CECILIA 2050

OPTIMAL EU CLIMATE POLICY

Choosing Efficient Combinations of Policy Instruments for Low-carbon development and Innovation to Achieve Europe's 2050 climate targets

Food and agriculture

The current policy mix

Funded by the European Union

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AUTHOR(S)

Dr Onno Kuik, Institute for Environmental Studies, VU University Amsterdam

Dr Agni Kalfagianni, Institute for Environmental Studies, VU University Amsterdam

With contributions by:

Carlijn Ginther, Obe de Vries, Stella Wirth Benedetti and Ilyana Arnaudova

With thanks to:

Kateřina Kaprová, Charles University Environment Center, Prague

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LIST OF ABBREVIATIONS

BSE	Bovine Spongiform Encephalopathy (mad cow disease)
CAP	Common Agricultural Policy
CBL	Centraal Bureau Levensmiddelenhandel (Dutch Food Retail Association)
CCC	UK Committee on Climate Change
CH_4	Methane
CLM	Centrum voor Landbouw en Milieu (Dutch Centre for Agriculture and the Environment)
CMCC	Euro-Mediterranean Center for Climate Change
CMO	Common Market Organisation
CO_2	Carbon dioxide
CO_2-eq	Carbon dioxide equivalent
DEFRA	UK Department for Environment, Food and Rural Afairs
EAFRD	European Agricultural Fund for Rural Development
EAGGF	European Agricultural Guidance and Guarantee Fund
EEC	European Economic Community
EERP	European Economic Recovery Plan
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
FLNI	Federatie Nederlandse Levensmiddelen Industrie (Federation of Dutch Grocery and Food Industry)
GHG	Greenhouse Gas
GHGAP	Greenhouse Gas Action Plan
INEA	Instituto Nazionale di Economia Agraria (Italian National Institute for Agricultural Economics Research)
IPLA	Istituto per le Piante da Legno e l'Ambiente (Italian Forestry and Environment Institute)
IPPC	Integrated Pollution Prevention and Control
kWh	Kilowatthour
LEAF	Linking Environment and Farming

LULUCF	Land use, land-use change and forestry
MIPAAF	Ministero delle Politiche Agricole Alimentari e Forestali (Italian Ministry of Agricultural, Food and Forestry Policies)
Mt	Megatonne (million tonnes, billion kilogrammes)
MW	Megawatt
NFU	UK National Farmers Union
NGO	Non-Governmental Organisation
NMV	Nederlandse Melkveehouders Vakbond (Dutch Dairy Farmers Union)
NVLV	Netwerk Vitale Landbouw en Voeding (Dutch Network for Vital Agriculture and Food)
N_2O	Nitrous oxide
PBL	Planbureau voor de Leefomgeving (Netherlands Environmental Assessment Agency)
SAC	Scottish Agricultural College
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added tax
VNO/NCW	Confederation of Netherlands Industry and Employers
WP	Work Package

1 Executive summary

In this report we assessed the 'optimality' of the current policy mix in the agri-food sector in Europe. We used the information from the CECILIA2050 country reports (WP1), surveyed the literature, and carried out interviews with stakeholders in four European member states. The agri-food sector is a large and diversified sector in Europe. The exact delineation of the agri-food sector differs across studies and statistical sources. Total GHG emissions from the agri-food sector have been assessed at 18% – 22% of total EU27 emissions. Non-CO_2 GHG emissions from primary agriculture (CH_4 and N_2O) are responsible for around 10% of total EU27 emissions. These emissions have decreased over the past two decades by 20%. The largest percentage reductions occurred in Central and Eastern European countries. The European Commission projects a further decrease of non-CO_2 GHG by 3% towards 2020 if no additional measures are taken. There are no GHG mitigation policies at the level of the agri-food sector, just policies for its constituent parts such as primary agriculture, transport, manufacturing, and energy use and CO_2 emissions in general. The main policy that drives changes in primary agriculture is the Common Agricultural Policy (CAP). Following the CAP Health Check revision in 2008, environmental protection gained higher priority, e.g. through the promotion of sustainable agricultural and forestry management practices; followed by investments in new environmental technologies in agricultural holdings, e.g. for soil erosion, water contamination, manure management, energy saving and training and advice on climate change mitigation. There is no formal evaluation of the effects of this policy (change) yet. The economic crisis seems to have had a negative effect on the funding of some of these measures, e.g. in Italy. At the Member State level, apart from the CAP-related initiatives, there is little evidence of climate policies to curb non-CO_2 emissions from agriculture. An exception is that most Member States have policies in place to decrease CH_4 emissions by promoting the production of biogas on farms. Agri-food stakeholders in four case study countries advocated the development of an EU-wide policy for climate change mitigation that would provide a level playing field for EU farmers. Farmers, and sometimes consumers, were considered the most disadvantaged stakeholder groups by current policies in terms of bearing the costs of implementation while other supply chain actors, in particular retailers, were considered major beneficiaries. In developing the EU-wide policies it was felt important to target the whole supply chain in an integrated manner and to avoid a piecemeal approach that would address some environmental issues but not others and that would neglect the interaction between environmental and social issues. The role of government was considered crucial, but predominantly in terms of providing a general framework within which voluntary approaches could develop.

2 Introduction

For Task 2.4 of the CECILIA2050 project, current greenhouse gas (GHG) mitigation policy instruments in food and agriculture in the European Union (EU) are screened and assessed. This Task aims to assess the current policy mix in food and agriculture in terms of environmental effectiveness (EU and global), economic efficiency (static and dynamic), administrative feasibility (monitoring and enforcement), and political and legal feasibility, taking account of the criteria defined in Task 1.1, and the risks, priorities and market and other institutional imperfections that provide the rationale for public policy but may also hamper the scope and/or effectiveness of the current policy mix. On the basis of the instrument mix identified in Task 1.2, the assessment was carried out in a sample of Member States (case study countries) with the objective to capture a part of the European diversity in farming systems, policy and food cultures, and wider social standards and norms.

We based the assessments on a comprehensive review of literature and interviews with key stakeholders in the case study countries. The analysis includes policy instruments that focus both on the producer (the farm, processing, distribution and retail) and on the consumer. In the terms of reference of the CECILIA2050 project, it was proposed that the assessment would be carried out in four Member States, including the UK, The Netherlands, a Southern Member State (Spain or Italy) and a Central European Member State (Poland or Czech Republic). Despite much effort, we did not succeed to attract a research assistant who could carry out the required research tasks in a Central European Member State. Therefore, in the end, we selected the UK, The Netherlands, Spain *and* Italy as our case study countries, capturing at least some part of European diversity (although less than we originally hoped for).

The report is structured as follows. Section 3 briefly introduces the food and agriculture sector in Europe. It discusses different approaches to describe and delineate the agri-food sector and provides some statistics on the sector's contributions to the economy, employment, and greenhouse gas emissions. Section 4 discusses the evolution of the Common Agricultural Policy, the policy instrument that has shaped European agriculture and that will in all likelihood continue to do so in the foreseeable future. Section 5 presents and discusses patterns, trends and projections of GHG emissions from agriculture and the agri-food sector. Section 6 identifies GHG mitigation policy instruments in Europe's agri-food sector. It presents an overview and preliminary assessment of policy instruments in the UK, The Netherlands, and Italy, and it discusses the promotion of agricultural biogas in greater detail. Section 7 reports on the stakeholder interviews that were carried out in the four case study countries: the UK, The Netherlands, Italy, and Spain. Section 8 concludes.

3 The food and agriculture sector in Europe

3.1 Introduction

The food and agriculture sector is the complex of economic activities that is directly or indirectly related to the cultivation, processing, delivery and distribution of agricultural goods from the farm to the consumer. The food and agriculture sector in Europe is large, diversified and includes millions of firms and provides millions of jobs.

The exact delineation of the food and agriculture, or 'agri-food' sector, may differ somewhat across studies and statistical sources. Core sectors of the agri-food sector include primary agriculture, forestry and fisheries, and manufacturing, wholesaling and retailing of food, beverages and tobacco products. There are many industries that supply goods and services to these core sectors, including fertilisers and pesticides, feed, gas and electricity, packaging materials, construction services, transport, and financial and commercial services. Such industrial activity is to a varying extent included in the definition of the agri-food sector across studies, statistical sources, and the purpose of analysis. Finally, economic activities towards the collection and disposal of food waste may or may not be included in the definition of the agri-food sector.

For the purposes of the present report, the agri-food sector is broadly defined to include all industrial and economic activities related to the supply chains of food and agricultural materials from the farm to final disposal (Figure 1). We have to acknowledge, however, that statistical data is often not readily available for this broadly defined sector, and we have to do with the data that are available.

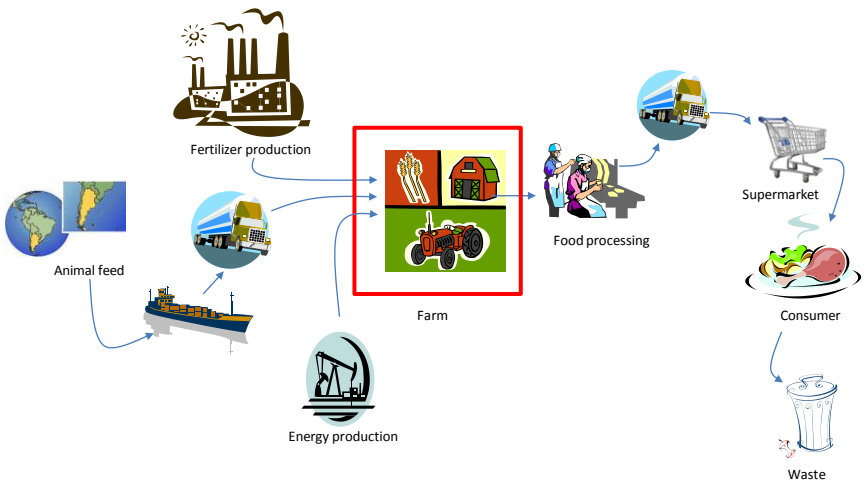


Figure 1 Schematic representation of the agri-food sector

The statistical office of the EU, Eurostat, collected information on the agri-food sector under the heading "From farm to fork statistics" (EC, 2011b). Unfortunately, this project is phased-out.[1] Some national statistical offices, such as those of the United Kingdom and the Netherlands, produce statistical overviews of their agri-food sectors (van Leeuwen et al., 2012; DEFRA, 2012c). Backward and forward linkages between economic activities in the agri-food sector can be made explicit in Input-Output Tables or Social Accounting Matrices (SAM). The Joint Research Centre has produced an agricultural Social Accounting Matrix, called AgroSAM, for the year 2000 (Müller et al., 2009). The Joint Research Centre is currently working on un update for the year 2007 (Cardenete et al., 2012). Some national statistical offices produce agricultural SAMs on a more regular basis.

In EU27, more than 48 million persons were employed in the EU27's food chain in 2008. They were employed in nearly 17 million holdings/enterprises, the majority of which were agricultural holdings. In total, these holdings/enterprises generated € 751 008 million of value added (EC, 2011b). Among these holdings/enterprises, there were almost 14 million agricultural holdings, with a labour force of more than 26 million persons. Just over half of the EU27's agricultural holdings produced crops, while almost one-third of the holdings were engaged in livestock farming. Primary products of the food chain are crop products (such as cereals and vegetables), animals (cattle, pigs) and animal products (milk). The production of specific agricultural and food products depends to a large degree upon climatic/geological conditions, the availability of land and water resources, and the level of imports. France is the leading producer of cereals (23.6 %), followed by Germany (16.8 %) and Poland (10.1 %). Italy and Spain are the leading producers of fresh vegetables in the EU, each accounting for around one fifth of total production. France and Germany are the largest producers of bovine meat (19.3 % and 15.0 %), Germany and Spain were the biggest producers of pig meat (24.7 % and 15.4 %), while poultry production is widespread across most of the Member States. Sheep production is concentrated within the United Kingdom (39.2 %) and Spain (17.4 %) (EC, 2011b).

The structure of the agri-food sector differs substantially across Member States. The highest number of farms is in the eastern Member States – in particular, Romania and Poland – often of small size. These two countries together accounted for 43.2 % of the EU27's workforce in primary agricultural production in 2008. The number of food and beverage manufacturing, wholesaling, retailing and service providing enterprises is highest in the southern Member States – in particular, in Italy and Spain. The size of agricultural and food and beverage manufacturing, wholesaling, retailing and service providing enterprises are, on average, largest in Germany, the United Kingdom, and in some northern countries – such as Finland and the Baltic States (EC, 2011b).

Agricultural, forestry and fishing products, together with food, beverages and tobacco products account for just over a quarter of all the goods transported by road within the EU27

[1] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/From_farm_to_fork_-_food_chain_statistics#Main_tables, accessed 26 August 2013.

and for 18.1 % of the goods transported by road nationally; the majority of these goods are transported over distances less than 150 km (EC, 2011b).

Consumers purchase food and beverages from specialist retailers (butchers, bakers), non-specialised outlets (supermarkets), or market stalls. There were 7.4 million persons working within the food, beverages and tobacco retailing sector in the EU27 in 2008. Food is also consumed outside the house: 1.5 million restaurants, cafés and bars/pubs are providing food and beverage consumer services (EC, 2011b).

3.2 Greenhouse gas emissions

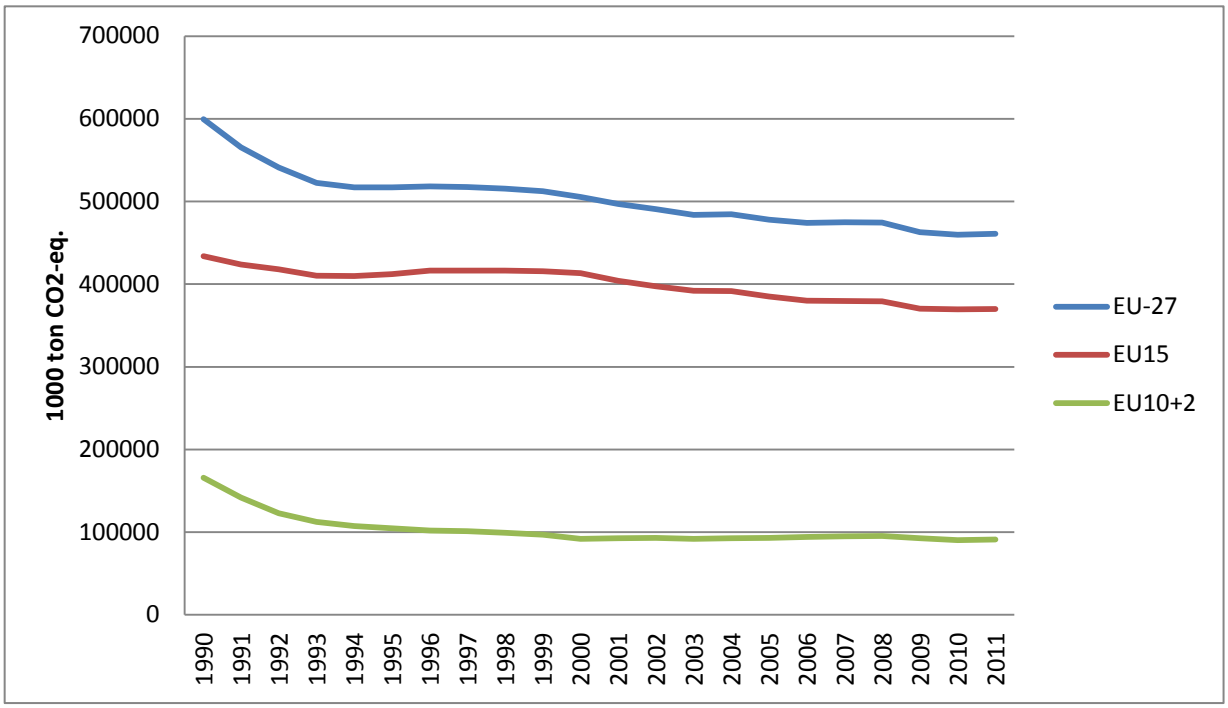
The food chain produces greenhouse gas (GHG) emissions at all stages in its life cycle, from the farming process and its inputs, through to manufacture, distribution, refrigeration, retailing, food preparation in the home and waste disposal. The three main GHG emitted by the agri-food sector are carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). CO_2 is emitted through the combustion of fossil fuels and through soil processes. N_2O is emitted mainly from fertiliser production and fertiliser and manure applications to soils and CH_4 is emitted mainly from livestock and manure handling, and, to a lesser extent, from rice cultivation.

Member States report their GHG emissions through a common UNFCCC reporting framework. For agriculture, the emissions of N_2O and CH_4 are reported. CO_2 emissions from agricultural soils are reported under land use, land use change and forestry (LULUCF). CO_2 emissions from fossil fuel use in buildings, equipment and machinery in agriculture are not reported under the 'agriculture' category, but are included in the 'energy' category. Other agriculture-related emissions, such as from the manufacturing of fertilisers and animal feed are included in the inventory on industrial processes (EC, 2009). Further-up the food chain, GHG emissions are recorded under 'energy', 'industrial processes', 'transport', or 'waste', but not under 'food' or 'agriculture'.

Hence, integrated information on greenhouse gas emissions from the agri-food sector is not readily available. Some EU Member State Statistical Offices, such as those of the Netherlands and the UK, have only recently started to publish emissions data on their agri-food sectors, apart from their standard reporting to the UNFCCC (van Leeuwen et al., 2012; DEFRA, 2012c). In addition, the quantitative assessment of emissions from the farm sector is still highly uncertain, as compared to other sectors (DEFRA, 2012b).

