Member State could profit a lot from a more linked approach in the future, given the benefits from this sector's potential towards climate change control.

2.3.4 Conclusions

Germany has launched its revised **National Climate Change Programme 2005** in August 2005, reporting on the current situation in GHG emissions in Germany as a consequence of measures and policies implemented over the last years and outlining planned measure for the near future. Yet, a comprehensive overview on the progress under the Kyoto Protocol (i.e., the Fourth National Communication to the UNFCCC) is still missing.

On the whole, Germany appears to be on track to meet its Kyoto commitment, given that GHG emissions are already about 18.5 percent below base year levels in 2003, being thus quite close to Germany's Kyoto target of 21 percent in 2012. The measures outlined in the revised national climate strategy are expected to move Germany even closer to its targets, although the accomplishment is becoming more challenging due to changed national circumstances, evidenced by the new increase in emissions from the energy sector. The new circumstances as well as insufficient measures have also led to a situation in which the domestic target of the German Government – 25 percent by 2005 – were out of reach. In addition, the European Emissions Trading Scheme has become a key element of Germany's climate change strategy, but the overall implementation of this instrument appears to be relatively weak as evidenced by its first phase national allocation plan.

Emissions from the agriculture and forestry sector have been declining over time, but mostly due to measures with origins other than climate change. In general, the **agriculture, forestry and land management sector** has a **relatively important role** in Germany's climate change control, but **mostly indirectly through the strong emphasis on renewable energies**. In addition, Germany has designed a range of measures able to use the potential of agriculture and forestry for climate change control, indicating that further measures will be examined.

However, even more strongly than in the case of the UK, important decisions still remain to be made about the way forward in rural development and other domestic policy. More incentives towards climate change control through agriculture and forestry are required, and the potential of this sector to contribute to climate change control needs to be highlighted and used.

Looking at the whole picture related to Germany's Climate Change Programme, it appears that despite the challenging targets and initially significant successes in national GHG reductions, Germany appears to be no longer a driving force behind Europe's climate policy. Yet, some of the elements identified in its climate strategy suggest that this Member State has the potential to develop promising ideas if it would recognise the real benefits of a more linked approach in climate change control, assigning greater weigh to agriculture, forestry and land management.

3 Concluding comment

The situation among the three countries is quite different: on one hand we find Germany and UK with initial very high CO₂ emission per capita and quite interesting progress in the development of strategic options for carbon emission reduction; on the other hand Italy showed an increasing trend in CO₂ emission while the economy has a high energy efficiency and a relatively low carbon-intensity production system.

As regards the specific weight of the agriculture, forestry and land management in contributing to the national emission reduction targets, emissions arising from these sectors – amounting to about 7% of the total GHG emissions – are clearly important to enable a successful national strategy. In addition, the analysis has shown that these sectors have increased their weight also due to the potential for carbon sequestration, especially in Italy where LULUCF might have a rather important role.

Over the last years, emissions from agricultural sector have significantly been reduced in the three Member States. This downward trend in GHG emissions is due to a range of policies and measures that have induced a more targeted input use and thereby led to decreasing animal numbers and fertiliser use, an expanded forest area and a tendency to less intensive agriculture. However, an important difference among the three countries can be identified when looking at the motivations behind the policies and measures.

Even if climate change concerns were rarely the initial cause for these measures in both countries, the recent actions in the UK show that this Member State assigns an important role to the potential benefits of the agriculture, forestry and land management sector. Most importantly, the UK Government has adopted a number of innovative measures to develop and expand the use of bioenergy and biofuels as an important element towards a low-carbon economy, increasing the weight of the agriculture, forestry and land management sector as compared to the previous strategies. The UK both emphasises the need of this sector to adapt to the threats and opportunities caused by climate change, and to preserve a sustainable strategy in the sector. A variety of measures (albeit some of them still quite vague) is proposed to better respond to this challenge, and the UK clearly highlights that agriculture, forestry and land management will play an important role in the design of an successful future approach to climate change control, considering the linkages and potential multiple benefits between these two areas.

