

The Greenhouse Gas Action Plan for Agriculture in England

Fact sheet

for:

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and Nuclear Safety (BMU)**

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The information and views set out in this study are those of the author(s) and do not necessarily reflect the official opinion of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

This study is based on a policy paper with an overview of greenhouse gas emission reductions and policy instruments in non-ETS sectors across Europe (hereafter referred to as 'Policy Paper'). The Policy Paper can be downloaded from the EUKI website.

ABBREVIATIONS

AHDB	Agriculture and Horticulture Development Board
AIC	Agricultural Industries Confederation
CAP	Common Agricultural Policy
CCA	Climate Change Act
CCC	Committee on Climate Change
CFE	Campaign for the Farmed Environment
CLA	Country Land and Business Association
CPD	Continuing professional development
Defra	Department for Environment, Food and Agricultural Affairs
ETS	Emissions Trading System
EU	European Union
EUR	Euro
GAK	Joint Task for the Improvement of Agricultural Structures and Coastal Protection (‘Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes’)
GBP	Great British Pound
GDP	Gross domestic product
GHG	Greenhouse gas
GHGAP	Greenhouse Gas Action Plan
N ₂ O	Nitrous Oxide
NFU	National Farmers Union
UAA	Utilised Agricultural Area
UK	United Kingdom

TABLE OF CONTENTS

1. Summary	1
2. National Context in the United Kingdom	2
2.1 National climate policy.....	2
2.2 Sector context	3
3. General description of the GHG Action Plan for Agriculture	5
3.1 History	5
3.2 Legal basis	5
3.3 Functioning	5
3.4 Interlinkages with other policy instruments	6
4. Impacts of the policy instrument	8
4.1 Effectiveness	8
4.2 Cost efficiency	10
4.3 Co-benefits and side-effects	10
4.4 Success factors and challenges.....	11
5. Transferability	13
5.1 General comparability of the context.....	13
5.2 Properties of the instrument	14
5.3 Potential impacts	14
5.4 Conclusion.....	15
6. References	16

1. SUMMARY

The Greenhouse Gas Action Plan (GHGAP) for Agriculture in England was adopted in 2011 by 14 organisations representing the English agricultural sector in order to achieve the UK-wide sector emission reduction target of 3 million tonnes CO₂e (MtCO₂e) by the end of 2022. Composed and implemented by a wide range of actors, the action plan enjoys wide-spread support and is taken forward through existing networks and channels of communication to provide farmers with up-to-date advice, training, and information about ways to increase production efficiency while also reducing emissions.

The action plan has been successful in achieving emission reductions amounting to 1 MtCO₂e per annum by 2016, mainly due to measures promoting increased efficiency, modern farming methods and the application of good practices. Actions taken forward by farmers have mainly been framed around improved productivity and business performance through efficiency and resource reduction measures. Most measures provide a business benefit to farmers by promoting efficient farming while also reducing emissions. As a result, the GHGAP has in recent reviews been deemed a cost-efficient instrument for climate change mitigation in the agricultural sector, with related co-benefits of reduced resource use and better productivity. While positive results have been achieved by the GHGAP, further significant mitigation will be associated with increasing costs and is therefore unlikely to be realised based on voluntary measures alone. It is important to be conscious of the fact that agriculture is a sector mainly regulated at EU level, with the Common Agricultural Policy and several directives severely limiting the influence of national policies.

Considering the transferability of the GHGAP the agricultural sectors of Germany and England offer a good comparability based on structural, political and economic indicators. Similar reasons that led to the action plan being the preferred instrument to achieve emission reductions in British agriculture also apply to the German context. These include the flexibility of being able to choose how to achieve a specific amount of emission reductions. However, to achieve climate change mitigation that goes beyond a business-as-usual scenario it is necessary to have some regulatory background framework and safeguards in place that incentivise meaningful action being taken forward. Without such a regulatory framework it seems unlikely that a voluntary action plan will result in the amount of emission reductions needed. Yet, with the appropriate framework in place, implementation of an action plan can be a positive step towards meaningful mitigation in the agricultural sector and is suitable for achieving short- to mid-term reduction targets.

2. NATIONAL CONTEXT IN THE UNITED KINGDOM

2.1 National climate policy

The United Kingdom (UK) of Great Britain has been a global forerunner in climate policy and began to introduce policies to tackle climate change in the early 2000s. Its flagship legislation is the Climate Change Act (CCA), adopted in 2008. Based on a societal and political consensus, the CCA was the globally first legislative act translating climate mitigation targets into law. It contains a target of -80% in greenhouse gas (GHG) emissions by 2050 compared to 1990 (Climate Change Act, 2008). This statutory long-term target serves the purpose of providing a clear legal signal where policy is aiming in the long-term. The long-term goal is translated into a series of five-year carbon budgets, which are adopted 12 years before coming into effect in order to provide sufficient planning time for policy and businesses. Each budget provides an economy-wide cap on emissions. The first two targets, set for the period from 2008–12 (26% below 1990 levels) and 2013–17 (31% below 1990 levels) have already been met and projections indicate that the country is on track to meet its third target of a 37% emission reduction by 2022 (Grantham Research Institute, 2015). However, analysis suggests a significant gap between policy delivery and emission targets specified by the 4th and 5th carbon budgets (Fankhauser et al, 2018). It is widely recognised that extended policy efforts will be required to achieve these reduction objectives.

