

The Future of Agriculture A common agenda

Recommendations of the Commission on the Future of Agriculture (ZKL)

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EXECUTIVE SUMMARY

Agriculture is systemically important:

It represents the most fundamental economic activity practised by mankind. It gave rise to the division of labour and to the formation of cities and states, providing the roots from which civilisations emerged. Constituting more than 80 % of German territory, farming and forestry in Germany has a major impact on the natural environment, on soil, animals, waterbodies and biodiversity, and on the country's topography, the 'lay of the land'. With steady increases in production, agriculture has enabled strong population growth. And it has made the supply of food to that growing population ever more reliable and affordable for households. To a large extent, this has resulted in what is now generally perceived as prosperity, meaning that large shares of government, business and household income are available to spend on non-foods and other consumer goods.

The flip side of this progress is seen in overexploitation of the natural environment, and of animals and biological cycles – up to and including seriously harmful effects on the climate.

Added to this is the fact that farming faces an economic crisis. Various factors, not least policy decisions in the past, have led to farming practices that are no longer sustainable in environmental, economic and social terms. Along with general progress, technological advancement has brought rapidly accelerated structural change to Germany's farming system. As a result, production and productivity have increased manifold, while rising costs mean that more and more farming families no longer see a future for their farms. These trends have led to farming being increasingly less able to operate in environmentally sustainable resource cycles

without exceeding natural limits. Given the external costs of prevailing production forms, retaining today's agriculture and food system is not an option on environmental, animal ethics and economic grounds.

The agriculture and food system displays numerous tensions and contradictions. It stands both at the centre of the **global changes** that have gripped our entire civilisation and on the verge of a **radical transformation process**. Given our responsibility for present and future generations, that transformation must be completed within a very short period of time. It is consequently an **agenda for society as a whole**. To secure social acceptance, environmental protection and climate action must be translated into business and economic success. Farming cannot and must not be left behind.

The scope and complexity of the challenges and the diversity of perspectives, interests, needs and expectations also find expression in social conflicts and protests. This is what prompted the Federal Government in July 2020 to establish the Commission on the Future of Agriculture (*Zukunftskommission Landwirtschaft*, or ZKL). This is the Commission's final report.

The Future of Agriculture

In its analyses and recommendations, this final report is also guided by a vision for the future of the agriculture and food system jointly developed for the Commission by representatives of Young Friends of the Earth Germany (BUNDjugend) and the German Rural Youth Association (BDL). That vision links the needs of agricultural producers, the natural environment and future generations worldwide. Intent is that farmers earn social recognition, including in the form of

financial remuneration, because they assume both social and environmental responsibility. In the future, agriculture will serve biodiversity conservation and positively impact the climate. Equally important in this vision are fair structures in commercial dealings with upstream and downstream sectors, the promotion and predominant use of regional cyclical economies, and ideally stable or growing farm numbers. The vision for the future also encompasses farmers and agricultural workers who enjoy the work they do. And it shows high welfare livestock farming, consumers who are well informed about the quality of food, adherence to climate policy agreements and wide-ranging use of digitalisation.

The Commission's final report sets out **development paths** towards that future vision. Those paths are designed to contain risks inherent in future transformation, providing planning reliability and increase farmers' acceptance of the transformation. But above all, they are intended to significantly improve the environmental sustainability of Germany's agriculture and food system, secure its economic viability over time and counter the relocation of production to regions with less stringent environmental and social standards, either elsewhere in Europe or beyond.

For this purpose, the Commission has developed a wide range of proposals and recommendations relating to various aspects of the agriculture and food system. These follow a **common principle: That environmental and ethical (including animal welfare) responsibility in farming can be improved most effectively and sustainably by translating avoidance of the prevailing immense macroeconomic costs of agriculture into economic benefits for farms.**

The agriculture and food system must thus be structured in such a way that increasing the

positive and avoiding the negative effects on the climate, the environment, biodiversity, animal welfare and human health can be in agricultural producers' business interest.

For their part, policymakers must promote and accelerate these changes. They should coherently integrate their entire policy toolkit (from legislation to agricultural administration to financial support) and carefully coordinate their measures with other policy areas (such as trade, consumers, building and education). It is also recommended that, where possible, they switch from indicator-based input management to process and outcome management and attach particular importance to regional cooperation and targeted trials.

Building environmental skills and capabilities

To increase the **positive impacts** of agricultural production **on the climate, the environment, biodiversity, animal welfare and human health** and in turn **avoid negative impacts**, the Commission sets out a package of measures whose integration into farming practice should be supported by various forms of funding, consultation and advice, vocational education and training, and more.

At the forefront are the contributions made by farming in efforts to combat climate change and conserve biodiversity. The aim must be for agriculture and land users to exploit available opportunities to help limit global warming to 1.5 °C. For example, as a matter of urgency, restoration of agricultural greenhouse gas sinks (peatlands and humus-rich soils) must be significantly accelerated and made more attractive. No less important is the creation of stable agroecosystems, the conservation and provision of biodiversity-rich landscape features in sufficient quantities and the establishment of sustainable

nutrient cycles at the regional economic and farm level. In this regard, the Commission also puts forward recommendations for reduced consumption of animal products, improved animal welfare and a more environment-compatible geographical distribution of livestock farming which, in all likelihood, will go along with further reductions in livestock numbers.

Sharing the societal burden

The climate and the environment, biodiversity and animal welfare are public goods and factors of production at the same time. Overusing them incurs economic costs, but protecting them also has its price. Measures to both increase the positive and reduce the negative externalities of agricultural production usually go hand in hand with **rising costs of production**. They must therefore be underpinned with clear, practicable goals that provide reliability for operational and investment planning. The services farming provides to society deserve public recognition and economically attractive remuneration. As the funding needed will exceed currently available public finances, **generating that funding is an agenda for society as a whole**.

The transformation is therefore to be financed first and foremost from targeted excise duties and subsidies, and also from market remuneration for food – especially foods with highly sustainable process and product characteristics – and for other agricultural products (such as energy) and management of the cultural landscape. A further part of the investment in the transformation will be recouped in the form of lower future external costs compared with current forms of production.

Fair markets and enjoyable food

Markets for food and other agricultural products are critical to farm profitability and to income and wages in agriculture. To a certain extent, the additional costs of more sustainable farming, also with regard to environmental and animal welfare concerns, have to be earned in the respective markets. That can only be done if food prices better reflect actual production costs and if competition on the basis of process and product quality gains in importance relative to competition on quantity alone. Value creation and public appreciation are closely linked: the share of agriculture and food in total economic output is at an all-time low and will have to grow again.

Responsible, varied consumption of food is part of changing, increasingly plant-based dietary choices as well as a more modern culinary approach. This is in line with the recommendations of nutrition organisations and can be promoted by appropriate shaping of food environments, by using policy tools to improve market transparency (labelling and certificates) and by refocusing public food procurement. This type of sustainable consumption has positive effects for all involved – as well as for the healthcare system, the environment, the climate and animal welfare.

The Commission looks at many different aspects of the food markets and the food system. It recommends diversification of business models and the promotion of both regional and direct marketing channels. It demands that purchasing relationships between farmers and food processors and food retailers be structured fairly so that the costs of environmental and animal welfare-oriented production are passed on to the consumer. This includes greatly improved transparency for consumers by means of clear, comprehensible and binding labelling schemes

regulated at EU level, social compensation for lower-income consumers and, last but not least, concerted further development and improvement of food environments. It also calls for foreign trade policy that ensures a level playing field for agriculture, both in the EU and beyond the borders of the internal market.

Promoting societal goals and objectives

The Commission unanimously believes that for the process of transforming the agriculture and food system to succeed, the financial resources provided by the public sector must be maintained at current levels but be directed overall in future at **financing the provision of public goods**.

The Common Agricultural Policy (CAP) thus has a key role to play in mastering the transition to a sustainable food system in the EU and placing farmers in a position, economically as well as in other respects, such that they can make the necessary contribution towards achieving climate, clean air, clean water and biodiversity goals and comprehensively protecting the environment. This requires that, over the course of the next two funding periods, the previous area-based direct payments from the first pillar of the CAP be gradually and completely transformed into payments that make it economically attractive to provide specific services benefiting societal goals. The Commission thus recommends reducing conditionality requirements accordingly, gradually increasing the share accounted for by eco-schemes, developing transitional arrangements for the transformation process, and promoting the creation of ecological networks of habitats, landscape features etc. and the establishment of cooperation-based solutions. The national funding arrangements under the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK) should also be

adjusted to address societal challenges such as biodiversity, climate protection, ecosystem restoration, the establishment of protected areas and adaptation to climate change to a greater extent than before.

Benefits for society as a whole

While detailed economic impact assessment of the Commission's recommendations presents considerable methodological challenges, it can nevertheless be said that the anticipated annual **economic cost** of thorough transformation to a sustainable, publicly accepted agriculture and food system is in any case well below the figure in the high double-digit billions of euros represented by the external costs of maintaining the status quo. However, the public budgetary resources currently earmarked for agriculture will not be sufficient to cover the cost of the transformation. The volume of public transfer payments required will also depend on the extent to which a functioning market can be developed for sustainably produced, high-quality food and other agricultural services.

In the mid and longer term, consumers are likely to face higher prices for food. The transformation must therefore be accompanied by social policy measures for low-income consumer groups. However, this additional expenditure will be offset by lower health-related costs as a result of healthier diets, as well as savings in government spending due to the reduction or internalisation of negative environmental externalities in agricultural production. The Commission is thus convinced that the transformation pathways it sets out can be structured in such a way that they are linked to **fair distribution of burdens across society and to savings for the economy as a whole**. Shaping those pathways is a political matter of the utmost urgency.

The greening of economically profitable farming in Germany as a favourable farming location

has its price. But the price of failing to take that action is even higher, incurring far greater costs: for farmers, for the domestic economy as well as for future social cohesion.

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FOREWORD BY THE COMMISSION CHAIR

The production of food is a task of fundamental importance to society and one of existential importance to humanity worldwide. In conjunction with the food system, farming and its associated upstream and downstream sectors form a highly diverse, highly differentiated and complex branch of the economy. This can be viewed from numerous angles – including social, economic and environmental perspectives – some of them mutually complementary, others in conflict with each other. There are practical aspects relating to craft trades to be considered along with questions involving high-tech, hygiene and nutritional physiology, and not least the moral, ethical, political and legal dimensions. Cultural, religious, aesthetic and tourism issues also come into play when discussing farming and food, for example when talking about individual and collective self-reproduction.

In the first instance, this means that no one can participate in social discourse on farming and food without being directly affected; there is no neutral objective standpoint looking in from the outside. From this, however, it can be seen that social discourse on farming is shaped by very wide-ranging perspectives and in some cases intensive debate. Differing positions often seem irreconcilable and not infrequently they clash, if only on the basis of simplistic contrasts. Large-scale industrial farming systems are pitted against small-scale farm structures and vice-versa, organic versus conventional, intensive versus extensive production systems and regional versus global competition. But such simplifications lack nuance regarding both the actual conditions of production and sustainability aspects of the agriculture and food system. They are not suited

to the development of meaningful strategies and models.

The intensity of social discourse over farming and food is also reflected in protest movements, the latest examples in a long line of which being the youth climate movement (Fridays for Future) and the many farmers' protests that have flared up since 2019. From agriculture, climate change, environment and animal welfare policy to policies on food and health and on to economic and trade policy, pronounced conflicts also shape related policy fields at all levels from local communities to the EU and beyond. As policymaking of this kind often lacks a coherent approach, in many cases it fails to meet its own environmental goals.

Against this backdrop, by a cabinet resolution of 8 July 2020, the German Federal Government established and appointed a Commission on the Future of Agriculture (Zukunftskommission Landwirtschaft, or ZKL) (for details see Appendix 1). Its membership comprises what were initially 32 and later 31 leaders appointed ad personam from the most important German sectoral associations and organisations in the fields of agriculture, industry and business, consumer protection, environment protection and animal welfare, together with six academics from the fields of agricultural and environmental research and a Commission Chair. Representatives of the Federal Chancellery and of the Federal Ministries of Finance, of the Interior, Building and Community, of Justice and Consumer Protection, for Economic Affairs and Energy, of Food and Agriculture, and for the Environment, Nature

Conservation and Nuclear Safety participate in Commission activities as non-voting guests.

The Commission's core remit is to draw up "recommendations and proposals to ensure that agriculture in Germany is environmentally, economically and socially sustainable into the future." A highly ambitious time frame was set – between 7 September 2020 and 29 June 2021, during which the Commission met in a total of nine plenary sessions and one extraordinary session. A large and particularly important part of the Commission's work was conducted in internal working groups that the Commission set up to focus on the social, environmental and economic dimensions of the agricultural and food system and on the Common Agricultural Policy (CAP). A further working group, assisted by an external service provider and using a methodologically pre-structured foresight process, drafted scenarios for potential farming systems of the future (see Appendix 4). In addition, at the Commission's request, two Commission members who represent youth organisations engaged in extensive exchange to develop a **Shared Vision for the Future of Agriculture**. Responsibility for planning, organising and coordinating the Commission's work fell to the Commission office located at the Federal Ministry of Food and Agriculture (BMEL) and to the Chair, who was advised in particular by a small group of 'Critical Friends of the Chair'.

As can be seen from the resolution establishing the Commission, it is less a neutral expert commission and more a kind of round table, where representatives of various organised societal interest groups and members of academia meet to share and discuss their different standpoints. The logic in setting up the Commission is to strike a societal and political balance between conflicting economic, environmental and social interests. This final report shows the Commission's achievements in pursuing this endeavour. The result owes much to the common will, shown

by all Commission members from the outset, not to consider the views and interests of others as less relevant, less reasonable or less legitimate than their own. In other words, the paper's existence owes much to the shared commitment of the participants to learn from one another and together as one.

This final report sets out viable perspectives for agricultural and environmental policy over an average time horizon of around ten years (the equivalent of two to three legislative periods). This implies that, rather than taking a specific position on current policy conflicts, the report aims to provide focus for policy-related decision-making.

The future agricultural and environmental policies are described at a medium level of concreteness and abstraction. While refraining from setting out detailed proposals on, for example, regulatory indicators or legal and administrative implementation of the Commission's recommendations, the report nonetheless intends to foster political efficacy. It is primarily directed at the Federal Government's agricultural, environmental and consumer protection policy. Where it does address options for action in farming and the food system, this is largely done in an attempt to suggest and underpin policy-related options, preferences and priorities.

Finally, it should be noted that, despite its overarching perspective, this final report concentrates first and foremost on farming in Germany in relation to the EU. As the most important and influential reference basis in the agricultural system, the food system and rural regions are naturally taken into account, but they are not addressed in the same detail as the agricultural system itself. Forestry and fisheries had to be left out of the analysis.

The members of the Commission believe this endeavour to have been wholly worthwhile.

They see it as an important step both in resolving entrenched conflict and in moving towards common, objective, fair efforts to shape Germany's farming sector into one that is sustainable, and equally viable in environmental, economic and social terms as well as enjoying broad social acceptance. The significance of this can hardly be overstated given the tremendous societal challenges presented by the civilisational paradigm shift that will ensue from interconnected transformations of the agriculture and food system, resource use and mobility and will radically change every sector of economic – and hence also agricultural – production, distribution and consumption.

The Commission on the Future of Agriculture unanimously adopted this final report on 29 June 2021.

Peter Strohschneider (Chair)

OVERVIEW

The following overview sets out the numerous thematic areas and findings covered in this final report.

A Introduction

The first section, **Introduction: Agriculture in Germany** (p. 19), describes the initial situation. The section on **economic aspects** (p. 22) presents key figures on the structure of agriculture, the sector's economic importance and the financial situation of farms as part of a complex value chain. The situation of those who work in agricultural production, either as farm managers, family members or employees, is addressed in the **social aspects** section (p. 28). This is followed by a look at the situation of rural regions, the change in societal demands on agriculture and the self-perceptions of farming families. The **societal tensions** associated with food production, consumption and dietary choices are also discussed: the desire for more sustainable food is not always reflected in the consumer

behaviour that actually shapes the food market and is sometimes associated with adverse health impacts. The third part of this situational report deals with aspects concerning the **environment and animal welfare** (p. 34). The desire for more sustainable food does not always correspond with the fact that farming takes place in nature. More than any other branch of the economy, agriculture influences public goods such as the landscape, soil fertility and biodiversity, water, air and the climate, and the situation for animals living in natural habitats and especially for those kept as livestock. Agriculture is also reliant on the good condition of the natural systems that, by practising increasingly intensive farming, it currently influences in a way that gives rise to a need for change.

B Recommendations

The **recommendations put forward by the Commission** (p. 40) describe what needs to be done in response to that need for change. These are guided by a **Shared Vision for the Future of Agriculture** (p. 40), which the Commission's two youngest members drafted on its behalf. This describes what kind of future of the agriculture and food system the instruments and measures proposed by the Commission in the following are designed to achieve. The broad horizon

inherent to this vision plays a key role, because the Commission aims to mitigate the risk of the agricultural and environmental policy debate getting in its own way by becoming bogged down in matters of detail (as important as these may be) and losing sight of the larger scale societal tasks at hand. This is followed by **twelve guiding principles for rapid, comprehensive transformation** (p. 45) of Germany's agriculture and food system. These describe how the economic,

environmental and social challenges involved can be overcome. They also provide a step-by-step approach to achieving the vision, seeing it not as a task that farming, food processing, industry and trade must tackle alone, but as an agenda for society as a whole. Environmental sustainability and resilience of the food and agriculture system require that its negative externalities be avoided, that food prices reflect actual overall costs as far as possible and that, in the extremely short transformation period (especially in light of the climate crisis and biodiversity loss), reliable economic prospects are ensured for producers. Agricultural and environmental policy will, however, only be able to serve the goals that have been set if their financial and legal measures are designed in an outcome-oriented manner, tested and evaluated in practice and developed coherently using consensus-building processes that require continuous effort.