'Agricultural emissions' (emissions from N_2O and CH_4 from agricultural activities) amount to 461 million tonnes of CO_2-eq in 2011 or 10% of total EU27 emissions (Figure 2). Note that these emissions only account for a subset of emissions (only N_2O and CH_4) from one part of the agri-food chain ('the farm', depicted within the red box in Figure 1). Total GHG emissions from the agri-food sector have been assessed at 18% – 22% of total EU27 emissions, depending on the exact definition of the agri-food sector (EC, 2011a; EEA, 2012).

Figure 2 Agricultural emissions over the period 1990-2011 (in 1000 t CO2-eq.)



Source: Eurostat

A slightly different perspective is provided by life-cycle analysis studies. Life-cycle analysis attempts to capture all direct and indirect environmental impacts of a specific activity. One life-cycle analysis study estimated that the consumption of food would be responsible for 31% of global warming potential in the EU, taking account of all forward and backward linkages (Tukker et al., 2006). Other life-cycle studies found different shares, but agree that from a consumption perspective, food consumption is among the main contributors to global warming, together with transport and housing (Wolf et al., 2011).

The agricultural sector has the potential to mitigate climate change by increasing the carbon sequestration rate (i.e. rate at which carbon is stored in the soil), and to a lesser degree, through the reduction of other GHG emissions, such as N_2O and CH_4 (Smith et al., 2007).

The EU's Roadmap to a Resource Efficient Europe includes as a milestone that by 2020, incentives to healthier and more sustainable food production and consumption will be widespread and will have driven a 20% reduction in the food chain's resource inputs. Disposal of edible food waste should have been halved in the EU (EC, 2011c). It identifies three broad domains to diminish the environmental impacts, including the contribution to global warming, of the agri-food sector:

- Reducing food waste.
- Changing food choices.
- Changing production techniques.

Food waste in the EU27 is 89 million tonnes of food per year or 180 kg per person per year. Much of this is food is still suitable for human consumption. It has been estimated that food

waste represents about 3% of total GHG emissions of the EU27, or 170 Mt CO_2-eq. per year, to which households contribute 45% (EC, 2011a). Food choice may have a considerable impact on GHG emissions, as the GHG-intensity of different food products differs enormously. In particular, consuming animal products has much higher impacts than consuming a similar nutritional level of plant based products (EC, 2011a). Food and drink can be produced with different methods, emitting more or less GHG, during agricultural production, manufacturing processes or as waste treatment. The European Commission highlights in this respect that the market can significantly affect production choices and associated emissions – through consumer preferences either acting directly or through influencing intermediary buyers, i.e. wholesalers and retailers. In this way, co-operation along the value chain can bring innovation in farming practices, through the diffusion of information and provision of incentives (EC, 2011a).

4 The Common Agricultural Policy

The Common Agricultural Policy (CAP) is one of the oldest policies of the European Union, strongly rooted to the European integration project. Created in 1957, it has undergone major transformations throughout the years, but remains one of the most important policy areas of the EU. This chapter provides a short overview of CAP and its main reforms until 2013.

4.1 History and raison d'être

At the end of the Second World War a devastated Europe searched for ways to feed its undernourished population. In the European political agenda at that time, issues of food security, land reforms, increasing productivity and technological improvement scored very high. The aim was to produce enough affordable food for society. At the national levels, state-driven policies supporting the industrialization, intensification and rationalisation of agricultural production were put forward with the adoption of the Fordist model of increasing wage/productivity (McMichael, 1997) through American led reconstruction programs, such as the Marshal Aid (Goodman and Redclift, 1991; Marsden et al., 1996; Ward and Almas, 1997). At the same time, industrialisation, which paid much higher wages than labour in agriculture, occurred in different sectors of the economy and resulted in urbanisation and rural exodus. For that reason, subsidies were introduced to keep agricultural labour from lapsing to competitive fields and secure production. The results were rewarding: agriculture began to transform from a relatively backward and highly labour-intensive sector of the economy towards one of increasing technological sophistication (Bowler, 1985; Gardner, 1996), while the process of business termination slowed down (van Leeuwen, 2003).

The development of the Common Agricultural Policy (CAP)[2] in 1957 along with the Treaty of Rome and the establishment of the European Economic Community (EEC)[3] promoted and harmonised the national objectives set for agriculture. State intervention and price support schemes were further promoted to secure an income for the farmers and adequate food for society. Moreover, a reduction of barriers to trade between the EEC Member States was introduced and common prices for agricultural products were set. As a result, the CAP and national policies achieved self-sufficiency in food, stability in agricultural markets and a fair standard of living for the farmers in Western Europe. The objectives of CAP did not differ significantly from the objectives of national agricultural policies which were now harmonized under CAP. Specifically, these objectives as formulated by article 39 of the Treaty of Rome were the increase of productivity in agriculture, a reasonable standard of living for the farmers, stability of agricultural markets and food supply at reasonable prices for the consumers.

These objectives were supported by the principles of market unity, community preference and financial solidarity. Specifically, market unity ensured the abolishment of trade restrictions between Member States and the set of common prices for agricultural products; community preference ensured the protection of the common market with the establishment of threshold prices for imports and subsidies to encourage exports; finally, financial solidarity ensured that the costs of CAP would be shared with all member-states regardless in which country they have been made, by setting up the EAGGF (European Agricultural Guidance and Guarantee Fund). At the same time, intervention and price support schemes were developed for securing the income of the farmers. These schemes were based on the establishment of (relatively high) target market prices for agricultural products and the setting up of lower intervention prices to account for the potential failure of the market to meet the target prices.[4] This price support mechanism did not include all agricultural products, only the basic or core products, which were, at that period, milk, beef, cereals and sugar. The rest of the products received less or no financial support at all. However, even with the support of the core products alone, agriculture became the most heavily subsidized and state (and supra-state) protected sector of the European economy. As a result, the objectives of CAP and national agricultural policies of self-sufficiency in food, stability of agricultural markets, and a fair standard of living for the farmers, at least in the first years of their operation, were successfully met.

Although CAP and national policies were successful in their objectives, they created a number of problems which shifted the aims and operation of subsequent agricultural policies,

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[2] CAP was initially shared between the six European countries which formed the EEC: Germany, France, Italy, Luxemburg, Belgium and the Netherlands.

[3] These member countries were Germany, France, Italy, Luxemburg, Belgium and the Netherlands.

[4] Specifically, the intervention schemes worked as follows. The Commission set a target price for the agricultural products, which was supposed to be met by demand and supply in the market. If, however, the market did not support the target price, then the Commission started to buy the product itself at the intervention price.

however. From an economic perspective the CAP and national policies resulted in a consumer loss because of the high prices that had to be paid due to levies on imports and intervention prices. The increasing productivity policy resulted in massive overproduction and storage problems with increasing costs or in selling products at a loss (mostly in developing countries). Furthermore, CAP resulted in the dumping on world markets with the accompanying depression of world agricultural prices and catastrophic results for developing countries which based their economy on agricultural exports[5]. The economic failures of CAP as well as international pressure, induced governments to reconsider the state-protected status of agriculture and support more liberal policies with emphasis on the market and the private sector. Consequently, the state started to loosen its tight control over agriculture and the private sector started to get more involved in the development of agricultural policies.

In addition, the CAP and national agricultural policies failed to take into account environmental and health considerations, which had severe consequences for both, the environment and human health. Specifically, the intensive forms of production promoted by CAP and national policies have had severe consequences for both the environment and human health. The agricultural sector in particular, has been proven an important source of air pollution[6] and greenhouse gas emissions[7] (Biesiot and Moll, 1995), contributing to global warming, acidification and eutrophication and causing health problems. Studies have established that emissions increase as the intensity and scale of agricultural production amplify (Kramer et al., 1999). The growing industrialization and intensification of agriculture has also been responsible for the continuing decline of biodiversity in agricultural landscapes, a trend observed throughout Europe (Andreasen et al., 1996; Baldock, 1990; Delbaere et al., 1998; Fuller et al., 1995; Manhoudt and de Snoo, 2003). Intensive agriculture is considered responsible for the extensive drainage and extraction of groundwater, causing groundwater shortages, decline of groundwater-dependent ecosystems and poor water quality (van Ek et al., 2000). Similarly, the intensive use of agricultural land affects the long-term production capacity of the soil, which is crucial for a continued supply of high quality foodstuffs.

In addition to the agricultural sector, the stages of processing, packaging, storing and transportation have also been significant in terms of their impact. In meat production, for instance, studies report that the processing stage causes the largest environmental impact due to production of water effluents of high organic waste content. This kind of waste is very difficult to purify and dispose of because it is predominantly made from wastewater coming from all stages of the meat production process, including washing, cleaning, scalding, boilers and cooling machinery (UNEP, 2000). Similar observations are made for the production of fish. Fish production is reported to contribute even more to waste because of its high

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[5] McMichael (1997) reports, for instance, that Argentina found that its earnings in cereals and vegetable oil seeds (accounting for 50 percent of its export earnings in 1980) fell by 40 percent in the 1980s due to the US and EU dumping.

[6] CH_4 from cattle farming, waste and animal husbandry; N_2O from the use of synthetic nitrogen fertilizers.

[7] CO_2 resulting from the use of fossil fuel and the production of agricultural inputs.

perishable nature in comparison to other foods, and the associated large losses that occur during the production chain as a whole (UNEP, 2000).

Moreover, intensive animal production methods reportedly cause important health and safety hazards such as joint, kidney, and heart problems (Buzby, 2002), infections (Tauxe, 2002), various kinds of cancer (Nijinski, 1999; Navarro et al., 2003; Norat et al., 2002; McKnight et al., 2003) and even diseases that are thought to be extinct from Western countries such as hepatitis E (van der Poel et al., 2001; Hoekstra, 2002). More dramatically, in terms of concentrated effects in a short period of time, intensive animal production methods also foster the outbreak of assorted animal diseases, such as pig plague, swine fever, salmonella, and Bovine Spongiform Encephalopathy (BSE). Especially during the BSE crisis society was shocked not only by the revelation of the fact that one could actually die by eating meat but also by the way animals were treated. Consumers began to question the ability of the modern food system to provide safe food (Smith and Riethmuller, 2000; Tansey and Worsley, 1995; Yeung and Morris, 2001) and called for more attention to environmental and health problems as well as animal welfare concerns.

4.2 Reforms[8]

As a result of these realisations, a shift in policy objectives regarding agriculture and food took place. The concept of sustainability and sustainable development was gradually introduced as a core element of national and regional (EU) policies. Today agricultural and food policies in pursuit of sustainable development must consider environmental and social consequences in addition to economic and food security concerns. Policy makers realised that agricultural and food policies should not only concentrate on securing an income for producers and sufficient food for society but also must take into account environmental and health aspects. As such the quest for food sufficiency has now become a quest for food sustainability. At the same time, the reforms of CAP supported a more liberal trade regime in agricultural products with less state intervention. Price supports had to be decoupled from production aiming towards direct income payments per hectare or per animal and combined with production limits (McMichael, 1994; Bonnano and Constance, 1996; IISD, 1996; Watts and Goodman, 1997). A short overview of these reforms is provided below.

4.2.1 The 1992 reform (MacSharry)

The MacSharry reform initiated the shift from product support (through prices) to producer support (through income support). It aimed to improve the competitiveness of EU agriculture, stabilise the agricultural markets, diversify the production and protect the environment, as well as stabilise the EU budget expenditure. Direct payments were

[8] Information on the reforms of CAP is largely provided by the site of the European Commission: http://ec.europa.eu/agriculture/cap-history/agenda-2000/index_en.htm

introduced in order to compensate for the decrease of the price support (for example, cereal guaranteed prices were lowered by 35%, and beef prices by 15%). In addition, it aimed at the adoption of measures that encourage “farming practices compatible with the increasing demands of protection of the environment and natural resources and upkeep of the landscape and the countryside” (EC, 1991), on the basis of compulsory set-aside and other measures (such as agri-environment programs, afforestation, early retirement, and diversification).

4.2.2 Agenda 2000

The Agenda 2000 is a follow-up of the MacSharry reforms aiming to reduce state support to the farmers and respond to calls for environmental responsibility in agriculture consistent with the requirements of the Amsterdam Treaty. It divided the CAP into two 'Pillars': support to farmers' incomes provided in the form of direct payments and market measures financed from the European Agricultural Guidance and Guarantee Fund (EAGGF; pillar 1) and support for rural development in the form of rural development programs co-financed from the European Agricultural Fund for Rural Development (EAFRD; pillar 2). Under this reform, agriculture was supposed to maintain landscape and countryside, contribute to the vitality of rural communities and respond to consumer concerns – regarding food quality and safety, environmental protection and animal welfare standards. Such requirements were ensured through providing income support to the farmers only if they complied with specific environmental demands set independently by member states (principle of 'cross-compliance').

The simultaneous development of a number of directives in the area of environmental policy supplemented some of the provisions of Agenda 2000. Specifically, the directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources aims to limit the spreading of fertilizer containing nitrogen and to set the limits for the spreading of livestock effluent. The water framework directive (2000/60/EC) which sets the aim to achieve good water status for all waters by 2015; the IPPC (Integrated Pollution Prevention and Control) directive (2008/1/EC) with the aim to prevent or minimize emissions to air, water and soil, as well as waste, from industrial and agricultural installations in the community; and the pesticide directive (1991/414/EEC) concerning the placement of plant protection products on the market. These examples indicate the increasing integration of *environmental* considerations into agricultural practices, further promoted by subsequent reforms.

4.2.3 2003 reform

In line with the objectives of the previous reforms, in 2003 the Commission proposed adjustments which aimed at enhancing the competitiveness of the farm sector, promoting a 'market-oriented, sustainable agriculture and strengthening rural development policy'. The

reforms supported the 'decoupling' of income support payment to farmers via the Single Payment Scheme in most sectors of the first pillar, i.e. the removal of the link between the receipt of a direct payment and the production of a specific product. This process continued with reforms in sugar (2006) and fruit and vegetables (2007) as well as in the 2008 'Health Check' (see below) (EC, 2007). Member States were, however, permitted to continue to couple a small number of direct payments to production of particular products and to avoid land falling out of farming in vulnerable regions. In addition the 2003 reform supported the principle of cross-compliance demanding from farmers to comply with a set of environmental and health related requirements as explained above, and that of 'modulation', the progressive reduction of direct payments allowing a transfer of funds from pillar 1 (EAGGF) to pillar 2 (EAFRD) aiming to balance policy tools designed to promote sustainable agriculture and those designed to promote rural development. A 2011 assessment of the 2003 CAP reform shows that the reform has strengthened environmental policies and performed better in relation to Agenda 2000 for some countries (Serrão, 2011). However, Mediterranean countries were not able to capitalise on this reform as much as their Central and Northern-European counterparts. While the analysis does not dwell on the reasons behind this disparity, it reveals that the context within which reforms are taking place has to be included in the policy design to improve its effectiveness.

4.2.4 Simplifying the CAP: the single CMO

In October 2005 the European Commission proposed a major simplification of the CAP with the aim to reduce technical and policy complexities by making rules more transparent, easier to understand and less burdensome to comply with. Technical simplification concerned the revision of the legal framework, administrative procedures and management mechanisms to achieve streamlining and greater cost-effectiveness and attain existing policy objectives more effectively, without changing the underlying policies. Policy simplification concerned improvements to the agricultural support and rural development policy instruments relying increasingly on impact assessment (EC, 2005, p.11). Continuing the process of simplification, in 2007, the EU integrated 21 common market organisations, i.e. sets of measures to manage, to a greater or lesser degree, the markets for agricultural products within the EU's own territory by altering the supply and demand for agricultural products, into a single Common Market Organisation(CMO). One year later, on 20 November 2008, the EU agriculture ministers reached a political agreement on the CAP 'Health Check', addressing three main issues: (i) making the Single Payment Scheme more effective, efficient and simple; (ii) rendering market support instruments, originally conceived for a Europe of six member states, relevant for 27 member states; and (iii) mastering new challenges from climate change to growth in biofuels and water management as well as traditional ones such as biodiversity (EC, 2007, p.3). Specifically with respect to climate change, the Commission while noted improvements in climate change mitigation via more efficient fertiliser use and reduced cattle numbers also underlined the need to further contribute to climate change mitigation due to the climatic vulnerability of the sector. In this context, the link between

climate change and other environmental challenges was also highlighted by the Commission. Several measures were proposed in this regard including: strengthening existing research and development measures; cross-compliance; innovation; and examining cost-effectiveness of price support schemes in the light of new incentives for biomass production. Further, a strengthening of the second pillar was envisaged particularly due to constraints in financial support under the first pillar implying that innovation efforts could only be achieved through increased co-financed compulsory modulation.

Simultaneously, as a result of the financial crisis, in 2008 the Commission developed the European Economic Recovery Plan (EERP) to help European economy remain tuned in with future demands of competitiveness and employment as outlined in the Lisbon Strategy. Farmers could receive support from this plan to address priority areas as identified in the Health Check, including climate change. Specifically, € 0.7 billion (representing 14.2% of the EERP budget) were allocated to climate change mitigation and adaptation for the period 2007-2013.[9] Some Member-States, particularly Slovakia, Czech Republic, Slovenia and Luxemburg, serve the climate change priority particularly well and for this reason they receive 35% of allocated funds. Other countries prioritise other areas, e.g. renewable energy (Bulgaria), water management (Denmark, Bulgaria, Greece, Belgium, Spain, Finland and France), or biodiversity (Cyprus, Slovakia, Ireland, United Kingdom, Spain and France).