The CCA also set up the Committee on Climate Change (CCC), an independent advisory body of experts which was established to provide expert assessments, recommend carbon budgets and monitor progress towards meeting the targets. An annual progress report is prepared by the CCC and presented to Parliament (Fankhauser et al, 2018). These progress reports are then debated in Parliament where the government is statutorily obligated to respond to any inquiries, mainly regarding different rates of progress in economic sectors and future challenges of meeting the carbon budget. The level of each carbon budget, recommended by the CCC, is meant to reflect a cost-effective path for achieving the long-term mitigation objective. Each carbon budget is then debated and legislated by Parliament. The government is accountable to Parliament to deliver the emission reductions legislated.

Although these are economy-wide targets, the government is obligated to present Parliament with a plan of how these mitigation milestones will be achieved. These carbon plans contain instruments and measures for all different sectors of the economy, including individual sector reduction targets. The policies listed in the carbon plans must ensure that the overall budget is met. A number of laws, policies and measures have been implemented by the British government to ensure the successfully meeting its mitigation objectives. These include the 2011 Carbon Plan, replacing the 2009 Low Carbon Transition Plan, the 2011 Energy Act and the launching of the Green Investment Bank in 2012. The latest addition to this portfolio is the 2017 Clean Growth Strategy, which sets out a policy of low carbon growth with incentives for improved efficiency and improving the natural environment (Department for Business, Energy and Industrial Strategy, 2017).

The 2009 Low Carbon Transition Plan detailed the emission reduction targets for all sectors of the economy to meet the third carbon budget by the end of 2022. For agriculture, this plan contains a 3 MtCO_{2e} per year reduction of GHG emissions. In order to meet its overall third carbon budget, a carbon price floor was established in 2013 as a response to the low price of emission allowances in the European Union Emissions Trading System (EU ETS). This carbon levy was set at a rate of GBP 16 (EUR 18.23) per tonne when first introduced and is meant to continuously increase to GBP 30 (EUR 34.18) per tonne of carbon in 2020 (GRI, 2015). However, it was later announced that the price will remain at GBP 18 (EUR 20.52) from 2016 until 2020. The carbon levy has played an important role in continuous emission reductions in the British power sector, which is covered by the EU ETS. The British government has announced plans to terminate energy production from coal-fired power plants by 2025

(Reuters, 2015). So far, the main share of the decline of emissions in the UK has resulted from sectors covered by the EU ETS.

The CCA has been instrumental in holding the government to account for its climate policy. The regular reporting obligations of the government to Parliament and the public, which are part of the CCA, are meant to ensure transparency and accountability for progress being made.

Although, as mentioned before, carbon budgets apply to the economy as a whole and are therefore not sector specific, meaning that there is no separate budget for the agricultural sector, the CCA requires the government to present to Parliament a detailed proposal for meeting the budget in a carbon plan. These plans acknowledge the different rates of emission reductions possible in the different sectors based on reduction costs and limitations of available technology (Defra, 2016). Based on these factors it was established that a cost-effective distribution of emission reductions among all sectors of the economy relies on agriculture reducing its annual emissions by at least 3 MtCO_{2e} by 2022. Different government departments have a specific responsibility to ensure the emission reductions in their respective sectors are achieved. For agriculture, this is the Department for Environment, Food and Agricultural Affairs (Defra). In response to the 3 MtCO_{2e} target, a coalition of agricultural industry partners launched the Greenhouse Gas Action Plan (GHGAP) in 2011.

Table 1: UK Carbon Budgets¹

Budget	Carbon budget level	Reduction below 1990 levels
1 st carbon budget (2008–2012)	3,018 MtCO _{2e}	25%
2 nd carbon budget (2013–2017)	2,782 MtCO _{2e}	31%
3 rd carbon budget (2018–2022)	2,544 MtCO _{2e}	37% by 2020
4 th carbon budget (2023–2027)	1,950 MtCO _{2e}	51% by 2025
5 th carbon budget (2028–2032)	1,725 MtCO _{2e}	57% by 2030

2.2 Sector context

Agriculture in the UK has traditionally played a major role in the country's economy, culture and landscape. However, in the past decades its significance has declined continuously. Today, the agricultural sector's share of UK's gross domestic product (GDP) makes up around 0.6%, which is very similar to the German agricultural sector (World Bank, 2018). The number of people employed in the sector was ca 466,000 in 2016, which constitutes a decrease of 2.1% compared to the previous year. The sector's share of employment is 1.35% (Defra, 2017). According to Eurostat, agricultural income in the UK fell by 4.1% between 2015 and 2016, the 8th largest fall among the EU Member States. Over the past few decades, the number of farms has decreased significantly, along with the number of people employed in the agricultural sector and its share of GDP, while overall output and productivity has seen a steady increase.

