



Sustainable agriculture – more ecologically sound food production

Agriculture is the basis of our diets. Arable and livestock farming provide us with food. In addition, agriculture produces renewable resources for use as material feedstock and for energy generation, and it generates employment. Every ninth job in Germany is directly or indirectly related to agriculture and the food industry.

Roughly half of our land area is under agricultural land use. This shapes the landscape and impacts on soils, biodiversity, air, groundwater and surface waters. Agricultural production is dependent on natural processes and is therefore particularly vulnerable to climate change; at the same time it also generates greenhouse gases.

With the end of the use of fossil resources, humankind will in future be more dependent on renewable resources. This makes it all the more important for these to be produced and utilised in a sustainable manner. Adapting production to our environment's natural carrying capacities is therefore one of the great tasks of future-proofing the farming sector.

Greenhouse gases: Livestock farming and nitrogen fertiliser use as the main causes

In 2018, the agricultural sector emitted 69.8 million tonnes of greenhouse gases or around eight per cent of Germany's total emissions. These emissions are expressed in CO₂ equivalents, which also include the climate gases methane and nitrous oxide, which are relatively common emissions in farming. Agricultural production is also per se associated with climate gases due to its inherent biological processes that cannot be reduced to zero even by means of more evolved technologies.

Roughly half of the emissions come from livestock production and are caused by ruminant digestion and the storage and landspreading of manure and slurry. Slightly more than one third of the emissions come from excessive nitrogen fertiliser use in arable farming (including the production of animal feed and energy crops). The remaining 15 per cent are caused by fuel consumption for agricultural machinery, fermentation of energy crops and other fertiliser applications.

Scientists from the Oeko-Institut, Prognos AG and the Wuppertal Institute studied the development of emissions in the agricultural sector as part of a study entitled "Towards a Climate-Neutral Germany" commissioned by Agora Energiewende, Agora Verkehrswende and the Climate Neutrality Foundation. They developed a scenario for a joint pathway towards carbon neutrality in all sectors by 2050.

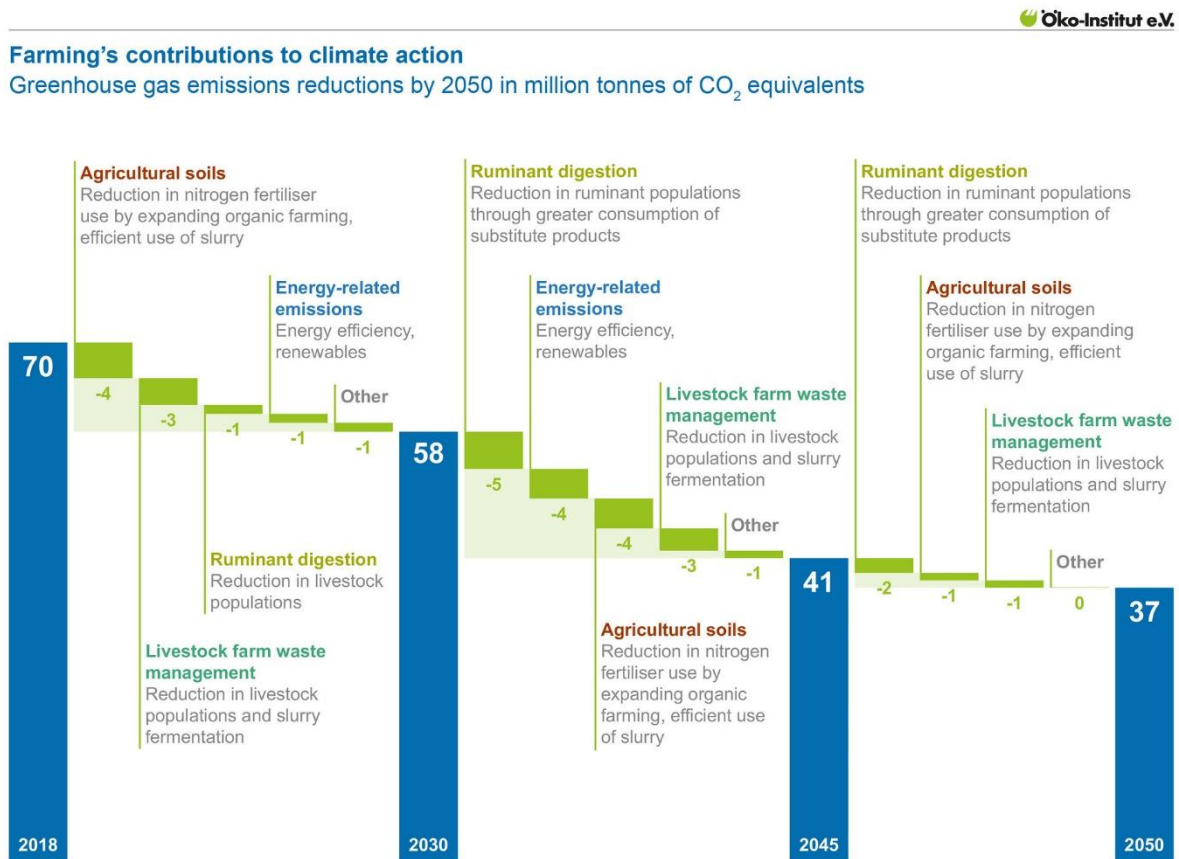
Reducing greenhouse gases, developing storage solutions