In Germany instead, agriculture and forestry have gained their relatively important role mostly indirectly through the strong emphasis on renewable energies. Still, Germany has designed a range of measures able to use the potential of agriculture and forestry for climate change control, indicating that further measures will be examined. Some of the elements identified in its climate strategy suggest that this Member State has the potential to develop promising ideas if it would recognise the real benefits of a more linked approach in climate change control, assigning greater weight to agriculture, forestry and land management.

In Italy the emission reduction is mainly due to shrinking effects of CAP reforms during the last 15 years. Cattle decreases led to relevant reduction of methane emission while the reduction of nitrous oxide was negligible. Results from the first analysis of LULUCF show a potential role of carbon sequestration in forest land. However the policy design proceeded very slowly and until now it is not so clear what kind of strategy Italy wants to choose as far as the agroforestry sector. In general terms, energy demand is still increasing and taking account of the already high level of efficiency of the Italian energy system it does not seem much room for additional emission reductions without dramatic limitation to some industrial production. In order to fulfil the Kyoto target it will likely be needed a relevant purchase of credits in the carbon market (Costantini, 2006).

Concluding, important steps towards a critical role of agriculture and forestry in climate change control have been made, and particularly the UK has highlighted a promising direction as regards

the exploitation of this sector's potential. Still, also in particularly in Germany and Italy but even in the UK, important decisions still remain to be made about the way forward in rural development and other domestic policy. More incentives towards climate change control through agriculture and forestry are required, and the potential of this sector to contribute to climate change control needs to be highlighted in order to prepare an integrated approach to cope with the problems and opportunities of the two sectors.

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Appendix I: **Annex I National Communications and Reports Demonstrating Progress under the Kyoto Protocol**

Annex I Parties should submit their fourth national communication to the UNFCCC secretariat by 1 January 2006. Find below the fourth national communications submitted in accordance with Article 12 of the Convention and decision 4/CP.8 and progress reports submitted in accordance with Article 3.2 of the Kyoto Protocol and decisions 22/CP.7 and 25/CP.8. Status: June 26th, 2006. Annex I Parties to the Convention only are indicated in italics

Annex I countries	Fourth national communication	Report demonstrating progress under the KP
<i>Australia</i>	Submission date:	---
<i>Austria</i>		
<i>Belarus</i>	Submission date:	Submission date: 29/05/06
<i>Belgium</i>	Submission date:	Submission date: 22/12/05
<i>Bulgaria</i>		
<i>Canada</i>		
<i>Croatia</i>		---
<i>Czech Republic</i>	Submission date:	Submission date: 03/02/06
<i>Denmark</i>	Submission date:	Submission date: 30/12/05
<i>Estonia</i>	Submission date:	Submission date: 30/12/05
<i>European Community</i>	Submission date:	Submission date: 22/12/05
<i>Finland</i>	Submission date:	Submission date: 14/02/06
<i>France</i>		
<i>Germany</i>		
<i>Greece</i>	Submission date:	Submission date: 10/03/06
<i>Hungary</i>	Submission date:	Submission date: 17/01/06
<i>Iceland</i>	Submission date:	Submission date: 28/01/06
<i>Ireland</i>		
<i>Italy</i>		
<i>Japan</i>	Submission date:	Submission date: 06/02/06
<i>Latvia</i>	Submission date:	Submission date: 25/05/06
<i>Liechtenstein</i>	Submission date:	
<i>Lithuania</i>	Submission date:	Submission date: 06/02/06
<i>Luxembourg</i>		
<i>Monaco</i>	Submission date:	---
<i>Netherlands</i>	Submission date:	Submission date: 22/12/05

New Zealand	Submission date:	Submission date: 04/05/06
Norway	Submission date:	Submission date: 16/02/06
Poland		
Portugal		Submission date:
Romania		Submission date:
Russian Federation		
Slovakia	Submission date:	Submission date: 30/12/05
Slovenia	Submission date:	Submission date: 12/06/06
Spain	Submission date:	Submission date: 21/01/06
Sweden	Submission date:	Submission date: 30/12/05
Switzerland	Submission date:	Submission date: 02/12/05
Turkey		---
Ukraine		
United Kingdom	Submission date:	Submission date: 08/03/06
United States of		---