In 2016, the Utilised Agricultural Area (UAA) was 17.4 million hectares, while the amount of organically farmed land was at 508,000 hectares (Defra, 2017). The UAA covers 71% of land in the UK. The number and size of agricultural holdings saw opposing trends over the period from 2010 to 2016. While the total

¹ Table adapted from CCC: <https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/>

area on holdings increased by 2.4%, the number of holding declined from 222,000 to 218,000, thereby resulting in an increase of the average size of holdings to 80 hectares. The numbers of pigs and dairy cows remained relatively constant over the past few years, with 4.9 million and 1.9 million animals, respectively. The total number of cattle and calves increased slightly to just over 10 million. The population of sheep and lamb also saw an increase to 33.9 million animals in 2016 (Defra, 2017).

The agricultural industry is very well organised in a number of organisations, covering the breadth of the industry. The most significant ones include the National Farmers Union (NFU), the Agricultural Industries Confederation (AIC), the Agriculture and Horticulture Development Board (AHDB), and the Country Land and Business Association (CLA). Of particular significance is the fact that these organisations have a history of partnerships and co-operations, where the different industry bodies frequently cooperate in order to achieve a shared objective.

Current GHG emissions from the agricultural sector contribute to 9% of the country's overall emissions (Defra, 2017). It is estimated that this share could increase to 14% by 2035 due to other industries successfully reducing their emissions with a simultaneous rise in agricultural production. Overall emissions from the UK's agricultural sector have fallen by 18.6% over the period from 1990 to 2015 (Department for Business, Energy and Industrial strategy, 2017). The GHG intensity of the sector was reduced significantly over the same period. The most important GHG emitted by the agricultural sector in the UK is methane which accounts for the second largest share of the country's GHG emissions, after CO₂. In 2015, emissions of methane (from agriculture and other sources) were estimated at 52.6 MtCO₂e, which constituted approximately 10.5% of UK's GHG emissions in that year and also meant a reduction in methane emissions since 1990 of 16% (Department for Business, Energy and Industrial Strategy, 2017).

3. GENERAL DESCRIPTION OF THE GHG ACTION PLAN FOR AGRICULTURE

3.1 History

After the reduction target for the agricultural sector of at least 3 MtCO₂e was accepted by the industry as realistic and achievable a Climate Change Steering Group composed of representative industry organisations was established. This Steering Group then drew up a framework for action, the GHGAP published in 2011. To deliver the actions outlined in the plan, a first phase delivery plan was produced, outlining the different actions to be implemented by the partner organisations in the period from 2010 to 2012.

The partnership and industry-led approach of the GHGAP was not a new phenomenon in the British agricultural sector. In 2009, the Campaign for the Farmed Environment (CFE) was established to provide an alternative to regulatory intervention and instead implement industry-led measures to retain environmental benefits. Similar to the GHGAP, the CFE consists of a range of organisations ranging from farming bodies to conservation groups. The CFE's 2013–2016 Delivery Plan aimed to establish a coherent approach across different industry-led initiatives, including the GHGAP, which was formally incorporated into the CFE in April 2013 (Defra, 2017b). Being part of the CFE as an umbrella organisation with local partners and associations has been hugely beneficial for the delivery of the GHGAP. This indicates that the partnership established for the GHGAP was based on previous similar initiatives. Defra, like the British government in general, supports voluntary industry-led undertakings and considers them preferable to regulatory interventions².

3.2 Legal basis

As a voluntary, industry-led undertaking the GHGAP for agriculture is not based on any legal provisions. There is, however, an obligation to adhere to the agreed emission reduction targets for this sector, for which the GHGAP is the principal mechanism for delivery.

Since the government is required to ensure the reduction of GHG emissions in line with the sector targets set out in the carbon budgets and carbon plans for all economic sectors, the department responsible for the agricultural sector must fulfil this responsibility. Defra therefore has a responsibility to ensure the successful reduction of GHG emissions in the agricultural sector. As mentioned in the previous section, it is the department's current position that the sector should continue to self-regulate and take the leading role while Defra provides support and critical assessments. Holding the agricultural industry to account for emission reductions while also supporting the sector in its mitigation effort is considered as the main role of the government with regards to the GHGAP.

3.3 Functioning

The GHGAP for Agriculture is a detailed action plan, containing measures to be taken forward in the period from 2011 to 2022, which are agreed and implemented by 14 organisations representing all areas of the agricultural industry. These 14 organisations, along with their local representations, consultants and advisers are involved to ensure all farmers and industry actors can be reached and their expertise included in the delivery of the GHGAP. The Steering Group, comprised of representatives from the different industry bodies, ensures the coordination of different activities to

² Personal correspondence with academic expert

avoid duplication of effort and wide-ranging support for all relevant actors. The GHGAP utilises numerous channels of implementation and delivery, mainly building on existing networks and channels of communication.

The action plan comprises a comprehensive list of measures (see the following section), which cover a broad spectrum of activities to achieve GHG emission reductions. The focus of the GHGAP and its delivery plans is to promote overall resource use efficiency and thereby increasing business efficiency with the additional effect of reducing GHG emissions. The overarching approach follows a set of core objectives. These evolve around establishing a robust partnership and improving awareness amongst farmers of farm practices that will improve efficiency and business performance while reducing emissions at the same time. Other objectives include continuously updating technical advice, disseminating relevant information and developing effective means to deliver advice and training to all relevant actors (GHGAP, 2011).