The subsequent sections specify how the transformation described in the **vision** and **guiding principles** can be implemented in the various areas of action. Of the **social areas of action** (p. 48), section 2.1 first discusses **diversification of the farming sector** (p. 48), which is necessary in achieving economic stability for smaller farms. This means broadening the range of business segments, products and processing structures, and underpinning these with policy measures and appropriate funding programmes. Careful consideration must also be given to **farm risk management** (p. 50) along with the processes of **farm succession** or, where necessary, **farm exit** (p. 50).

A more comprehensive list of measures is set out under 2.2 and 2.3. These are intended to make the **situation for farm workers** (p. 51) more socially equitable and attractive, and address the tasks associated with **generational issues and also diversity** (p. 52) – both in farm succession and with regard to greater equity in agriculture. Section 2.4 addresses the most important of the

future challenges arising from structural change in **agricultural social security** (p. 55).

The social and value creation system around farming remains an important factor for **rural development** (p. 56). However, in section 2.5, the Commission shows this to be a cross-sectional field to which agricultural policy can only do justice in coordinated interaction with a whole range of other policy fields.

Focusing on **social perceptions and appreciation of farming and food** (2.6; p. 57) and on **dietary choices and consumer behaviour** (2.7; p. 58), the two subsequent sub-sections open up yet another thematic area. First, they revisit the different societal positions and expectations regarding farming and food and draw **conclusions for food policy** (p. 58). The Commission believes that without improved dietary choices and changes in consumer behaviour, which also include reductions in the consumption of animal products as well as sugar, fat and salt, transformation of the agriculture and food system will not succeed. The Commission thus sets out recommendations on nutritional education, improving communal catering, healthier food environments, **food labelling** (p. 60) and prevention of **food waste** (p. 61).

The two concluding parts of the second section in Part B, on **politics and administration** (2.8; p. 62) and **knowledge management and scientific political advice** (2.9; p. 64) set out recommendations for structuring the transformation process in terms of policy and administration. In particular, the activities of all relevant policy areas and government departments must be coherently coordinated and provide market players with reliable planning perspectives. At the same time, there are growing demands with regard to the level of knowledge needed in the agriculture and food sector and in relevant policymaking. This must be taken into account when developing practitioners' skills in education, training and

advisory services, and in policy-level reliance on agricultural and nutritional expertise.

Section 3 of the recommendations section of this report turns to **environmental action areas and livestock farming** (p. 68) – the biggest priority (3.1) being the **climate crisis** (p. 68), which poses a particular challenge in the farming sector. Farming is especially affected by climate change and must become **more resilient** to its outcomes (p. 72). This calls for changes in the farming countryside, improved soil quality and the development of adapted crops and varieties. As farming produces greenhouse gases, it also contributes significantly to **global warming** (p. 69). This is why a focus is placed in this section on carbon pricing systems, greenhouse gas sinks such as **peatlands and humus-rich soils** (p. 70) and emission reduction measures – for example in connection with nitrogen fertilisation and livestock farming.

Biodiversity (3.2 to 3.3; p. 72) and biodiversity loss, which is caused to a considerable extent by agricultural production, comprise a second field of environmental action of no lesser urgency for agriculture and society as a whole. The Commission believes it is imperative to reverse the trend as quickly as possible and to meet the goals set out in the Farm to Fork Strategy and the EU Biodiversity Strategy. The focus here is on targeted use of **fertilisers and pesticides, on biodiversity-promoting cultivation methods** (p. 72) and **farming countryside that is diverse in terms of both landscape features and species** (p. 75), and also on conserving and enhancing diversity in livestock breeds and crops, together with corresponding economic incentives. In the implementation of agri-environment-climate measures deemed suitable for this purpose, the Commission advocates approaches in which these measures are developed and implemented not in isolation at individual farm level, but in **cooperatives involving both farmers and conservation workers** (p. 75), thus achieving

better outcomes in terms of conservation goals and bureaucratic effort.

The third field of action covered in this section is **livestock farming** (3.4; p. 79). This is a sector of utmost importance in both environmental and economic and also in social and ethical terms. Here, the Commission on the Future of Agriculture makes express reference to the proposals put forward by the Commission on Improvements in Livestock Farming (Kompetenznetzwerk Nutztierhaltung) and supplements these with additional recommendations for improved animal welfare and health, environmental protection and climate change mitigation. These include proposals for adapting livestock density to available land areas and for a more even geographical distribution of livestock farming, and for reforms to building and emissions legislation.

Finally, in section 4 of its recommendations, the Commission addresses the **economic areas of action** associated with the transformation of the agriculture and food system (p. 82). It is assumed here that, given the major social and environmental challenges in achieving this transformation at national and international level, the prevailing policy programmes, legal frameworks and contractual arrangements must be adapted and that this must be done in a way that also provides operators in the agriculture and food system with economic prospects and a reliable planning horizon. Moreover, it is assumed that meeting the additional costs arising from the transformation is an agenda for society as a whole, that the process can be shaped in a way that is economically viable for farmers and that avoidance of the externalities passed on today to the general public and to future generations will result in a future net gain to the economy.

Subsection 4.1 on **markets** (p. 83) first explains that the form of transformation most compatible with the requirements of functioning markets comprises **avoidance and internalisation of the**

externalities of farming and food production (p. 83). Given the great structural differentiation in the agriculture and food sector, achieving such a transformation calls for a diverse package of measures. In addition to regulatory law and publicly funded incentives, these include various mechanisms to **price in externalities**, thus integrating them into business profitability calculations and thus into market pricing. Where this results in an increase in prices for food, appropriate social compensation must be afforded to low-income groups. In principle, measures to promote the **internalisation of externalities should be embedded at EU policy level**. The EU must also ensure corresponding environmental and social standards by means of border adjustment mechanisms which, as explained in subsection 4.2, establish a **level playing field in international agricultural trade** (p. 90).

One fundamental economic problem, especially for farms, involves the uneven **distribution of market power in the food system** (p. 85). This report thus addresses issues of anti-trust laws, the UTP Directive and the Supply Chain Act. It also deals with producer associations and reducing the distance to consumers with local and regional value chain partnerships (VCPs). These can help boost producers' market positioning and share. **Market transparency and labelling and certification schemes** are particularly important and comprise the main focus in section 4.1.3 (p. 87). In the interest of consumer sovereignty, the Commission argues in favour of clearly comprehensible, trustworthy, binding labelling regulated at EU level.

Subsection 4.1.4 looks at **organic farming** (p. 88) as the only EU-wide, legally defined production system with its own market and well-documented performance requirements for meeting the goals and targets described in the earlier sections. It sets out the policy measures required to further improve the provision of public goods by organic farming and achieve the expansion

targets set at various levels in Germany and the EU.

Subsidies (p. 92) represent a considerable share of income for the vast majority of farms and constitute the largest budget item in the EU. As they are consequently of tremendous economic importance for farmers and have a significant governing effect, the topic is addressed in a dedicated subsection (4.3) of its own. For the EU's **Common Agricultural Policy (CAP)** (4.3.1; p. 92), it is recommended that the current area-based direct payments be gradually and completely transformed from 2023 onwards into economically attractive measures that aid transformation processes in farming – all in line with the guiding principle that public funding for farming activity is specifically directed at financing the provision of public goods. Attention must be paid here to the effectiveness of the funding in relation to the intended goals and also to efficient administration and evaluative monitoring of the funding instruments used. The same applies to **Federal and Länder funding programmes**, which are addressed in 4.3.2 (p. 94). These must also be further developed in a way that ensures they support efforts to protect the climate, biodiversity, farm animal welfare and protected areas in a much more targeted and robust manner than before.

Section 4.4 deals with **technological progress** (p. 97) as a necessary prerequisite in the transformation to a sustainable system, while acknowledging that technology is not sufficient on its own. On the one hand, it discusses the opportunities that digitalisation brings for farming. On the other, it deals with the much-debated innovative field of **plant breeding** (p. 98). In achieving a sustainable, resilient, productive agriculture and food system, along with the largest possible number of crop species, location and climate-adapted varieties are needed that are high-yielding, robust and healthy and of high food or feed and processing quality. Scientifically

sound assessment of breeding methods must be carried out in compliance with the principles of precaution and freedom of choice. **Agrochemical progress** (p. 97) can also aid the sustainable transformation of farming. This calls for a regulatory framework that enables rapid introduction of appropriate products such as biostimulants and low-risk pesticides.

Finally, section 4.5, headed **“Precaution pays”**, **summarises the economic costs and benefits** of a sustainability-focused transformation of the agriculture and food system (p. 100). It calculates the additional costs of such a transformation and shows they will be significantly higher than the public funding currently available for the farming sector. It also shows that these additional costs are far below the figure in the high double-digit billions of euros representing the estimated annual externality cost of maintaining the status quo.

The transformation proposed by the Commission is needed to meet the environmental challenges, the ethical and social aspects of animal husbandry and to enable an economically viable future for Germany's agricultural and food system. As it will be associated with considerable economic benefits in the future, the transformation can be structured in a way that is both socially acceptable and economically attractive for farms. For this reason, achieving it is an agenda for society as a whole.

Appendices

In the Appendices to this final report, the Commission sets out the background to and the milestones in its work process. These include, firstly, the establishing resolution adopted by the Federal Government, the Commission's rules of procedure, its meetings and its working groups. Secondly, they include a **position paper on the Common Agricultural Policy** prepared by the CAP Working Group (p. 161) and four different **scenarios for the future of agriculture** in Germany (p. 147). The latter were developed by the Futures Working Group with support from the *Fraunhofer Institute for Systems and Innovation Research* (Fraunhofer ISI) as part of a methodologically structured foresight process that played a formative role in integrating the heterogeneous problem areas listed in the Commission's mandate and in drawing up its recommendations.

Scenarios A and B, developed as part of this foresight process, describe the target corridor recommended by the Commission for the transformation towards sustainable agriculture in Germany. By way of contrast, Scenario X depicts a business-as-usual approach, which is considered less than sustainable.

Scenario A predicts a broad societal shift towards sustainable farming and food, triggered by a wide range of different stakeholders. In that process, livestock farming will see a sharp decline and will meet societal expectations; external costs will be fully internalised. There is greater regionalisation, decentralisation and the creation of fair value chains along with an increase in direct marketing and the diversity of domestic agricultural products. Environmental policy will make use of regulation, but environmental goals will primarily be achieved by means of market-based incentives. Consumers will have a pronounced

awareness of sustainability, and sustainability will also drive innovation.

Scenario B is characterised by policy activities that bring about fundamental change in the market. Pricing will remain the decisive control variable for consumers. In addition, sustainability and environmental aspects of a product or production process will be priced in by government, thus resulting in sustainable consumption. Societal expectations on animal welfare are not met on a broad scale, so demand for meat and thus livestock farming in Germany will see significant decline. Socially accepted livestock farming will emerge in niches, but the German population will obtain its daily protein requirements from alternative protein sources. The food market will be highly diversified, with biotechnological production of food gaining greatly in importance. Environmental goals will be achieved by means of both regulatory instruments and market-based mechanisms, with compensation provided to offset regulatory interventions.

Scenario X leads to considerable problems regarding biodiversity and goes hand in hand with agriculture migrating and relocating outside of Germany. Environmental policy goals will be achieved by means of regulation and external costs will either be paid for from public funds or exported abroad. The market will be highly segmented and diversified consumption patterns will prevail.

A

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INTRODUCTION: AGRICULTURE IN GERMANY

The production of healthy, environmentally and ethically acceptable food in sufficient quantity and variety is fundamental to human society. It is the central function of the agriculture and food system, which is irreplaceable as a result. However, the ways in which this function is fulfilled are subject to profound and rapid processes of change, driven by both endogenous and exogenous factors. The massively interdependent exogenous factors include social structures, consumption styles and dietary preferences, macro-economic conditions, climatic and environmental conditions, scientific progress and technological advancement, as well as political and legal frameworks, to name but a few. In light of their direct effects on and in many cases the endangered state of ecosystems, agricultural practices and dietary choices are thus increasingly discussed from the perspective of finite resources and intergenerational justice. Agricultural revenues themselves are influenced by the same (both negative and positive) ecosystem impacts.

The outcome is a complex interplay between diverse social trends and the impacts of the agriculture and food system on nature. This results in multilayered and conflict-ridden social discourses that become more and more highly charged in increasingly fragmented publics and in social media. The public debate is strongly influenced by a shift in social values that parallels advancements in scientific knowledge and results in society attaching greater importance to environmental protection and animal welfare. This is

especially evident in the public attitudes towards livestock farming, which are moving from an anthropocentric perspective to increased recognition of the intrinsic value of animals.¹ Similar trends can be seen in relation to climate change and biodiversity loss. While preferences towards animal welfare and environment protection tend to fit with agricultural values of conservation and intergenerational thinking, differences between the various social strata are widening. This can hinder constructive communication, for example between urban and rural communities.

With regard to expectations on farming and food, social science research shows a pronounced “naturalness preference”² among large sections of the population. In many societies, there is widespread scepticism towards interventions in natural processes, such as towards food additives and breeding methods. This phenomenon of a preference for naturalness is based on a concept of nature that goes hand in hand with an idealised notion of nature. ‘Nature’ is charged with positive value concepts. It is ‘good’ (in an ethical, sometimes even religious sense), it is ‘origin’ (home and provenance) and it is ‘pure’ (unadulterated). This preference for naturalness is part of the ambivalence seen in the agri-environment debate. While technical domination of nature in farming processes meets with opposition, farmers themselves often see it as progress. The greater the emphasis on productivity-focused aspects of agriculture and its technologies, the more sceptical perceptions become in certain

1 S. Hölker, A. Spiller et al. (2019): Tierethische Intuitionen in Deutschland: Entwicklung eines Messinstrumentes zur Erfassung bereichsspezifischer Werte im Kontext der Mensch-Tier-Beziehung, in *German Journal of Agricultural Economics*, 299-315.

2 S. Román et al. (2017): The importance of food naturalness for consumers: Results of a systematic review, in *Trends in Food Science & Technology*, Doi: 10.1016/j.tifs.2017.06.010, 44-57.

sectors of society, and also in parts of the farming profession itself.

Such apprehension towards modern agriculture can be interpreted as a critique of nature being brought under the logic of economic exploitation. That critique sees nature and the landscape as one of the few remaining sources of connection to the living world, a place to retreat to and escape the impositions of capitalism and modernity, a place of identity and home. From this perspective, an industry moving away from regional ties, the natural limits of animals and artisanal traditions of food production can be perceived as a threat – a threat of potentially existential dimensions because it is directly linked to food production as a physical need and a culturally shaped process.

Also, many farmers see a considerable gap (known as the citizen-consumer gap) between society's high quality expectations and the prices (too low in farmers' opinion) that people are willing to pay for food. They often perceive public attitudes and expectations of the kind alluded to as a sign of ignorance and alienation from the realities of food production and feel that they are not taken seriously in their role as experts. It is a well-known fact that more and more people no longer have a direct connection with farming. Farmers often feel powerless in this situation, seeing it as unfair given the considerable economic pressure they face. Being a farmer is a form of self-identity which in many cases has been a way of life over several generations and is accompanied by considerable social, financial and time and place-related ties and obligations.

It would, however, be wrong to generalise critical attitudes towards farming as an overall lack of social acceptance or attribute them to mere lack of information. Social discourse is more complex

than that. A highly critical assessment of the agriculture 'system' can also go hand in hand with high esteem for the farmers who work it. And despite the fact that knowledge about agricultural production is declining in an increasingly urbanised population, there is little to suggest that information campaigns alone can boost appreciation for farming; on the contrary, critical attitudes tend to grow with increasing consumer knowledge.³

The situation surrounding the farming discourses outlined in this report harbours the risk of misunderstandings and mutual disappointment where expectations are concerned. These further complicate the objective reconciliation of divergent interests and increase the challenges associated with the creation of a sustainable agriculture and food system.

In the following sections of this introduction, the Commission provides a brief outline and some key figures on the current situation in the agriculture and food system⁴ and on its transition towards the situation assumed in the descriptions, scenarios and recommendations contained in subsequent parts of this final report.

³ W. I. Sonntag, A. Spiller et al. (2021): Im Streit um die Nutztierhaltung: Gesellschaftsorientierte Kommunikationsstrategien für die Agrar- und Ernährungswirtschaft, in *German Journal of Agricultural Economics*, [Doi.org/10.30430/70.2021.1.1-16](https://doi.org/10.30430/70.2021.1.1-16), 1-16.

⁴ By the agriculture and food system, we mean all actors and activities extending from the production to the consumption of food.

1 Economic aspects

Agricultural structure: Agriculture in Germany has a broad range of different farm structures. This primarily reflects great variation in natural conditions from region to region, but also differences in other conditions for agricultural production including socio-structural patterns (such as urban versus rural), economic factors (such as industrialisation) and historical influences (such as inheritance law). There are thus major regional differences between the southwest of Germany, where farms are mostly small, and the east, where large farms predominate.

Superimposed on such differences, however, are changes in agricultural structure that highlight with particular clarity the deep and rapid transformation processes underway in agriculture. For example, the number of farms has remained reasonably stable in the eastern German Länder, while in the western German Länder it has been declining by 2 % to 3 % per year for some decades. Fifty years ago, former West Germany had over 1.1 million farms. Today, the total number of farms in all 16 Länder – former West Germany and former East Germany together – has fallen to 263,500.⁵ The share of German territory accounted for by agricultural land area has shrunk since 1993 by over a million hectares, or by three percentage points.⁶ While there are large regional differences in farm sizes, the average size has grown steadily and continuously, with the number of farms with up to 100 hectares falling by 40,000 in the last decade and

that of farms with over 100 hectares increasing from 33,600 to 38,100.⁷ Livestock holdings have also been growing steadily for decades.

The trend toward larger and often highly specialised farms goes hand in hand with rising agricultural productivity and increasing capital intensity. As the structure of agriculture changes, so do the relative proportions between the agricultural factors of production. Lease and purchase prices for farmland, which accounts for some 51 % of Germany's surface area, are rising, driven by competition with other land purposes (such as for building development, roads, energy generation, resource extraction and nature conservation). They are also increasing due to the privileged treatment of farming under agricultural policy (the CAP) and because land is a particularly attractive investment. Purchase prices of agricultural land rose 204 % between 2005 and 2019.⁸ It is becoming increasingly hard for farmers to buy or lease land that they need to expand or start an agricultural holding.

On the whole in economic terms, and disregarding considerable regional differences, livestock farming can be said to be the largest sector of agriculture in Germany. The same pattern is repeated here as elsewhere, with the number of farms in the sector decreasing, while average livestock holdings and specialisation in livestock farming increase. Cattle, pig and poultry production account for just under two-thirds of all sales

5 Destatis (2021): Landwirtschaft im Wandel – erste Ergebnisse der Landwirtschaftszählung 2020 (press conference statement), <https://www.destatis.de/DE/Presse/Pressekonferenzen/2021/LZ2020/statement-lz2020.pdf>.

6 1993: 54.7%, 19,543,270 ha; 2019: 50,7 %, 18 127 992 ha; Destatis (1994): Land- und Forstwirtschaft, Fischerei. Bodenfläche nach Art der tatsächlichen Nutzung, https://www.statistischebibliothek.de/mir/servlets/MCRFileNodeServlet/DEHeft_derivate_00059032/FS-3-5-1-1993.pdf; Destatis (2020): Flächenerhebung nach Art der tatsächlichen Nutzung, <https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Landwirtschaft-Forstwirtschaft-Fischerei/Flaechennutzung/Publikationen/Downloads-Flaechennutzung/bodenflaechennutzung-2030510197004.pdf>.

7 Destatis (2021): Landwirtschaft im Wandel – erste Ergebnisse der Landwirtschaftszählung 2020 (press conference statement), <https://www.destatis.de/DE/Presse/Pressekonferenzen/2021/LZ2020/statement-lz2020.pdf>.

8 BMEL (2021): Der landwirtschaftliche Bodenmarkt in Deutschland, <https://www.bmel.de/DE/themen/landwirtschaft/flaechennutzung-und-bodenmarkt/bodenmarkt-deutschland-landwirtschaft.html>.

revenue and just under half of the total output value of German agriculture.⁹

This emphasis on livestock farming also impacts the structure of arable farming, which is practised by 74 % of farms on 70 % of the agricultural land area in order to grow agricultural commodities, most of which are destined for use as livestock feed or for human consumption, with a smaller proportion being utilised for energy generation and biomass. About half of the agricultural land is used for fodder production by grassland farming and the cultivation of arable fodder crops such as silage maize,¹⁰ while a good third is used for cereals, mainly wheat.

Manual labour-intensive specialised crops are grown on approximately 230,000 hectares in Germany. The highest-revenue activity here is vegetable farming, which, with a variety of crops, generates 6 % of agricultural output value on 0.8 % of total farmland. The main focus of fruit growing is on apples, followed by strawberries and, to a lesser extent, plums, cherries and pears. Approximately 15,800 winegrowing enterprises in Germany cultivate vines with an output value of over €1.3 billion on an area of 103,000 hectares.¹¹

The structural and economic weighting of German agriculture is also reflected in significantly varying degrees of self-sufficiency. In products such as potatoes, cheese, fresh dairy products, cereals, sugar and pork, German farms meet domestic demand, and in some other areas they produce a surplus. Conversely, Germany is only 37 % self-sufficient in vegetables other than potatoes and just 21.7 % in fruit.¹²

Farm structures: The impact of different farm structures on socioeconomic attributes such as

economic strength, jobs, social integration and cultural heritage is not clear. Even in rural areas, agriculture is now only one of several economic factors and one whose contribution to regional development, at least outside of cluster regions, is to be considered relatively small.

The influence of farm structure on the stability and resilience of the agricultural sector is also complex and unclear. Specialised larger farms – if they have not accumulated sufficient reserves – may be more severely affected by price risk. They may be more vulnerable in certain crises (such as the COVID-19 pandemic or during livestock disease outbreaks) due, for example, to greater dependence on external factors such as seasonal labour and world market prices. To an extent, however, they can offset these disadvantages with higher overall efficiency and hence profitability in specialised production programmes.

Diversified farms, on the other hand, have a greater risk tolerance and their broader positioning gives them advantages in the event of severe crises (such as price fluctuations or crop losses) in a single branch of farming. Their expertise and resources in different branches of farming may enable them to adapt production between their various lines of business relatively flexibly in line with demand.

Yield: Key factors directly affecting farm yield include changes in the market situation (commodity, energy and input markets including the land market, financial markets and the agricultural goods and food markets) and weather conditions influencing crop yields. These cause farm incomes in Germany to fluctuate continually.

⁹ Agrarpolitischer Bericht der Bundesregierung 2019, <https://www.bmel-statistik.de/fileadmin/daten/DFB-0010010-2019.pdf>, 40.

¹⁰ BMEL (2020): Understanding Farming – Facts and figures about German farming, <https://www.bmel.de/SharedDocs/Downloads/EN/Publications/UnderstandingFarming.pdf>

¹¹ Ibid.

¹² Ibid.

An important influence on the size and structure of agricultural earnings is the increasing trend in recent years for farmers to tap additional sources of farm income. 42 % of all farms generate extra income from activities such as processing and directly marketing agricultural produce or energy generation.

Income: Income in the agricultural sector fluctuates greatly and the added value chain is characterised by a wide spectrum of profit margins. Improvement of the income situation and an increase in added value would contribute to the safeguarding and further development of innovative, ecologically sustainable and economically viable agriculture in livestock, crop and horticulture.

Defined as profit plus personnel expense per worker, income in the years 2009 to 2020 was between €23,600 and €35,900.¹³ Comparing between farm types, however, shows a very large spread in terms of income and also income trends over the years (between about €23,000 for grazing livestock farms and almost €73,000 in pig and poultry farms), and this limits the usefulness of the statistical averages for the economics and sociology of agriculture.¹⁴ The same applies with regard to farm size; the bigger the farm, the higher the average income per worker.¹⁵ Overall, a slight upward trend is to be seen over the past one-and-a-half decades (nominal 1.93 % p.a.; real 0.56 % p.a.).¹⁶ It remains to be seen how this will continue in the mid to long term.

Farm incomes also include payments from the EU and from the Federal Government and the Länder. An important factor in farm incomes, albeit one that varies considerably according to

the type of farm and is politically controversial, comprises the area-based direct payments under the CAP. On average across all farms, these accounted for a 40 % share of profit in the last three financial years (2017/2018 to 2019/2020). The largest shares are recorded by grazing livestock farms (69 %) and arable farms (64 %), while the smallest shares are found among farms with particularly high added value per hectare (fruit growing 11 %; viticulture 7 %; horticulture 2 %). In addition, there are farm capital investment subsidies provided by the Federal Government and the Länder under the main national funding scheme – the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK) – a compensatory allowance for farmers in less-favoured areas, and payments under agri-environmental measures. In the 2019/2020 financial year, these payments and subsidies accounted for 10.4 % of operating earnings and 49.5 % of income per worker. On average, due to their size, farms in eastern Germany receive significantly higher payments per farm.¹⁷

This is not an exhaustive list, and in addition to the farm-related assistance mentioned here, active farmers and their families are aided by government support of the agricultural social security system. Tax benefits and simplified tax treatment (regarding, for example, inheritance law or tax rebates on agricultural diesel and motor vehicle tax) also have to be taken into account when looking at agricultural incomes.

Unpaid family workers make up at least part of the workforce on 95 % of farms in Germany. In accordance with the 1955 Agriculture Act, their income situation, and with it the income situation of farming families, is compared with a benchmark

¹³ BMEL (2021): Die wirtschaftliche Lage der landwirtschaftlichen Betriebe. Buchführungsergebnisse der Testbetriebe des Wirtschaftsjahres 2019/2020, <https://www.bmel-statistik.de/fileadmin/daten/BFB-0111001-2020.pdf>.

¹⁴ Ibid., 11.

¹⁵ Ibid., 14..

¹⁶ Own calculation based on BMEL (2021): Die wirtschaftliche Lage der landwirtschaftlichen Betriebe. Buchführungsergebnisse der Testbetriebe des Wirtschaftsjahres 2019/2020, <https://www.bmel-statistik.de/fileadmin/daten/BFB-0111001-2020.pdf>.

¹⁷ Ibid.

wage in commercial employment. On this basis, unpaid family workers earned the benchmark wage in only one-third of the years 2009/2010 to 2017/2018. For methodological reasons, however, this comparison (as with the test farm sample it is based on) is of only limited use for assessing the social situation of the self-employed in agriculture, as it does not make sufficiently precise, if any, allowance for farm divisions, business diversification (such as into renewable energy) and additional income (such as from other businesses or letting). It therefore tends to underestimate the actual income situation of many farming households. Corporate profits alone say little about household incomes and the social situation. The same goes for the substantial rise in farm wealth in some places as a result of very steep increases in land prices. Active farmers are not likely to benefit from this in every instance, however, as selling farmland reduces a farm's productive asset base.

The income situation of agricultural employees is unfavourable. Monthly wages both for skilled workers (averaging about €2,030 in 2018) and for unskilled workers are significantly below the average full-time wage (about €3,000 in 2018).¹⁸ Average wages are particularly low in the livestock sector. This unfavourable overall wage situation is also reflected in the low-wage statistics: In 2018, about one in every five workers in Germany was paid a low wage (21 %). The low-wage rate in agriculture, forestry and fishing is well over twice as high at 54 % (only in the hotel and restaurant industry is it even higher, at

67 %).¹⁹ Analysis of the test farm sample shows, however, that employee incomes on family farms have increased slightly since 2011/2012 after years of standstill. Both the introduction of the minimum wage in 2015 and the shortage of skilled workers are likely to have contributed to this increase.

Value chain: As with the production structures, processing and marketing structures in the food system are highly diverse and vary in their degree of concentration. They have changed significantly since the 1950s, however, for example with the number of food processing companies declining by 90 %. The range of sales channels for agricultural commodities and food products include direct marketing via food wholesalers and retailers, the food processing industry and artisanal food producers, mass catering, the hotel and restaurant trade and European and international export. There is also considerable variation in contractual arrangements (an example being cooperatives in the dairy sector), the degree to which food is processed until market ready and the number of processing stages involved (as with the milk and meat value chains)²⁰ and various extraneous factors (such as international markets and weather conditions). As a rule, contractual relationships in the food supply chain follow a pattern comprising upstream sectors, then production, then processing, then marketing (national and international).²¹ In practice, according to the production sector and the degree of organisation, there may be further

18 Destatis (2020): Verdienststrukturerhebung. Niveau, Verteilung und Zusammensetzung der Verdienste und der Arbeitszeiten abhängiger Beschäftigungsverhältnisse. Ergebnisse für Deutschland, <https://www.destatis.de/DE/Themen/Arbeit/Verdienste/Verdienste-Verdienstunterschiede/Publikationen/Downloads-Verdienste-und-Verdienstunterschiede/verdienststrukturerhebung-heft-1-2162001189004.pdf>, 256; Statista (2020): Höhe des durchschnittlichen Bruttolohns/Bruttogehalts im Jahr je Arbeitnehmer in Deutschland von 1991 bis 2019, <https://de.statista.com/statistik/daten/studie/39044/umfrage/monatlicher-verdienst-in-deutschland-seit-2000/>.

19 Bundeszentrale für politische Bildung: Zahlen und Fakten. Die soziale Situation in Deutschland, <https://www.bpb.de/nachschlagen/zahlen-und-fakten/soziale-situation-in-deutschland/61750/niedriglohn>.

20 Specifically: Bundesanstalt für Landwirtschaft und Ernährung (2020): Bericht zur Markt- und Versorgungslage mit Milch und Milcherzeugnissen, <https://www.ble.de/SharedDocs/Downloads/DE/BZL/Daten-Berichte/MilchUndMilcherzeugnisse/JaehrlicheErgebnisse/Deutschland/2020Bericht-Milch.pdf>; Bundesanstalt für Landwirtschaft und Ernährung (2020): Bericht zur Markt- und Versorgungslage Fleisch 2019, <https://www.ble.de/SharedDocs/Downloads/DE/BZL/Daten-Berichte/Fleisch/2019BerichtFleisch.pdf>.

21 Regarding the food retail trade sales share for various fresh produce groups and the importance of the export trade for the German agricultural and food industry, see also: Die Bedeutung der Strategie des Lebensmitteleinzelhandels in Deutschland für die Landwirtschaft, in Rentenbank (2020): Die künftige Rolle des Lebensmitteleinzelhandels in der Wertschöpfungskette – Chancen, Perspektiven, Risiken (Schriftenreihe, 36).

intermediate stages such as producer groups, agricultural traders, wholesalers or exporters. It goes without saying that the more contracting parties are involved in setting sales and purchase prices as products progress along the value chain, the more complex and indirect are the interrelationships between the beginning and the end of the chain. Despite its constitutive function, the position of agriculture within these value chains has weakened over the decades. Whereas almost 50 % of food sales revenue went to agriculture 50 years ago, for at least 15 years now this figure has been 20 % to 25 %.²² This decline relates both to crop and livestock farming.²³ It is partly explained by productivity increases in production, by market asymmetries between multi-faceted agriculture and the downstream stages and by changes in the competitive situation. In addition, the food industry also subjects agricultural products to more processing than before, which also increases the industry's share of sales revenue.

For a full picture of added value, it is also necessary to consider the share of consumer spending on food. Whereas in 1950, food, beverages and tobacco products accounted for some 44 % of German household expenditure, this figure was down to 25 % by around 1970 and 15.5 % in 2020.²⁴

Farmers have fought for a stronger position in the food value chain for some time, especially with food retailers. Directive (EU) 2019/633 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain (the UTP Directive) was transposed into German law in 2021 with the enactment by

the German Bundestag of the Agricultural Organisations and Supply Chain Act (Agrarorganisationen-und-Lieferketten-Gesetz – AgrarOLkG). This prohibits the most harmful trade practices and is thus intended to ensure greater fairness in contractual and supplier relationships in the food supply chain. Among other things, it establishes an independent ombuds office providing an anonymous and confidential service for anyone in the food supply chain affected by unfair trade practices and prices – including outside of the EU and including trade practices not yet covered by the Act. The Act's effectiveness is to be assessed in an initial evaluation and adjustments made as necessary.

The German agricultural and food sector exports a considerable share of goods and products, amounting to about a third of total agricultural output and about a third of total food industry revenue.²⁵ Germany consequently ranked third among the world's top exporting countries in 2019, behind the United States and the Netherlands. The main exports are dairy and cereal products, confectionery, tobacco products and alcoholic beverages. Meat and meat products are similarly important, with nearly half of all domestic output worth €9.8 billion exported in 2019, including products that have little or no market in Germany (such as pig's ears, pig's trotters and chicken feet).

In total, however, Germany imports significantly more agricultural and food goods than it exports. Germany likewise ranks third worldwide on the import side. Imports include foodstuffs – primarily fruit and vegetables – as well as animal feed.

²² Thünen-Institut für Marktanalyse (undated): Anteil der Verkaufserlöse der Landwirtschaft an den Verbraucherausgaben für Nahrungsmittel inländischer Herkunft in Deutschland, https://www.thuenen.de/media/institute/ma/Downloads/Tabelle1_Anteilsberechnung_2017.pdf.

²³ Bundesanstalt für Landwirtschaft und Ernährung (2020): Welcher Anteil der Verbraucherausgaben für Nahrungsmittel kommt bei den Landwirten an?, https://www.ble.de/SharedDocs/Downloads/DE/BZL/Informationsgrafiken/201120_Verbraucherausgaben.jpg.

²⁴ Statista (2021): Anteil der Ausgaben der privaten Haushalte in Deutschland für Nahrungsmittel, Getränke und Tabakwaren an den Konsumausgaben in den Jahren 1850 bis 2020, <https://de.statista.com/statistik/daten/studie/75719/umfrage/ausgaben-fuer-nahrungsmittel-in-deutschland-seit-1900/>.

²⁵ BMEL (2018): Daten und Fakten – Land-, Forst- und Ernährungswirtschaft mit Fischerei und Wein- und Gartenbau, <https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/Daten-und-Fakten-Landwirtschaft.pdf>.

Organic farming: With rapid growth (by 41.3 % in the last ten years²⁶), organic farming features increasingly in agricultural practice. In Germany, 13.5 % of all agricultural holdings operate in accordance with the rules of the EU Organic Regulation²⁷ on 10.3 % of the total agricultural land area.²⁸ Government policy aims to increase the proportion of organic farming to 20 % (Federal Government figures) and 25 % (EU Farm to Fork Strategy figures) by 2030.

Organic farming is currently the only integrated management model that encompasses management, certification and marketing and has its own significant and highly dynamic market (with current annual revenue of approximately €15 billion). Precisely defined process qualities allow consumers to incorporate specific requirements for agricultural production into their purchase decisions.

Together with rising consumer demand, support under the second pillar of the CAP enables a steadily increasing number of farms to make a living within this value chain. Most direct marketing, community-supported agriculture and regional citizen shareholder schemes are established in connection with organic farming.

Macroeconomic significance: Some 4.7 million employees in around 700,000 operations in the agriculture and food sector produce food and

plant-based commodities for non-food uses. Agriculture accounts for a good 12 % of employment in the entire food value chain. In other words, each job in agriculture is matched by seven other jobs in upstream and downstream sectors. Total production value across the agriculture and food sector was an estimated €499 billion in 2019, or 8 % of the production value of the German economy.²⁹

The national agricultural balance sheet currently places the annual production value of German agriculture alone at around €55 billion to €60 billion, and its gross added value after deducting intermediate inputs at around €20 billion.³⁰ The entire agriculture and food system including upstream and downstream sectors accounts for about 6.6 % of total gross added value.

The relative share of the agricultural system in the overall economy that these figures represent has declined over the decades. Nevertheless, the figures on their own are insufficient to describe the macroeconomic importance of agriculture. The agricultural sector's demand for intermediate inputs (such as seeds and seedlings, chemicals, pharmaceuticals and technical infrastructure) also benefits primarily small and medium-sized enterprises in the wholesale, craft trade and industry sectors. Alongside food and commodities for the food industry, farms increasingly produce renewable energy from

²⁶ BMEL (2021): Ökologischer Landbau in Deutschland, <https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/OekolandbauDeutschland.pdf>; Bundesinformationszentrum Landwirtschaft (2020): Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten der Bundesrepublik Deutschland 2020, <https://www.bmel-statistik.de/fileadmin/daten/SJB-0002020-2020.pdf>.

²⁷ Regulation (EU) 2018/848 of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007

²⁸ BMEL (2021): Ökologischer Landbau in Deutschland im Jahr 2020, <https://www.bmel.de/SharedDocs/Downloads/DE/Landwirtschaft/Biologischer-Landbau/oekolandbau-deutschland-2020.pdf>.

²⁹ On the basis of agriculture statistics (BMEL 2021), the upstream and downstream sectors are added across the entire value chain through to consumption and presented in a chart showing aggregate production values for agribusiness in the Situationsbericht (Situation Report) published by the German Farmers Association (Deutscher Bauernverband 2021). For this purpose, agribusiness is defined as the entire food value chain and thus all stages from primary production including upstream sectors and the food industry including craft trades to food wholesale and retail, catering and consumers.

BMEL (2021): Landwirtschaftliche Gesamtrechnung; Deutscher Bauernverband (2021): Situationsbericht 2020/21. Trends und Fakten zur Landwirtschaft, <https://www.bmel-statistik.de/landwirtschaft/landwirtschaftliche-gesamtrechnung/>; https://www.bauernverband.de/fileadmin/user_upload/dbv/situationsbericht/2020-2021/kapitel1/Kap_1.pdf, 9.

³⁰ BMEL (2021): Landwirtschaftliche Gesamtrechnung, <https://www.bmel-statistik.de/landwirtschaft/landwirtschaftliche-gesamtrechnung/>; <https://www.bmel-statistik.de/fileadmin/daten/SGT-3130500-0000.xlsx>.

biomass, wind and solar power. In 2019, energy crops covered some 2.3 million hectares or about 14 % of the total agricultural land, comprising 1.5 million hectares planted with crops for biogas and 800,000 hectares with crops for biofuels.

2 Social aspects

The social aspects of farming are highly diverse. In addition to the economic dimensions outlined in the previous section, the concerns of those involved in production must also be taken into account, as must rural development. Along with consumer behaviour and people's eating habits, society's view of and expectations of farming are changing. At the same time, attitudes and choices in modern society are characterised by considerable pluralism and are disseminated by numerous channels, including public media and politics, the retail sector and advertising. If it is to provide for an economically viable and environmentally sustainable agriculture and food system, then agricultural and environmental policy must also consider the issues surrounding social acceptance.

Agricultural labour: In an unbroken trend, technological advancements and increasing capital input, combined with high labour costs and comparative wages, have led to strong increases in agricultural labour productivity and the need for an ever smaller workforce. Agriculture no longer employs a quarter of the national labour force – as it did when the Federal Republic of Germany was founded – but only just under 2 % (936,900 people). In the period between 1999 and 2020, farming's share of the labour force fell by almost 35 %. This can largely be attributed to a sharp decline in the family labour force (-54 %). The number of seasonal workers has also dropped

Agriculture also contributes to the preservation of cultural landscapes and habitats for flora and fauna, thus maintaining the appearance of the countryside and in many regions securing the basis for the hospitality industry and tourism.

over the past 20 years, but only by 10 %. By way of contrast, a significant rise has been seen in the number of permanently employed non-family workers (+17 %). This group accounted for 14 % of all workers in 1999 and 24 % in 2020 (+71 %).

In 2020, the labour force structure – meaning the number of employees (irrespective of their employment status as full or part-time workers) – comprised 47 % family labour, 24 % permanent non-family labour and 29 % seasonal labour. As some workers are only employed part time, it thus makes sense to look at the labour force structure on the basis of full-time equivalents. Such data is not yet available for 2020, however, but only for 2016, when the figures were 55 % family labour, 34 % permanent non-family labour and 11 % seasonal labour.

The labour-force structure displays great regional differences: in eastern Germany, for example, permanently employed workers dominate (55 % of workers) due to the large-scale structures in farming. Only 19 % of workers are family workers. Seasonal workers are particularly important in regions where fruit, vegetables and wine are grown.

In 2020, the share of women in family labour amounts to 33 %, in permanent non-family labour 32 % and in seasonal labour 43 %. According to the Federal Statistical Office, only

one in nine farms is run by a woman and in the 2020 agricultural census,³¹ 17 % of designated farm successors are female (compared with only 14 % in 2010). It can thus be expected that a slight increase will be seen in the proportion of farms managed by women. The gender ratio in agricultural studies at universities is relatively balanced.

What these figures do not reflect, however, is women's significance in the running of farms. Many women either manage branches of the farm that generate additional farm income or contribute to the household income by means of off-farm employment. Women are often the drivers of innovation on farms and frequently play a key role in refocusing, modernising and diversifying farm operations. They are the linchpin and bear a high level of responsibility, both within the family and on the farm. Compared with their husbands, they often have far more contact with the non-farming population in the local village – not least through their children (in preschool or school) – and are thus far more likely to hear the concerns and worries of their neighbours and the local population. They play an important role on the ground in explaining what farming means today and what it entails. They can contribute to change processes in farming practice and ultimately to 'building bridges' by being aware of neighbours' concerns and of those of the non-farming population. But despite all of this, male-dominated structures are still prevalent in agriculture and agribusiness.

Finally, when assessing agricultural labour, it should be noted that some of the work needed is outsourced, meaning bought in. The work performed by contractors, machinery rings (pools) and other external service providers amounted to 20.6 million working days in 2020, increasing the labour input performed by farm workers by almost one fifth.³²

Working conditions: Subjective perceptions of working conditions in farming can vary considerably from favourable to unfavourable. Depending on people's preferences, the fact that farm work is an outdoor activity, working with animals and living in rural areas can be seen as an advantage or a drawback, depending on perspective. One particular challenge is that the work is tied to biological processes and is weather-dependent, thus calling for great flexibility – for example as to what type of work needs to be done when. Compared to many other economic sectors, the working hours of people employed in farming are especially unfavourable. There is no other sector in which such a large proportion of workers work at weekends. On many farms with peak periods of seasonal work, work is increasingly done around the clock, not least to make optimum use of expensive machinery. Shift work arrangements, which the situation would normally demand, are lacking in most cases as the peak in work activity only lasts a few weeks.

Agricultural workers are also in demand in other sectors, not least on account of their high levels of motivation and tremendous flexibility. In many regions, the competition for labour is already leading to noticeable increases in income and to improvements where working hours are concerned. Demands for flexible working hours can pose a problem for many workers, especially those with families, and are often a reason to switch to other sectors with more predictable working hours.

Working in livestock farming, with the dirt and the unpleasant odours, and also the heavy manual work involved in crop production is so unattractive that local workers are often no longer available for this type of employment, or only to a very limited extent. With the use of technology, the handling of live animals and the

31 Destatis (2021): Landwirtschaft im Wandel – erste Ergebnisse der Landwirtschaftszählung 2020 (Statement zur Pressekonferenz), <https://www.destatis.de/DE/Presse/Pressekonferenzen/2021/LZ2020/statement-lz2020.pdf>.

32 Ibid.

great variety of activities involved, agriculture has a particularly high risk of occupational accidents.

Seasonal workers: In certain production processes, and especially in the production of vegetables and fruit, seasonal workers are indispensable – not least for harvesting work. They often come to Germany from low-wage countries for a limited period of time. The importance of such seasonal workers will certainly not diminish as the production methods in question have to be further expanded to ensure better regional supply of food.

Various legal provisions such as the Minimum Wage Act (Mindestlohngesetz) and the Posted Workers Act (Arbeitnehmer-Entsendegesetz) have improved overall working conditions for seasonal workers. But in some cases they are still employed on very low wages and under questionable conditions as regards working hours, accommodation, health and safety. However, reports of poor working conditions spread increasingly quickly among seasonal workers (including via social media), and many farms now find that they have to provide better conditions in order to recruit and retain reliable seasonal labour. It can be expected that the provisions contained in the Occupational Safety and Health Control Act (Arbeitsschutzkontrollgesetz), most of which came into force on 1 January 2021, will improve the working conditions of seasonal workers. It will be some time, however, before the impact of these improvements can be assessed.

Rural regions: Rural regions are not only an economic sphere in their own right, they are also a place of retreat for people living in conurbations. However, the traditional triad of farming, rural regions and rural society has dissolved. Farming is now only one of several sources of income in rural regions. Despite the important role of farmers in achieving socially sustainable development in some villages, in most regions the contribution of

agriculture can be assumed to be fairly small. This is despite there being individual cluster regions in which farming provides the basis for a strong processing sector. Whether and to what extent farming has an impact on the social situation in rural regions thus primarily depends on the region and the activities of specific stakeholders, including those in farming and the regional networks they form. In structurally weak regions, for example, organic farming shows how integrated development of farming and processing aids the creation of new value clusters.

An efficient, state-guaranteed infrastructure is central to liveable rural regions. Likewise, committed and innovative stakeholders (individuals, associations, companies, etc.) and equally innovative community structures are needed to create places of social cohesion. Case studies show that special forms of farming and marketing, such as direct marketing, community-supported agriculture and regional citizen shareholder schemes, can act as catalysts in this regard. The success achieved with new production and marketing approaches also depends on the presence of favourable conditions. In some respects, farms nearer to urban centres therefore have an advantage over those which cultivate their land far away from urban markets.

Sustainable regional development is underpinned by a wide range of policy instruments. These include the funding measures under the European Agricultural Fund for Rural Development (EAFRD), such as the LEADER programme and the regional budgets which support community alliances for integrated rural development.

Agriculture and society: Farming's expectations of and demands on society and also the expectations of society of and demands on farming are increasingly frequently a subject of public debate that is becoming more and more polarised. That debate brings to light the often conflicting perceptions that abound and the gaps between

reality and aspiration regarding various aspects of the agriculture and food system.

Structural change in agriculture is widely viewed with more scepticism than in other sectors, for example, and not only farmers themselves but also society as a whole sometimes regard agriculture as a special case (known as agricultural exceptionalism). The decline in the number of farms and the constant growth in farm sizes (more land, more animals, 'industrial farming') tend to be viewed negatively in the public eye. While little is known about the underlying motives, reference is made to preferences towards a small-scale, regional, resilient food system, the preservation of jobs and diversity in rural regions, preservation of cultural traditions, sustainability and the ethically responsible treatment of animals.

These preferences are not only reflected in the media and policy debate, they are also exploited and reinforced in marketing. The imagery of familiar, small-scale, diverse farming landscapes used for this purpose reflects society's prevailing notions of 'desirable' or idealised farming. More than any other, society sees the agriculture and food sector as a counterbalance to mechanised modernity. Trust in individual farmers is considerably higher than systemic trust in the development of the agriculture and food sector overall, with value placed in the continued existence of regionally anchored farming. Anonymous, 'industrialised' structures are seen as the diametric opposite. Against this backdrop, society shows relatively broad-based support for calls to promote smaller, more diverse farms and to limit the dynamics of structural change.

By way of contrast, the self-perception of many farmers differs from public perceptions of their

societal role. The academic standpoint on the relationship between farm size and sustainability is equivocal. An overall review of the admittedly comparatively few relevant and available studies so far shows no clear link between farm size (in hectares) or herd size (in head of livestock) and the environmental impacts of agricultural production and animal welfare.³³

From a sociological perspective, farming is a fundamentally conservative sector whose history – despite great willingness to change – has been coloured by resistance to both the social and the political impositions that modernisation brings. Thus, in the wake of the major transformational challenges faced today (digitalisation and global change), it is hardly surprising that a counter-movement has emerged, aiming to avoid restrictions and continue along proven expansion paths. Corresponding protests are not only to be found in Germany. At their margins, there are currents in which the rejection of modernisation and globalisation is linked to nationalist-conservative perspectives and – as in other areas of society – is increasingly articulated in populist language. In psychological terms, too, modernisation and sustainability trends trigger counter-movements (reactance) partly because many farmers feel they have little power, seeing themselves as small-scale stakeholders at the mercy of society and of high purchasing-power companies in the value chain. Dissatisfaction with prices and income is thus not only, or at least not primarily, related to the level of prices or incomes (see section B 2.1), but also to perceptions of lacking procedural fairness (dependence on the world market, cyclical phenomena in pig farming, residual income in the case of retroactive price setting, etc.). At the same time, farmers' current protests are also fuelled by their perception of a loss of recognition, as described above – "farmer

³³ Animal welfare is seen as the psychological and physical well-being of animals, which can be qualified from very low to very high, whereas animal protection refers to human activities (including regulation) that serve to achieve or secure a certain degree of animal welfare.

bashing" is seen as an expression of lack of respect.³⁴ Protests then also reflect farmers' experiences of social marginalisation ('last farmer in the village').

Nutritional behaviour: In Germany, unlike in other regions of the world, a continuous supply of food is guaranteed by a diverse range of products in a wide variety of product categories. This enables consumers to choose safe food tailored to their particular nutritional needs at an affordable price. Food is more than just food, it is also a cultural asset and a source of identity. In some parts of German society, a '21st century cuisine' has already developed which can be described as 'responsible eating' – the essential motives being taste, convenience, health and sustainability (including in climate and animal welfare terms). This leads to changing consumer desires within the individual food categories themselves, while their relative weighting is also shifting (meat consumption is seeing a slight decline, while consumption of plant-based alternatives is on the rise), all the way through to the establishment of different production systems (such as organic farming).

Most consumers want sustainable, high-quality food. In addition to price, when buying food, great importance is attached to fair production and cultivation conditions, high environmental and animal welfare standards, organic cultivation and regional and seasonal production.³⁵ Ac-

ording to a survey conducted by the European Consumer Organisation (BEUC), two thirds of consumers say they are willing to change their eating habits as a way of contributing to environment protection and sustainable development.³⁶ To some extent, that awareness is also reflected in purchasing behaviour. Younger consumers in particular show increasing preferences towards fresh, organic and regional products, vegetarian or vegan food and plant-based alternatives to animal products. But even so, there is still an attitude-behaviour gap between what consumers say they want and what they actually buy. Suitable measures must be taken to reduce that gap.³⁷

Despite a recognisable trend towards a change in eating habits, the results of German health monitoring also highlight a need for action. In Germany, life expectancy has seen a substantial rise for decades (since the 1970s by more than two years per calendar decade).³⁸ Recently, however, that increase has slowed and Germany now has only average life expectancy rates compared with the rest of the EU.³⁹ Given that the occurrence of disease is partly determined by lifestyle factors, comprehensive primary prevention is of particular importance in reducing the risk of illness. A balanced diet, avoiding overweight/obesity, ensuring an adequate supply of micronutrients and regular physical activity can help to delay or even prevent the occurrence of disease.

34 See R. G. Heinze, S. Kurtenbach (2021): Sorgen und Proteste auf dem Land. Ergebnisse einer empirischen Untersuchung aktueller Bauernproteste, https://www.researchgate.net/publication/350580514_Sorgen_und_Proteste_auf_dem_Land_Ergebnisse_einer_empirischen_Untersuchung_aktueller_Bauernproteste_Kurzfassung_Marz_2021.

35 BMEL (2020): Ökobarometer 2019. Umfrage zum Konsum von Biolebensmitteln, <http://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/oekobarometer-2019.pdf>; Verbraucherzentrale Bundesverband (2021): Verbrauchermeinungen zu Nachhaltigkeit in der Lebensmittelproduktion, https://www.vzbv.de/sites/default/files/downloads/2021/01/18/21-01-15_veroeffentlichung_verbrauchermeinungen_zu_nachhaltigkeit_in_der_lebensmittelproduktion_final.pdf.

36 Bureau Européen des Unions de Consommateurs (BEUC) (2020): One Bite at a Time: Consumers and the Transition to Sustainable Food, https://www.beuc.eu/publications/beuc-x-2020-042_consumers_and_the_transition_to_sustainable_food.pdf.

37 See D. Shaw et al. (2016): Care and Commitment in Ethical Consumption: An Exploration of the 'Attitude-Behaviour Gap', in *Journal of Business Ethics*, <https://doi.org/10.1007/s10551-014-2442-y>.

38 Robert-Koch-Institut (2020): Sterblichkeit und Todesursachen, https://www.rki.de/DE/Content/GesundAZ/S/Sterblichkeit_Todesursachen/Sterblichkeit_Todesursachen_node.html.

39 Eurostat (2021): Lebenserwartung nach Alter und Geschlecht, https://ec.europa.eu/eurostat/databrowser/product/view/DEMO_MLEXPEC%24DV_292?lang=de.

Since the mid-2000s, preventive health measures have been implemented in Germany as part of an ongoing process. The prevalence of overweight and obesity among children and adolescents has stabilised at a high level in the course of the past decade.⁴⁰ It is thus important that prevention approaches continue to focus strongly on children and adolescents; supported by findings in the field of perinatal programming and social research, preventive measures have a greater effect the earlier the age they target. But at the same time, results of German nutrition and health monitoring indicate a socio-economic (and partly cultural) connection. Population groups with the greatest need for support still tend to benefit too little from the measures that have been introduced.

In addition, prevalent dietary choices in Germany are also associated with environmental impacts that will not be remedied or mitigated by technological innovation alone (such as increased efficiency, with the focus on sustainable intensification). The most important example in all of this is the level of consumption of animal products. As the associated greenhouse gas emissions (notably methane and nitrous oxide) can only be avoided to a limited extent by technical means and because processing losses can also only be reduced to a limited extent due to the conflicting goals in ensuring animal welfare, most research suggests that behavioural change, essentially the consumption of fewer animal products, is a prerequisite.⁴¹

There have recently been calls in nutrition research for more societal solutions addressing the nutritional environment to complement individual nutritional responsibility.⁴² Both consumer protection and the limits of state regulatory power need to be considered in this connection, and both of these are the subject of heated consumer policy debate.⁴³

40 A. Schienkiewitz et al. (2018): Übergewicht und Adipositas im Kindes- und Jugendalter in Deutschland – Querschnittergebnisse aus KiGGS Welle 2 und Trends, in *Journal of Health Monitoring*, <http://dx.doi.org/10.17886/RKI-GBE-2018-005.2>.

41 W. Willet et al. (2019): Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems, in *The Lancet*, [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4); WBAE (2020): Politik für eine nachhaltigere Ernährung. Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten, https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.pdf.

42 WBAE (2020): Politik für eine nachhaltigere Ernährung. Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten, https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.pdf.

43 See most recently U. Di Fabio (2021): Staatliche Ernährungspolitik und Verfassung. Stellungnahme zum WBAE-Gutachten 2020, in *Zeitschrift für das gesamte Lebensmittelrecht*; P. Kenning, I. Wobker (2013): Ist der „mündige Verbraucher“ eine Fiktion? Ein kritischer Beitrag zum aktuellen Stand der Diskussion um das Verbraucherleitbild in den Wirtschaftswissenschaften und der Wirtschaftspolitik, in *Zeitschrift für Wirtschafts- und Unternehmensethik*, <http://www.nomos-elibrary.de/10.5771/1439-880X-2013-2-282/ist-der-muendige-verbraucher-eine-fiktion-ein-kritischer-beitrag-zum-aktuel-len-stand-der-diskussion-um-das-verbraucherleitbild-in-den-wirtschaftswissenschaften-und-der-wirtschaftspolitik-jahrgang-14-2013-heft-2>, 282-300.

3 Environment and animal welfare

Agriculture takes place in and with nature and also depends on nature. Natural conditions play a decisive role in determining the opportunities for agricultural activity in a given region. With the exception of only a few areas, Germany is a favourable location for agricultural production due to its fertile soil, currently temperate climate and adequate levels of precipitation. In turn, farming impacts the environment, both in the farmed areas themselves and, in some cases, far beyond. In recent years, these interdependencies have increasingly been a subject of public debate, with issues of climate, water quality and biodiversity receiving the greatest attention.

Climate: Agriculture is closely linked with climate change. Farming activity causes emissions of greenhouse gases, but is itself directly affected by human-induced climate change, often in a negative way. In addition, certain forms of farming hold considerable potential for permanent sequestration of greenhouse gases.

In Germany, a total of 739.5 million tonnes of carbon dioxide equivalents (CO₂-e) were emitted in 2020. According to the greenhouse gas reporting system, 66.4 million tonnes of CO₂-e, or just under 9 %, came from the farming sector (60.4 million tonnes of CO₂-e plus six million tonnes of energy-related CO₂-e emissions). Emission levels dropped between 1990 (77 million tonnes CO₂-e) and 2006 (62 million tonnes CO₂-e), then rose slightly in the period up to 2014 (66 million tonnes CO₂-e). They have since seen another slight fall, matching levels in 2006 (2019: 62 million tonnes CO₂-e). A further 4.4 % comes from land use/land use change in arable land and grassland, with about 41 million tonnes of CO₂-e recorded in 1990. By 2020, this figure had fallen to about 32.4 million tonnes CO₂-e. Farming thus accounts for 13.4 % of total emissions

in Germany (9 % for agriculture and 4.4 % for agricultural land use/land use change on arable land/grassland), although this does not include effects from imports and exports (for example of soya as animal feed). Livestock farming and fertilisers are the largest emitters of greenhouse gases. Ruminants emit climate-impacting methane during digestion (23.2 million tonnes of CO₂-e in 2020), which accounts for approximately 38.4 % of total emissions from farming. Added to this are emissions from farm manure storage and application (8.6 million tonnes CO₂-e in 2020). In 2020, nitrous oxide emissions from agricultural soils as a result of nitrogen fertilisation (both mineral and organic) accounted for 24.4 million tonnes of CO₂-e.

The Federal Government's Climate Action Plan 2050 envisages a reduction in greenhouse gas emissions from the agriculture source group plus direct energy-related emissions from farming, forestry and fisheries of between 31 % and 34 % by 2030 compared to 1990. This corresponds to emissions of between 58 and 61 million tonnes of CO₂-e in 2030. Other goals set out in the Climate Action Plan include the preservation and improvement of ecosystems' sink performance through, among other things, the conservation of permanent grassland and the protection of peatlands as sinks.

The Federal Climate Change Act of 2019 set the sectoral target for farming at 58 million tonnes of CO₂-e. The recent amendment to this Act, constituting the Federal Government's response to a German Federal Constitutional Court ruling of 24 March 2021, provides for a sectoral target of 56 million tonnes. Among the climate action measures in the farming sector as adopted under the Climate Action Programme 2030 are reduction of nitrogen surpluses, including

the reduction of ammonia emissions, targeted reduction of nitrous oxide emissions, promotion of fermentation of farm manure of animal origin, expansion of organic farming and a reduction in greenhouse gas emissions from livestock farming. In addition, carbon storage potential is to be promoted, for example through humus conservation and creation.

Soil: Soil forms the basis for agricultural production. The economic utility of an area of land is largely determined by its soil properties. Soil provides habitats for a wide range of organisms. By breaking down organic material and loosening the soil, those organisms contribute to the creation of healthy, fertile soil. In turn, land management affects both soil and soil fertility. This takes in various aspects, such as soil erosion, soil biodiversity, soil compaction and pollutants in soils.

The extent of soil erosion by water and wind on farming land depends first and foremost on the prevailing geological conditions, landscape structure and the practices used in cultivating the soil. The phenomenon of erosion does not occur to any significant extent in forests or grassland. The risk of erosion increases considerably in areas where there is little or no vegetation.

Soil biodiversity can be positively influenced by certain forms of cultivation, but it can also be harmed by certain predominant farming activities. For example, pesticides and excessive nutrient levels can have a negative impact, as can soil compaction and deep tillage. Although soil biodiversity is not systematically recorded and evaluated, studies point to a negative trend.⁴⁴

Nutrient surpluses, including those from farming, impair the quality of surface and groundwater bodies and contribute to higher nutrient levels in ecosystems. At lower nutrient levels, more species occur (with relatively fewer individuals), meaning positive consequences for species numbers and thus for biodiversity. Conversely, high nutrient levels or fertiliser loads in the landscape have a negative impact on biodiversity as specialised, competitively weak species can be displaced by a small number of other species that then proliferate. The current situation in Germany is unsatisfactory in this respect: in 2015, 68 % of the area of sensitive ecosystems was threatened by excessive nitrogen inputs. Nitrogen surpluses from farming show a downward trend in the overall balance. Between 1992 and 2016, the five-year moving average of nitrogen surpluses fell from 116 kg hectare of agricultural land per year to 93 kg. The Federal Government's National Sustainable Development Strategy sets a target of 70 kg per hectare per year.⁴⁵ In 2019, the European Commission's Farm to Fork Strategy⁴⁶ set an ambitious target for 2030 of reducing nutrient losses by 50 % and fertiliser quantities by 20 % while maintaining soil fertility levels.

Farming activities can also be a source of soil pollutants. Through the application of slurry and sewage sludge, nutrients in excess of plants' needs and also other residues (such as medicines and microplastics) can enter the soil.

Excessive soil compaction has a limiting effect on various positive soil properties such as water absorption capacity, resistance to water erosion, the living conditions of soil organisms and ultimately soil fertility. One particular cause of soil compaction is cultivation and driving over

⁴⁴ J. P. van Leeuwen et al. (2017): Gap assessment in current soil monitoring networks across Europe for measuring soil functions, in *Environmental Research Letters*, <https://iopscience.iop.org/article/10.1088/1748-9326/aa9c5c>; Umweltbundesamt (2013): Verlust der Biodiversität im Boden, <https://www.umweltbundesamt.de/themen/boden-landwirtschaft/bodenbelastungen/verlust-der-biodiversitaet-im-boden#funktion-der-bodenorganismen>.

⁴⁵ Umweltbundesamt (2020): Stickstoffeintrag aus der Landwirtschaft und Stickstoffüberschuss, <https://www.umweltbundesamt.de/daten/land-forstwirtschaft/stickstoffeintrag-aus-der-landwirtschaft#stickstoffueberschuss-der-landwirtschaft>.

⁴⁶ European Commission (2020): A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system (Communication of 20 May 2020), COM/2020/381 final.

land with heavy farming machinery. There is no uniform nationwide field data on the extent of and trends in soil compaction. Point measurements and soil structure studies by the various Länder indicate that actual impairment due to compaction is found on about 10 % to 20 % of arable land.⁴⁷

Water quantity: In 2015, there were only a few groundwater bodies in Germany with water quantity problems (4.2 %). Six years later, in 2021, the picture is very different. The years 2018 and 2019 were the two driest since weather records began and 2020 saw exceptionally little rain in many parts of Germany. According to forecasts by the German Weather Service (DWD), the next five years will also be too dry. In the EU, economic losses due to extreme weather events (mostly droughts) already average more than €12 billion per year.⁴⁸ This particularly affects farming which, according to the latest data from the Federal Statistical Office from 2016, uses about 1.4 % of the fresh water extracted annually in Germany for irrigation. The conflicting goals in water use are also becoming more acute – it can be said that the impacts of climate change are also being felt in Germany.

Water quality: The EU Water Framework Directive requires Germany to report on the quality of its waterbodies. The reports show that almost 35 % of groundwater bodies have ‘poor chemical status’. Almost 80 % of waterbodies with this status are subject to excessive nitrate loads from farming, the main causes being intensive, high external input livestock farming and cultivation of fruit and vegetables. In surface waters, too, loadings of certain substances, especially nitrate and phosphorus, are mainly due to farming. This applies to 75 % of nitrogen loadings and 50 % of

phosphorus loadings in surface waters, coastal waters and seas.

As this shows, the past efforts of policymakers and the agricultural sector did not go far enough. In the last reporting period on implementation of the EU Nitrates Directive (2016 to 2020), the permissible nitrate content was exceeded at 17.3 % of the nationally representative groundwater monitoring sites and at 26.7 % of the representative groundwater monitoring sites in agricultural areas. This also means failure to meet the goals contained in the EU Nitrates Directive of reducing water pollution caused by nitrates from agriculture in all waters, maintaining a nitrate content of no more than 50 milligrams per litre per year and preventing eutrophication. Accordingly, in 2018 the European Court of Justice ruled that Germany had violated the provisions of the Nitrates Directive because despite the measures taken, groundwater nitrate levels were too high in many places remedial action had been insufficient. In addition, far too many nutrients enter waterbodies and consequently the oceans, including nitrogen and also phosphorus from fertilisers and sewage treatment plants. The Federal Government has since responded to the requirements of the EU Nitrates Directive with amendments to the Fertiliser Application Ordinance (Düngeverordnung) that came into force last year to implement the Directive, an amendment to the Federal Water Act (Wasserhaushaltsgesetz) on the greening of riparian strips and the adoption of a General Administrative Regulation on the Designation of Nitrate-Polluted and Eutrophic Areas (AVV Gebietsausweisung). Alongside a general tightening of requirements, the provisions of the Fertiliser Application Ordinance in particular are intended to aid groundwater protection in nitrate-polluted areas, for example by reducing

47 Umweltbundesamt (2015): Bodenzustand in Deutschland, https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/bodenzustand_in_deutschland_0.pdf, 54.

48 European Commission (2021): New EU strategy on adaptation to climate change, https://ec.europa.eu/commission/presscorner/api/files/document/print/en/qanda_21_664/QANDA_21_664_EN.pdf.

nitrogen fertilisation to an average of 20 % below the calculated nitrogen fertilisation requirement for farmland located in such areas.

Air: Recent years have seen a positive trend with regard to various air pollutants of agricultural origin. For example, emissions of sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds and particulate matter dropped by 25 % between 2005 and 2017. This contrasts with only a slight decrease in emissions of ammonia, 95 % of which comes from agricultural sources. More than 70 % of ammonia is produced by livestock farming, but emissions from biogas plant digestate are also gradually increasing. While ammonia itself is an air pollutant, it also forms particulate matter and can lead to acidification and eutrophication. In 2015, a quarter of Germany's terrestrial habitats were at risk. The share of agriculture in acidification potential (ammonia and also nitrogen oxide emissions from agricultural soils) rose from just over 16 % in 1990 to almost 54 % in 2017. Ammonia emissions in Germany have exceeded the limits of the EU NEC Directive for years. The goal of reducing ammonia emissions by 29 % by 2030 compared with 2005 must therefore be characterised as highly ambitious.

Habitats, landscape features and species:

Until the middle of the 20th century, the use of land for farming contributed to habitat diversification and thus to the development of complex agroecosystems. By increasing the size of agricultural management units, modern or highly mechanised farming has led to the loss of landscape features and habitats (such as hedges, field margins and copses) and thus to the monotonisation of entire landscapes with considerable impacts on biodiversity, ecosystems and

countryside appearance.⁴⁹ In combination with increasingly intensive cultivation, nutrient inputs and pesticide use, conversion or intensified use of grassland, abandonment of unfavourable sites and excessive land-take for development with ground sealing, this impoverishment of landscapes – contrary to all biodiversity and nature conservation objectives – leads to sometimes dramatic losses in biological species and populations. Given the importance of biodiversity for ecosystems, this trend is fundamentally negative and leads increasingly to massive societal criticism of the farming sector as a whole. All available indicators of biodiversity in the farming landscape show a statistically significant decline and clear downward trends. Of a total of 75 different grassland habitats, 83 % are classed as endangered.⁵⁰ Conservation status assessment for Habitats Directive habitat types and species shows an unfavourable conservation status for 55 % of the grassland habitat types and almost two thirds of Habitats Directive species found in such habitats. The conservation status of species in agriculturally dominated areas has thus developed even more negatively than across all habitats together. The high nature value (HNV) indicator is used to assess high nature value farmland. In the period between 2009 and 2017, the share of HNV areas dropped from 13.1 % to 11.3 %. The 'biodiversity and quality of life' indicator surveyed as part of the National Sustainable Development Strategy is also still far from the targeted 100 % for 2030 for agricultural landscapes and currently stands at 59.2 % of the target value.⁵¹

Animal welfare: Especially in regions with very intensive livestock farming, the negative impacts on the natural environment are clear (as already addressed above). Livestock farming can also have negative consequence for the animals

⁴⁹ Bundesamt für Naturschutz (2017): Agrar-Report 2017 – Biologische Vielfalt in der Landwirtschaft, https://www.bfn.de/fileadmin/BfN/landwirtschaft/Dokumente/BfN-Agrar-Report_2017.pdf, 4.

⁵⁰ Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (2020): Die Lage der Natur in Deutschland. Ergebnisse von EU-Vogelschutz- und FFH-Bericht, https://www.bfn.de/fileadmin/BfN/natura2000/Dokumente/bericht_lage_natur_2020.pdf, 22.

⁵¹ Destatis (2018): Nachhaltige Entwicklung in Deutschland. Indikatorenbericht 2018, <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Nachhaltigkeitsindikatoren/Publikationen/Downloads-Nachhaltigkeit/indikatoren-0230001189004.pdf>, 106.

themselves. These range from barren and confined housing environments (such as crate stalls for sows) to animals being adapted to suit their housing conditions via what are known as non-curative interventions (such as piglet castration and beak or tail trimming) to health damage as an outcome of high performance achieved through breeding and feed. Court decisions are forcing considerable adjustments to be made in livestock farming and policymakers are under growing grassroots pressure to improve animal welfare. There are also growing numbers of people who, for various reasons (such as animal welfare, health and climate change mitigation), reduce or reject the consumption of animal products in their diets. As animal welfare is enshrined as a national policy objective in the German constitution, however, sustainable livestock farming not only has to measure up to standards of social acceptability but must also be subject to ongoing debate on a normative and ethical basis.

The BMEL Scientific Advisory Board on Agricultural Policy, Food and Consumer Health (WBA) concludes in its report that urgent changes are needed in livestock farming from an animal welfare perspective.⁵² These include affording all animals access to different climatic zones (preferably an outdoor climate), offering different functional areas with different ground or floor coverings, providing sufficient space, dispensing with amputations, significantly reducing the use of antibiotics and taking greater account of functional traits in breeding. In 2020, the Commission on Improvements in Livestock Farming also identified a “considerable need for action to improve animal welfare in livestock farming that stands in sharp contrast to the so-far hesitant pace of reform in EU and German regulatory law, as well as of funding policy in this area”.⁵³ To meet this need for action, the representatives

of various interests consensually outlined a path towards more sustainable and more socially acceptable livestock farming practice. These recommendations are widely seen as a good basis on which to conduct the debate on transforming livestock farming on the road to a future-focused agriculture and food system.

52 WBA (2015): Wege zu einer gesellschaftlich akzeptierten Nutztierhaltung, https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/GutachtenNutztierhaltung.pdf.

53 Empfehlungen des Kompetenznetzwerks Nutztierhaltung (2020), https://www.bmel.de/SharedDocs/Downloads/DE/_Tiere/Nutztiere/200211-empfehlung-kompetenznetzwerk-nutztierhaltung.pdf.

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RECOMMENDATIONS

1 Visions, aims and guiding principles

1.1 A vision for the future of agriculture

The Commission on the Future of Agriculture is guided by the following vision of a future agriculture and food system. It was jointly developed on behalf of the Commission by Kathrin Muus and Myriam Rapior, who in their capacity as members of the Commission represent the youth organisations Young Friends of the Earth Germany (BUNDjugend) and the German Rural Youth Association (BDL). Based on the values of environmental, economic and social sustainability set out in the Commission's appointing resolution, they set out a vision of a desirable agriculture and food system whose many aspects expressly lie at differing points in the future and are associated with a wide range of differing demands on society, farming and policymakers.

Shared Vision for the Future of Agriculture

Farmers and farms

German agriculture contributes to feeding the population. Farmers are valued by society, meaning by people and societal institutions (companies, associations, political parties, academia, religions, etc.), for the service they provide in producing food and the role they play in efforts towards environmental protection, nature conservation and animal welfare. Food production and supply on the part of farmers form the basis for peace and prosperity worldwide, making them important factors in securing social stability. As an economic sector, farming has great social relevance because it assumes the fundamental task of securing food supply and thus provides the basis for human existence.

Farms are business enterprises with both societal and environmental responsibility. Farmers work independently and manage their businesses on their own account. As business enterprises, farms allocate resources, investment, production and labour in their business activities based on of the farmer's own judgement. Farmers exercise future-focused good farming practice that is based on scientific rationale and is environment and climate-friendly.

Agriculture in Germany is highly diverse. Some farms are specialised, while others have diversified their operations. Society views farming without prejudice; farming and society stand together as one. Farmers enjoy their work and operate on fair terms. Their income is comparable to the average income in Germany and is earned working on their own farms. Producer prices are set in a fair, polypolistic market in a way that makes

participation in social life, farm security and retirement provision possible for farmers and farming families. Farm workers receive a fair wage and enjoy working conditions that are decent and safe.

Ideally, Germany needs a stable to growing number of farms, while preserving the diversity of farm structures. Both society and policymakers support farm succession within and outside the farming family as a matter of priority. The state provides assistance for new farmers. Young farmers are given preferential access to land.

The environment, nature and climate change

Agriculture aids environmental protection, nature conservation and animal welfare. Through regenerative land use, the health of people and animals and the quality of water, soil and air is maintained and improved.

Farming segments and farming practices that contribute effectively to climate-change mitigation are expanded and easily implemented on farms. The future-proof, climate-friendly transformation of farming continues to receive public support.

Biodiversity is seen and valued as a fundamental resource, forming the basis of ecosystem functions. Activities that promote biodiversity and especially the protection of insects are the order of the day. The farming countryside is characterised by structural diversity, often with interconnected habitat structures such as flowering areas, hedges and green strips and verges.

Agroforestry structures have been expanded and there is no further land-take with surface sealing. Peatlands have been largely rewetted

with the aid of public funds, and the long-term prospects of the farms affected have been secured. Increased creation of humus-rich soils, a wide range of locationally adapted varieties and balanced crop rotation along with the use of legumes and catch crops all ensure that farming has a positive climate impact. Farmers work to ensure continuous soil cover to prevent erosion.

Where possible, available slurry and manure is used as fertiliser and mineral fertiliser is no longer added. Government research is being stepped up to find an adequate, mid-term replacement for synthetic fertilisers and chemical plant protection.

Farming is prepared for the consequences of global warming, receiving support in the conversion to climate-friendly, resilient production methods (such as via independent climate advice). The climate-friendly effects of farming have become established farming practice, some opening up new income opportunities for farmers in the form of new business segments.

All sectors of the economy share responsibility towards the environment. Sector coupling gives rise to synergies in environmental protection and between farms, ensuring their activities and efforts are well coordinated and aid efficient use of resources.

Economic conditions

Farmers face a fair market. Market power is balanced both in food production and in downstream processing and distribution. German policies and legislation prevent the formation of oligopolies and monopolies. German farming offers decent income opportunities and fair and transparent access

to information within its markets. Unfair trade practices are prevented by means of effective legislation.

The activities of farms are made transparent and information about them is easily available. Farmers are appreciated by society and receive recognition for the work they do.

Cooperation with upstream and downstream sectors of the agricultural value chain is structured fairly, focusing on regional processing and marketing. In this context, supraregional trade complements regional structures and provides additional business opportunities.

Regionality

Germany's agriculture and food system functions to a large extent in regional cycles. Food is ideally processed regionally, with transport distances for agricultural products kept as short as possible. To make this possible, regional structures (such as food processing and marketing) are strengthened and bureaucratic and legal hurdles to implementation are either removed or overridden.

Offering healthy, regional, organic food in public and private institutions – such as schools, authorities, hospitals, company canteens etc. – strengthens local demand for such food, ensuring farmers reliable order quantities in the market.

Most material and energy cycles are closed loops so that materials and nutrients from production, consumption and waste disposal largely circulate at regional level.

Nutrition and consumers

Everyone has access to high-quality food, and

no one in the world goes hungry. People eat a healthy, balanced diet. Food is not wasted because of the value society places on food.

People are familiar with food production process and are informed about the ways in which farmers work. Consumers thus pay close attention to the origin of and production methods used in their food and increasingly consume regional products. Reliable and easily comprehensible labelling systems help them in this regard. Consumption of animal products is reduced to a healthy level, one in harmony with the environment, the climate, nature conservation and animal welfare.

Vocational education and training; starting a farming career

Young people of all genders are keen to take up farming professions. They receive assistance in entering the profession or in becoming self-employed by taking over a farm or establishing one.

Dual training in agricultural professions provides general knowledge in both theory and practice and offers a training allowance which enables trainees to lead independent, self-determined lives. Degree and training programmes address current and future challenges – from environmentally friendly and innovative, technology-focused farming to the development of new farming segments (by introducing ecosystem services, for example).

Courses of study in agriculture and agricultural sciences, and continuing education in the agricultural professions, provide prospective farmers with practical knowledge needed in their subsequent (and in some cases specialised) working lives. Continuing education and training held at regular intervals

provides farmers with knowledge about new production practices and ways of coping with new challenges that arise. An independent advisory service is also available for them to use.

Cooperation at policymaking and institutional level

Farmers are satisfied with the level of cooperation with public institutions – planning security is guaranteed and paperwork is kept in relation to the size of the farm.

Throughout the EU, public funds are made available under the Common Agricultural Policy (CAP) exclusively for use in the provision of public goods provided by farmers, such as ecosystem services and care of the cultural landscape. This means that farmers receive subsidies for societal services performed in the interest of the public, nature and the environment.

Uniform standards for working conditions and the production and processing of food apply throughout the EU. This also creates uniform transparency for consumers Europe-wide as regards the origin, production and further processing of food.

Livestock farming

Livestock is kept in accordance with strict animal welfare standards and livestock holdings are distributed throughout the rural regions. Long-term prospects have been developed and put into place in conjunction with the farms affected by structural change. Animals have adequate space and room to move around and be active. Farm animals are largely supplied with on-farm or regional feed. Veterinary medicines are used as needed and

in accordance with qualified medical advice, diagnosis and treatment. Livestock numbers and husbandry conditions have developed in such a way that Germany complies with environmental and climate policy conventions.

Digitalisation

Digitalisation is used in farming to reconcile the needs of people, animals and the natural environment. This includes techniques for precision work in the fields and for targeted plant protection as well as the use of modern innovations to promote animal health. In farming, digitalisation aids global environment protection, nature conservation and the production of food.

Data sovereignty lies with the farmers themselves. The state supports agricultural engineering in the further development and research of new technologies and in providing access to digital technologies for farms. Small and medium-sized farms should also be given access to and be able to use those technologies.

Despite the availability of digital applications, farmers are essential to the work performed on their farms. They make the decisions for both digital and analogue approaches to the respective work processes.

To enable farmers to take full advantage of the opportunities brought by digitalisation, digital coverage for rural regions is guaranteed and constantly adapted in line with technological advancement.

Global impact of German farming

Agricultural structures exist worldwide and are designed to be globally fair. Farmers can

work globally under fair working conditions. Germany's farming sector trades in fair regional, national and global markets along the entire supply chain. It has neither explicit nor implicit negative impact on third countries' human rights, society and environment.

The environmental and economic conditions for smallholder farmers worldwide enable a stable income, social participation and market access. Unrestricted access is ensured to important resources such as water, arable and pasture land, seeds, energy, capital and education.

1.2 Twelve guiding principles on transformation

The above Vision for the Future of Agriculture describes the goals of a rapid, comprehensive economic and environmental transformation of Germany's entire agriculture and food system. That transformation moves along the development path described by the forecast scenarios A and B developed as part of the Commission's foresight process (see Appendix 4). Its necessity stems from factual circumstances and the direction set by societal goals. First and foremost, these are climate, environmental, biodiversity and animal welfare goals arising from national, international and supranational legislative initiatives and strategies mentioned by way of example in the resolution establishing the Commission (see Appendix 1). Germany's Federal Constitutional Court recently narrowed down the required level of ambition and timeframe for the country to implement related constitutional requirements in its decision of 24 March 2021.⁵⁴

In addition to producing food and feed, farming can and must provide a wide range of services to ecosystems and help to mitigate climate change. Those services must be adequately remunerated by society so that they contribute to farm diversification as attractive sources of income. This is why the systemic transformation of farming and food is an agenda for society as a whole. Farming, food processing, industry and trade must face up to this task, as must all people along with a wide range of societal institutions and not least policymakers in all areas related to agricultural production and food. It is thus part of the specific responsibility that lies with policymakers to enable and facilitate rapid transformation of the agriculture and food

system by creating appropriate conditions, and by promoting and helping to shape it.

In this process, the Commission believes that it is essential for policymakers to take into consideration the following twelve guiding principles:

Guiding Principle No. 1:

Taking into account planetary constraints, the transformation of the agriculture and food system must improve both the environmental **compatibility** and the resilience of farming production and animal welfare and promote the **diversity** of farm types, production systems, agricultural structures and agricultural landscapes. At the same time, the transformation must provide a reliable framework for farm planning processes and give farmers an economically viable future that counteracts the relocation of production to other regions in Europe or beyond that have lower social and environmental standards.

Guiding Principle No. 2:

Avoiding harmful impact and increasing positive impact on the climate, the environment, biodiversity, animal welfare and human health must be in both the personal and the entrepreneurial interests of agricultural producers. Along with agricultural and environmental policy, the agriculture and food system must thus be designed so that **avoidance** of today's **negative externalities** and the achievement of positive effects are made economically attractive to producers.

Guiding Principle No. 3:

Opportunities in farming and food markets must be linked to economic, environmental and social sustainability. This means that **food prices** (including taxes and duties) reflect the actual overall

⁵⁴ BVerfG, Beschluss des Ersten Senats vom 24. März 2021 - 1 BvR 2656/18 -, Rn. 1-270, http://www.bverfg.de/e/rs20210324_1bvr265618.html.

costs of food production along the entire value chain, that product and process-related competition on the basis of quality gains in importance relative to competition on quantity and that consumer behaviour develops along similar lines. The fact that farming is an important part of society must thus be expressed as a value in terms of farming's share of total economic output. Sustainably produced food calls for higher prices. Therefore appropriate financial assistance is needed in the form of comprehensive, accompanying social policy provision for low-income consumer groups.

Guiding Principle No. 4:

Given the (external) costs caused by today's agriculture and food system and subsequently borne by society, it can be assumed that even a highly cost-intensive transformation of the agriculture and food system will result in considerable **savings potential** at the level of **national accounts** in the mid and longer term.

Guiding Principle No. 5:

Transformation towards a sustainable agriculture and food system takes time; account must be taken of complex economic, technical, legal, social, cultural and political circumstances in a sector with a particularly small-scale structure, not all of which can be changed overnight. In addition, the necessary **transformation window** is very short for reasons of climate, biodiversity, environment protection and animal protection. In social policy terms, this can only be achieved if the systemic transformation process begins without delay and is designed so that the burdens of transformation do not grow over time and do not have to be disproportionately borne by younger and future generations. The conflict between the urgent need for

systemic transformation of the agriculture and food system and the time needed for this to happen can be reconciled by ensuring predictability and plannability in structuring the process, with pre-defined milestones (stages) that in turn are underpinned by monitoring of environmental impact and economic viability and allow for adjustments to be made where necessary.

Guiding Principle No. 6:

The full range of **political instruments** relating to the agriculture and food system (legislation, requirements, taxes and duties, subsidies, emission allowances, advisory services, training and continuous education, research funding, etc.) must be conceptually coherent with these guiding principles.

Guiding Principle No. 7:

Effective agricultural and environmental policy that aims at sustainability in farming requires both better horizontal and better vertical **integration and continuous improvement of policy measures**. This means, firstly, that policy instruments (such as financial support and regulation) and policy areas (such as agricultural, trade, consumer, environmental and animal protection policies) must be more reliably coordinated, the various policy levels (EU, Federal Government and Länder) be more coherently linked and their policy measures more effectively dovetailed with each other. Secondly, it necessitates ongoing adjustment of the legal and administrative framework for the agriculture and food system, which is extremely complex at all policy levels (from Länder law up to international agreements). That framework must neither obstruct nor slow the transformation process. Instead, it must promote and accelerate the

transformation while ensuring planning and investment security.

Guiding Principle No. 8:

In the future, public sector funding for farming activities must serve the purpose of targeted **financing of the provision of public goods.**

Guiding Principle No. 9:

In many areas of agricultural and environmental policy, it is not possible to precisely measure target achievement at reasonable cost. Political and administrative decision-makers therefore often fall back on indicators on the input side, such as land area, that are constitutive of agricultural production and are considered easy to measure and operationalise. However, area-based measures have an impact on the market for land. For this reason alone, they are subject to the risk of undesirable side effects. It is thus advisable to align policy measures with the achievement of objectives and, where possible, to switch from indicator-based input management to **process and outcome management** based on impact measurement.

Guiding Principle No. 10:

To the extent possible, when designing agricultural and environmental policy, variations in geography and agricultural structure must be taken into consideration. Regional cooperation between agricultural and environmental stakeholders and other partners should thus be facilitated and promoted by means of appropriate measures at policy level. This can deliver quick results especially in the implementation of agri-environment-climate measures. **Cooperation** of this kind can strengthen the commitment of all stakeholders involved.

Guiding Principle No. 11:

Where possible, new policies and transformational measures should be tested and scientifically evaluated in targeted, open-outcome randomised controlled **trials** ('real-world laboratories'). Such trials would also relieve the decision-making process of the need for fundamental debate and aid better integration of the various administrative levels (regions, Länder, Federal Government and EU).

Guiding Principle No. 12:

Discourse processes such as those used by the Commission on Improvements in Livestock Farming and by the Commission on the Future of Agriculture (despite the adverse conditions caused by the COVID-19 pandemic and the end of a legislative period) indicate that even the pronounced polarisations in the agri-environment debate can be overcome. Such processes should be promoted at the various political levels using suitable formats (round tables, commissions of inquiry, partnerships, etc.).

2 Societal areas of action, policy options and recommendations

2.1 Farm structures and farm value creation

Agriculture and horticulture contribute decisively in providing the population with a secure supply of high-quality domestic food, high levels of self-sufficiency being a desirable aim. In addition, multifunctional agriculture shapes and maintains the cultural landscape and contributes increasingly to the supply of energy and raw materials.

Farm structures: The sector is characterised by great diversity. This applies to the size and structure of farms, their economic situation and resilience to upheavals, their production methods and products, and their innovative capacity and business areas. Such diversity can be equally beneficial for the long-term viability of the agricultural system and for that of individual farms.

The Commission recommends that this diversity of agricultural holdings should be further increased with the goal of securing a resilient and future-proof domestic agriculture and food system.

At the same time, the Commission notes that many farms are no longer economically viable in the long term and that insufficient and fluctuating incomes threaten to further accelerate structural change. In many cases, producer prices for agricultural products do not currently cover the full cost in agriculture. For many farms, efficiency gains from adapted production and management measures (specialisation; unit cost depression) are no longer enough to compensate for the

poor revenue situation. Yet financial stability from sufficient value creation is necessary for the long-term viability of agricultural holdings. Recent surveys (see below regarding methodology) show that income levels in agriculture are often below the level needed to provide the long-term economic viability needed for farms to continue developing; many potential farm successors consequently see no future in the business.

However, strategic adaptation processes require time spans that mirror investment cycles in the agriculture and food system.

In this connection, **the Commission recommends** in particular that policies should be deployed to support and help shape farm diversification, encouraging farmers to go into additional or alternative lines of business.

On the basis of the Commission's concept of sustainability, there is much to be said for policies that focus not on the size of farms and enterprises, but on aims such as business diversification, maintaining the diversity of countryside features to conserve biodiversity, animal welfare, increased direct and regional marketing and rural structural development.

Attention should also be paid in this connection to improving the prospects of smaller farms. In particular, it would be helpful to significantly step up support for the following:

- Business activity analyses and diversification based on the analysis findings (such as diversification into renewable and alternative energy sources, agritourism, catering, nature conser-

- vation/landscape management and the promotion of biodiversity);
- New business models and forms of ownership and organisation with largely social, cooperational and educational objectives (such as cooperatives, community-supported agriculture schemes and regional citizen shareholder schemes);
 - Product differentiation (niche markets, food specialities and protected designations of origin);
 - Regional higher welfare processing structures (such as artisanal slaughtering and meat processing) and direct marketing, including innovative marketing channels (online direct marketing, regional product shelves, etc.) and market-related consulting;
 - Timely farm succession with business reorientation for long-term viability;
 - Lateral and new entrants with innovative value generation ideas; knowledge partnerships (such as innovation hubs).

If suitable payments are available, additional income can be generated by providing biodiversity areas in the form of multi-year (temporary) set-aside. This is only economically viable, however, if the payment amounts are calculated on the basis of region-specific average contribution margins.⁵⁵

Long-term cooperation and purchasing relationships with wholesalers and retailers, manufacturers, processors and consumers also make for more stable farm incomes, cushion risks and enable farmers to plan for the future. Bilaterally negotiated purchase quantities, fixed price models and long-term contractual relationships can reduce risks for all parties in highly volatile food markets.

In order to promote the diversification of agricultural structures, agricultural production and structures in the processing, wholesale and retail sectors (in effect, diversification of the whole value chain) and as a result to create new lines of work and sources of income and to widen and strengthen the rural employment base, it is very important to continue providing gender-equitable support that combines EU and national funding.

Land market: The Federal Government and the Länder should tighten the rules on selling and leasing farmland and on subsidies for startups and should also enforce the rules more rigorously. This is something that could be done today. In recent years, however, investors have been land-grabbing by means of share deals, sidestepping any farmers' right of first refusal and avoiding the payment of real property transfer tax.

In this connection, **the Commission recommends** as follows:

- The notification requirement for real property leases should be enforced in order to help provide the desired transparency;
- Share deals should be included in agricultural land law and the threshold for real property transfer tax liability on them lowered significantly;
- The Länder should reduce the speculation threshold on sale contracts to 10 % above the market price in the Land Transactions Act (*Grundstücksverkehrsgesetz*) in order to slow down price increases and reduce speculation with farmland;

⁵⁵ For real-world calculations see U. Latacz-Lohmann et al. (2021): Kalkulation von Zahlungen für die mehrjährige Stilllegung von Ackerflächen, available from <https://www.betriebslehre.agric-econ.uni-kiel.de/de/abteilung-landwirtschaftliche-betriebslehre-und-produktionsoekonomie> and <http://www.landwirtschaftskammern.de/fachinfos/index.htm>; WBAE (2019): Zur effektiven Gestaltung der Agrarumwelt- und Klimaschutzpolitik im Rahmen der Gemeinsamen Agrarpolitik der EU nach 2020, https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/Stellungnahme-GAP-Effektivierung-AUK.pdf.

- It should be made easier for young farmers to obtain land (for example by providing funding for the purpose).

An express target under Germany's National Sustainable Development Strategy is to reduce land-take to 30 hectares per day. To date, however there are no effective rules, incentives or funding instruments for unsealing formerly developed land in order to reduce development pressure on farmland. Lawmakers should consider revising the Federal Building Code (Baugesetzbuch) in this connection to provide local authorities with greater scope to act.

Risk management: Considering highly volatile producer prices, climate change and other uncertainties, active risk management – which also includes liquidity management – is not as widespread in agriculture as it should be. Available resources in this regard should therefore be improved and expanded in line with requirements. This includes intensive training that also covers index-based insurance, commodity futures and futures markets to put farms in a better position for the future.

Farm succession and farm exit: Systematic vulnerability analysis (including in groups with other farmers, jointly going through business figures, etc.) can help farmers better realise their income potential. It generally pays off for farmers to invest time and money in consulting services. But it is precisely farms with poor income situations and the greatest need of advice that tend to shy away from such investment.

The Commission recommends services such as that provided by SVLFG, the farmers' social insurance scheme. The aim is to ensure that as many farmers as possible see a future in farming. that consideration should be given to providing state-subsidised business viability advice. The same applies to farm succession situations (see

also section B 2.3). Here, too, provision should be strengthened for open-ended and psychosocially well-founded advice on generational succession with the involvement of existing offers, for example the Social Insurance Scheme for Agriculture, Forestry and Horticulture (SVLFG). The aim is to secure future perspectives for a maximum number of farming businesses.

If despite all efforts it is not possible to make a farm economically and environmentally sustainable, timely exit from farming may be the best option for the farmer in welfare terms, even if family ties, tradition and loss of independence make it a difficult choice. Many such farms are located in regions with labour shortages, making alternative employment a realistic option. Moreover, in a market economy, there is no entitlement to be self-employed if the basis is not there. Timely exit safeguards financial resources, reduces psychological stress and is not to be regarded as a stigma or failure. The availability of specific crisis or career change advice should therefore be increased by providing low-threshold access to advice services.

Survey methodology: Policymakers need meaningful information in order to make appropriate decisions. The data surveys used to determine farm and agricultural employee incomes need to be improved. The current test farm sample is insufficient to adequately assess whether the "standard of living for the agricultural community" is "fair". Ideally, it needs to be improved in such a way that it is possible to determine total farm household disposable income. This includes income from diversification and – in cases where enterprises have been carved out from the main business – from all agricultural and commercial undertakings and shareholdings (such as biogas or wind energy interests). This implies extending income data collection to at least those household members (in addition to the farmer or farming couple) who are employed in agriculture or agri-

culture-related parts of the whole undertaking.⁵⁶ In order not to inconvenience farming families with additional surveys, use could be made of data from the tax authorities as is already done in a limited way for farming couples. To better determine the social situation of farming households (including those whose business is incorporated as a legal entity), these should be treated like all other households with regard to income data in future microcensuses. In addition, it is necessary to question the use of a commercial benchmark wage – under section 4 of the Agriculture Act (Landwirtschaftsgesetz) – in the official comparative statistics for reporting purposes. Different benchmark wages should be used depending on farmers' qualification levels and the regional labour market situation.

2.2 Labour force

The situation for farm workers varies greatly depending on the type of work they do and their employment status. As organised employee bodies are not represented among the Commission's members, only basic information⁵⁷ is provided in this report.

To improve the situation for employees and thus the attractiveness of jobs in farming, **the Commission recommends:**

- Attractive, collectively agreed wages;
- Greater development and use of available technology to make work easier, avoid physical strain and improve job quality;
- Provision of working time models, including during seasonal peaks, to limit daily working hours and enable weekly working time;
- Regular exchange with management, option to contribute own ideas, regular staff appraisals;
- Opportunities to participate in further and continuous training, constant review and further development of training content;
- Ensure and improve protection for farm workers regarding work-related hazards by means of consistent enforcement of prevailing regulations; in particular, continue the activities of the SVLFG (Social Insurance for Agriculture, Forestry and Horticulture) to improve occupational health and safety;
- Raise awareness with regard to gender roles in farms and associations.

The following should be ensured specifically for all seasonal farm workers:

- That they are employed subject to social insurance and that any exemptions are examined for appropriateness;

⁵⁶ This applies to agricultural undertakings regardless of legal form, although in the case of legal entities it should be limited to significant shareholders (such as upwards of a 5% shareholding).

⁵⁷ This is partly based on demands from Industriegewerkschaft Bauen-Agrar-Umwelt, the trade union for the construction, agricultural and environmental industries.

- That in the case of short-term employment not subject to social insurance, workers are insured and have access to a range of benefits that corresponds to the provisions of German statutory health insurance;
- That for all seasonal workers, their pay, accommodation and working conditions comply with domestic law; enforcement of the applicable requirements must be ensured;
- That a clear and understandable monthly pay statement is provided;
- That before they leave their country of origin to travel to work in Germany, written employment contracts – or the key terms and conditions of employment under section 2 of the Act on Notification of Conditions Governing an Employment Relationship (Nachweisgesetz) – are handed out in the home country and written in the workers' native language or in a language they understand;
- That the various competent authorities conduct adequate, concerted, across-the-board controls.

2.3 Generational and diversity aspects

Generational aspects: An above-average number of farm owners are older than 55 and that figure continues to grow. Almost half of farm managers will reach the regular retirement age in the course of the next ten years. Only in 36 % of full-time farming businesses is succession assured. A future with prospects should ideally be secured for as many farms as possible.

Germany is a favourable farming location with fertile grassland and arable land, a well-established education system and comparatively wealthy consumers. These positive aspects come up against a variety of challenges regarding the future prospects of young farmers. The high societal demands on farming, compliance with nature conservation, environment protection and animal welfare requirements, heavy workloads, uncertain conditions and the partial lack of a permanently secure income combined with good off-farm earning opportunities make many young and prospective farmers doubt whether they should follow in their parents' footsteps. This is especially the case with livestock farms. To keep young people in farming, agriculture must be made more attractive by providing planning security and good prospects for the future. They must also feel that society and public opinion recognise and value their way of working.

Given the trend so far, farm sizes will continue to grow in the future. This and the use of new technologies call for higher professional qualifications and good communication and leadership skills in dealing with employees. The responsibility placed on farm managers and the work they are expected to perform is constantly increasing.

Germany's current training structure suggests that, measured against the need for farm managers in the future, sufficient junior managers

are being trained who possess the appropriate qualifications and must be prepared for the structures and conditions that prevail in farming.

To ease the often difficult situation regarding farm handovers and succession, **the Commission recommends:**

- The provision of advice for young farmers in the run-up to taking over a farm in terms of the economic situation and the future viability of the farm;
- The mandatory introduction of specific (state-funded/supported), timely counselling and advice for all parties involved prior to the farm being handed over (see also section B 2.1). It is important here that the issue be addressed along with any financial and/or interpersonal/personal concerns at an early stage in the process;
- Health-related aspects should be taken into account because an unresolved situation regarding farm succession can make people ill – and physical and cognitive resilience decreases with age, thus increasing the risk of accidents. The topic of farm succession should be taken up by the social insurance system and included in the financing provisions under the second pillar of the CAP. Along with appropriate advice and seminars, the availability of such support must be widely communicated;
- The introduction of public funding for coaching for farm successors/entrants before the farm is handed over and in the first three years thereafter, complete with lump sum assistance for young farmers (per hectare) and its conversion into public funding for young farmers' farm development plans (in the case of farm handovers, restructuring and start-ups, including access to land);
- Examine whether existing or future funding measures (such as targeted promotion of ac-

- cess to land for prospective farmers who cannot or do not want to take over an existing farm) can be linked to early farm transfer;
- Promotion of advisory services on the subject of farm transfer, marriage and inheritance law, taxation law and social insurance.

Diversity: Traditional role models are especially persistent in the farming sector. This disadvantages women and members of marginalised groups (including sexual and gender minorities, people of colour, refugees, immigrants and their descendants, and people with disabilities). These groups often find it difficult to become established in the agricultural sector, gain sufficient recognition or find a suitable apprenticeship. Measures are thus needed to increase both equity and equality in farming and its various bodies, as well as in agribusiness as a whole – the aim being to ensure equal visibility, recognition and participation (including in leadership positions) for all.

Increased diversity in the management of farms and companies in the agriculture and food system and in agricultural bodies will promote equity in farming and accelerate cultural change. This is likely to lead to more innovation,⁵⁸ better producer-consumer relations and more openness and willingness to change given the environmental, nature and animal welfare challenges faced.

To make farms future proof, agriculture needs to adopt a range of different perspectives.

The Commission thus recommends:

- Separately collecting and publishing data on the contribution of women in farming in agricultural statistics;
- Raising awareness with regard to gender roles and role models and to diversity in all its

⁵⁸ Accenture, for example, found that a culture of equality, meaning an environment where everyone has equal opportunity to advance and grow, significantly drives innovation and growth; see Accenture (2019): Getting to Equal 2019: Creating a culture that drives innovation, <https://www.accenture.com/gb-en/about/inclusion-diversity/gender-equality-innovation-research>.

dimensions in the farming family and also in associations, chambers of agriculture and agribusiness as a whole;

- Embedding gender equality and diversity issues in education and training and also in academic study, with corresponding focus in professional competitions and the promotion of young talent;
- Using gender and diversity-sensitive language and imagery in marketing, associations, chambers of agriculture, etc. (including in social networks);
- Promoting training programmes for women and for members of marginalised groups as farm successors and lateral entrants (including incentives and mentoring programmes);
- Examining and, if necessary, restructuring existing social insurance models for family members and partners working on farms;
- Ensuring equal participation of all people in professional bodies, chambers of agriculture and cooperatives and in agribusiness management; this could be addressed, for example, by setting a target of at least 30 % women members within the next ten years;
- Improving the welcoming culture within the various bodies;
- Introducing family-friendly meeting structures and times;
- Consistent pursuit of gender-equitable staffing in decision-making bodies;
- Establishing and implementing measures in connection with public funding programmes (such as EAFRD) with the aim of promoting genuine gender equality;
- Gender parity in the composition of commissions and other important bodies in the Federal Government’s remit (see the Federal Act on Appointment to Bodies [Bundesgremienbesetzungsgesetz]).

As has been shown by experience in industry, quotas help place women in leadership positions, thus giving them the opportunity to utilise their training and expertise.⁵⁹

⁵⁹ “Without a gender quota, there is hardly any change in the percentage of women on German corporate boards. That is the conclusion of a study presented in Berlin this Wednesday by the German Institute for Economic Research (DIW Berlin). ‘Two years after the introduction of a gender quota for supervisory boards, the picture is relatively clear. The quota works, as it does in other countries,’ said Elke Holst, Research Director at DIW. ‘But it is evidently also true that almost nothing changes without pressure and the threat of penalties’”; see also Deutsches Institut für Wirtschaftsforschung (2019): *Managerinnen-Barometer 2019* (DIW-Wochenbericht 3/2019), https://www.diw.de/documents/publikationen/73/diw_01.c.611733.de/19-3.pdf.

2.4 Social security in agriculture

Self-employed farmers, foresters and horticulturalists are required by law to have health and long-term care insurance, pension insurance and occupational accident insurance. This sets them apart from the self-employed in other professions. The four statutory social insurance schemes for agriculture are organised under Social Insurance for Agriculture, Forestry and Horticulture (SVLFG). For members, this has the advantage of a single point of contact and one-stop advice and support.

While there are similarities with the general statutory social insurance system for employees in other sectors – especially in terms of provision under agricultural health and long-term care insurance – there are also significant differences due to the focus on farm owners and their families. Farmers' pension insurance, for example, only provides partial cover. The farm and household help provided for in all branches of farmers' social insurance represents a significant benefit in agriculture that is foreign to the general social insurance system.

Agricultural social insurance has been organised in various ways in the past. The most recent reform was a statutory merger in 2012 creating the SVLFG as a single national provider. The SVLFG today operates cost-efficiently and is geared to the particular business and social situations and concerns of self-employed farmers, foresters, horticulturalists and their families.

The agricultural social security system faces further challenges due to structural change in agriculture and also the changing age structure of society as a whole. The special concerns of agricultural, forestry and horticultural businesses continue to require a social security system provided from a single source. However, that system must also move with the times. When there are fewer and fewer payers and more and

more claimants as in the general statutory social insurance system, timely reform is crucial. The principle of social solidarity must continue to be adhered to here by requiring high-income farms to contribute more than low-income farms.

In order to safeguard this socially important sector, therefore, **the Commission recommends** that the separate agricultural social security system should be retained, improved in conjunction with all stakeholders and in particular its self-governing body, and supported by the state.

2.5 Rural regions and spaces

Over the years, the importance of farms for village communities has seen a significant decline. Agricultural and environmental policies are unlikely to be able to reverse this trend.

Whether farms are big or small is not a crucial factor in determining whether they develop into social places and sociocultural focal points of village life. Rather, the deciding factors for the emergence of social cohesion are committed and imaginative stakeholders (individuals, associations, farms, etc.) and an equally imaginative and committed public administration. With regard to the role of agri-food businesses, of great importance are regional integration, corresponding willingness on the part of communities to accept and support them, and close connections to the rural population. Last but not least, innovative economic and marketing forms enable farms to become a space in which to foster social cohesion. Case studies show, for example, that community-supported agriculture and regional citizen shareholder schemes can act as catalysts in this regard.

Village infrastructures are also a key factor in achieving sustainable development in rural regions. This includes sociocultural and service infrastructures, technical facilities and high-performance digital networks, which are also vital in securing a financially stable, competitive agriculture and food sector.

The Commission believes that the development of rural regions remains a priority policy area – one that must be actively shaped and promoted. Its members have come to the conclusion that the social functions of rural regions cannot be enhanced by means of agricultural policy instruments alone. Policymakers must thus respond to a diverse patchwork of shared and divided responsibilities among ministries by systematically restructuring all departmental competences that touch upon rural development. They must also significantly improve coordination between the ministries involved and also between the various levels of government (local authorities, administrative districts and administrative regions, the Länder, the Federal Government and the European Union).

2.6 Societal perception and appreciation of the agricultural and food sector

Societal debate around the agriculture and food system and the associated diverging perceptions and expectations are addressed at various points in this final report. The multifaceted nature of perceptions, interests and motives means that the resulting conflicts (both subjective and real) are not easily resolved. The main aspects involved are set out in the following.

In the longer term, the agriculture and food sector can only improve its image if it accepts the inherent sustainability-related challenges and tackles them in a gradual, verifiable approach. In this process, each and every stakeholder is called upon to step up, act, become involved and accept responsibility. In addition, farming must be afforded intensive policy-based assistance and support on the path to sustainable transformation, and this in turn will require additional public funding. This large-scale transformation must be shaped by clearer, more focused policy and, where necessary, increased financial compensation.

The preference for naturalness (see section A) shown by many consumers creates market opportunities for premium products but also gives rise to conflict regarding the prospect of technological innovations. As with sustainability policy per se, striking a balance between efficiency, sufficiency and consistency is all important.

In this regard, **the Commission stresses** that:

- Transparent presentation of sustainability goals and progress at farm, regional and national level (monitoring) is essential in fostering social debate and should thus be required and promoted in policy.
- Across sectors and interests, focus should be placed on creating an atmosphere of improved, more consensus-oriented, objective societal communication.
- Greater use should be made of formats designed to achieve a targeted balancing of interests (such as the Commission on Improvements in Livestock Farming or the Commission on the Future of Agriculture) in order to support policymaking.
- Strengthening of the cooperation-based approach in the implementation of binding policy targets and goals on the basis of outcome management is expected to lead to long-term regional partnerships between farmers and other stakeholder groups and build trust.
- In combination with better school meals, more hands-on education in schools in relation to farming production and food promotes a deeper appreciation for farming and food that takes in both the regional and global dimensions of sustainable development. Greater focus on communication in agricultural initial and further training ensures a better understanding of societal negotiation processes and enables farmers to better represent both their own and wider, sector-related interests.
- The Commission agrees that the small group of individuals from the agriculture and food sector who choose not to comply with legal provisions bring the entire industry into disrepute. These may be isolated cases, but it is important to ensure early identification by means of suitable, better developed and industry-supported quality assurance systems such as QS and IFS (product and process quality). In addition, the resources available to enforcement authorities must be improved and their efficiency and

efficacy enhanced overall with organisational improvements and digitalisation.

2.7 Dietary styles and consumer behaviour

Eating habits: One feature of the food system is that a major part of the challenges arising from more demanding sustainability goals cannot be solved purely by using technology to increase efficiency. Consumption and dietary choices also need to develop in line with the recommendations published by the German Nutrition Society (DGE). Research efforts to identify what constitute health-promoting, sustainable dietary choices have been stepped up significantly in recent years. Diet-related disorders are multifactorial, with epidemiological studies showing highly complex cause-effect relationships in relation to individual foods or food groups. It is undisputed, however, that nutrition has a considerable impact on people's health.

The Commission therefore recommends:

- Promoting a varied, plant-based diet with a high proportion of fruit and especially of vegetables, pulses and fibre-rich foods – this is the global preference in almost all dietary recommendations published by nutrition organisations.
- Reducing consumption of animal products in line with the recommendations of the German Nutrition Society.
- Where beverages are concerned, giving preference to water and unsweetened drinks.

Food production: The nutritional recommendations are also largely beneficial in efforts to protect the environment and mitigate climate change. They pose huge challenges for the agriculture and food sector.

Reducing the consumption of animal products affects a segment that accounts for a good 50 % of added value in the agriculture and food sector. The Commission on the Future of Agriculture

thus expressly welcomes the proposal put forward by the Commission on Improvements in Livestock Farming to tie long-term funding measures to upscaled financing instruments. Restructuring livestock farming requires cost compensation and planning certainty that is enshrined in law.

The Commission recommends, as part of an integrated transformation strategy, that the proposal should be supplemented with consumption-side support for producers, including increased funding of research into and marketing of domestic agricultural commodities for use in animal feed and in substitute products for animal-based foods.

- The much-needed sustainability-focused restructuring of the farming and food industry harbours attractive opportunities. By means of sustainable innovations, companies can play a leading role in refocusing the national and international food industry. There is significant commercial potential in focusing on quality-oriented sustainable production methods. The new focus can improve social acceptance of the agriculture sector and foster trust in the companies involved.
- Germany is only marginally self-sufficient when it comes to fruit and vegetable production. Given climatic conditions, any expansion of this market segment in Germany must also be linked to a consistent transition towards sustainable production using the latest production and cultivation methods – the aim being to use only renewable energy sources and to protect and expand the valuable habitats that have already been created. Intensive fruit and vegetable cultivation must also improve in terms of environmentally optimised nutrient and pesticide use. Organic fruit and vegetable production must also be further promoted.
- Likewise, health and food policy aiming among other things to reduce sugar, fat and salt calls for a long-term transformation strategy to pro-

vide structural support for the affected segments and businesses in the food industry.

Food and nutrition education: To improve consumers' nutritional knowledge and household budgeting skills, the Commission proposes a target group-specific, nationwide, permanent educational programme which, among other things, teaches the value of sustainable, healthy diets along with the corresponding preparation and cooking skills. For consumer groups in precarious living situations, low-threshold outreach counselling and advice services are especially important which, supplementary to financial compensation (see section B 4.1.1), are directed at enabling such groups to adopt healthy, sustainable diets despite rising food prices.

Food policy: However, trends in global health policy and the state of scientific research indicate that to achieve the above-mentioned goals, food policy should increasingly use instruments beyond food and nutrition education.

It should be remembered that consumer behaviour is habituated. It is shaped by sensory preferences and by social norms, values and contexts. While these can be relatively resistant to change, consumption habits do have a certain plasticity. The latter can be seen during the COVID-19 pandemic and in current generational and group-specific changes in dietary behaviour (vegetarianism and veganism). Hence, the collective behavioural changes needed are to be largely achieved in the mid and longer term and will require a package of targeted policy instruments.

The Commission therefore recommends:

- Also testing and introducing financial incentives on the consumption side. Potential instruments could include an excise duty on sugar, salt and fat along with promotion of fruit, vegetables and pulses (for example, via a reduced VAT rate);

- Providing easily accessible drinking water infrastructure in public spaces to make drinking water more of a habit and a matter of routine. This should be linked to broad-based public campaigns.

For a variety of reasons, food policy should make communal catering a priority focus. Preference should be given in calls for tender to sustainably produced food.

Catering in preschools, schools and university canteens influence future dietary choices on account of their formative effect. The Commission has little understanding for the fact that there are currently only very basic mandatory and monitored product and process quality standards in place. Combining high-quality catering with better food and nutrition education would be a longer-term but effective instrument that would also result in greater appreciation of food.

The Commission therefore has the following recommendations for communal catering:

- For communal catering, mandatory quality standards are recommended along with an eating environment that is pleasant and – for general education schools and childcare facilities – non-discriminatory in that parents are not required to make financial contributions.
- Catering for senior citizens and in the health-care system also harbours potential for qualitative upgrading and binding quality standards. Positive effects are also to be expected here with regard to preventive healthcare and greater appreciation of food.
- In contrast, some employers have already recognised the importance of health-promoting company catering. The aim here should be to achieve and, where necessary, promote more widespread adoption of best practice examples.
- Climate-friendly options should be made mandatory in public institutions. All public insti-

tutions should set a positive example and consistently adapt and align their communal catering and procurement processes to prevailing quality, health and sustainability standards.

In addition, a 21st-century cuisine should be communicated and cultivated that focuses not so much on abstinence, but on the abundance and diversity of a varied, plant-based diet. Taste and enjoyment are important factors in a successful transformation strategy that promotes more sustainable dietary styles.

Consumer information: Consumer policy that focuses on health and sustainability plays an important role in the further development of food policy.

Many of food's sustainability attributes are trust-related characteristics that are not readily visible and whose market relevance depends on clear and credible labelling schemes. The current lack of transparency makes it hard for the sustainability efforts of operators in the agriculture and food sector to be reflected in food prices. Improving labelling would remove that lack of transparency and is an essential step, but for various reasons (including the attitude-behaviour gap, path dependencies, habitual behaviour and lack of a sense of urgency) it will not be enough to trigger broad-based sustainability transformation. And in any case, transformation can only be successful if consumers are also taken on board.

The Commission therefore has the following recommendations:

- With regard to legally prescribed labelling, the Commission is in favour of backing it up with prohibitions in advertising (banning the use of 'reserved terms') for products that do not comply with the label in order to prevent consumer deception.
- Recently implemented policy measures (such as Nutri-Score, a voluntary commitment under

Germany's National Reduction and Innovation Strategy and a voluntary commitment regarding children's advertising) must be evaluated in terms of their impact. For the purpose of trialling such instruments, they should be suitably monitored by the state to assess their intended and unintended effects (including with regard to health parameters) so they can be withdrawn if proven ineffective or made mandatory if proven effective but with insufficient take-up.

- The development of regional production, processing and consumption structures can be supported by labels of origin and by increased efforts to promote more direct, more regionally focused, digital marketing concepts. Less regulation along with risk-oriented implementation of legal requirements for small and medium-sized businesses are key prerequisites for success.
- For example, increased use of EU quality stipulations in Germany could serve as a strategy to retain added value in the region and create awareness to the diversity and quality of regional products. Germany should make greater use of EU funds in marketing quality products and awareness of quality labels should be enhanced among consumers and businesses alike. In addition, EU minimum standards are needed for any and all claims to regional origin.

Food waste: A particularly socially consensual goal of food policy is the reduction of avoidable food waste along the value chain, both from farm to fork and in consumption. Progress in implementing the target set by Germany of halving food waste by 2030 requires significantly greater effort and more far-reaching instruments than has been the case to date.

The Commission therefore recommends:

- On the production side, address the main food waste categories (fruit and vegetables, bakery products and large-scale consumers) in a targeted way. Measures needed include improvements in the availability of data to identify and broadly apply effective changes and the agreement of binding reduction targets for industry, trade, farming and the hospitality sector.
- On the consumption side, informational and motivational approaches should be reinforced and more effective instruments researched, tested and initiated as a matter of urgency.

2.8 Politics and administration

Most of the recommendations set out in Part B of this final report of the Commission on the Future of Agriculture have preconditions and consequences of a political, legal and administrative nature. For various reasons, including the fact that they go beyond the Commission's remit, they cannot be addressed in detail here. What the Commission sees as the most important guiding principles regarding policy shaping and promotion of the transformation process for the agriculture and food system are set out in section B 1.2. The following take the form of brief supplementary notes.

Legal framework: The legal framework for the agriculture and food system is extremely diverse, taking in Länder law and German federal law, EU law and international agreements (including UN, WTO and other international treaties), regulations on production practices, taxation and anti-trust law, and international trade law. It also includes climate, environmental and animal welfare law, land law, food law, labour law and numerous other types of laws and regulations.

Many of these legal systems and the corresponding executive, administrative and control bodies are by no means neutral with regard to the requirements for economically viable, environmentally sustainable and socially responsible agriculture. In many cases they reflect conceptual frameworks that modern agricultural policy has (or should have) left behind it, at least in unmodified form – prominent examples including the 1955 Agriculture Act (Landwirtschaftsgesetz) and Article 39 of the Treaty on the Functioning of the European Union. Several of these systems have the effect of privileging an economic system in which numerous incentives have been put in place to boost competitiveness by externalising

actual production costs at the expense of public goods such as the climate, biodiversity and animal welfare. As the feasibility study on the recommendations of the Commission on Improvements in Livestock Farming⁶⁰ shows, major obstacles in trade, market and anti-trust law may stand in the way of economically effective implementation of many environmentally sound policy options.

The removal of such legal obstacles requires cross-sectional, long-term political action. The systemic transformation of the agriculture and food system needed in order to make it sustainable will not succeed as long as the aforementioned legal and administrative framework is left as it stands. Instead, the Commission believes that the latter must be dynamically reformed in a direction that promotes and accelerates the transformation process.

Policy: State action concerning the agriculture and food system, including its interdependencies with climate, environmental, biodiversity and animal welfare policy, is characterised to a problematic extent by the lack of an integrative guiding vision and a consistent national legal framework. This function is frequently met instead by executive-level policies (such as the Sustainable Development Goals (SDGs), the Green Deal, the Arable Farming Strategy and the Action Programme for Insect Protection). Internal contradictions and a lack of coordination between the relevant policy areas, for example in the relationship between funding and regulatory law, are thus accompanied by enforcement deficiencies and missed targets. This applies both to the economic viability of farming and to environmental sustainability goals.

For agricultural and environmental policies to be effective in achieving sustainable development, better horizontal and also better vertical integra-

⁶⁰ C. Deblitz et al. (2021): Politikfolgenabschätzung zu den Empfehlungen des Kompetenznetzwerks Nutztierhaltung (Thünen Working Paper 173), https://www.bmel.de/SharedDocs/Downloads/DE/_Tiere/Nutztiere/folgenabschaetzung-borchert.html.

tion of political measures is needed. Instruments (such as financial support and regulatory law) and policy fields (including agricultural policy and environmental and animal welfare policy) must be more decisively coordinated. The different administrative levels (EU, Federal Government, Länder, local authorities) must be more coherently interlinked and their policies more effectively integrated.

Achieving all of this is naturally a challenge as the lawmakers face rapidly changing conditions as well as changing expectations among the general public and the relevant addressee groups. Meeting the above needs regarding laws and regulations and effectively involving stakeholders requires better assessment of the potential interrelationships between the political measures and policy goals.⁶¹

Farmers report a tendency towards highly detailed regulation and increasing bureaucratic red tape. To the extent that demonstrable progress is made towards environmentally sustainable transformation in farming, current regulatory provisions in agricultural and environmental policy – which are often detailed and administratively burdensome – can be scaled back down to their intended function, which is to set minimum standards and subject noncompliance to legal penalty.

The much-needed transformation of the agriculture and food system means fundamental change for all involved. Wide-ranging acceptance, including among those directly affected, is thus key in ensuring that the transformation process is successful. To achieve that acceptance, it is necessary to set an appropriate timescale, create predictable conditions and provide planning reliability. Only if they have foreseeable, sufficiently reliable and economically viable transformation

paths will farms make the necessary investment – and only then will it make sense for companies and research institutions to invest in the development of new, future-proof practices, technologies, products and varieties. And only then will there be positive change in contractual arrangements, negotiation structures and dietary choices.

Administration: Rapid across-the-board implementation of the sustainability-focused agricultural and environmental policy described in earlier sections and regular monitoring of the transformation process call for highly effective agricultural and environmental policy administration at all levels (local authorities, the Länder, the Federal Government and the EU). All of these levels of administration must therefore be provided with adequately support and the resources needed to cope with the tremendous administrative demands of the transformation process.

To maintain a high level of food safety monitoring, authorities must be better equipped as regards both staffing and technology. This is crucial because although food safety in Germany and the EU has reached a high standard in principle, food safety and food quality still pose an ongoing challenge in practice both for the food industry and for supervisory authorities.

The merits of placing or not placing specific monitoring or certification responsibilities in the hands of the private sector should also be assessed.

⁶¹ See Nationaler Normenkontrollrat (2019): Erst der Inhalt, dann die Paragraphen. Gesetze wirksam und praxistauglich gestalten, <https://www.normenkontrollrat.bund.de/nkr-de/bessere-rechtsetzung-buerokratieabbau/praxistaugliche-gesetze>.

2.9 Knowledge management and scientific political advice

Knowledge growth: Methodically acquired, systematically explained, subject-specific and increasingly specialised and complex knowledge plays an increasingly important role in the agriculture and food system. In this regard, the agriculture and food sector in no way lags behind the rapid pace of change seen in other areas of society or in other sectors. Knowledge is being revised and added to at a rapidly accelerating and challenging rate, both in (micro-)biology and in agricultural production technology (agrochemicals and pharmaceuticals, plant engineering, agricultural machinery, etc.).

By contrast, farming has a relatively large share of lesser-skilled workers. This is explained among other things by the importance of seasonal and helper labour.⁶² Better qualified individuals currently make up a comparatively small share of the farming workforce and are usually farm owners and family workers. Demand for mid-level (skilled worker and specialist) labour is likely to increase in the future. As a result, continuous refreshment and renewal of knowledge and the learning of new skills are of eminent importance in making farming businesses future-proof.

For farming workers and the owners of farms to be able to meet both society's altered expectations and the increasing demands associated with the systemic transformation of agriculture, a broad range of targeted training, further education and advisory services are needed. Unlike in the past, this must not be limited to areas of knowledge that are primarily related to business management and production technology. Rather, the transformation of farming makes it necessary to expand this canon of knowledge to include

sustainability-related knowledge about the effects of agricultural production on the climate, the environment, biodiversity and animal welfare, and the opportunities to be had in making ecological services economically viable.

Initial, further and continuing vocational education and training: Good training forms the basis of farming success. This is why training content must be continuously adapted in line with developing knowledge and newly emerging challenges, with the current focus on topics such as risk and liquidity management, staff management, IT and data use, communications, new business models, higher value-added production systems and so on. For the same reasons, farm owners are equally called upon to continuously and consistently update both their knowledge and their professional skills. It must be noted here that active farmers have very little time to attend training courses, especially when it involves several days away from the farm. There is thus a great need for compact high-quality training formats (evening or one-day events). Free lectures organised by agribusiness not from an educational but from a marketing perspective at best meet this need to only a limited extent. The Commission expects that formal certification of skills and skills development will become more important for everyone working in the farming sector.

With regard to vocational training and academic study, **the Commission has the following recommendations:**

- Course content in technical colleges and universities must be adapted to the new challenges. This relates among other things to communication (with consumers, social groups and the media), staff management, dealing with new digital technologies (big data, AI and

⁶² O. Strecker et al. (2020): Arbeitsmarkt Landwirtschaft in Deutschland, <https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/studie-arbeitsmarkt-landwirtschaft-in-deutschland.pdf>.

robotics), environment protection, biodiversity conservation and animal welfare. Remuneration of trainees must be structured in such a way that it enables them to lead independent, self-determined lives.

- Agriculture and horticulture have a growing need for skilled workers in the permanent workforce. Greater effort could be made here to address new target groups such as people from immigrant backgrounds and refugees. Training farms and companies should be offered training that gives them the intercultural skills they need for this purpose.
- Further expand and support vocational competitions in agricultural professions with the aim of communicating specialist knowledge on the environment and sustainable development and also of connecting people in those professions beyond the classroom walls.

The Commission recommends the following regarding further training and continuous education:

- Given the extensive challenges of transformation, there is a need for in-depth, certified further education programmes that lead to recognised qualifications.
- In addition, the availability of flexible (such as blended learning) and educationally high-quality, short-term further and continuous training programmes should also be expanded to provide digital formats with the flexibility that farmers need.
- One particular challenge involves farmers who have no relevant training and/or are not willing to undergo further training. A minimum level of initial and further training is also needed in view of the large and increasingly complex range of responsibilities around environmental protection, nature conservation and animal welfare.
- