Impacts of rural development programmes in Germany on the reduction of greenhouse gas and ammonia emissions and associated mitigation costs

Andrea Pufahl[1] and Wolfgang Roggendorf[2]
[1] Thünen-Institute for Rural Studies (andrea.pufahl@thuenen.de)
[1] Thünen-Institute for Rural Studies (wolfgang.roggendorf@thuenen.de)

Extended abstract prepared for presentation at the 181st seminar of the EAAE
"Greenhouse gas emissions in the EU agriculture and food sector: potential and limits of climate mitigation policies and pricing instruments"
Berlin, Germany
October 5-7, 2022

Impacts of rural development programmes in Germany on the reduction of greenhouse gas and ammonia emissions and associated mitigation costs

Andrea Pufahl and Wolfgang Roggendorf

The European Union's (EU) rural development (RD) policy as part of Common Agricultural Policy (CAP) is considered to be a central instrument to reduce greenhouse gases (GHG) and ammonia emissions from agriculture (EU-KOM, 2020a, 2020b). The impact of RD programms is therefore evaluated regulary (ENRD, 2019). This is important to foresee the potential contribution of RD policies to achieve set targets. In this paper, we present the impact of the four German RD programmes 2014 to 2022 of Schleswig-Holstein, Lower Saxony/Bremen, North Rhine-Westphalia and Hesse on the reduction of agricultural GHG and ammonia emissions. The period of analyses comprises 2015 to 2018/2019 (RAUE ET AL., 2019; HMUKLV, 2019; MKULNV, 2019; GRAJEWSKI ET AL., 2019).

Total expenditures of analysed RD programmes (EU+national funds) accounted for 2.0 billion Euro in 2018. Together, they represent about one third of all RD expenditures in Germany. Climate mitigation has been of low importance in RD programmes so far. Only 3 % of RD expenditures in the study regions are targeted to emission reductions. Most impacts originate from measures not targeted to climate mitigation as e. g. organic farming. Their impacts are rather welcoming side effects. In our analysis we consider the impacts all relevant measures, irrespective of wether they are targeted to emission reduction or not. We do not consider interventions for climate adaptation (e. g. flood prevention) nor nationally financed support schemes.

The effectiveness of RD programms on emission reduction has to be quantified by using the impact indicators "Greenhouse gas emissions from sector agriculture", "Greenhouse gas emissions from sector Land Use, Land Use Change and Forestry (LULUCF)" and "Ammonia emissions from agriculture" as set out by the Common Monitoring and Evaluation Framework for the CAP (EU-KOM, 2018). The impact is defined as the difference between potential situation without support and the observed situation with support. Relevant information about the uptake of agri-environment and climate measures (AECM) and organic farming is derived from the Integrated Accounting and Control System (IACS). For RD measures supporting investments, training and advisory, information about the characteristics of beneficaries and projects (e. g. amount of slurry treated differently) were used. For selected AECM and organic farming, a contrafactual study design (difference-in-difference analysis with matching) were carried out based on nutrient comparison data according to the German Fertiliser Regulation (ROGGENDORF UND SCHWARZE, 2020; ROGGENDORF, 2020A).

A total of 636 kt carbon dioxide equivalents (CO_{2eq}) were reduced through RD support between 2015 and 2018, as compared to the situation without support. 64 % of these emissions (411 kt CO_{2eq}) stem from the agricultural sector, the remaining part from the LULUCF sector. The impact is equal to a 0.1% reduction of total GHG and a 1.4 % reduction of GHG emissions in the sector agriculture. The impact varies between -1,0 % in Lower Saxony and -3,6 % in Hesse. About 90 % of the emissions reduced stem from organic farming and AECM. Relevant impact paths are the renunciation of mineral nitrogen fertilisers, the improvement of nitrogen efficiency and reduced livestock densities. However, these input-reducing measures result in yield losses and, most likely, in displacement effects that are not considered here. A further drawback is that the input-reduction is not ensured permanently, but for the five-year commitment period only. Hence, achieved emission reductions have a risk to be reversed. Only 8 % of the impact estimated results in a permanent reduction of GHG. They are induced by investments into emission-reduced storage and spreading of manure and farm advisory services targeted to water protection. Impacts in the LULUCF are mainly induced upon humus build-up in agricultural soils and to a small extent by peatland restoration and forestry measures.

Compared to the national reduction target for agriculture of 20 % until 2030 (Klimaschutzprogramm 2030) the estimated emission reduction in the sector agriculture (-1.4 %) is low. It is even lower (-0.4 %), if the impact of new entrants to RD programms is considered only. Since interventions as organic farming and other input-reducing AECM measures have been supported since many years, their emission-reducing effect is already partly included in national GHG inventory. Depending on the assumptions regarding organic farming and similar interventions, an abandonment of RD support would result in an increase of GHG compared to the current situation.

Analysed RD programms reduced ammonia emissions from agriculture by 2.7 kt between 2015 and 2019. This impact accounts for -0.9 % of ammonia emissions of the five federal states. 75 % of this impact is induced by emission reduced manure management either supported via AECM schemes or investment support (ROGGENDORF, 2020B). This impact is of a mainly permanent nature. Reduced mineral nitrogen application – which is of risk to be revesered – account one third of the estimated impact. To judge the impact of RD support on ammonia reduction we take reference to the target set out by the NEC directive (NEC-RL 2016/2284/EU). According to this, agricultural ammonia emissions in Germany need to be reduced by about 29 % until 2030 (HAENEL ET AL., 2020). With this respect, the current RD impact of -0.9 % of federal states ammonia emission is low, too.

The analysis shows that RD support contributes to the reduction of GHG and ammonia emissions. In relation to targets set for the agricultural sector, these impacts are very small. The reason for this observation lies in the type of interventions supported: A large fraction of reduced GHG stems from organic farming, an intervention that is mainly targeted towards other, biodiversity and resource protection, targets. Its climate impacts are welcome but more of a positive side effect. Only a limited amout of RD expenditures have been spent to interventions targeted to the reduction of GHG or ammonia emissions with mainly permanents impacts. Interventions as investment support for emission reduced storage and manure spraying as well as advisory services do permanently reduce emissions, but their share of RD-induced impacts has been low so far. A limitation of this study is, that it only comprises the impact of EU-financed RD programmes. There are similar national schemes, which's impact so far is not analysed. The presented impacts therefore represent only a fraction of all emission reducing policies in agriculture in the regions studied.

Literatur

ENRD [European Evaluation Helpdesk for Rural Development] (2019) Summary Report Synthesis of the Evaluation Components of the Enhanced AIRS 2019: Chapter 7, 91 p, zu finden in <https://enrd.ec.europa.eu/sites/enrd/files/evaluation_publications/air2019_report_chapter_7_december2019.pdf> [zitiert am 28.2.2021]

EU-KOM [Europäische Kommission] (2020a) Mitteilung der Kommission an das Europäische Parlament, den Rat, den Europäischen Wirtschafts- und Sozialausschuss und den Ausschuss der Regionen. Mehr Ehrgeiz für das Klimaziel Europas bis 2030. In eine klimaneutrale Zukunft zum Wohl der Menschen investieren: Der Klimazielplan für 2030, zu finden in <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52020DC0562&from=EN>

EU-KOM [Europäische Kommission] (2020b) Mitteilung der Kommission an das Europäische Parlament, den Rat, den Europäischen Wirtschafts- und Sozialausschutz und den Ausschuuss der Regionen. „Vom Hof auf den Tisch" – eine Strategie für ein faires, gesundes und umweltfreundliches Lebensmittelsystem, zu finden in <https://eur-lex.europa.eu/resource.html?uri=cellar:ea0f9f73-9ab2-11ea-9d2d-01aa75ed71a1.0003.02/DOC_1&format=PDF>

EU-KOM [Europäische Kommission, GD Landwirtschaft und Ländliche Entwicklung] (2018) Impact indicators, zu finden in <https://ec.europa.eu/info/files/impact-indicator-fiches_en> [zitiert am 22.4.2020]

Grajewski R, Bathke M, Bergschmidt A, Eberhardt W, Ebers H, Fengler B, Forstner B, Franz K, Gröner C, Peter H, Pollermann K, Pufahl A, Raue P, Reiter K, Sander A, Roggendorf W (2019) Ergebnisse der laufenden Bewertung von PFEIL - Beitrag zu Kapitel 7 des erweiterten Durchführungsberichts 2018. Braunschweig, 5-Länder-Evaluation 13/2019, zu finden in <https://www.eler-evaluierung.de/fileadmin/eler2/Publikationen/Projektberichte/5-Laender-Bewertung/2019/Fortschrittsbericht-NI_HB-2019_mit_Beitrag_Kapitel_7-endg.pdf> [zitiert am 12.5.2022]

Haenel H-D, Rösemann C, Dämmgen U, Döring U, Wulf S, Eurich-Menden B, Freibauer A, Döhler H, Schreiner C, Osterburg B, Fuß R (2020) Calculations of gaseous and particulate emissions from German agriculture 1990 – 2018 : Report on methods and data (RMD) Submission 2020: Berechnung von gas- und partikelförmigen Emissionen aus der deutschen Landwirtschaft 1990 – 2018 Report zu Methoden und Daten (RMD) Berichterstattung 2020, Thünen-Institut (TI), 448 p. Thünen Report, zu finden in <https://literatur.thuenen.de/digbib_extern/dn062152.pdf> [zitiert am 8.6.2020]

HMUKLV [Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz] (2019) Erweiterter jährlicher Durchführungsbericht für 2018 Germany - Rural Development Programme (Regional) - Hesse (Zeitraum 01/01/2018 - 31/12/2018). Wiesbaden, zu finden in <https://umwelt.hessen.de/sites/default/files/media/hmuelv/erweiterter_jaehrlicher_durchfuehrungsbericht_eplr_2018.pdf> [zitiert am 25.3.2020]

Klimaschutzprogramm 2030: Klimaschutzprogramm 2030 der Bundesregierung zur Umsetzung des Klimaschutzplans 2050 (2019), zu finden in <https://www.bundesfinanzministerium.de/Content/DE/Downloads/klimaschutzprogramm-2030-der-bundesregierung-zur-umsetzung-des-klimaschutzplans-2050.pdf?__blob=publicationFile&v=2> [zitiert am 06.10.202]

MKULNV [Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen] (2019) Erweiterter Durchführungsbericht Germany - Rural Development Programme (Regional) - North Rhine-Westphalia. Düsseldorf

Raue P, Bathke M, Eberhardt W, Ebers H, Fengler B, Forstner B, Franz K, Grajewski R, Pollermann K, Pufahl A, Reiter K, Sander A, Roggendorf W (2019) Ergebnisse der laufenden Bewertung des Landesprogramms Ländlicher Raum (LPLR) des Landes Schleswig-Holstein 2014 bis 2020 : Beitrag zu Kapitel 7 des erweiterten Durchführungsberichts 2018. Braunschweig, 5-Länder-Evaluation 14/2019, zu finden in <https://www.eler-evaluierung.de/fileadmin/eler2/Publikationen/Projektberichte/5-Laender-Bewertung/2019/14_19_SH_Beitrag_zu_Kapitel_7_MS.pdf> [zitiert am 12.5.2022]

NEC-RL 2016/2284/EU: Richtlinie (EU) 2016/2284 des Europäischen Parlamentes und des Rates vom 14. Dezember 2016 über die Reduktion der nationalen Emissionen bestimmter Luftschadstoffe, zur Änderung der Richtlinie 2003/35/EG und zur Aufhebung der Richtlinie 2001/81/EG (RL (EU) 2016/2284)

Roggendorf W (2020a) Minderung von Ammoniak- und Treibhausgasemissionen der Landwirtschaft. Braunschweig, 5-Länder-Evaluation 17/2020, zu finden in <https://www.eler-evaluierung.de/fileadmin/eler2/Publikationen/Projektberichte/5-Laender-Bewertung/2020/17_2020-HE_Minderung_Treibhausgas-und_Ammoniakemissionen.pdf> [zitiert am 16.2.2021]

Roggendorf W (2020b) Verringerung von Treibhausgas- und Ammoniakemissionen – Fördereffekte im Schwerpunktbereich 5D: NRW-Programm Ländlicher Raum 2014 bis 2020. Braunschweig, 5-Länder-Evaluation 15/2020, zu finden in <https://www.eler-evaluierung.de/fileadmin/eler2/Publikationen/Projektberichte/5-Laender-Bewertung/2020/15_2020_NRW_SPB5D_Verringerung_Treibhausgas-und_Ammoniakemissionen.pdf> [zitiert am 29.10.2020]

Roggendorf W, Schwarze S (2020) Effekte auf Wasser- und Klimaschutz - Eine Analyse betrieblicher Nährstoffvergleiche für ausgewählte Flächenmaßnahmen: NRW-Programm Ländlicher Raum 2014 bis 2020. Braunschweig, 5-Länder-Evaluation 14/2020, zu finden in <https://www.eler-evaluierung.de/fileadmin/eler2/Publikationen/Projektberichte/5-Laender-Bewertung/2020/14_2020_NRW_Wasser_und_Klimaschutz.pdf> [zitiert am 28.10.2020]

Rösemann C, Haenel H-D, Dämmgen U, Döring U, Wulf S, Eurich-Menden B, Freibauer A, Döhler H, Schreiner C, Osterburg B, Fuß R (2019) Calculations of gaseous and particulate emissions from German agriculture 1990 – 2017 : Report on methods and data (RMD) Submission 2019: Berechnung von gas- und partikelförmigen Emissionen aus der deutschen Landwirtschaft 1990 - 2017 - Report zu Methoden und Daten (RMD) Berichterstattung 2019, hg. v. Thünen-Institut (TI), 432 p. Thünen Report, zu finden in <https://www.thuenen.de/media/institute/ak/Allgemein/news/Thuenen_Report_67.pdf> [zitiert am 2.9.2019]