Regular reviews of progress achieved are conducted both by the industry itself and Defra to assess the effectiveness of different measures included in the GHGAP to facilitate a focus on the most effective activities. Effectiveness is mainly measured by the number of actors that have taken up certain actions and the estimated impact of these actions on GHG emission reduction. For a more detailed discussion of these reviews and their methodology, see section 4.1. The groups of measures include, for example.

- > The addition of new GHG mitigation trainings to the fertiliser adviser course or the take up of continuing professional development (CPD) by farmers;
- > Provision of current advice on farming methods to increase efficiency through precision nutrient management techniques, improved soil management and livestock nutrition and other activities aims to penetrate the agricultural sector and have since April 2013 been facilitated by greater local engagement through the CFE's wide-ranging local coordination and delivery umbrella;
- > Raising awareness amongst farmers and providing information regarding on-farm actions to reduce emissions through increased production efficiency are two of the GHGAP's core objectives (Defra, 2017b);
- > Highlighting existing best-practice guidance and tried-and-tested methods of production largely provide the basis for actions to achieve such efficiencies as identified by experts in the industry partnership organisations (GHGAP, 2016);
- > Further key areas of activity include crop nutrient and crop health management, livestock nutrition and progress on energy efficiency and renewable energy.

Defra supports the implementation of the GHGAP by investing in related scientific research, providing data on effectiveness of different measures through detailed surveys and regularly reviewing progress towards the emission reduction target. Initiatives complementing the GHGAP include for example the Agri-Technology Initiative and new Centres of Agricultural Innovation. These initiatives conduct research into innovative farming methods and new technological developments to assist the agricultural sector in becoming a world leader in modern and efficient farming.

3.4 Interlinkages with other policy instruments

The agricultural sector in all EU Member States is regulated by the Common Agricultural Policy (CAP). The CAP is the main instrument for support of this sector, providing income support for farmers and supporting sustainable rural development across the member states. Subsidies for farmers are based on production, environmental considerations, animal welfare and food safety. After its reform in 2013, 30% of direct payments to farmers must be 'Direct Green Payments' which are linked to certain

environmental public goods. These are based on three environmentally friendly farming methods, namely crop diversification, the maintenance of permanent grassland and dedicating 5% of arable land to environmentally friendly measures (European Commission, 2017b). While these provisions have numerous environmental benefits, including biodiversity protection and water quality, climate change mitigation is only one of several effects. Due to the CAP's regulation GHG emissions play only a very minor role in the allocation of subsidies and other funding mechanisms, which limits the scope of policy measures to address emissions in this sector. In the period from 2014–2020, the total allocation of direct payments amounts to EUR 22 billion (European Commission, 2017).

Further regulatory background conditions are the EU Water Frameworks Directive and Nitrates Directive which are being implemented by the Member States through own regulations and regulate certain aspects of fertiliser use, manure management and other aspects of agricultural practice. Similar to the GHGAP and CFE, the Tried and Tested Campaign, an industry initiative, aims at helping farmers meet the regulatory requirements of the Water Frameworks Directive by providing them with advice and a toolkit for their nutrient management (Tried and Tested, 2015).

The current political debate in the UK regarding agricultural policy is very much centred on the question of how the exit from the European Union, including from the CAP, will allow the country to implement and perhaps be even more ambitious in adopting further measures to protect the environment and address climate change (Department for Business, Energy and Industrial Strategy, 2017). The GHGAP is supported by several government strategies and programmes, which are mainly focused on research, providing data and developing innovative solutions. This includes the Agri-Tech Strategy, a partnership between government and industry to ensure scientific knowledge and insights are translated into new agricultural technology, innovation and sustainability benefits (HM Government, 2013).

The GHGAP analysed in this study only applies to the English agricultural sector, while the devolved administrations of Scotland, Wales and Northern Ireland have very similar agreements in place. Due to the administrative and political structure of the UK, climate policy is decided at the national level and GHG inventories and recording of emissions is also located at UK-wide level. While emission reduction targets are determined at UK level, the devolved administrations have some freedom in implementing own measures to achieve emission reductions. As a result, similar instruments are in place in these parts of the UK with slightly differing focuses.

4. IMPACTS OF THE POLICY INSTRUMENT

4.1 Effectiveness

The latest estimates from 2016 place the emission reductions achieved through the activities of the GHGAP at 1 MtCO₂e, which constitutes a third of the overall reductions necessary to realise the sector target by the end of 2022 (Defra, 2016b). As will be discussed later in this chapter, attributing emission reductions to the GHGAP is very challenging and the influence of many co-variables cannot be excluded with certainty. The industry review of this action plan assumes that, since the GHGAP is the principal mechanism for reducing agricultural GHG emissions in England, all or almost all of the reductions achieved result from GHGAP-related activities (GHGAP, 2016). Since the implementation of the GHGAP, several review reports have been produced by industry bodies and Defra. The 2012 Defra review concluded that significant progress had been made by the industry and that the 3 MtCO₂e per year reduction target could be achieved by the end of 2022 given continued efforts and a focus on most successful measures (Defra, 2012).

An industry progress report of the GHGAP emphasises the role of the action plan in driving up knowledge about mitigation actions, increasing commitment amongst feed advisers to assist livestock farmers in implementing actions facilitating GHG reductions, and providing continuous professional development training for crop nutrition advisers on efficient nitrogen use (GHGAP, 2016). Targeted activities in the grazing livestock sector have led to improvements in nutrient management through the adoption of nutrient planning tools and management methods. In addition, the 2016 industry review of the GHGAP states that apparent interest in soil management across the industry is at its highest level (based on turn out at events, the number of articles in the industry press and other indicators). Regarding activities in the area of livestock nutrition, many farms with livestock are receiving expert advice or using a ration programme to optimise their fodder. In dairy herds, this has led to a reduction in dietary protein levels with simultaneously increasing milk yields, resulting in lower N₂O emissions. Developments in the quality of feeding materials, along with tailored advice for farmers, are having significant impact on this progress (GHGAP, 2016). The provision of current information about energy efficiency measures and on-farm renewable energy projects, which is distributed through press, events, and other established communication channels, has been able to reach a large share of farmers³. Many of these activities have benefitted significantly from joining the CFE umbrella initiatives. This network delivered 373 events on resource protection and resource use efficiency within the period from April 2013 to June 2015. These events particularly addressed the GHGAP's priority areas of soil and land management and crop nutrient management.

³ The emissions from these sources are included in the EU Emissions Trading System

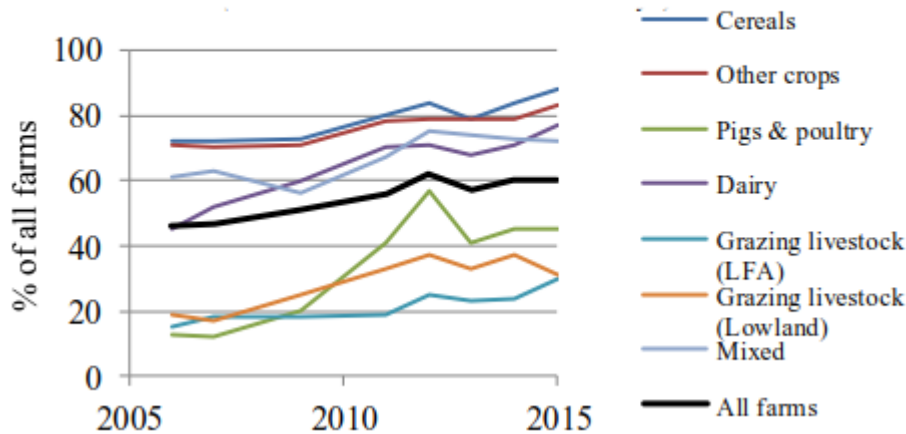


Figure 1: Possession of nutrient management plan (GHGAP, 2016)

In its first phase of delivery, from 2011 to 2012, the GHGAP's main focus was on giving advisers, consultants and trainers the necessary information, knowledge and tools to assist farmers in identifying possibilities for increased efficiency. The second and third phase delivery plans built on this effort and focused on the more effective areas of activity. For the period from 2016 to 2022, this will include an economic roadmap for technically feasible reductions of emissions from manures and slurries, the publishing of a Nutrient Management Guide, and increased manure management planning in the beef sector (GHGAP, 2016).

When assessing the impact of this action plan, it is important to consider that measuring the effects of the different activities realised through the GHGAP comes with many difficulties. Additionally, it should be kept in mind that the reviews and data included in this section are based on official reviews by the government department responsible (Defra) and the industry itself, while no independent assessment is available at this point. The estimate of 1 MtCO₂e decrease in emissions by the Agricultural Statistics and Climate Change publication (Defra, 2016) is based on modelling the impacts of the current uptake of relevant mitigation measures included in the GHGAP. The current uptake rates are in turn based on the Farm Practices Survey (FPS, 2015). For those activities covered by the GHGAP but not included in the Farm Practices Survey, estimates were taken from the industry's GHGAP progress report (GHGAP, 2016).

Monitoring the uptake of different activities that result in GHG mitigation provides insights into progress towards achieving the 3 MtCO₂e reduction target as well as identifying the contributions from different kinds of activities. Since the implementation of the GHGAP in 2011, the most significant impact on emissions has resulted from methods related to nutrient management. These have led to an estimated mitigation effect of 0.4 MtCO₂e by 2016, which constitutes around 37% of the assessed maximum technical potential for reduction by this method (0.9 MtCO₂e) (Defra, 2017b). Nutrient management has therefore contributed almost half of the emission reduction in the agricultural sector since the adoption of the GHGAP.

An important shortcoming of the progress reports and data collected so far is the lack of a common set of indicators to appropriately reflect the progress made in all areas of the industry. This fact is emphasised by both the GHGAP progress report and the reviews by Defra. This lack of suitable indicators adversely affects the validity of critical assessments of activities taken forward so far and

hinders progress in understanding what farmers are investing in, for what reasons and what possible barriers to productivity improvements might still exist. Until now, industry, government and independent advisers are using three different sets of indicators for assessing progress (GHGAP, 2016). Improved data sharing in the future is intended to facilitate better progress evaluations and to attribute outcomes to specific actions being taken by the GHGAP.

Not being able to clearly attribute environmental outcomes to certain initiatives and activities makes a detailed evaluation of the GHGAP's impact challenging.