LIST OF ACRONYMS

AAU	Assigned Amount Unit. Units issued out of a country's initial assigned amount.
Annex I	Industrialised countries that, as parties to the UNFCCC, have pledged to reduce their greenhouse gas emissions by the year 2000 to 1990 levels as per Article 4.2 of the Kyoto Protocol are listed in Annex I. Annex I Parties consist of countries belonging to the OECD, the Economies-in-Transition and Turkey.
AP6	Asia Pacific Partnership on Clean Development and Climate. Technology-based partnership among the US, Australia, Japan, China, India and South Korea to reduce GHG emissions without legally binding emissions targets.
BAT	Best Available Techniques.
BAU	Business as Usual.
CDM	Clean Development Mechanism. Project-based Kyoto Protocol flexibility mechanisms between developed and developing countries. Allows for the acquisition and transfer of certified emission reductions.
CCS	Carbon capture and storage. The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen and store the carbon.
CERs	Certified Emission Reductions. Represent units derived from a Clean Development Mechanism project, issued by the CDM registry, and designated as certified emission reduction units by the CDM registry.
CO₂	Carbon dioxide: The main greenhouse gas affected directly by human activities.
CO₂eq	Carbon dioxide equivalent. The concentration of CO ₂ that would cause the same amount of radiative forcing as the given mixture of CO ₂ and other greenhouse gases.
COP	Conference of the Parties to the UNFCCC: The supreme body of the UNFCCC (e.g., COP 11 stands for "Eleventh Conference of the Parties").
ECCP	European Climate Change Programme. Framework for European climate policy.
ERU	Emission Reduction Unit. Unit derived from a Joint Implementation project issued by converting an Assigned Amount Unit or a removal unit.
ETS	Emission Trading Scheme. Annex 1 countries are allowed to sell emission reductions if in excess respect to their individual targets or symmetrically to purchase them if in shortage.
EUA	EUropean Allowances. Other name for emission rights in the European

	Emission Trading Scheme.
GEF	Global Environment Facility.
GHG	Greenhouse gas: Any trace gas that does not absorb incoming solar radiation but does absorb long-wavelength radiation emitted or reflected from the Earth's surface. The most important greenhouse gases are water vapour, carbon dioxide, nitrous oxide, methane and Chlorofluorocarbons (CFC's).
IPCC	Intergovernmental Panel on Climate Change: The body responsible for the scientific and technical assessment underlying the UNFCCC.
JI	Joint Implementation. Project-based Kyoto Protocol flexibility mechanisms between Annex1 countries. Allows for the acquisition and transfer of emission reduction units.
ICERs	long-term Certified Emission Reductions. Valid for the full project crediting period.
LULUCF	Land Use, Land-Use Change and Forestry: Art. 3.3. of the Kyoto Protocol describes land use, land use change and forestry activities that require or allow the net GHG emissions from sinks to be accounted for by Parties in meeting their emission targets.
MOP	Meeting of the Parties to the Kyoto Protocol
NAPS	National Allocation Plans. Plans according to which national governments allocate emission rights to different sectors in view of the mandatory cap-and-trade scheme for CO ₂ that started in the EU in January 2005.
Non-Annex I country	All countries that do not belong to Annex I of the UNFCCC, i.e. the developing countries and some countries in transition.
tCERs	temporary Certified Emission Reductions. Valid for just one commitment period.
RMU	Removal Unit. Represents sinks credits generated in Annex I countries, which can be used only to meet a party's emissions target in the commitment period in which they are generated.
7th RTD framework	Research and Technological Development. EU Seventh Research Framework Programme, to last from 2007 to 2013.
SBSTA	Subsidiary Body for Scientific and Technological Advice
UNFCCC	United Nations Framework Convention on Climate Change: a multi-lateral agreement that lays the basis for international climate negotiations.