Agriculture cannot become climate-neutral; the scenario envisages emissions reductions down to 58 million tonnes of CO₂ equivalents by 2030 and 44 million tonnes by 2050. The biggest levers for emissions reductions are reduced nitrogen deposition into the soil (more organic farming, less mineral fertiliser, more efficient use of slurry, cultivation of legumes), a decrease in energy-related emissions, and changes in the livestock population (fewer bovines and more poultry).

The scenario explicitly makes no assumptions regarding behavioural changes, but rather assumes a continuation of current consumption trends. The major lever – a reduction in livestock numbers as a result of reduced demand for animal products – therefore remains largely unused in this scenario. Changes in land use, such as the rewetting of peatlands or changes in grassland management, also play a role.

In the scenario for a carbon-neutral Germany, the remaining emissions from the agricultural sector are offset by technical measures that are not yet available today, such as Bioenergy with Carbon Capture and Storage (BECCS). This involves the burning of biomass in industrial processes, capturing the carbon dioxide from the waste gas stream and storing it underground in empty North Sea gas fields.

Figure: Contributions of the farming sector to greenhouse gas reduction



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Source: Oeko-Institut

[Klimaneutrales Deutschland study by the Oeko-Institut, Prognos AG and Wuppertal Institute commissioned by Agora Energiewende, Agora Verkehrswende and the Climate Neutrality Foundation](#)

[Executive Summary in English: "Towards a Climate-Neutral Germany"](#)

Surplus nitrogen: A systemic issue

Excess nitrogen from agricultural sources is problematic for soil, water, the climate and species diversity. [Two thirds of all nitrogen deposition into the environment](#) in Germany comes from arable and livestock farming. This is due in part to the high level of mineral fertiliser use in conventional agriculture, mainly with a view to achieving maximum yields or particular crop qualities – especially when it comes to baking wheat or vegetables – and also unfavourable crop rotations.

Excrement from livestock production also drives nitrogen loads up. This is true especially in regions with high livestock densities. Bought-in feed contributes additional nitrogen to farms, further overloading soils. These processes strongly upset the natural nitrogen cycle – in Germany and around the world; the planetary carrying capacity has already been clearly exceeded.

In addition to the impacts caused by the release of greenhouse gases, excess nitrogen is disastrous for biodiversity. Many species depend on nutrient-poor soils, and many of them are now at risk of extinction. Moreover, excess nitrogen in the form of nitrates enters groundwater and watercourses and ultimately drinking water. In the form of ammonia emissions, it is also a serious air pollutant.

In a project funded by the state of Baden-Württemberg, scientists at the Oeko-Institut and FIBL Projekte GmbH analysed these issues in detail. They examined the input pathways and action mechanisms, identified reduction potentials and mitigation targets, analysed the existing legal framework and defined a more supportive one, and identified actions, instruments and implementation options.

[Final report "Instrumente und Maßnahmen zur Reduktion der Stickstoffüberschüsse" \[Instruments and actions to reduce nitrogen surpluses\] by the Oeko-Institut and FIBL Projekte GmbH, with financial support from the state of Baden-Württemberg](#)

Biodiversity: Land-use change destroys ecosystems

Not only nitrogen emissions have adverse impacts on biodiversity. The use of phosphates and pesticides also leads to biodiversity loss. Land-use change such as forest clearance directly destroys natural ecosystems – an effect that is particularly extreme in rainforests of the global South. Moreover, increasingly intensive cultivation leads to the loss of agricultural landscapes characterised by structural heterogeneity and high species diversity.

The intensification of agricultural production is often accompanied by an overexploitation of natural resources. As a result, soil organic matter decreases, leading to soil erosion, compaction and salinisation – impacts that also adversely affect biodiversity.

But even post-harvest, food production still has a damaging impact on biodiversity. From the food industry to transports and from processing to plastic waste every step in the value chain uses up resources, energy and water or consumes land resources. Climate change itself, caused by the greenhouse gases emitted in the process, is changing ecosystems worldwide, and this is an enormous problem particularly for ecological specialists among species.

Making agricultural policy more sustainable, engaging consumers

To address the interconnected problems, we need more sustainable agriculture that conserves soil, water and biodiversity. Responsible production methods will also be able to feed future generations and leave them with an intact environment. They protect the climate while not losing sight of the global social dimension. They also allow for a good quality of life in the countryside.

A diverse range of approaches is needed in order to achieve these objectives. Scientists at the Oeko-Institut from a variety of disciplines are contributing their expertise to develop instruments that help shape sustainable agriculture. Some of these instruments focus on the political level, others on consumer behaviour.

EU Common Agricultural Policy

The EU's Common Agricultural Policy (CAP) has a considerable steering effect on agriculture. In June 2018, the EU Commission presented a reform package for the years 2021 to 2028, which scientists from the Oeko-Institut evaluated on behalf of Germanwatch with regard to its climate change mitigation impact. The core message: in its proposed form the CAP will not be sufficient to achieve the set climate and environmental objectives or to implement the objectives of the "Farm to Fork Strategy" and the "Green New Deal".

The negotiations on the new agricultural policy have not yet been concluded. At EU level, the next trilogue on EU agricultural policy reform will take place in early May. In Germany, discussions on national implementation are ongoing. The Federal Cabinet meanwhile agreed on key draft legislation for the implementation of the EU agricultural policy (as of April 2021).

In order to receive payments from the EU agricultural budget, recipients must already comply with a variety of mandatory minimum standards. These standards are supposed to ensure that land is kept in "good agricultural and environmental condition (GAEC)". However, the precise details of the new GAEC standards are still unclear, especially with regard to wetland conservation and nutrient management. Voluntary eco-schemes are a new planned addition, through which farmers will receive higher area premia if they deliver additional environmental and climate benefits going beyond the minimum standards. The eco-schemes are to be developed by the individual Member States.

The following factors have been identified as distinct drivers for emissions reductions in agriculture:

- Reduction of nitrogen loading including the reduction of nitrogen surpluses
- Linkage between livestock production and forage area, especially with regard to grassland for ruminants
- Peatland-conserving management of agriculturally used organic soils
- Expansion of uncultivated land and agroforestry systems

If the GAEC standards and the eco-schemes were to be ambitiously designed, agricultural policy could contribute to the reduction of greenhouse gases in the European agricultural sector by 2030. It is not yet clear whether sufficient funding will be available.

[Short study "Verbesserung des Beitrags der Gemeinsamen Agrarpolitik zum Klimaschutz in der EU – Quantifizierung der Treibhausgasreduzierungsziele der GLÖZ-Standards und der Eco-Schemes" prepared by the Oeko-Institut on behalf of Germanwatch 10/2020](#)

[\[English summary “Improving the contribution of the Common Agricultural Policy to climate change mitigation – Quantification of the greenhouse gas reduction potentials of GAEC standards and Eco-Schemes”\]](#)

A Sustainable Food Act: Promoting transformation in agriculture

An innovative instrument for the necessary transformation of agriculture towards greater sustainability is being developed by scientists from the Oeko-Institut, the Research Institute of Organic Agriculture (FiBL) and the organic farming association Bioland on behalf of Germany’s Federal Ministry of Education and Research (BMBF). Analogous to the Renewable Energy Sources Act, which gave a huge boost to renewable energy production in Germany (and also globally), the Sustainable Food Act (Nachhaltige-Lebensmittel-Gesetz, NLG) is intended to advance transformation in the farming sector.

The higher costs for food that promotes biodiversity and protects the climate and the environment would be reimbursed to producers through a kind of fixed "feed-in tariff" (to use the Renewable Energy Sources Act term). The difference in cost between market prices and fixed prices would in turn be apportioned among all products in the form of a surcharge. Farmers' representatives and civil society actors are also involved in the development of this forward-looking policy instrument. Ultimately, the NLG should address both the demand and supply side.

Major leverage: Communal catering

It is clear that for agriculture to become more sustainable, not only production but also consumption, i.e. people’s diets, must change. In a working paper, researchers from the Oeko-Institut developed policy recommendations for a transformation of communal catering. This area can be seen as a “system lever”, as it is often under the direct influence of public procurement. Moreover, it is here that different age groups, especially children and young people, can come into contact with a sustainable offering.

The researchers identified the following key points as goals for the intended transformation of communal catering:

- Reduction in the proportion of animal products offered in communal catering, e.g. compliance with the German Nutrition Society (DGE) recommendations with regard to meat consumption.
- Increase in attractive and tasty meat-free alternatives offered in communal catering.
- Increase in the proportion of sustainably produced food offered in communal catering facilities; this includes, in particular, organic foods and animal products from farming systems with high animal welfare standards
- Reduction in food waste
- By means of the food they offer, community catering facilities contribute to consumers (re)valuing sustainably produced food.

The researchers also identified barriers to the implementation of more sustainable catering in communal facilities and formulated recommended actions for the federal and regional levels.

Public procurement: Putting the spotlight on biodiversity

As part of the research project titled “Biodiversity Criteria in Procurement II”, scientists at the Oeko-Institut addressed the question as to how the issue of nutrition with a view to conserving biodiversity

and ecosystem services could be taken into account when awarding public contracts for food and catering services. As part of this project, the available findings on selected biodiversity criteria were revised and expanded, and recommended actions for practical implementation in public procurement were presented.

The results are set out in such a way that they may be incorporated directly into administrative regulations under public procurement law. They provide for tangible substantive requirements for public procurement items, compliance with which enables the state, in its function as a role model, to verifiably establish a nature-friendly federal procurement system. In principle, the key approaches can be transferred directly to the area of private consumption.

- Purchasing food the production of which resulted in a lower environmental impact.
- Purchasing food the production of which does not destroy ecosystems that are important for biodiversity conservation (e.g. subtropical or tropical primary forests, mangrove forests).
- Implementation of measures to reduce food waste as much as possible, and thus reduce overproduction of food.
- Implementation of measures designed to reduce the use of foods of animal origin.

[Oeko-Institut research project “Biodiversitätskriterien in der Beschaffung II – Weiterentwicklung und praxisbezogene Konkretisierung von Biodiversitätskriterien in ausgewählten Produktgruppen der öffentlichen Beschaffung des Bundes”](#) [Biodiversity Criteria in Public Procurement II – Further development and practical concretisation of biodiversity criteria in selected public procurement product groups of the German Federal Government] commissioned by the Federal Environment Ministry (BMU)

Further information

[Oeko-Institut e-paper entitled “Unser Essen – eine Gefahr? Nachhaltigkeit bei Ernährung und Landwirtschaft”](#) [Our food – a hazard? Sustainability in nutrition and agriculture], March 2020

[Topic page on “Project results from the field of application ‘sustainable production and consumption of meat’” on the Trafo 3.0 website](#)

[Topic page on “Stickstoff” \[nitrogen\] on the website of the Baden-Württemberg Ministry for the Environment, Climate and the Energy Sector](#)

[Topic page on “Main features of the Common Agricultural Policy \(CAP\) and its implementation in Germany” on the website of the Federal Ministry of Food and Agriculture](#)

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