4.2 Cost efficiency

No cost estimates for emission reductions achieved through GHGAP-related activities are available at this point, which makes a valid evaluation of the instrument's cost efficiency impossible. Only qualitative assumptions can be made for an approximate assessment of the GHGAP's cost efficiency. These are also based on general experiences with voluntary approaches for climate change mitigation.

Based on its voluntary nature and wide range of activities the GHGAP provides abundant flexibility in how the emission reduction target is to be achieved by the industry. This flexibility arguably also leads to a degree of cost efficiency since it allows actions to be taken, which incur the largest beneficial outcome with least financial cost. The leading role of industry actors also means that the best ways to improve and implement on-farm methods to increase efficiency are being identified by the people most familiar with them. According to expert opinion, most farmers are forced to make decisions as market actors and in the interest of business outcomes, therefore opting for activities that promise cost reductions while also contributing to climate change mitigation. As actors in a competitive market, farmers have to take cost-effective measures in order to run a competitive business⁴.

Public financial resources and funding only play a minor role in the GHG mitigation efforts of the agricultural sector. Government funding is mainly supplied for research and development, including GBP 160 million (ca. EUR 181 million) to be invested in the Agri-Technology Strategy (HM Government, 2013). Further financial incentives are provided for energy efficiency measures and renewable energy use, as part of economy-wide programs such as feed-in tariffs for small-scale renewable energy plants.

The GHGAP can be seen as a very cost-efficient instrument since the voluntary approach provided the industry with the flexibility to identify the most cost-efficient means for reducing GHG emissions. As many of these measures also increase overall efficiency and profitability of farming businesses, they incur financial benefits for farmers and can therefore be regarded as highly cost-efficient with even positive financial outcomes. The GHGAP has been implemented by industry organisations without core government funding. It has been stated by the executing organisations that this lack of funding has been restraining their activities⁵. An overall cost estimate of the GHGAP is undermined by the fact that the different organisations involved integrated the GHGAP measures into their already existing activities.

4.3 Co-benefits and side-effects

As discussed earlier, reduced GHG emissions are for the most part not the primary objective of actions taken by farmers and growers. The main message of actions taken forward is one of increased efficiency and improved production methods to enhance business performance. The activities taken in

⁴ Based on authors' correspondence with academic expert.

⁵ Based on authors' correspondence with an organisational representative.

the first phase of delivery of the GHGAP have helped in establishing the link between better production efficiency, land management decisions, and associated benefits regarding profitability of farms. Such improvements in profitability and production are important co-benefits of the GHGAP, along with wider environmental protection and reduced pollution through better soil management and fertiliser use as well as energy efficiency.

While it is the explicit aim of the GHGAP to reduce emissions in the sector, the activities included in the action plan mainly aim to improve sustainability and efficiency more broadly, with GHG reductions as a side effect. Achieving the goal of climate change mitigation is therefore attempted by utilising its co-benefits. The dissemination of information regarding best-practice methods such as the Tried and Tested Campaign increase the knowledge base of actors in the sector. This is facilitated by new methods being used to reach farmers who usually do not attend events where such information is dispersed. Disseminating training, advice and information on modern production methods improves the agricultural sector's overall competitiveness. Fostering and strengthening cross-industry partnerships and networks, the exchange of knowledge and experience, and slowly changing attitudes and behaviour of farmers can be regarded as further co-benefits.

Negative side effects (if relevant)

4.4 Success factors and challenges

A significant success factor of the GHGAP has been the partnership-based institutional and organisational landscape of the agricultural sector in England. The action plan could therefore build on existing collaborative efforts, utilising existing synergies and networks. This enabled the GHGAP's overall strategy to not duplicate efforts or establish a number of new instruments, but to integrate its efforts into existing initiatives and focussing on filling the gaps. Examples of activities that resulted in significant impacts are therefore mainly those that are embedded in other initiatives, for examples nutrient management, crop storage, and generally improving management practices (Defra, 2017b). The fact that all major industry organisations are part of the GHGAP and act as facilitators in its implementation has played a significant role in its success. The Steering Group plays an important leadership role and acts as a catalyst for action. With representatives from all industry organisations under the umbrella of the GHGAP the members of the Steering Group implement actions und the banner of their respective organisations. The GHGAP provides an overarching framework for actions taken forward by the individual organisations.

Another significant aspect underlying the successful implementation of the GHGAP is the regulatory background, which established a clear emission reduction target the sector has to achieve by the end of the third carbon budget (2022). Since Defra has a special responsibility to ensure the fulfilment of the target, there is an implicit threat of government regulatory intervention should the voluntary initiative not lead to sufficient emission reductions.

Framing actions covered by the GHGAP around a message of improved efficiency, resource use and business productivity is one of the main aspects why awareness raising amongst farmers has been a successful effort and has led to farmers taking actions that lead to emission reductions. Climate change mitigation has only played a minor role as a motivating factor. Farm surveys indicate that the main incentive for taking up GHGAP activities is grounded in business considerations (FPS, 2015). For the sector, improving competitiveness and profitability are much stronger messages than contributing to climate change mitigation. The agricultural industry is receptive to the message of climate change mitigation if it is integrated with messages of improving farm practices, with increased productivity being the key point of engagement. According to a survey amongst farmers and industry actors that forms part of a Defra review of the GHGAP's progress, the necessity of emission reductions in itself was not seen as a sufficient entry subject to engage actors with the GHGAP (Defra, 2017b). Focussing on the

most effective channels of communication has been another important success factor of this action plan. The Steering Group provides coordination of communicating messages which emphasise productivity gains through increasing efficiency and decreasing emissions. Focussing on messages that are linked to and consistent with existing practices instead of an entirely separate climate change message/communication has been essential in the wide-spread uptake of on-farm activities.

However, in many parts of the agricultural industry, further progress in emission reductions will be challenging and associated with significantly increasing costs. Some measures can only result in marginal further changes in emissions, for example regarding nitrogen emissions through livestock nutrition. One of the challenges for reducing emissions in the agricultural sector also provides an opportunity: emissions stem from a very wide range of activities, which means a large number of farm practices is potentially available to reduce emissions. But identifying the most effective actions to be taken remains a challenge in this context. As discussed earlier, improvements in data collection and reporting are required to critically assess progress and be able to identify the most effective measures efforts should be focused on. The wide-spread range of activities covered by the GHGAP needs to be more targeted in the future. After identifying key activities, effective methods and technologies, the areas with the greatest scope for GHG mitigation can be addressed more directly. A current challenge lies in the lack of measurable objectives for the different GHGAP areas of activity and their link to mitigation actions (Defra, 2017b). Improved reporting can supply important data necessary to establish links between on-farm activities and outcomes for mitigation and measure their effects. Providing statistical series data, for example from the Farm Practice Survey is necessary to gain important insights into where further focus of the GHGAP should be directed.

While a large share of farmers has taken up actions which, as a by-product, reduce emissions, many remain sceptical and have as of yet not been successfully reached by the messages of the GHGAP. Engaging the sceptical groups amongst agricultural actors remains a challenge and requires very pro-active outreach efforts (GHGAP, 2016). To achieve its emission reduction target for 2022 the GHGAP has to intensify its efforts and engage those actors that have so far not been involved in its activities. The improvements achieved by the GHGAP until now will not be sufficient to reach the target of 3 MtCO₂e reduction in emissions by the end of 2022. While progress has been made, it is still patchy and increased momentum and pro-active action is needed to fulfil the sector's emission reduction potential. Increasing work/engagement with essential influencers and multipliers such as agricultural advisors forms an integral part of the future work of the GHGAP.

5. TRANSFERABILITY

5.1 General comparability of the context

Comparability of the German and British agricultural sectors is very high regarding economic, political and structural context. In both countries agriculture makes up about 0.6% of GDP (World Bank, 2018) with a continuously decreasing trend in the sector's economic significance over the past few decades. The UAA in Germany amounts to 16.7 million hectares, compared to the UK's 17.4 million (Statistisches Bundesamt, 2017). This means a larger share of the country's land area is under agricultural cultivation in the UK. Average farm size in Germany in 2016 was 60 hectares (80 hectares in the UK), with a share of farms using organic production methods of 7%, which is similar to the UK. A special feature of the German agricultural sector is the fact that almost half of farms (46%) are run as a secondary occupation. This means that the 1 million people working in agriculture amount to 0.5 million full-time equivalents, only slightly higher than the 466,000 workers in the British agricultural sector. The production value of the German agricultural sector was estimated at EUR 51.7 billion in 2015 with almost half of this value coming from crop cultivation and livestock (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, 2017).

Both countries also have similar shares of GHG emissions stemming from the agricultural sector, with approximately 8% of total emissions produced by this sector in Germany (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, 2017). In the UK, latest estimates place the share of GHG from this sector at 9% of overall emissions. Significant emission reductions with simultaneous increases in productivity of the agricultural sector were achieved in both countries since 1990. In Germany, overall agricultural emissions have declined by 15.9% between 1990 and 2015 (Umweltbundesamt, 2017). As mentioned in section 2.2, the UK's agricultural sector reduced its GHG emissions by 18.6% over the same period (Department for Business, Energy and Industrial Strategy, 2017).

Important regulatory instruments in the German agricultural sector include the Fertiliser Application Regulation (Düngeverordnung), which was amended and implemented in May 2017, thereby putting into effect the main provisions of the EU Nitrates Directive. The Joint Task for the Improvement of Agricultural Structures and Coastal Protection (Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes (GAK)) is the most significant funding instrument for farming and forestry, coastal protection and rural development with more than EUR 1 billion of total annual funding. The GAK contains numerous agricultural structure and infrastructure measures in its framework plan (Federal Ministry of Food and Agriculture, 2018). An important difference in the political and administrative circumstances of Germany and the UK is Germany's federal structure whereas the individual federal states (Länder) partially implement their own funding instruments or regulatory measures.

The agricultural sector in both countries, as is the case in all EU Member States, is heavily regulated at EU level. A lot of the same regulations therefore apply in Germany and the UK, significantly reducing the flexibility in policy measures and aligning the regulatory context. A further similarity of the context in both countries is the fact that the agricultural sectors are very well organised and have several strong interest groups representing the interests of farmers, growers and other actors.

While partnership-based and industry-led initiatives such as the Campaign for the Farmed Environment, the Tried and Tested Campaign or Catchment Sensitive Farming, which supports farmers in meeting their statutory requirements under the Water Framework Directive, this culture of public-private partnerships is not transferable to the German context. No comparable institutions exist in Germany at the moment, which could provide an important building block for a similar action plan. Partnership

approaches and voluntary action have been the preferred policy instrument in British agriculture long before the GHGAP was established.

Another significant difference exists in the overall climate policy context of the two countries. While the British government is legally obligated to reduce emissions, and can be held accountable by Parliament, an equivalent legal context cannot be found in Germany.

5.2 Properties of the instrument

As a voluntary and industry-led undertaking the GHGAP represents a very flexible and adjustable approach to reducing emissions in the agricultural sector. Legal implementation would not constitute an issue in this context as no legal provisions are required. However, given the statutory obligation of the British government to ensure compliance with the carbon budgets, the legal background of the instrument is quite different from the German regulatory context. As will be discussed further in the following section, voluntary approaches do not produce the necessary results as stand-alone instruments but are most effective in combination with a regulatory framework that provides incentives for action.

For the German context this means that the instrument would act as a complementary measure to existing regulations such as the amended Fertiliser Application Regulation (Düngeverordnung), the German Sustainable Development Strategy and several EU directives regulating for example water pollution and fertiliser use. Yet, the strict legislative framework of the CCA and its carbon budgets is essential for the success of a voluntary approach like the GHGAP. Additionally, a clear and believable government statement that regulation will be enacted if meaningful mitigation is not achieved through voluntary measures, as is the case in the context of the GHGAP, is deemed necessary⁶. To ensure the emission reduction target is achieved by means of a similar action plan, accompanying measures need to be in place. A regulatory background that provides a clear framework and incentive to achieve real emission reductions therefore seems a necessary component of a similar instrument. An opportunity to establish a similar legislative context in Germany comes with the planned climate change law to be developed in 2019. This could provide a comparable background to that found in the UK and make meaningful action based on a climate action plan more likely.

Partnership approaches can facilitate cooperation, especially when logistical, organisational and financial support is provided by the government. A common set of objectives within a wider regulatory framework which defines reduction targets and clear guidelines is necessary. Based on this framework, a consensual agreement to give the industry the flexibility to decide how to achieve this target can be reached. However, a fundamental question regarding the effectiveness of such a voluntary instrument remains. Since such a voluntary measure by definition does not involve enforcement mechanisms, the amount of resulting emission reductions is highly uncertain. To increase the instrument's chances of success an important step is to identify potential industry organisations and interest groups. Working through channels of communication that farmers already know and trust has proven very effective for the GHGAP and could provide benefits for a similar instrument in Germany.

5.3 Potential impacts

Estimating the potential impact of a voluntary initiative is plagued by similar difficulties as were discussed regarding the attribution of outcomes to the GHGAP (see section 4.1). The main difficulty is attributing the mitigation effects to the activities covered by the action plan. Additionally, the climate

⁶ Based on authors' correspondence with independent expert.

change mitigation impact resulting from an action plan for GHG reductions in the German agricultural sector would be dependent on many variables. The most important determining factor in this context is the willingness of the industry to actively support and implement the necessary activities. Since no enforcement or punitive measures are involved, it would be easy for the agricultural industry to agree to certain measures but lack the willingness to ensure their implementation. In addition, even when at an organisational level this willingness exists, it has to translate into individual farmers taking action. There is an explicit risk that individuals will free-ride and avoid becoming active themselves and instead rely on other people's actions to meet the sector-wide targets.

A voluntary approach will not achieve 100% of the reduction potential and quite possibly less impact than a regulatory or incentive-based approach. However, implementing good practice methods and raising awareness about potential efficiency gains while simultaneously providing the necessary information and advice can have sector-wide benefits for emission levels as well as productivity and competitiveness. While voluntary actions are likely to achieve only relatively modest emission reductions, they can form the basis for more extensive policy interventions.

Realistic expectations regarding the potential impacts of this kind of instrument are important as not all farmers will be willing to participate, nor will those who do take action implement all possible improvements.

5.4 Conclusion

Introducing an instrument similar to the GHGAP for Agriculture to Germany would be recommended for several reasons. First, it offers a flexible and cost-efficient way of achieving emission reductions without significantly constraining the choices of farmers through regulatory instruments. Instead it would facilitate activities that increase efficiency and sustainability while also aiming at higher productivity. Through modernised farming methods, continued training of farmers and efficient technologies, significant emission reductions can be achieved.

Secondly, given that the main emphasis of this instrument is on measures that carry a financial benefit for farmers, while simultaneously reducing emissions, actors in the agricultural industry are more likely to accept and participate in those measures.

To incentivise actions being taken by the industry after the adoption of a similar action plan, regular independent reviews could be established with the clear signal that a lack of meaningful action would result in more stringent measures being taken. It should also be discussed to complement such an action plan with further measures once the potential for actions that increase productivity while reducing emissions is exhausted. A measure similar to the GHGAP could serve as a first step for meaningful emission reductions in a sector where a large number of actors and diverse emission sources make regulatory intervention difficult to implement and monitor. Having an action plan in place can help reduce emissions in the short- to medium-term and prepare the ground for an economic or regulatory instrument needed to achieve further emission reductions in the agricultural sector once the opportunities for relatively easy reductions are exploited.

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