4.2.5 The CAP post-2013

To address continuing challenges facing the agricultural sector the CAP reform process continued. After a wide-ranging public debate the Commission presented on 18 November 2010 a Communication on 'The CAP towards 2020', which outlined options for the future CAP and launched the debate with the other institutions and with stakeholders, and a new political agreement was reached on 26 June 2013. Three strategic aims were recommended: (i) preserve the food production potential on a sustainable basis throughout the EU in order to guarantee long-term food security for European citizens and contribute to a growing world food demand; (ii) support farming communities that provide European citizens with quality, value and diversity of food on the basis of public health, environmental and animal welfare requirements; and (iii) maintain viable rural communities depending on agriculture for employment opportunities. The challenges of climate and broader environmental concerns were especially highlighted while the need for more equitable budget distribution under both pillars for active farmers is particularly stressed. Further it was envisaged that the newest reform of CAP would contribute to the overall EU 2020 Strategy for smart, sustainable and inclusive growth by increasing resource efficiency and improving competitiveness through technological knowledge and innovation; maintaining the food, feed and renewable production base and fostering sustainable land management, environmental sustainability and public health; and unlocking economic potential in rural areas by developing local markets and creating new jobs.

[9] http://ec.europa.eu/agriculture/healthcheck/recovery-plan_en.pdf (07.10.2013)

The instruments supporting this reform are classified in four categories: direct payments, market measures, rural development, and instruments addressing the overall architecture. More specifically, direct payments are to be distributed more equitably among members states and farmers putting an end to 'historical references' on the basis of three measures: (i) convergence, i.e. ensuring that no single Member State receives less than 75% of the Community average by 2019; (ii) direct income-support schemes only to farmers currently active and encouraging young farmers to set up businesses with the introduction in all Member States of a 25% aid supplement during the first five years in addition to the existing investment measures aimed at young farmers; and (iii) allocate increased amounts of aid to less-favoured areas, with a specific 2% coupling for plant-based proteins, so as to make the EU less dependent on imports in this area.

Market measures include the use of intervention instruments only as safety nets in the case of price crises and market disruptions; removal of dairy quotas until 2015, sugar quotas by 2017; replacing the planting rights system in the wine sector (starting 2016 applicable until 2030) by a planting-authorisation management mechanism in which professionals are involved to a greater extent, with a fixed planting limit of 1% for vines per year; allocate new resources to the farmers to enhance their position in the food production chain, for instance via the promotion of professional and interprofessional organisations aiming to increase efficiency by negotiating sales agreements on behalf of their members.

Rural development programs are envisaged to contribute to the competitiveness of agriculture by improving resource efficiency, sustainable management of natural resources by improving the resilience and production capacity of soil, and balanced territorial development by empowering people in rural areas and strengthening the link between rural and urban areas. Guiding themes steering agricultural policies are environment, climate change and innovation. Specifically over € 100 billion will be invested to help farming meet the challenges of soil and water quality, biodiversity and climate change between 2014 and 2020. 30% of direct payments will be linked to three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and conserving 5%, and later 7%, of areas of ecological interest as from 2018 or measures considered to have at least equivalent environmental benefits. At least 30% of the rural development programs' budget is supposed to be allocated to agri-environmental measures, support for organic farming, or projects associated with environmentally friendly investment or innovation measures. Further, under these programs farmers will be encouraged to take part in risk prevention mechanisms (income support schemes or mutual funds) and to devise sub-programs deployed for sectors facing specific problems.

Finally, regarding the overall architecture of CAP, the two main pillars will be maintained, with the first pillar containing financial support paid to farmers on an annual basis and the second pillar remaining the support tool for community objectives on a multi-annual, programming and contractual basis.

All aspects of the reform will be applicable as from 1 January 2014, except for the new direct payments structure ('green' payments, additional support for young people, etc.) which will

apply as from 2015 in order to give Member States time to inform farmers about the new CAP and to adapt computer-based CAP management systems.

4.3 Summary

This chapter provided a short overview of the historical foundations, aims and objectives, and reforms of CAP from 1957 until 2013. Two main elements of the reforms were highlighted; the increasing liberalisation and market orientation of agriculture, on the one hand, and the increasing emphasis and integration of environmental and, more recently, climate related concerns within agricultural policies, on the other. The extent to which these elements are translated in specific national policies will be examined in the subsequent chapters on the basis of four member-state case-studies: United Kingdom (UK), Netherlands, Italy and Spain.

5 Greenhouse gas emissions: patterns, trends and projections

The agri-food sector emits greenhouse gas (GHG) emissions at all stages in the food chain, from the farming process and its inputs, through to manufacture, distribution, refrigeration, retailing, food preparation in the home and waste disposal. As we argued in Section 3.2 of this report, statistical data on GHG emissions at all these stages at the EU level is not readily available. In this chapter we will therefore focus on the UNFCCC category 'agricultural emissions' at the level of the EU27 and provide information on GHG emissions in other stages of the food chain in some selected countries.

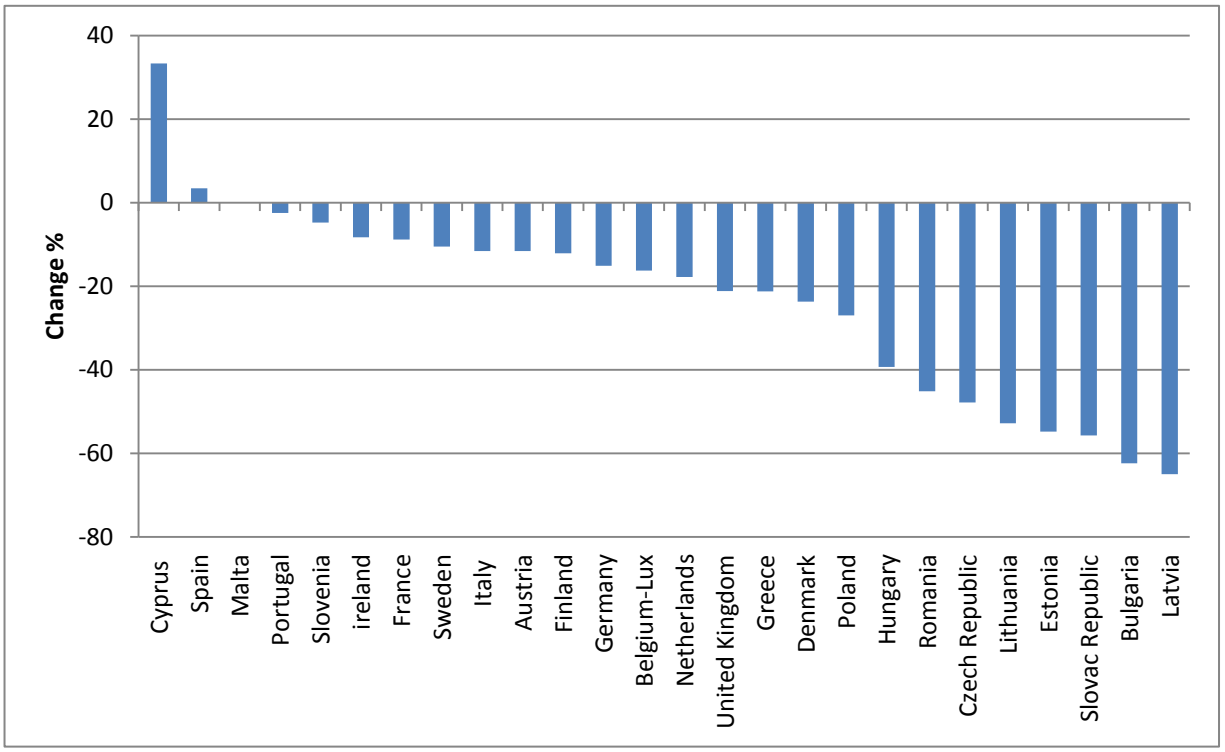
5.1 Agricultural emissions

A recent report of the Joint Research Centre provides a quantitative assessment of current agricultural emissions in the EU27, their projected evolution towards 2020, and the impact of the implementation of policy options to mitigate these emissions (Domínguez et al., 2012). We will briefly summarise their research findings here.

The agricultural emissions in the EU27 have decreased over the past two decades. On average, EU27 emissions decreased by 20.2%. Figure 3 shows that the largest percentage reductions occurred in Central and Eastern European countries (except Slovenia), while increases occurred in Cyprus and Spain. In the EU27, emissions of methane decreased by 18.4%, while those of nitrous oxide decreased by 21.5%. The decrease of methane emissions can mainly be attributed to significant decreases in cattle numbers that followed increases in animal productivity (milk and meat) and related improvements in the efficiency of feed use. The decrease in nitrous oxide emissions are mainly due to reduced use of mineral and organic nitrogen fertilisers following productivity increases and declines in the cattle herds and because of regulation through the Nitrogen Directive. In recent year a slight increase in

nitrous oxide emissions can be observed in the EU12, related to the modernisation of agriculture and an associated increase in fertiliser use.

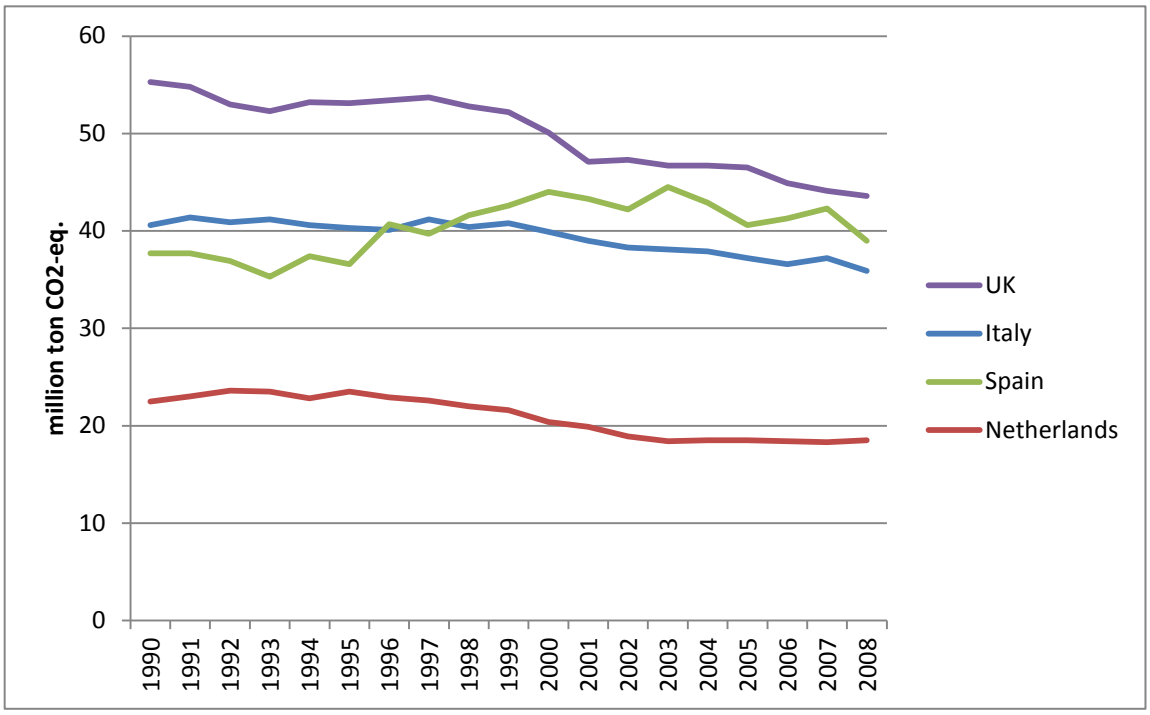
Figure 3 Change in agricultural emissions per Member State 1990-2008 (in CO_2- equivalents)



Source: Dominguez et al. (2012)

Changes in agricultural emissions our case study countries ranged from an increase of 3.4 % in Spain to a decrease of 21.2% in the UK. In Italy and the Netherlands, emissions decreased by 11.6 % and 17.8 %, respectively (see Figure 4). As in the EU27 in general, the evolution of agricultural emissions in the case study countries was due to changes in cattle numbers and fertiliser use, unrelated to climate change policies. For Spain, the increase in emissions was due to an increase in methane emissions as a result of an increase in the number of livestock (Eurostat, 2012).

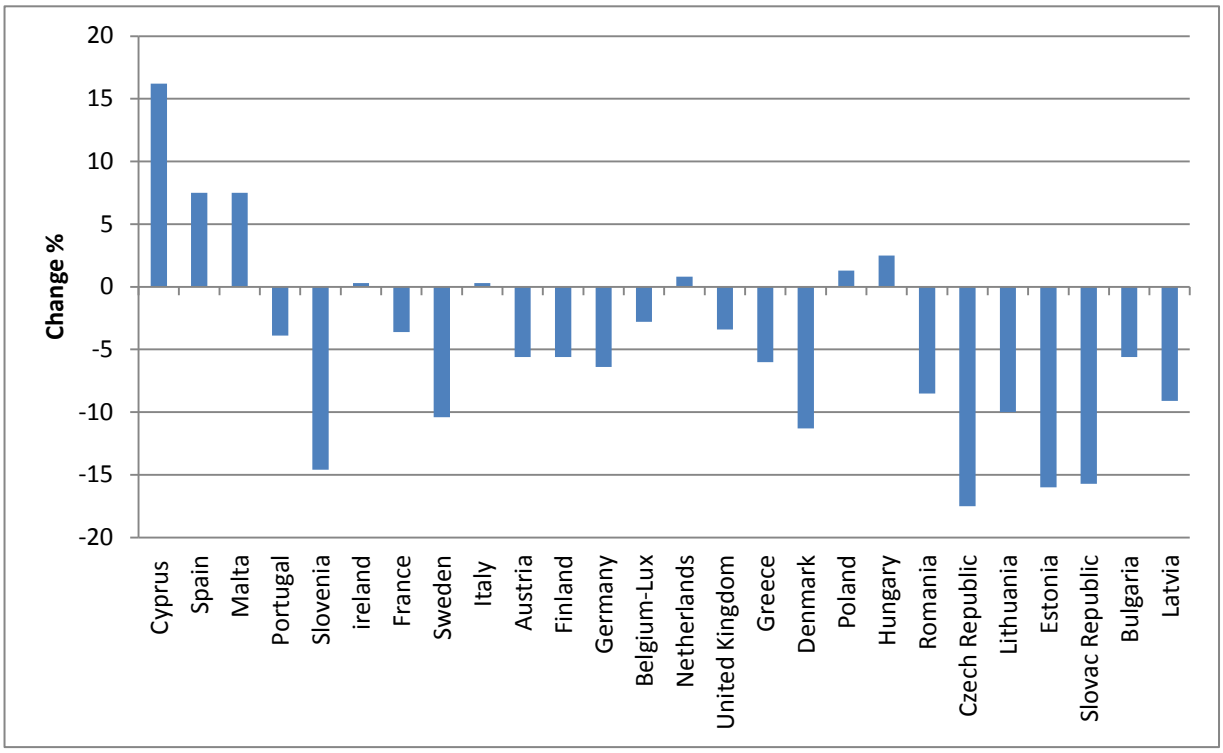
Figure 4 Evolution of agricultural emissions in case study countries 1990-2008 (in CO_2- equivalents)



Source: Dominguez et al. (2012)

Dominguez et al. (2012) developed a number of policy scenarios for agricultural emissions, including a baseline scenario that takes account of the most likely development of agricultural markets and the full implementation of the Health Check of the CAP (see Chapter 4). In this baseline scenario, total agricultural emissions between 2004 and 2020 decrease by 3%, with a somewhat higher reduction in the EU12 as compared to the EU15 (see Figure 5). The emissions of methane are projected to decrease by 16.7%, while those of nitrous oxide are projected to increase by 7.2%. The emissions reduction of methane can be attributed to reduced policy incentives for beef cattle and sheep/goats production after the conversion of coupled support for beef production into (mainly) uncoupled support, and the reform in the dairy market. The increase in nitrous oxide emissions is due to the modernisation of agriculture in the EU12, especially in Bulgaria and Romania.

Figure 5 Projected changes in agricultural emissions per Member State 2004-2020 (in CO_2- equivalents)



Source: Dominguez et al. (2012)

For the case study countries the projections range from an increase of 7.5 % in Spain to a decrease of 3.4% in the UK. In Italy and the Netherlands, emissions are projected to increase by 0.3 and 0.8%, respectively.

5.2 Total emissions from the agri-food sector

As was argued above, it is more difficult to information on other GHG emissions from the agri-food sector. We present information from the United Kingdom and the Netherlands. It should be emphasised, though, that the definitions of the agri-food sectors in these countries differ, making comparisons difficult.

The Agricultural Economics Research Institute of the Netherlands recently published a GHG profile of the agri-food sector in the Netherlands (van Leeuwen et al., 2012), based on detailed agricultural Input-Output tables. The sector includes primary agriculture and fisheries, processing and manufacturing (including the processing of agricultural commodities from abroad, e.g., cocoa, soya, tobacco), (parts of) industries that supply inputs to agricultural activities (including fertiliser, animal feed, construction, machinery, packaging materials, natural gas and electricity, and commercial services) and distribution (wholesale, retail, and transport).

Table 1 GHG emissions from the Dutch agri-food sector in 2005 and 2010 (million tonnes of CO2-eq.)

Subsector	GHG emissions (million tonnes of CO2-eq.)	
	2005	2010
Agriculture and fisheries	27.8	28.9
- *Arable* - *Horticulture* - *Animal husbandry* - *Fisheries*	*2.9* *7.8* *15.7* *0.8*	*2.3* *10.4* *14.9* *0.6*
Processing industry	3.1	3.1
Input supplying industry	9.4	9.3
Distribution	4.4	6.2
Agri-food total	44.7	47.5
% of national GHG emissions	*23.1*	*24.3*

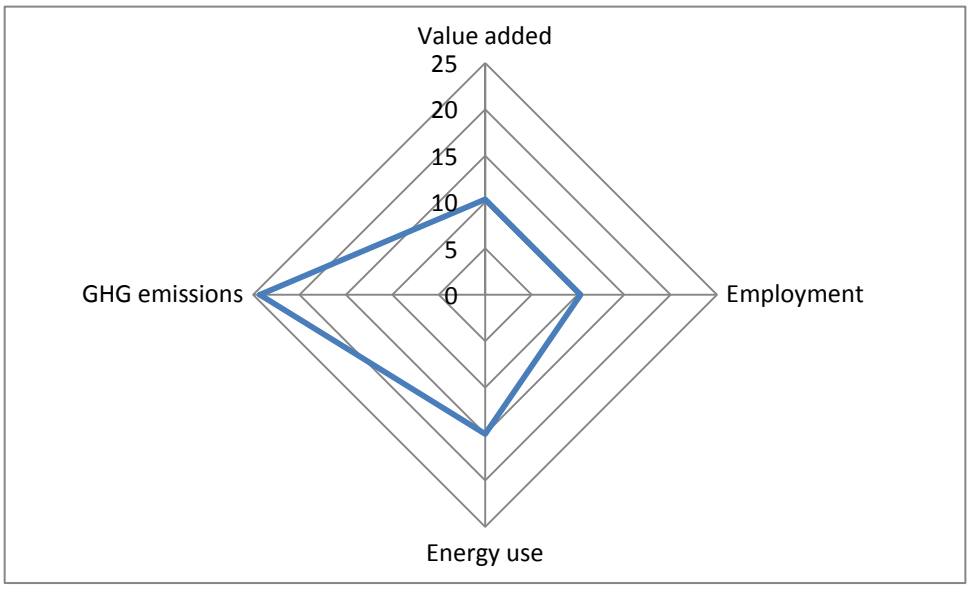
Source: Van Leeuwen et al. (2012)

In the Dutch agri-food sector, about 60% of GHG emissions can be attributed to primary agriculture and fisheries. In total the GHG emissions represent 23%-24% of total national GHG emissions. Between 2005 and 2010 total emissions have increased, both in absolute value as well as in the share of total national emissions.

Comparing the numbers from Table 1 with the UNFCCC numbers on agricultural emissions (Figure 4), shows that the UNFCCC numbers (18.5 Mt CO_2-eq in 2005, not including CO_2 emissions) are about one-third lower than the Van Leeuwen figures (27.8 Mt CO_2-eq in 2005, including CO_2 emissions). The reason for this is that Dutch agriculture, especially greenhouse horticulture, is very energy intensive and is therefore a large CO_2 emitter. The UNFCCC agricultural emissions are about 40% of total emissions from the agri-food chain, as defined by van Leeuwen (2012).

Figure 6 shows the relative contributions of the Dutch agri-food sector to value added (GDP), employment, energy use and GHG emissions. The Dutch agri-food sector emits a relatively high volume of GHG emissions in comparison to what it contributes to value added and employment (van Leeuwen et al., 2012).

Figure 6 Relative contributions of the Dutch agri-food sector to value added, employment, energy use and GHG emissions in 2010.



Source: Van Leeuwen et al. (2012)

The UK Department for Environment, Food and Rural Affairs approaches the agri-food sector from a consumption perspective. It therefore takes account of the international trade in agri-food stuffs and, in an experimental way, estimates the volume of GHG emissions that are 'embedded' in imports and exports. Another innovation of the UK approach is that it includes estimates of GHG emissions associated with food shopping, storage and preparation by UK households. In comparison to the Dutch accounts, the UK has less detail on GHG emissions from input supplying industries as it only accounts for electricity and fertiliser production. Table 2 provides information on GHG emissions for the UK agri-food sector in 2010.

Table 2 GHG emissions from the UK agri-food sector in 2010 (million tonnes of CO2-eq.)

Subsector	GHG emissions (million tonnes of CO2-eq.)
	2010
Agriculture and fisheries	54
Processing industry	13
Fertiliser	3
Commercial transportation	12
Retail	11
Catering	7

Households	19
Net trade (imports – exports)	77
Agri-food total	195

Source: DEFRA (2012c)

Leaving out the net trade component (that records foreign emissions), UK agri-food emissions of (195 – 77 =) 118 million tonnes in 2010 were 20% of total UK GHG emissions.

The UNFCCC agricultural emissions are about 20% of the total emissions from the agri-food chain as defined by DEFRA (2012c), or 37% if one leaves out the net trade component.

Information on GHG emissions of the agri-food sector in other Member States is more scattered. In our case study countries Italy and Spain no information on total emissions from the agri-food sector as defined in our study are available.

6 Greenhouse gas mitigation policy instruments

In our current research, a number of GHG mitigation policy instruments have been identified across EU member states. A distinction can be made between policy instruments that are specific to the sector and more general policy instruments that affect parts of the agriculture and food sector, such as instruments that focus on energy-efficiency and GHG savings in manufacturing, housing and transport.

In a recent survey of climate change policies in agriculture, the consultancy firm Environmental Resources Management (ERM) (Fernagut et al., 2011) concluded that climate change policies for non-CO_2 GHG are relatively new. Emissions reductions in agricultural sectors over the past two decades are the result of autonomous developments and policies such as the Nitrates Directive and the Water Framework Directive. Nevertheless, Member States are developing policies and strategies for reducing non-CO_2 GHG in agriculture. Policies range from direct payments for sustainable production, subsidies for biogas use, and partnerships with the private sector. According to ERM, financial incentives under the form of direct payments or subsidies for adopting measures and/or technologies appear the most commonly used policy instruments.

Most of the instruments applied have a voluntary nature, and relatively many are directed towards research and development and dissemination of knowledge. In a number of countries (Spain, Italy) policy instruments are often applied at the regional (sub-national) level and there is usually little publicly available information on their effectiveness. Many agricultural GHG mitigation policies across the EU are still in an explorative phase. For example, in the UK the GHGAP (Greenhouse Gas Action Plan) is a voluntary instrument launched by the UK farming industry in 2011 to reduce emissions in the agricultural sector. At

this moment, however, the GHGAP instrument focuses on communication strategies, the development of sector roadmaps and working together with DEFRA to monitor GHG emissions. In a second stage best farming practices will be promoted, and only later will GHGAP activities become more targeted.

In this chapter, we will take a closer look at the current policy instrument mix in three case study countries: the UK, The Netherlands and Italy. For the country-specific information, we are indebted to the research of three master-students (Ginther, 2013; de Vries, 2013; Wirth Benedetti, 2013). A similar research in Spain did not produce a useful overview of policy instruments. On the basis of the case study research and of the consultation of other sources of information it seems that Spain has no policy instruments to reduce GHG emissions from agriculture, except perhaps for those that are related to the CAP.

Our focus is on policy instruments that target agricultural emissions and instruments that directly target other parts of the food supply chain. For the analysis of more general GHG reduction and energy-efficiency policies in industry, housing and transport we refer to the CECILIA2050 country reports. In addition to the country studies we analyse the promotion of agricultural biogas at the EU27 level.

6.1 United Kingdom

The GHGAP is a voluntary instrument launched by the UK farming industry on the 29th of March 2011 with the primary aim of reducing emissions in the agricultural sector (Barclay, 2011). Steered by officeholders from the National Farmers Union (NFU) and the Country Land and Business Association (CLA), it has set a reduction target of 3MtCO_2-eq. by 2022 compared to a 2007 baseline (GHGAP, 2011; DEFRA, 2012a). As a reaction to the governments Low Carbon Transition Plan in 2009, the first Framework for Action was developed in February 2010 by an industry led partnership of initially 12 industries (GHGAP, 2011).[10] The Framework for Action describes how the sector can meet this 3MtCO_2-eq. reduction. One way could be via increasing production efficiency whilst at the same time reducing emissions per unit of output with mostly cost-negative or cost-neutral approaches (GHGAP, 2011; Drummond, 2013; Barclay, 2011).

The plan has key priority actions; the GHGAP is promoting production efficiency, which will simultaneously result in GHG emission savings (Fernagut et al., 2011). In addition, it is contributing in the protection of water, soils and biodiversity as they can be produced more

[10] Some of the initial organisations do not exist anymore. In 2013 the GHGAP is consisting of ADAS, AEA (Agricultural Engineers Association), AHDB (Agriculture and Horticulture Development Board), AIC (Agricultural Industries Confederation), BPC (British Poultry Council), CLA (Country Land and Business Association), LEAF (Linking Environment and Farming), NFU (National Farmers' Union), NIAB-TAG (National Institute of Agricultural Botany – The Arable Group), ORC (Organic Research Centre). In addition, the AHDB is made up of 6 separate sectoral organisations (covering dairy, livestock, arable crops, horticulture, pigs and potatoes).

efficiently and make less use of resources. GHGAP sets out pathways on how technical advice can be improved to motivate behavioural change. Also, GHGAP is trying to find a way in monitoring the sector (GHGAP, 2011). Next, the GHGAP is trying to reach the reductions by making the most out of existing initiatives such as roadmaps and 'tried & tested' and will report the progress made by farmers and land managers. These farmers will improve their use of energy, nutrients and their own carbon footprint. GHGAP aims at contributing to the competitiveness of farmers by providing them with the tools and knowledge to improve the efficiency of resource and energy use (GHGAP, 2011; The CCC, 2013). The GHGAP is complying with the voluntary agreement to reduce the need for regulations (GHGAP, 2011; Drummond, 2013). In other words, the GHGAP is an overarching strategic plan, which enhances the linkages between existing initiatives and industry roadmaps and works with retailers and supply chain organisations via food chain associations through bilateral relationships with individual retailers. To reach the targets on-farm actions are encouraged by GHGAP. Roughly it consists of four guidelines; (1) adopting best practice in soil and land management, (2) achieving more efficient crop and grassland production, (3) implementing more efficient management systems for livestock, and (4) to be more efficient use of on-farm energy and fuel (GHGAP, 2011). The livestock sector is already providing roadmaps for aligning the GHGAP with existing activities (DEFRA, 2012a).

The GHGAP is divided into three phases. The first phase (2010–2012) is focused on the establishment of key activities for future implementation, such as communication strategies, identification of key actors that are able to deliver GHGAP activities and the development of sector roadmaps and working together with DEFRA to monitor GHG emissions. Also, a feasibility study for an eventual Information Hub will be carried out. In phase two (2012–2015) the partnerships will establish key messages and promote best farming practices in different 30 sectors. The Steering Group takes care of the GHG Data Management and Modelling Project that is being used to understand current GHG levels better. At the end of the second phase, GHGAP wants to have achieved a high awareness level in all farming sectors with an increased uptake of the key activities (GHGAP, 2011; DEFRA, 2012a). In the last phase (2015–2020) the GHG inventory will report its outcomes, which will result in more targeted GHGAP activities and a vast majority of farmers to adapt the on-farm actions for their farm-type by 2018. They will be aware of the economic benefits of these on-farm actions and these will come together with more positive supply chain levers. A common monitoring method will be developed by the GHG inventory research, which is funded by government (GHGAP, 2011; DEFRA, 2012a). However, in the GHGAP there are some significant challenges to overcome. First of all there will be a technical difficulty in reducing emissions in the agri-food sector due to the complexity of the biological systems that have to be dealt with. There is uncertainty about the emissions in food production systems, and they are influenced by external conditions such as temperature and difference in soil (GHGAP, 2011; DEFRA, 2012b). This will imply that there is no 'one size fits all' solution in this sector. Many traditional farmers are reluctant to change, or at least the adoption of new technologies and approaches can be slow. In this sense, motivating farmers remains difficult. In addition, the state advisory system is privatised and this has resulted in a complex network

of advisory agencies; now expertise is sometimes limited and difficult to reach for farming businesses. In short, for the individual farming business a lot of trade-offs are to be made (GHGAP, 2011).

6.2 The Netherlands

The structure of agriculture in The Netherlands is specific because of its unusually large greenhouse horticulture sector. Since the early 2000s, horticulture has a share of 60% in agricultural value added (van Leeuwen et al., 2012).

The Netherlands has had active energy-efficiency policies in greenhouse horticulture since 1993. These policies had the form of negotiated agreements between the government and the sector and were supported by subsidies and tax incentive schemes. The latest negotiated agreement was called the GLAMI (Covenant Greenhouse Horticulture and the Environment) agreement and it ran from 1998 to 2010. In terms of energy-efficiency (energy input per product produced), the objective was an increase of 65% in 2010 in comparison to 1980. This objective has been (more than) achieved. Despite a doubling of total physical production over the period 1980-2010, CO_2 emissions of the sector remained constant since 1990 or decreased when CO_2 emissions associated with the outside sale of electricity generated by CHP is subtracted. An ex ante assessment of the GLAMI agreement estimated that the agreement would result in a reduction of CO_2 emissions (in comparison to business as usual) of 1.5-2 Mt CO_2 per year.

A broader picture of policy instruments in the agri-food chain and a preliminary assessment in terms of 'optimality' is based on a Parliamentary Review on climate and energy policies the period of 1989–2012, commissioned by Dutch Parliament (Tweede Kamer der Staten-Generaal, 2012), and carried out by CE-Delft and IVM-Amsterdam. It provides the most comprehensive picture on climate policy instruments in the Netherlands to date.

The aim of the Review was to identify the effects and costs of climate and energy policy instruments. The Review did not focus on the sector agri-food, but followed a more traditional sector classification, including Agriculture, Energy, Industry, Built Environment, Transport, Non-carbon GHG, and Foreign Emission Reductions. A combination of the sectors Agriculture, Industry, and non-carbon GHG gives an indication of the various policy instruments that have been implemented in various parts of the food supply chain. Table 3 presents the findings of ex-post evaluations on the effectiveness and cost-effectiveness of these policy instruments (de Vries, 2013).

Table 3 Ex-post evaluations of the (cost-) effectiveness op policy instruments in the agri-food sector

Ex-post evaluations on (cost-)effectiveness of policy instruments in the agrifood sector (PR2012)			
	EFFECTIVENESS relatively HIGH (> 1 Mt CO_2-eq/yr)	**EFFECTIVENESS relatively LOW (< 1 Mt CO_2-eq/yr)**	**EFFECTIVENESS unknown, unsure, or not unequivocal**
COST-EFFECTIVENESS relatively **FAVOURABLE** < € 10 / ton CO_2-reduction	EIA-**industry**	- EPC/EPN Building Decree - Energy label cars, + subsidies and fiscal incentives	
COST-EFFECTIVENESS relatively **UNFAVOURABLE** > € 10 / ton CO_2-reduction		-MJA mushrooms and bulbs - EU-ETS-industry	MJA2 (= non-ETS-industry)
COST-EFFECTIVENESS unknown, unsure or not unequivocal		- (Regulatory) Energy Tax - Covenant Benchmarking	- EIA/VAMIL-**agriculture** - GLAMI-covenant - EM-law agriculture - Various subsidies - MJA1, MEE, MJA3

EIA-industry: Energy Investment Allowance for Industry (1997-)
EPC/EPN Building Decree: Energy Performance Coefficient/Energy Performance Standard for buildings (1996-)
MJA: Multiannual Agreement on Energy (MJA1: 1990-1999; MJA2: 2001-2008; MJA3: 2008-)
EIA/VAMIL-agriculture: Energy Investment Allowance (1997-) and Arbitrary Depreciation for Environmental Investments (1991-)
GLAMI-covenant: Covenant Greenhouse Horticulture and the Environment (1998-2010)
EM-law agriculture: Environmental Management Act (energy-efficiency standards) (1993 -)
MEE: Multiannual Agreement Energy for EU ETS firms (2009-)

On this subsample of policy instruments, the Review concluded on:

- **Effectiveness**: in 'Industry' (including food manufacturing industry) fiscal incentives for energy saving (EIA/VAMIL) are highly effective. The effectiveness of all other instruments is low or unsure/unknown/ unequivocal.
- **Cost-effectiveness**: fiscal incentives for 'Industry' (EIA/VAMIL) are favourable. Also some decrees, subsidies and other specific fiscal incentives are cost-effective. Cost-effectiveness is low or unsure/unknown/ unequivocal for all other instruments.
- **Effectiveness and cost-effectiveness combined**: only one instrument (EIA) in 'Industry' combines high effectiveness with favourable cost-effectiveness.

Covenants are a popular policy instrument in the Netherlands, probably coinciding with the so-called Dutch 'Polder-model': intensive dialogues between stakeholders. Some current covenants in the agri-food sector are the Agrocovenant, the programme 'The greenhouse as energy source', and the Multiannual Agreement 3 (MJA3).

The Agrocovenant is a covenant between Government and (part of) the agri-food sector. It sets targets on emissions. Progress is monitored by Agentschap NL (Agentschap NL, 2011). The conclusion in the 2011 evaluation (Agentschap NL, 2011) is that objectives on GHG-emission reduction and energy saving are reached. The Agrocovenant does not cover the horticultural sector, as this has the special programme 'The greenhouse as energy source'. According to a recent evaluation CO_2 emissions decreased but energy-efficiency went down slightly (LEI, 2012).

For the food industry the MJA3-covenant is relevant. It is voluntary covenant between Government and non-ETS-industry and aims at 30% energy-efficiency improvement from 2005 to 2020 (= 2% per year). A recent evaluation suggested that the agreed energy-efficiency improvement might be reached, but that the administrative burden is too high (Ecorys, 2013). The EIA-investment allowance and the energy tax would be more cost-effective. The Environmental Management Act has provisions that allow authorities to enforce cost-effective investments in energy saving (with pay-back times of 5 years or less). These provisions are meant to provide enforcement pressure for MJA3, but are, in practice, only relevant for laggards.

Overall it can be concluded from the Dutch experience that fiscal incentives and subsidies are generally effective in stimulating technologies that are at the stage of innovation and initial market introduction. The energy tax was not very effective in reducing carbon emissions because of its regressive tariff structure with near zero marginal tax rates for large businesses. Standards, as formulated in the Decree on Horticulture, are effective when they are technology neutral, directed towards specific targets, generic in nature and properly enforced. Information and education are above all effective when there are cheaper routes to emissions reduction of which the parties in question are unaware. There is little to no evidence that Dutch voluntary agreements have had any real effect. Voluntary agreements should at most be used only as a complement to more effective instruments, not as an alternative.

In the Dutch context, monitoring and enforcement are generally not considered to be a serious problem. The relevant authorities do, however, set their own priorities when it comes to enforcement, and this sometimes leads to a de-facto laxer enforcement regime than was envisaged by the legislator (e.g. in the case of the energy savings provision of the Environmental Management Act). The political acceptance of the current instrument mix by firms and business is large, most likely because it is to a large extent shaped by their preferences (voluntary agreements, subsidies and tax exemptions).

6.3 Italy

GHG mitigation for Italian agriculture is to a large extent driven by the CAP, especially by its Rural Development budget. Rural Development in Italy is elaborated in 21 regional Rural Development Plans (RDPs). The Italian RDPs are planned to support a range of activities that can also contribute to the reduction of GHG emissions. The European Agricultural Fund for

Rural Development (EAFRD), established by Regulation (EC) 1290/2005, complements national, regional and local actions. In particular, it aims to strengthen the management and controls of the rural development policy for the period 2007-2013. At the initiative of the Member States, the Fund may finance up to 4% of the total amount for each programme, measures concerning the preparation, management, monitoring, evaluation, publicising and control of programme assistance. This means that the RDPs are quite dependent on available regional resources. RDPs are divided into four axes of intervention divided into measures, each of which is dedicated to a particular aspect of the development of the agricultural sector. For the purpose of this research, the measures contained in Axis 2 are the most relevant, as it is indicated as the main pillar to address climate change in Italy.

The allocated public aid for Axis 2 amounted to 980 million euro (INEA, 2013). More than 82% of funding affects measures to promote the sustainable use of agricultural land, where agri-environmental measures account for about 49% of the entire axis, with total payments of 479 million euro; while the remaining 18% is distributed among measures for sustainable use of forestry land. Following the CAP Health Check revision in 2008, new strengthened operations have been implemented for environmental protection. These are particularly related to the promotion of sustainable agricultural and forestry management practices; followed by investments in new environmental technologies in agricultural holdings, e.g. for soil erosion, water contamination, manure management, energy saving and training and advice on climate change mitigation. Amongst the priority objectives of Axis 2 figures the reduction of GHG emissions through improved soil management practices and land use changes (conversion of arable land to pastures), next to the protection of water resources and the increase of organic matter in soils.

Table 4 Some measures from Italian RDP's that have a direct or indirect effect on GHG mitigation from agriculture

measure	description
Measure 214	agri-environment payments for organic farming, conservation agriculture and integrated farming
Measure 221	actions aimed at the afforestation of agricultural land which directly contributes to the uptake of CO_2 emissions
Measure 123	energy saving investments such as energy efficient buildings, installations, glasshouses and use of new materials
Measure 311	diversification into non-agricultural activities. Support activities for the development of renewable energies, in particular biogas production using organic waste and processing of agricultural/forest biomass, and has the potential effect to reduce CH_4 emissions and substitute for fossil fuels

Source: Wirth Benedetti (2013)

Two recent factors can hamper the effectiveness of the RDPs: the first is that from the end of 2011, there has been the tendency towards a general tightening of access to credit. During

2012 cases of credit rationing have created more difficulties for small businesses and this gap does not seem to shrink in the first months of 2013: in March, for small businesses the chance of not getting the requested funding was, on average, almost twice that of the average of large enterprises. Secondly, according to the National Institute for Agricultural Economics Research (INEA) and confirmed by one of the interviewees, in 2010, national agricultural policy was affected by a general containment of budget provision, cutting down to € 73 million the originally allocated three-year provisions of € 110 million for sector plans envisaged under Law 296/2006 (INEA, 2011). In fact, the progress of public spending for each program under the regional RDPs, is still of great concern, due to the existing disparities between regions. The discrepancy goes from 74.02% in the Autonomous Province of Bolzano to 32.93% in Campania, which along with Basilicata, Molise, Lazio and Abruzzo, represents the program group most at risk of having to return unused funds in the final management stage for RDPs set up in the 2007-2013 programming period (INEA, 2013).

The regulation on incentives for self-produced electricity from renewable sources has been translated into a growing interest in biogas plants. A feed-in tariff was introduced in Italy with the Finance Act of 2008. Its application is limited to plants which became operational after December 31, 2007. It consists of a monetary incentive, which is granted for the net electricity supplied to the grid. It is a benefit designed to promote small installations (with average annual capacity not exceeding 1 MW), simplifying procedures and ensuring a fixed return and it is extended to all renewable sources (with the exception of solar energy), granted for a period of 15 years. In order to access the tariff, it is essential that the plant has obtained from the GSE (Grid provider) the IAFR (plants using renewable sources) certification. The Legislative Decree n. 28/2011, established that the tariff applies "also to biogas plants owned by farms or managed in connection with agricultural, food processing, farming and forestry enterprises". Moreover, for these plants it is allowed to accumulate Green Certificates with other national, regional, local or community incentives, not exceeding 40% of the cost of the investment (INEA, 2011). This decree foresees incentives on biogas and biomass and their production through organic material to be collected within 70 km from the plant itself.

The most numerous bio-energy installations, are those fuelled by biogas (66%), followed by biomass (20%) and finally bio-liquids (14%). However, 53% of power is produced by plants burning biomass, 26% from bio-liquids and only 22% from biogas, due to the low average size of plants (just over 1 MW), while biomass and waste plants reach about 9 MW on average. In March 2010, on a total of 619 plants were counted, from which 273 fuelled by biomass from agro-livestock, and 32 by effluents from agri-industry (INEA, 2013).

According to provisional data for 2010 from INEA, it seems that national and regional incentives have led to 30% increase in renewables between 2008 and 2010. The increase in the number of biogas generation plants continued in 2010, following the introduction of a feed-in tariff pursuant to Law no. 99/2009. Data available show that 75% of agricultural and livestock plants are already operational, raising installed power from 32 MW in 2007 to 350 MW in early 2011 (INEA, 2011).

The incentives on biogas are appreciated especially by farmers who see in the production of this energy source a new form of diversification of income and a way to get the possibility of gain and long-term savings.

There are a number of private initiatives in Italy that are worth mentioning. One is the voluntary carbon market 'Carbomark' set up from the Veneto Region, the Universities of Padova and Udine, the research institute IPLA and co-financed by the EU project programme 'LIFE'[11]. Carbomark activities aim to set up a local market for carbon credits both by developing transparent carbon offsetting methods and by defining the legal aspects of the market. The main objective of this project is to actively involve local players, such as forest owners, local authorities and SMEs (small and medium enterprises). The market service started in September 2010, when local (in the Veneto and Friuli Venezia Giulia Regions) SMEs had the opportunity of buying local carbon credits to offset their emissions. Among the aims of the project figure the estimation of the service that forest ecosystems provide in terms of carbon sinking; promotion of offset strategies by local administrations; raise SMEs awareness of the importance of mitigating their impact on the environment. The project is mainly involving agro-forestry activities, therefore it should be analysed more in depth by further research. For the purpose of the paper it is mentioned as a voluntary initiative involving both public and private sector, which, if funds will not be cut, can mean an important instrument to market carbon credits on a national base and therefore offset CO_2 through the commitments undertaken

The initiative 'COOP for Kyoto', started in 2006, is an example of voluntary agreements set up by retailers with producers. Coop invited suppliers of branded products to adopt measures to reduce energy consumption in line with the objectives of reducing GHG emissions of the Kyoto Protocol, by providing guidelines for several actions applicable both in terms of management and production plant changes. The data provided by the manufacturers were collected and verified by Bureau Veritas Italy (international organisation that deals with certification and one of the partners in this initiative). It was estimated that until 2008, a reduction of 2.8% of CO_2 emissions was achieved, avoiding 62.175 tonnes of CO_2 considering the business as usual production estimates (Wirth Benedetti, 2013).

The project 'Campagna amica' from the farmers union COLDIRETTI aims at encouraging consumers to buy locally grown products, hence shortening the supply chains and avoiding emissions from the transportation of products. Although this initiative do not target solely GHG emission reduction, they might contribute to curb the emissions in the long run (Wirth Benedetti, 2013).

With the aim of reducing wastage from the food chain, the spin-off 'Last Minute Market' (LMM) was created under the initiative of the University of Bologna. From 2003 it became a business reality and operates throughout the national territory by developing local projects

[11] LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU. Source: http://ec.europa.eu/environment/life/

aimed at recovery of unsold (or non-marketable) goods in favour of charitable organisations. With over 40 active projects in Italian municipalities, provinces and regions, through LMM, institutions see a decrease in the flow of waste to be managed and have more resources for assistance to the most vulnerable of the population (Wirth Benedetti, 2013).

Those kinds of initiatives are growing, but still individual initiatives, which miss an overarching framework, which could help in defining a clear reduction target, lower the costs of implementation by shared responsibilities.

The current situation in Italy, witnesses a lack of national framework setting inter-sectoral targets for lowering emissions from the agro-food sector. There are some implementations of agro-environmental measures contained in the RDPs, but a monitoring and quantification system needs to be set up in order to regulate the accountability of each sector for lowering emissions. Second, the use of wastage deriving from overproduction, food processing and wrong consumption patterns needs to be optimised by reinserting it into the same chain and using it for energy production and by educating consumers to wealthier and healthier diets and habits. It is therefore necessary to bring back consumers' awareness about their place within the food chain. Without a switch to attitudes characterised by sufficiency, there is a danger that many attempts for mitigation remain futile.

Although a simplification of the administrative and bureaucratic procedures would increase transparency and reduce costs, a broader participation of stakeholders and civil society in climate-related policy making, is required in order to avoid planning drawbacks which can limit the effectiveness of the policy objective.

Given the fragmentation of environmental policy initiatives, in order to avoid ambiguities about the respective roles of national and regional levels of government, and to reduce gaps and inconsistencies in the transposition of EU environmental directives, round tables could be organised between the different levels of government in order to update and report on the developments achieved in different areas.

Policies could promote the diffusion of locally grown producer markets, favouring the connection of city's demand to local supply, reducing transport distances, which can curb emissions, and shortening the supply chain which can simplify the application of policy instruments.

Considering the mitigation potential of agriculture, there is opportunity to promote farms that restore environments rather than depleting it, that farm extensively rather than intensively, and from which society can gain multiple benefits, from economic, environmental, and health perspectives.

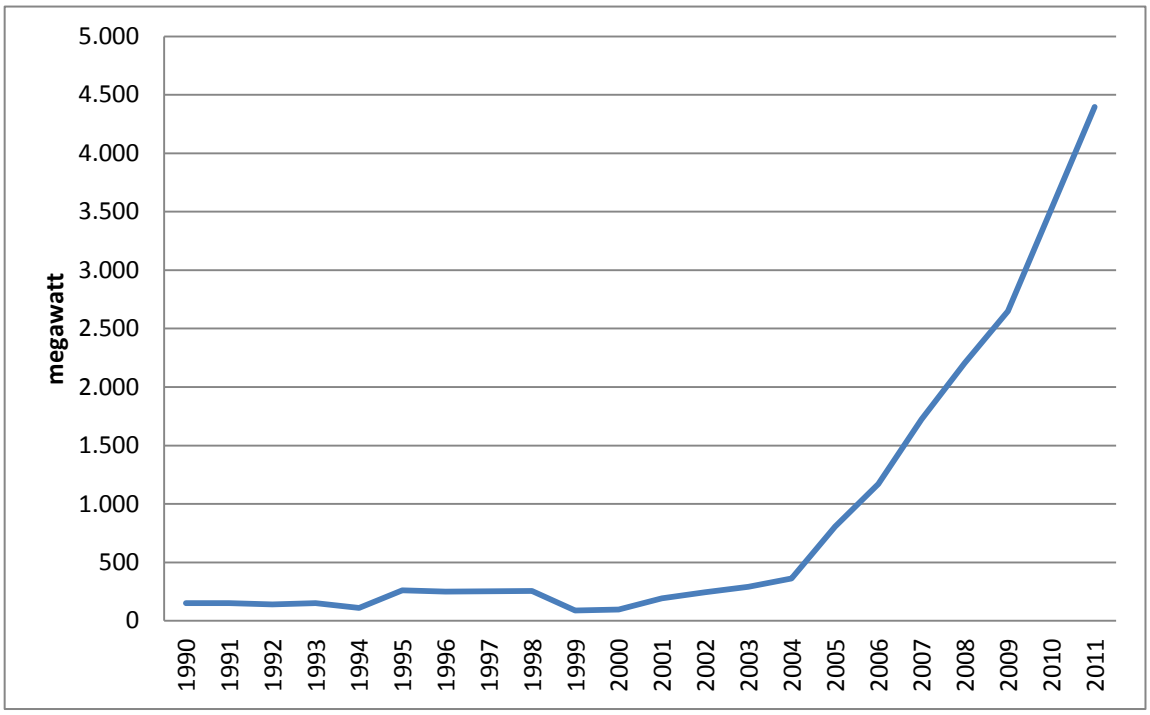
6.4 The promotion of agricultural biogas

Biogas is produced from a number of feedstocks, including landfill waste, sewage sludge, agricultural resources such as manure and by-products and waste of the food industry. Here we focus on the feedstock from agriculture and the food industry. Biogas consists mainly of

CH_4 and CO_2. It is often used in Combined Heat Power installations to produce heat and electricity.[12] From a GHG mitigation perspective, biogas production from animal manure offers the double advantage of avoiding CH_4 emissions during the storage of manure and replacing fossil fuels (for heating and electricity) and their associated CO_2 emissions (AEBIOM, 2009).

Figure 7 shows the evolution of agricultural biogas capacity in the EU over the period 1990-2011. The figure shows that biogas capacity was nearly constant for most of the period, but started to expand rapidly from around the year 2004. Initially this was due to developments in Germany and Austria, but lately biogas capacity also increased in the Netherlands and Italy, and small increases can be seen in a number of other Member States. The total capacity of agricultural biogas in the EU27 was 4379 MW in 2011. To put that number into context, it is comparable to the electric capacity of one medium-sized coal-fired power plant.

Figure 7 Capacity of agricultural biogas production in the EU27 (Megawatt)



Source: Eurostat, Infrastructure - electricity - annual data [nrg_113a]

Figure 8 shows the distribution of agricultural biogas capacity across Europe in the year 2011. Germany and Austria have 78% of the capacity.

[12] It can also be used differently: i.e. to produce electricity and heat and/or steam alone, and it can be upgraded to biomethane to be injected in the natural gas grid or as a vehicle fuel.

Figure 8 Distribution of agricultural biogas capacity across Europe

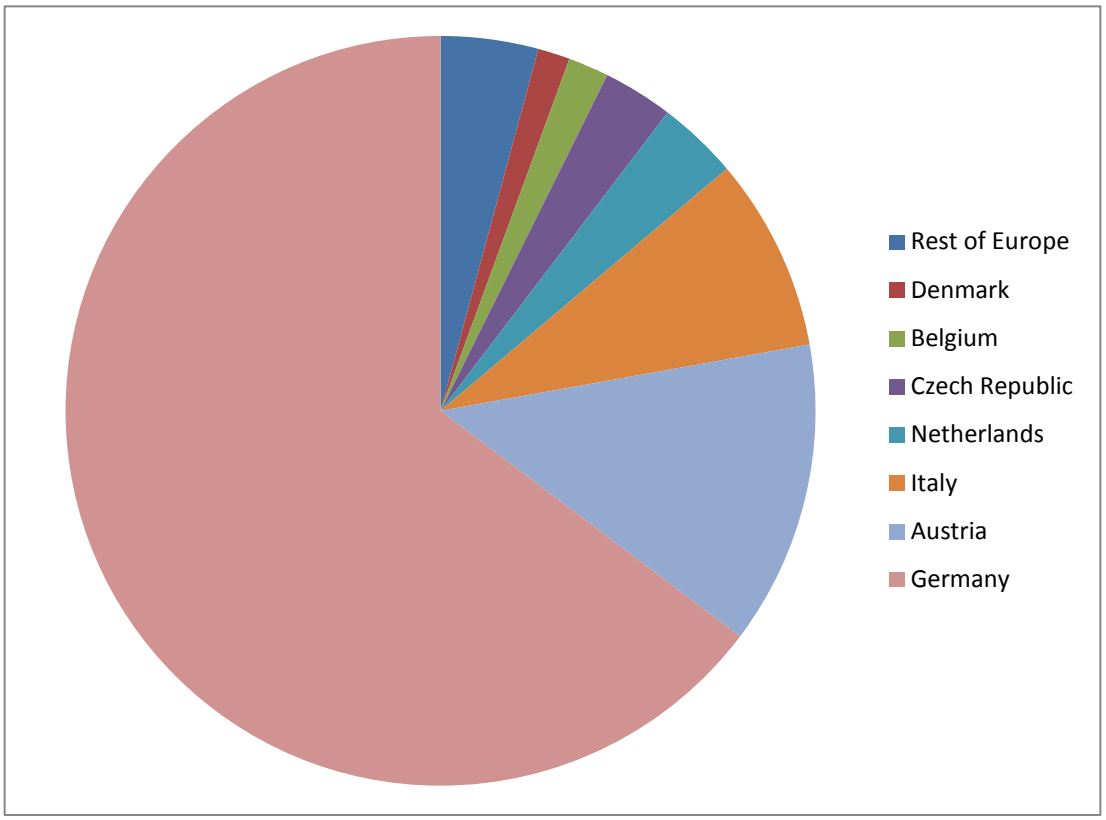


Table 5 shows the incentives (in terms of Eurocents per kWh of electricity) that EU Member States provide to agricultural biogas generation. The incentives in the form of feed-in tariffs and premium tariffs range from €ct 3.5/kWh to €ct 25/kWh depending on country, capacity of the plant, and a host of other country-specific variables.

Table 5 Biogas incentives in EU Member States (2013)

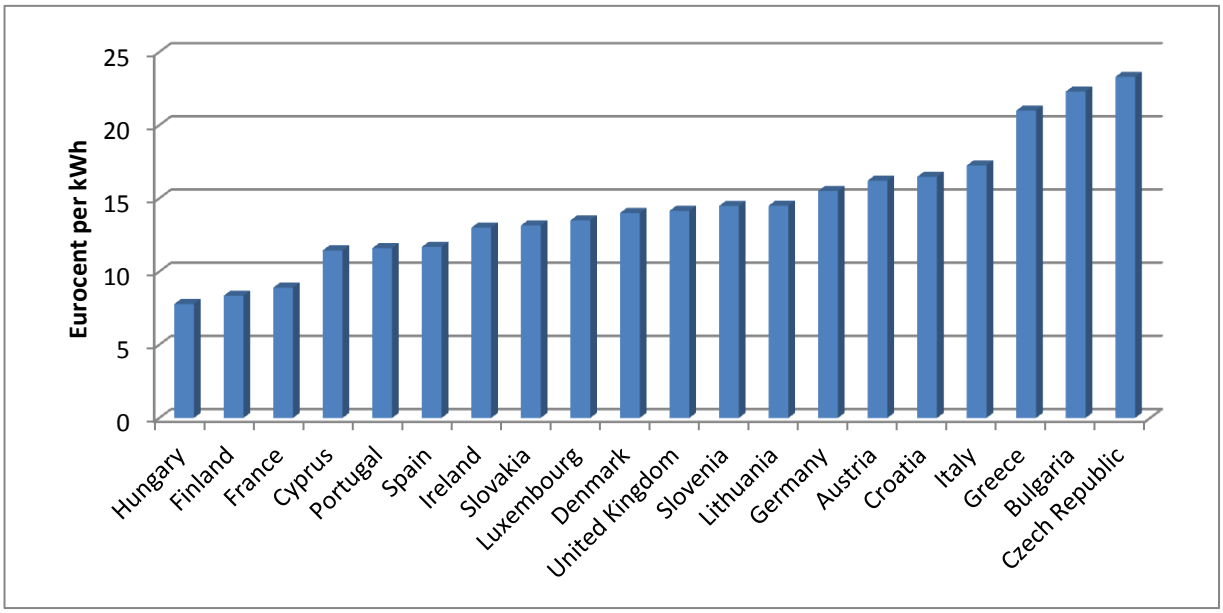
	Instrument	Legal Act	Rate €ct/kWh	Remark
Austria	Feed-in tariff	*ÖSG 2012*	12.93-19.50	Depending on maximum capacity
Bulgaria	Feed-in tariff	*ERSA*	20.5 – 24.1	Depending on plant capacity
Croatia	Feed-in tariff	*Tariff system for RES-E*	14.5 – 18.46	Depending on plant capacity; there may be a bonus of up to 15% on top of the tariff
Cyprus	Premium tariff	*SSRES 2012*	11.45	
Czech Republic	Feed-in tariff	*Act on Promoted Energy Sources*	13.7	Up to maximum capacity of 550 kW
	Premium tariff: green bonus	*Act on Promoted Energy Sources*	9.6	Up to maximum capacity of 550 kW
Denmark	Premium tariff	*Law on the Promotion of Renewable Energy*	11 - 17	Producer can chose between maximum bonus (difference between market price and statutory maximum) or guaranteed bonus
Estonia	Premium tariff	*ELTS*	5.37	Fixed bonus on top of market price (this is only the bonus)
Finland	Premium tariff	*Act No. 1396/2010*	8.35	This is the target price, plants that qualify for heat bonus get €ct 5/kWh extra
France	Feed-in tariff	*Arrêté du 19 mai 2011*	8.121 – 9.745	A bonus of €ct 4 can be applied to plans with energetic performance of at least 70%
Germany	Feed-in tariff	*EEG*	6 - 25	Depending on plant size and fuel
Greece	Feed-in tariff	*Law No. 3468/2006*	20-22	Depending on plant capacity
Hungary	Feed-in tariff	*Decree No. 389/2007*	3.5 – 12.06	Depending on capacity, time of day and time of week
Italy	Premium tariff		10.9 – 23.6	Based on formula
Ireland	Feed-in tariff	*REFIT*	10.4 – 15.6	Depending on capacity and technology (CHP or not)
Lithuania	Feed-in tariff	*Law on Energy from Renewable Sources*	13 - 16	Depending on plant capacity
Luxembourg	Feed-in tariff	*RGD du 8 février 2008*	12 - 15	Depending on plant capacity
Netherlands	Premium tariff	*SDE+*	€ 19.444 – 31.10 per GJ	Difficult system; total amount of subsidy is capped
Portugal	Feed-in tariff	*Tarivas feed-in*	11.5 – 11.7	Depends on complicated formula
Slovakia	Feed-in tariff	*Regulation No. 225*	11.813-14.488	Depends on feedstock used

Slovenia	Feed-in tariff	*RS 37/2009*	12.915 – 16.056	Depends on capacity and feedstock
Spain	Feed–in tariff	*Régimen Especial*	8.8679 – 14.5042	Depending on plant capacity; for the first 15 years
United Kingdom		*FTO 2012*	10.7 – 17.6	Depending on plant capacity

Source: http://www.res-legal.eu/compare-support-schemes/

Figure 9 shows the maximum incentives per country. For most countries the tariff rate is inversely related to plant capacity. These maximum tariffs could therefore be applicable to small farm-based biogas installations. A comparison between Table 5 and Figure 9 shows that countries with large biogas capacities usually have above-average feed-in tariffs (e.g. Germany, Italy, Czech Republic, Austria).[13]

Figure 9 Maximum incentives per country (Eurocents per kWh biogas-electricity)



7 Stakeholders

This chapter reports on the stakeholder analysis conducted for the four Member State case-studies: United Kingdom (UK), Netherlands, Italy and Spain. It gives insights on key stakeholders' perceptions of the policy mix in the respective countries and the feasibility of

[13] According to the Eurostat statistics Bulgaria and Greece have no biogas capacity.

possible future developments. For this chapter we are heavily indebted to the research of four master-students (Ginther, 2013; de Vries, 2013; Wirth Benedetti, 2013; Arnaudova, 2013).

7.1 Introduction

Stakeholders are individuals and organisations "who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion" (Yang et al., 2011, p.146). In other words, any individual or group, who has an interest in or is impacted by the project. In this report, four stakeholder divisions were made, i.e. Government, private sector, interest groups and experts. This division is widely used in the literature because it represents key societal actors where stakeholders can be derived from. To be able to search for optimal policy it is vital to look at all these four groups as they are able to influence or contribute to the policy-making process. Government needs to be included as government is the only actor that can regulate. The category private sector consists of companies, sector associations, and cross-sectoral associations. NGOs and consumer associations and to a lesser extent the media, are part of the category interest groups. Expert systems, such as research centres, consultancies, planning offices or advisory boards have specialized knowledge of the sector and they can give advice on where the main difficulties lie. Major stakeholders from all four categories were selected for the individual case-studies. Stakeholders were identified on the basis of literature and web research and in consultation with expert institutions from the four member-states (including those participating in the Cecilia project). These stakeholders were then invited to participate in this study and (mostly face-to-face) interviews were conducted with those who responded positively to our invitation. All interviews were conducted in May 2013, in the native language of the respondents and translated in English for the purposes of this report.

Interview questions

The following questions were formulated for the purposes of this study.

Table 1. Stakeholder questionnaire

#1.	In your view, which are the most important mitigation measures on climate change in regard to the agri-food sector?
#2.	What are the most important policy instruments in realizing these measures in your view that are in place at the moment?
#3.	How would you classify and evaluate the environmental effects/results of these policy instruments?
#4.	How would you classify and evaluate the economic costs and benefits of these policy instruments?
#5.	How would you evaluate equity and fairness concerns, associated with these policy

	instruments?
#6.	Given your previous responses, do you think this is the best instrument mix to mitigate climate change in the agri-food sector?
#7.	If not, what would be the most desirable instrument mix in your view? Why?
#8.	How can your desired instrument mix be realized? Which are the major constraints and opportunities towards achieving such a mix in your view?
#9.	Do you have any other comments or suggestions on the issue of policy instruments in the agri-food sector in regard to climate change?

7.2 United Kingdom

Ten stakeholder interviews were conducted in the United Kingdom (UK) with the following stakeholder groups: From expert groups, the Committee on Climate Change (CCC) (independent organisation but funded by DEFRA), the Food and Climate Research Network (FCRN), the Scottish Agricultural College (SAC), the Carbon Trust and the consultancy firm Ricardo-AEA were interviewed. From the private sector, two major retailers of the agri-food sector were interviewed: Waitrose with a market share of 4,9 % and 291 stores, is the 6th largest grocery market in the UK.[14] Marks & Spencer is a luxury warehouse with 703 shops throughout the UK. Its market share is 3.8 % in the food sector.[15] Interest groups included the National Farmers Union (NFU), an influential trade association since its establishment in 1908, representing the interests of the farmers.[16] Linking Environment and Farming (LEAF), a charity organisation aiming to enable sustainable farming that enriches the environment and that engages local communities, was also included in this category.[17] LEAF members are individual farmers but also retailers and other businesses.

In your view, which are the most important mitigation measures on climate change in regard to the agri-food sector? What are the most important policy instruments in realizing these measures in your view that are in place at the moment?

All stakeholders agreed that no real policy instruments directly targeting climate change mitigation in the agri-food sector can be identified at the moment. For instance, the Nitrate Vulnerable Zones Directive was considered to contribute to emissions' reduction in the agricultural sector as a result of reduced fertiliser use, but only indirectly. Likewise, the

[14] Available at: http://grocerynews.org/2012-06-16-08-27-26/supermarkets-market-share/grocery-stores, and http://www.guardian.co.uk/business/2013/apr/28/waitrose-buffet-supply-deal-eurostar accessed at 3rd of May 2013.

[15] Available at: http://annualreport.marksandspencer.com/strategic-review/performance-against-our-plan/index.html accessed at 3rd of May 2013.

[16] Available at: http://www.nfuonline.com/about-us/history/ accessed at 3rd of May 2013.

[17] Available at: www.leaf.uk.org accessed at 3rd of May 2013.

Climate Change Levy and the Climate Change Agreements were mentioned, but only regarding the processing part of the supply chain while their impact was considered minimal. The GHGAP (Greenhouse Gas Action Plan) was evaluated as a good initiative on paper but with no practical outcomes in emissions' reduction yet. The Feed-in Tariff and the Renewable Heat Incentive, although only indirectly targeting agriculture, were regarded as great incentives for the future uptake of renewable energy, according to the NFU. In contrast, the Carbon Reduction Commitment was considered a disincentive for business by the private sector.

How would you classify and evaluate the environmental effects/results of these policy instruments? How would you classify and evaluate the economic costs and benefits of these policy instruments? How would you evaluate equity and fairness concerns, associated with these policy instruments?

Given the absence of any direct instruments targeting climate change mitigation in the UK agri-food sector, it was difficult to draw conclusions about any actual effects. However, stakeholders provided their views on the importance of the different dimensions of optimality and a possible prioritisation of focus. More specifically, both the government and the private sector argued that cost-effectiveness is crucial as without economic viability farmers would not be able to invest in the future, including investments in mitigation strategies. Regarding the fairness dimension, Marks & Spencer specifically underlined the need for fair and equitable policies in the future but also warned that reaching consensus along the supply chain about what constitutes equitable and fair measures in addressing climate change concerns would be difficult. The Climate Change Committee (CCC) emphasised the need to create consumers incentives to buy 'good' (i.e. low contribution to GHG emissions) food. It further stressed out that in deciding policy options to deliver on-farm emission reductions, policies that adversely impact competitiveness of UK farming, i.e. policies creating a disadvantage for farmers should be avoided. Moreover, it pointed out that the best way to achieve fairness is the provision of an EU-wide level playing field in the agri-food sector. This was considered particularly important for the UK whose main trade partners for agri-food products are other EU member-states.

Given your previous responses, do you think this is the best instrument mix to mitigate climate change in the agri-food sector? If not, what would be the most desirable instrument mix in your view? Why?

All stakeholders agreed that a current climate mitigation policy mix seems to be lacking in the UK. Thus none of the stakeholders perceived the current instrument mix as 'best'. The majority of stakeholders pointed out the urgency to design mitigation policies in the agri-food sector addressing the whole supply chain on both the demand and the supply side. Creating interlinkages along the supply chain was considered key in achieving progress in emissions' reductions. In this context, the suggestion to follow the example of the Dutch

Sustainability Consortium, fostering a consistent approach to making business, products and supply chains more sustainable while linking the individual initiatives present in the sector, was made by LEAF. LEAF also underlined its own contribution to creating interlinkages in the supply chains via Open Farm Sundays where consumers and retailers share information and farmers share best practices.

Moreover, all stakeholders shared the opinion that efficiency improvements in the agri-food sector were crucial. In this context, suggestions made by the CCC and the government focused primarily on improving the competitiveness of farming businesses. To foster efficiency, however, both stakeholder groups emphasised that policies should avoid putting taxes on farmers, e.g. for fertilise use, as this would probably result in higher prices leading consumers to buy imported goods. Instead, improved efficiency via better management was favoured. Further, NFU pointed out that efficiency efforts should take into account the limits of different farming systems as not all farmers can be expected to deliver the same level of mitigation. In addition, the need to embrace contributions from carbon sequestration, the generation of renewable energy and the need for good implementation and spread of good practices were also underlined.

Voluntary approaches coupled with targeted regulation to achieve the emissions' reductions were in general favoured by all stakeholders. Retailers further emphasised the desire for the development of a goal-oriented approach, specifically the setting of overall targets by the government allowing the supply chain leeway on how to achieve these targets. According to the CCC the 'levels of ambition' of any policy framework should only be high enough to allow voluntary initiatives ability to respond., It was further suggested that the government should set 'trigger points' if targets were not met to address any deficiencies. The Carbon Trust, in contrast, was sceptical about the role of governmental policy and would like to see the government supporting rather than directing industry.

Further, it was emphasised that a cornerstone in the making of policy should be taking into account how different environmental and/or social concerns interact with one another. In this context, the Food and Climate Research (FCRN) network pointed out, for instance, that policy measures cannot be evaluated as 'good' if they reduce GHG emissions, but at the same time lead to other unintended consequences, such as an increase in water usage, for instance. Further, it was suggested that mitigation or other environmental measures need to be translated into an increase in shareholder benefits as companies need financial incentives to act responsibly.

How can your desired instrument mix be realized? Which are the major constraints and opportunities towards achieving such a mix in your view? Do you have any other comments or suggestions on the issue of policy instruments in the agri-food sector in regard to climate change?

The majority of stakeholders considered the lack of political will and vested interests as major constraints towards achieving an optimal policy mix. The current market with its

logistical difficulties was also mentioned as a constraint. Further, the number and heterogeneity of stakeholders targeted by the policy instruments was considered a difficulty. In addition, the current short-term focus of policies was mentioned as a constraint. Other concerns included the disconnect between governmental action and vision creating disincentives for business investment in renewable technologies, for instance (according to NFU).

However, stakeholders also identified opportunities that could help overcome the constraints. Specifically, more research and more public procurement were advocated. The development of voluntary measures that complement public regulation was also proposed, as pointed out above. In addition, as underlined earlier environmental targets translated into shareholder benefits, by prioritizing mitigation measures with subsidies, for instance, could be successful in mitigating climate change. Communicative instruments fostering knowledge transfer to create awareness of best practices in the supply chain gets was also favoured. Moreover, the current emphasis on green economy could support the flourishing of sustainable mitigation measures on the demand as well as on the consumption side throughout the whole supply chain.

Stakeholders also expressed their opinions of the recent CAP reform. On the one hand, opinions were positive because a decline in livestock numbers and consequently in emissions' reductions is expected. On the other hand, some stakeholders considered the decline in production as the wrong point of focus due to the future increased demand for food. Instead, the focus should be on efficiency, they argued. Moreover, they expressed the opinion that the targets of emissions' reductions should be set according to the development of production levels and should allow room for fluctuations in the Carbon Budgets.

Conclusion

Summing up, according to the stakeholder interviews, no satisfying climate mitigation mix is in place at the moment, in the UK. The voluntary industry-led initiative GHGAP, which is still in early phases, is currently the only measure addressing the agri-food sector directly but, as yet, there are no measurable GHG emission reductions. Cost-effectiveness, or the economic side of the notion of optimality was considered fundamental for warranting the actual implementation of policy, as supply chain actors are driven financial incentives. Environmental effects were considered important but only after cost-effectiveness is ensured. Fairness concerns are also considered relevant and need to be taken into account in future policies. The development of voluntary initiatives within the context of a broader public framework was advocated by the stakeholders as the best approach to achieve climate change mitigation. In this context, efficiency in farming practices, an integrated environmental approach and interlinkages along the supply chain were proposed as key issues policy-makers should take into account to ensure climate policy optimality in the agri-food sector.

7.3 Netherlands

Interviews were conducted with thirteen stakeholders in the Netherlands. Government representatives included the Ministry of Infrastructure and Environment (with its Department of Climate, Air and Noise) and the Ministry of Economic Affairs (in charge of agriculture). Expert representatives included two renowned advisory and consultancy institutes Netherlands Environmental Assessment Agency (PBL) and the Centre for Agriculture and the Environment (CLM). From the private sector interviews were conducted the chairman of the Netherlands Dairy Farmers Union (MLV), and the Product Board Horticulture (primary production); from the supply side interviews were held with a representative of the Product Board Animal Feed; in manufacturing sustainability experts from the industry and employers association VNO/NCW and the Federation of Netherlands Food and Groceries Industries (FLNI) were interviewed; in retail sustainability managers from the Food Retail Association (CBL) and a major retail chain, AHOLD, were interviewed. Representatives of interest groups included the Society for Nature and Environment (Stichting Natuur en Milieu) and the Network for Vital Agriculture and Food (NVLV).

In your view, which are the most important mitigation measures on climate change in regard to the agri-food sector?

Three policy measures were considered by the vast majority of stakeholders as important:

- GHG emissions reductions, in general, and more specifically in dairy, fertilizer-manufacturing, manure-application, or emissions from peat soils.
- Energy saving, both in the sense of using less energy as such (i.e. carrying out fewer activities that need energy) and energy efficiency.
- The development of renewable energy in any form (bio, solar, wind, geothermal).

Less often mentioned were dietary changes, e.g. less meat consumption, soil conservation and carbon sequestration in soils, and new technologies in animal husbandry.

What are the most important policy instruments in realizing these measures in your view that are in place at the moment?

Market-based ('economic', 'financial') instruments, such as subsidies and tax benefits were seen as useful by more than half of all stakeholder groups. However, on the subject of subsidies government representatives and the representative from PBL expressed reservations due to wrong incentives. Likewise, the Federation of Netherlands Food and Groceries Industries argued that subsidies create market distortion and an uneven playing field. The industry and employers association (VNO/NCW) warned strongly against too much emphasis on exploitation and too little on innovation. The NGOs expressed the wish for

innovation subsidies as particularly relevant. Finally, primary producers mentioned glass-horticulture co-financing, a form of long-term cooperation between government and industry, as a useful instrument in energy saving, while these types of instruments were also supported by manufacturers.

How would you classify and evaluate the environmental effects/results of these policy instruments? How would you classify and evaluate the economic costs and benefits of these policy instruments? How would you evaluate equity and fairness concerns, associated with these policy instruments?

Almost all stakeholders agreed that there has been energy saving and reduction in GHG emissions, however, opinions differed as to how these emissions reductions were achieved. According to the Ministry of Infrastructure and Environment and the PBL, the decrease of GHG emissions in primary production was not due to explicit climate change policy instruments, but because of manure regulations, milk quota, reduction of cattle numbers and technological improvements. Also, VNO/NCW had difficulties to attribute GHG emissions reductions in industry to specific instruments.

Regarding meeting climate targets, both manufacturers and retailers' representatives claimed that reductions were on target (as set by covenants and/or EU ETS). Likewise, the Product Board Horticulture stated that in horticulture energy saving was on target and that it would even improve in the coming years with new cultivation techniques. The Product Board Animal Feed, in contrast**,** indicated that in the feed production chain there have been no policy-instruments to mitigate climate change and therefore no results were visible. Both NGOs were hesitant in their comments. While acknowledging that there have been emission reductions, the Society for Nature and Environment indicated that results were suboptimal due to the lack of emphasis on the consumption side by governmental policies. Likewise, the Network Vital Agriculture and Food stated that many policies were counterproductive, referring specifically to manure injection techniques and to EU-policies on up-scaling, in general, which typically lead to more soil degradation.

Regarding cost-effectiveness, some stakeholders stated that until recently it was not a problem, but the Centre for Agriculture and the Environment expressed the fear that major costs were still to come. The Product Board Horticulture stated that while cost-saving took place along with energy-saving, investments were still huge. On this aspect the Netherlands Dairy Farmers Union emphasized that returns on investment in primary production were very low (almost zero or even negative) compared to industry and that margins were small. The comments from industry ranged from “difficult to say” (FLNI) to “climate change policies should be more than an economic business case only” and also that “there are often unexpected benefits on the way too” (AHOLD) . According to the Ministry of Economic Affairs subsidies on renewable energy worked well, with little administrative burden. This position was supported by the Society for nature and Environment. However, the Netherlands Dairy Farmers Union considered many of the present policy instruments very costly (e.g. manure injection legislation has increased the administrative burden). Likewise, stakeholders criticised

the recent increase of the VAT rate on food products from 6% to 21% which made it more difficult for low-income groups to buy high quality foods with less environmental damage.

Regarding fairness, some stakeholders considered current policies as 'fair' (Product Board Horticulture) and 'balanced' (PBL) or dismissed the question of fairness as "no issue, because every farmer who wanted could benefit" (Ministry of Infrastructure and Environment). However, the Netherlands Dairy Farm Union pointed out that specific measures, like abandoning the tax-incentive on diesel, put the bill on the farmers, meanwhile creating an uneven playing field within the EU. According to the Centre for Agriculture and the Environment, more generally speaking, farmers bear most of the costs. From a slightly different perspective the Network Vital Agriculture and Food added that with the present policies both primary producers and consumers were the losers, while banks, upstream suppliers and manufacturing industry and supermarkets were the winners. According to manufacturing representatives the issue of 'who will bear the cost' deserves further attention as, in the end, the price is or will be paid by the present or future citizens anyway. In this respect also the relatively low energy tax for big industry was discussed. In this context, while the Ministry of Economic Affairs expressed the opinion that an increase of the energy tax in industry would eventually be paid by citizens, the Society for Nature and Environment emphasised that low energy taxes discourage big industry to move to other forms of energy.

Given your previous responses, do you think this is the best instrument mix to mitigate climate change in the agri-food sector? If not, what would be the most desirable instrument mix in your view? Why?

Most stakeholders do not think that the current instrument mix is optimal. As mentioned earlier, market based instruments were generally favoured by most stakeholders. Examples include support for the introduction of sustainability levies (e.g. on polluting processes and on meat), price-incentives (Society for Nature and Environment) and the return to the 6% VAT on food products (Network Vital Agriculture and Food). Regarding taxes, in general, the Ministry of Economic Affairs maintained that the general energy tax has worked well, even though a carbon-tax would have been better, while the Society for Nature and Environment advocated a tax on carbon footprints. Some stakeholders were more sceptical, arguing that "taxes make farmers surly" (Centre for Agriculture and the Environment).

Regarding non-market based instruments according to the Federation Netherlands Food and Groceries Industries, legislation may have worked well in specific cases (e.g. packaging), but not always. The Society for Nature and Environment considered regulation on emissions necessary. The Food Retail Association saw chances for legislation to stimulate innovation. The Netherlands Dairy Farmers Union stressed the need for integral not piecemeal legislation and the Centre for Agriculture and the Environment considered that legislation on transparency of emissions would be necessary.

On voluntary instruments, the popular Dutch practice to make covenants was mentioned favourably by almost half of the stakeholders but critical remarks were reported by the

Federation Netherlands Food and Groceries Industries ("too slow, too little, ambitions too low"). According to the Centre for Agriculture and the Environment, a mutual business-to-business approach as used in industry, would be perhaps more promising, particularly because of the businesses' international networks. This was further supported by the manufacturing and retail industry. Finally, labels and information campaigns were strongly supported by NGOs. While the retailers were not against labelling schemes they expressed the need to remain informative rather than directive ("informed not edited choice"). In contrast, the Product Board Animal Feed warned against too early adaptation of labels, as long as consensus on what type of information should be communicated to consumers has not yet been reached.

How can your desired instrument mix be realized? Which are the major constraints and opportunities towards achieving such a mix in your view? Do you have any other comments or suggestions on the issue of policy instruments in the agri-food sector in regard to climate change?

According to the Ministry of Infrastructure and Environment, PBL and the Centre for Agriculture and the Environment, a major constraint towards an optimal policy mix was the negation of the climate issue for which awareness raising is necessary. Another constraint mentioned by AHOLD was the lack of consumer interest on sustainability issues. The Society for Nature and Environment considered vested interests as a major constraint to further developments. The need for new and better insights was also stressed, particularly with respect to emissions by dairy farms (Ministry of Infrastructure and Environment), the nutrient chain (Dairy Farmers Union), carbon footprints and the biobased economy (Product Board Horticulture)**.**

Comments with respect to general approaches to policy-making were made by several stakeholders, some regarded as constraints, others as opportunities or desirable ways to proceed. Examples include:

- Target the food supply chain as a whole (all).
- Consider climate-policy always in conjunction with other fields: animal welfare, water use, biodiversity (all).
- Relate costs to emissions (Ministry of Infrastructure and Environment).
- Internalize costs (Society for Nature and Environment); consider both short and long term perspectives (e.g. a road map) (Ministry of Infrastructure and Environment).
- Reconsider the concept of growth-for-the-sake-of-growth (Dairy Farmers Union).
- Reinstall the balance between man and nature (closed loop agriculture) (Dairy Farmers Union and Society for Nature and Environment);
- Consider the European (Dairy Farmers Union) and international (Product Board Animal Feed) dimensions too.

- Use the CAP more, in particular the green pillar (Ministry of Infrastructure and Environment).
- Realise a common understanding of the climate issue (agenda-setting) (AHOLD).
- Have high ambitions that stimulate innovation in the interest of all (Federation Netherlands Food and Groceries Industries).
- Evaluate properly: who will pay? Or do we leave the bill for the future generation? (VNO/NCW).
- Take care that evaluations are done by independent institutions (Centre for Agriculture and the Environment).
- Take care of continuity in policies (Ministry of Economic Affairs, PBL, Centre for Agriculture and the Environment).
- Political will is important (Society for Nature and Environment, Network Vital Agriculture and Food and Centre for Agriculture and the Environment).

Conclusion

Summing up, stakeholders in the Netherlands were less critical of the current policy mix in relation to their UK counterparts but had several recommendations for improvement. In general, the private sector was very much interested in clear targets and the need for continuity of government policies, on which innovative strategy and the time span for return on investments (5-10 years) could be based. Interestingly some similar views between business interests and NGOs could be identified, particularly regarding the need to target consumers in future mitigation strategies. Consumers are also considered important in exerting pressure within the food supply chain and could well be the binding factor in the food supply chain, with their diverse links to primary producers, retailers and manufacturers.

7.4 Italy

A total of eleven stakeholder interviews were conducted in Italy. Stakeholders represented all four main groups, amongst which the biggest national farmers union (Coldiretti), the consumers' cooperative operating the largest supermarket chain in Italy (Coop), the Association of Agri-Cooperatives for Rural Development (Legacoop Agroalimentare), the Ministry of Agricultural, Food and Forestry Policies (MIPAAF), the National Institute for Agricultural Economics Research (INEA), the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), the Forestry and Environment Institute (IPLA), the Euro-Mediterranean Centre for Climate Change (CMCC), the Food and Agriculture Organization (FAO), and Slow Food Italia.

In your view, which are the most important mitigation measures on climate change in regard to the agri-food sector?

The four most often mentioned important mitigation measures on climate change in regard to the agri-food sector amongst stakeholders were:

- Energy saving and efficiency measures, both through better technology and through information campaigns targeting both farmers and end consumers.
- GHG emissions reductions, mainly with regards to effective manure management, in fertiliser-manufacturing (using renewable energy) and application (reducing quantity and quality).
- Carbon sequestration, improving forestry and land management to increase the sequestration potential of soils, encouraging more sustainable practices such as in biological agriculture.
- Change in diets and consumption patterns, preferring less carbon intensive products and avoiding unnecessary waste.

Less often mentioned, but still relevant and embedded in the answers were:

- Use of renewable energy, often mentioned together with energy efficiency measures and GHG reduction in general.
- Measures towards the improvement of labelling, preparing the consumers through information campaigns and defining clearly the criteria and indicators used.
- Knowledge transfer to farmers, through information campaigns and advisory programs.

What are the most important policy instruments in realizing these measures in your view that are in place at the moment?

The state of uncertainty in the Italian policy environment targeting emissions reductions from the agri-food sector was emphasised by all stakeholder groups. According to the majority of respondents, the Italian government failed so far to provide an effective strategy to reduce emissions deriving from the agri-food sector, rather delegating it to regional governments. In this regard, the majority saw that in order to improve the quality of the emissions inventory and, even more, in order to assess the effectiveness of mitigation measures on the whole, it is necessary to have frequent and reliable data on farming management practices, collected with the most precise territorial details possible. The possibility of introducing mitigation measures should then be evaluated critically in relation to the territorial and cultural constraints, which may limit the application. It is therefore of great importance that sector statistics improve the capability to provide frequently and with sufficient detail data on the spread of technologies that can mitigate the environmental impact of Italian agriculture. Particularly underlined by the farmers' union and the retailers' group stakeholders was the

inefficiency of current environmental labelling of food products to guide the consumer towards products with lower emissions. A difference can be spotted, however, amongst these two categories: while the former mentioned the arbitrary measurements adapted due to lack of guidelines and high expenses involved, the latter underlined the difficulty in communicating emission data of products due to the lack of information and transparency provided to consumers at the national level.

According to the personal opinion of the FAO respondent, some labelling on minimal standards for agriculture machinery and information campaigns against food wastage are examples for climate related initiatives in place at the moment, however, "they are still isolated experiences which need to be scaled up and coordinated in a concerted way, possibly above national level".

According to the representative of the Ministry of Agricultural, Food and Forestry Policies (MIPAAF), there are at the moment enough policy instruments, however there is a need for simplification and transparency in order to make the implementation and effectiveness easier. Overall, the instruments contained in the RDPs were considered by the majority to have led to some results regarding the implementation of more sustainable farming practices. The need, however, to be strengthened in order to become more effective. Many respondents mentioned the greening component of the current CAP reform as the potential way to increase the emission reduction potential of agriculture, enhancing the multi-functional role of this sector. Nevertheless, the farmers union' representative, highlighted the necessity of a bigger share of budget to implement those changes, given also the big contribution of agriculture (and forestry) in meeting the Kyoto targets, being the only sector sequestering carbon.

How would you classify and evaluate the environmental effects/results of these policy instruments? How would you classify and evaluate the economic costs and benefits of these policy instruments? How would you evaluate equity and fairness concerns, associated with these policy instruments?

Concerning the environmental effects the respondents found it difficult to relate a particular policy to a correlated emission reduction. A number of respondents attributed the high costs of measuring, reporting and monitoring as possible causes for the delay in reporting environmental effects and therefore in analysing them. One of the interviewees mentioned voluntary schemes initiated by the private sector, such as 'COOP for Kyoto' as pivotal in fostering emissions' reductions. This was illustrated considering the energy efficiency level achieved by affiliate companies, of approximately 2.338 tCO2 saved in 2007, by applying energy efficient heating and cooling systems in several supermarkets. From the farmers union (Confagricoltura) point of view, the reductions in N_2O and CH_4 emissions, seen in recent years show that mitigation measures in the agriculture sector take many years, while a number of other respondents attributed those emissions reductions mainly to the effect of the crisis which reduced the consumption of fossil fuels and fertilisers, rather than to direct policy instruments. The rest of the respondents mentioned the Nitrates Directive as the reason for

reductions in methane and ammonia emissions from intensive livestock production, the incentives for biogas plants as reducing emissions from livestock manure and the avoidance of energy use from fossil fuels. Worth mentioning is also the reduction of incentives towards solar power, once its negative influence on land use was discovered. This reduction of incentives tries to slow-down the conversion of land for food production to land used for solar panels. In this regard, the director of Slow Food Italy argued: “the environmental effect of some policies might be hampered by the overseen effects of other policies involved in the same process. It is a planning issue which should overcome potential bottlenecks looking at the entire process involved“. He gave as an example the improved manure management breaking down nitrogen via anaerobic fermentation in biogas plants. If at the beginning there would have been a disproportionate amount of nitrogen fertiliser used for growing forage, the overall environmental effects would be difficult to evaluate, according to his opinion.

An economic evaluation appeared to be real difficult for the majority of respondents. The difficulty was attributed to the fact that most of the current policies were not targeting exclusively emissions mitigation, but were intertwined with other aspects, such as increasing energy efficiency to save expenses. The same holds for energy saving measures, or the increase of biodiversity to improve health and maintain produce variety. One of the interviewees mentioned that cost-benefit analysis of energy produced by wind and solar panels shows that wind energy is over-incentivised, despite using technologies from abroad and plants that do not bring back gains to the territory neither in terms of energy produced nor of employment. Moreover he recognised the recently revised biomass incentives, after realising that there has been a tendency to build bigger plants and renting lands to produce corn crops to be used for energy production rather than to produce food, due to the high incentives. Today this is not possible any longer, as plants with a capacity of more than 1 MW get fewer incentives and are allowed to use only up to 30% corn and the rest needs to come from livestock manure. In this way the distorted incentives have been adjusted and permit a more equal distribution of resources. Moreover, regarding biogas plants, one of the interviewed experts from INEA, declared: “the benefits for a cattle farm to implement biogas plants are threefold: firstly from the energy point of view, the system of manure management through biogas is a way to acquire efficiency, secondly it implies the acquisition of efficiency certificates that can be traded on the carbon market and at the same time it can solve the burdensome problem of the discharge of sewage. The investments made in this field have an attractive return for the actors, thanks also to the national incentives scheme.” It appears therefore, that the government intervention in subsidising biogas plants starting from 2008 should be continued in order to increase the environmental, social and economic benefits deriving from it.

The fairness question required in the majority of cases some additional explanation. However, many respondents mentioned compensation mechanisms as an instrument to implement only as a final step of an emissions reductions scheme and only when emissions cannot be further curbed. Otherwise it would favour big polluters that can effort to pay as much as they pollute, rather than being incentivised to emit less. The second most mentioned issue with

regard to equity and fairness was the fact that currently the most disadvantaged group by the policy mix in the agri-food chain are the primary producers. Another shared opinion was that the introduction of the cost of carbon would likely become an additional cost in the definition of the value of the finished product, which would then be carried by the consumers.

Given your previous responses, do you think this is the best instrument mix to mitigate climate change in the agri-food sector?

Optimality was difficult to assess, due to the lack of monitoring and data availability to evaluate the effectiveness of policy instruments. Planning and coordination are fragmented among ministerial bodies and the sharing of responsibilities between national and regional levels of government was considered ambiguous and generating inconsistencies.

If not, what would be the most desirable instrument mix in your view? Why? How can your desired instrument mix be realized? Which are the major constraints and opportunities towards achieving such a mix in your view? Do you have any other comments or suggestions on the issue of policy instruments in the agri-food sector in regard to climate change?

More than half of the respondents agreed that the whole food supply chain needs to be analysed to distribute the reduction measures according to the processes emitting the most and the more sustainable ones. For the reduction and stabilisation of emissions in the long term (after 2030) it was a shared opinion that best practices and transfer of technologies that are currently available needed to be encouraged at the national level. This would require the set up of a suitable incentive scheme to elide barriers and funding research and development. One of the biggest challenges for Italy was the need for inter-ministerial coordination that could transfer the skills directly to the different regions. Overall a summary of the policy mix proposed was:

- Proper use of targeted incentives.
- Informational and educational campaigns for the proper management of energy.
- Energy conservation, nutrition and health.
- Penalise polluters and major emitters by rising energy costs.
- Avoid huge penalties for enterprises that cannot cover their own management costs.
- Provide free public advice for evaluation on energy consumption and saving;
- Avoid the drafting of regulations with, in practice, unfeasible requirements.
- More policies to encourage uptake of new technologies by actors along the food chain (e.g. energy efficiency interventions, a favourable environment for development of renewable energy technology, mechanization, training about farming practices).

- More performance standards. These do not need to be mandatory in order to avoid adding an additional cost and burden for food production, but should be universally recognised and should be used to inform the public.
- Focus on the production and local consumption, on small or medium-scale, next to set up networks for sustainable actors (farmers, processors, distributors), encouraging their communication.

All these measures were considered interventions that could result in a cost in the short medium term and a benefit (or avoided cost) in the long term. This long term vision, however, was not shared by consumers and investors, according to stakeholder opinions. Therefore public steering was considered necessary, including investing in communication, setting standards and promoting long-term actions (personal opinion of the representative of the FAO). According to the research institute IPLA, opportunities could evolve from the creation of a convenient market for carbon credits, encouraging businesses to enter it in order to sell and buy credits. However, in order to be interesting for companies, the price of carbon should be increased to ideally € 30 per tonne of CO_2. Also according to the government stakeholder, market-based instruments such as carbon credits in the LULUCF sector could, if implemented in a simple way, create a significant opportunity.

Conclusion

Summing up, the main outcome of the stakeholder interviews in Italy can be recapped as follows: farmers unions share the vision of an emission reduction coming from the agricultural sector, however deem it necessary to realise these targets through more remunerative incentive schemes instead of stricter regulations. Further, the mitigation potential of agriculture should be taken into account when setting targets for emissions reductions, and the burden of the costs in implementing these measures should be equally distributed throughout the supply chain. From the retailers perspective many mitigation measures have already been implemented, ranging from voluntary agreements on environmental standards with producers, to energy efficiency interventions for the sales points and information campaigns for consumers. All contributed to more sustainable standards along the supply chain. However, the need for an overarching target set on a national base would favour coordination and probably result in a concerted aim shared by more stakeholders which could increase the effectiveness of measures. From the Ministry of Agriculture's perspective the current mix of policy instruments is diversified, but it should be simplified and made more accessible. The mix is in the Ministry's opinion particularly ambitious, however its feasibility in the long term, particularly regarding bureaucracy, should be checked. Regarding information and labelling schemes the Ministry is under the impression that the sensitivity of the Italian consumer to the issue of climate change is limited and would be more effective if the focused on the 'traditionality' of the product. Concerning the experts' point of view, the accent should be put on communication

campaigns to influence consumer choices towards more sustainable consumption patterns and to policies encouraging the uptake of new technologies by actors along the food chain, particularly to improve manure management and fertiliser use in agriculture and energy efficiency in the food processing and distribution phases.

7.5 Spain

25 individuals were approached and five were willing to share their knowledge and experience on the basis of four face-to-face and one electronic interview. One of the respondents was from the government (Ministry for Food, Agriculture and the Environment), two from the private sector (Spanish Agri-food Cooperatives and the Spanish Association for Distribution, Auto Services and Supermarkets) and two from interest groups (Birdlife Spain and World Wildlife Fund Spain, Agriculture Officer).

In your view, which are the most important mitigation measures on climate change in regard to the agri-food sector? What are the most important policy instruments in realizing these measures in your view that are in place at the moment?

The majority of interviewees considered it hard defining the most important mitigation measures on climate change in the agri-food sector in Spain or prioritising them. Most stakeholders gave equal weight to greenhouse reduction, energy savings, change in diet, renewable energy and carbon sequestration. However, importance was also given to food waste, fertiliser reduction and food mileage, better manure management and CO_2 sequestration.

How would you classify and evaluate the environmental effects/results of these policy instruments? How would you classify and evaluate the economic costs and benefits of these policy instruments? How would you evaluate equity and fairness concerns, associated with these policy instruments?

Analysing the environmental aspects of the policy instruments in place presented difficulties for the stakeholders. The government was praised for the consistency it promoted by the newly adopted reporting system of GHG emission reductions (in the annual National Inventory report). However, the environmental results of the policies in place were evaluated as limited in scope and lacking precision in measurement. The examples of conservation agriculture (minimum or zero tillage), production of agrochemicals (fertilisers), carbon capture and energy consumption illustrated the barriers in properly evaluating to what degree these practices have contributed to GHG reductions. However, the importance of having environmental targets in place was commonly recognised as a driver for initiatives. A valuable example was the successful voluntary initiative of retail markets to reduce the use of one-time-use plastic bags as a target

in the National Environmental Plan which led to 80% reduction. Similar initiatives could develop for climate mitigation purposes, stakeholders argued.

The economic aspects of the current policy mix in agri-food were again seen as a complicated matter and difficult to measure. Most of the interviewees avoided giving an answer to this question on the grounds they did not have enough expertise in the area. Another difficulty was that the costs and the benefits of the policy instruments differed per instrument. For example, for fertiliser reduction- the benefit would be less input of fertilisers which could mean less expenses for the farmers and benefits for soil fertility. However, precisely because the farmers would need to develop alternative ways to ensure fertility of soils and crops- costs could increase, a fair comparison could not be given.

In terms of fairness and equity, the stakeholders were unanimous that there is always a stakeholder group giving away more than the other: in the current situation, the farmers. Accordingly, there was agreement that the government should not push forward instruments that would further disadvantage the farmers by making their investments too high, also turning their productivity too low or reducing their target audience to whom they sell their food. Likewise, stakeholders mentioned that consumers are also disadvantaged as in most cases they have pay the price. Meanwhile the retailers and the distribution chain in between farmers and consumers were considered to benefit the most by getting the most profit.

Given your previous responses, do you think this is the best instrument mix to mitigate climate change in the agri-food sector?

The current policy mix was considered suboptimal by all stakeholders.

If not, what would be the most desirable instrument mix in your view? Why? How can your desired instrument mix be realized? Which are the major constraints and opportunities towards achieving such a mix in your view? Do you have any other comments or suggestions on the issue of policy instruments in the agri-food sector in regard to climate change?

The suggestions made by stakeholders for the future covered a great number of issues and included greater co-ordination, consultation with stakeholders, increased budget, and additional resources. Specifically, the coordination between departments, ministries, sectors and national and EU governments was considered one of the most important matters that need to be improved in the future climate policy in the agri-food sector in Spain. In addition, current environmental standards, rules for water quality and residues, and food waste policies that could achieve GHG reduction needed to be integrated with climate policy instruments. The need to re-establish financial resources and subsidies for renewable energy cut by the new public policies led by the conservative government was also considered crucial.

Another recommendation for the future development of the climate mix was improving and increasing consultation with different stakeholder groups. The process of consultation between the government and other organisations has already started at a slow pace one or two years ago but some organisations have never been reached. As an example, Cooperativas Agro-alimentarias, an organisation representing almost 3,000 cooperatives in all the Autonomous Communities has never been approached for consultation. All the stakeholders interviewed were convinced that in the instrument design, the opinions of representatives from all sectors should be taken into account – the farmers, the industries, the ministry and the consumers as well. If not, GHG mitigation would not be achieved as they would miss aspects from real life and have no link with reality.

Another point of improvement for the future was considered the implementation of the policies. Often the topic of GHG mitigation is discussed, a plan for action is drawn up but never sees the light of day. Transparency within the food chain was considered a missing element by the retailers. Better monitoring and reporting was also considered important.

The CAP was seen by the majority of the interviewees as a major area for change. In Spain a great number of subsidies deriving from the CAP exist but the effective promotion of sustainable and organic agriculture remains limited in the view of stakeholders. In addition, the distribution of total CAP payments was considered problematic, as it is currently focused on Madrid, Barcelona and Seville, where farming lands are limited. Further criticisms of the CAP included its support for intensive farms, the lack of attention for Natura2000, and the contradiction between the CAP and Habitat and Water Framework Directive. In this context it was mentioned that non-irrigated crops receive less support in relation to irrigated ones and more environmental crops receive less payments in relation to permanent and arable crops. Likewise, farmers inside Natura 2000 areas receive less payment in relation to farmers outside.

Regulation as an instrument was rejected by the majority of stakeholders because it was considered to burden the business sector and harm competitiveness. Likewise a dietary shift towards less meat consumption was also considered problematic. It was pointed out that cattle reduce risk of fires in the forests and are an important part of the biological cycle in the natural environment. Some interviewees believed that a change in diet was not promoted enough. Regarding organic production, stakeholders mentioned the pioneering position of Spain in Europe. However, organic products are also expensive and for this reason could not be a solution for everyone. Imposing more organic production through legislation would be unfair to certain social strata. Finally, information campaigns were considered vital for the future climate policy mix, even though there are not so many of them at present.

Conclusion

The stakeholder analysis from Spain highlighted that the Spanish climate policy mix in the agri-food sector is not optimal in terms of environmental effectiveness, cost-efficiency

and political feasibility. The existing framework offers different policy instruments that unfortunately work with limited interaction and are not fully implemented. In this way, the effectiveness of the overall climate policy mix is hampered. Stakeholder's suggestions for the future included many ideas but central to the climate policy mix in Spain remains the coordination of policies and consultation with stakeholders.

7.6 Concluding remarks

The stakeholder analysis from the four member-states highlighted that the current policy mix, if any, is not optimal in all cases under study. Although the analysis is limited both in terms of selected countries and number of stakeholders interviewed, it is representative in both respects. Accordingly, the results of this analysis while limited in scope are also illustrative of the situation in different counties of the EU regarding the current state of affairs as well as the feasibility of the future implementation of an optimal policy mix. Given the diversity of national contexts and opinions expressed, it is difficult to propose an integrated approach for the future. However, some commonalities can be identified in all cases.

First, the need for the development of an EU-wide policy for climate change mitigation in the agri-food sector that would provide a level playing field for EU farmers was emphasized in all cases. Farmers, and sometimes consumers, were also considered the most disadvantaged stakeholder groups by current policies in terms of bearing the costs of implementation while other supply chain actors, in particular retailers, were considered major beneficiaries.

Second, the need to develop policies that target the whole supply chain in an integrated manner and the need to avoid a piecemeal approach, limited in scope and comprehensiveness (i.e. addressing some environmental issues but not others, or neglecting the interaction between environmental and social issues), was also considered important.

Third, the role of government was considered crucial but only in terms of providing a general framework within which voluntary approaches could develop. Taxes and subsidies were, in general less favoured, while the provision of financial incentives was considered more important. Further, communicative instruments, such as labelling and certification schemes were also advocated but with caution, taking into account that they are expensive and cannot be implemented by all and taking care not to be too directional but informative instead.

8 Conclusions

Food and agriculture – the agri-food sector – is a large and diversified sector in Europe. The exact delineation of the agri-food sector, may differ somewhat across studies and statistical sources. Total GHG emissions from the agri-food sector have been assessed at 18% – 22% of total EU27 emissions. Non-CO_2 GHG emissions from primary agriculture (CH_4 and N_2O) are responsible for around 10% of total EU27 emissions. These emissions have decreased over the past two decades by 20.2%. The largest percentage reductions occurred in Central and

Eastern European countries. The decrease of CH_4 emissions can mainly be attributed to significant decreases in cattle numbers that followed increases in animal productivity (milk and meat) and related improvements in the efficiency of feed use. The decrease in N_2O emissions are mainly due to reduced use of mineral and organic nitrogen fertilisers following productivity increases and declines in the cattle herds and because of regulation through the Nitrogen Directive. In recent year a slight increase in nitrous oxide emissions can be observed in the EU12, related to the modernisation of agriculture and an associated increase in fertiliser use. The European Commission projects a further decrease of non-CO_2 GHG by 3% towards 2020 if no additional measures are taken.

The main policy that drives changes in primary agriculture is the CAP. Through its subsequent reforms the CAP is, on the one hand, increasing liberalization and market orientation of agriculture, and on the other hand, increasing emphasis on and integration of environmental and, more recently, climate related concerns within agricultural policies. Especially following the CAP Health Check revision in 2008, environmental protection gained higher priority, e.g. through the promotion of sustainable agricultural and forestry management practices; followed by investments in new environmental technologies in agricultural holdings, e.g. for soil erosion, water contamination, manure management, energy saving and training and advice on climate change mitigation. There is no formal evaluation of the effects of this policy (change) yet. The economic crisis seems to have had a negative effect on the funding of some of these measures, e.g. in Italy.

At the Member State level, apart from the CAP-related initiatives, there is little evidence of climate policies to curb non-CO_2 emissions from agriculture. Most Member States have policies in place to decrease CH_4 emissions by promoting the production of biogas on farms. Quantitative information on farm biogas policies has been shared with Task 2.6. In principle, the UK GHGAP is a broad policy to curb non-CO_2 GHG from agriculture, but at the moment this policy is still in a preparatory phase.

The Netherlands has a relatively long history in promoting energy efficiency in its energy-intensive agriculture (greenhouse horticulture). In recent years, energy efficiency targets have been complemented by CO_2 reduction targets. The policy instruments that are commonly employed are negotiated agreements (covenants) and subsidies/fiscal incentives. Apart from energy-efficiency policies, there is little evidence of climate change policy measures in the rest of the agri-food sector (except, of course, in those parts of the sector that are under control of the EU ETS). There are private and public-private initiatives at the retail and consumer level to make consumers aware of the environmental impacts of food consumption (and food waste), but they are often not climate-specific but promote a 'bundle' of attributes associated with 'sustainability'.

Agri-food stakeholders in four case study countries advocated the development of an EU-wide policy for climate change mitigation that would provide a level playing field for EU farmers. Farmers, and sometimes consumers, were considered the most disadvantaged stakeholder groups by current policies in terms of bearing the costs of implementation while other supply chain actors, in particular retailers, were considered major beneficiaries. In

developing the EU-wide policies it was felt important to target the whole supply chain in an integrated manner and to avoid a piecemeal approach that would address some environmental issues but not others and that would neglect the interaction between environmental and social issues. The role of government was considered crucial, but predominantly in terms of providing a general framework within which voluntary approaches could develop.

It is difficult to draw definite conclusions from this research on the 'optimality' of the current policy mix in the agri-food sector in Europe. We would, however, like to conclude with two observations on this issue. Our first observation is that there is presently no integrated climate policy across the entire agri-food supply chain at the EU or Member State level. The policy instruments that exist, including those of the CAP, focus on different parts of the chain without much (or any) coordination. As there are no overall GHG reduction targets for the sector, it is impossible to formally assess the effectiveness of the policy mix. Many stakeholders did, however, express a strong preference for integrated policies across the entire chain, suggesting that the present lack of integration could negatively affect the current effectiveness and/or efficiency of the policy mix. A second observation is that many stakeholders emphasised the importance of considering GHG emission reduction in the agri-food sector within the broader context of sustainable agriculture. Hence, 'optimality' in this case would need to take other aspects of sustainability into account, including its environmental, economic and social dimensions. This has implications for the 'feasibility' of policy instruments that should on the one hand serve multiple objectives and on the other hand take account of the large heterogeneity of the sector in terms of actors, processes, and economic and geo-physical conditions.

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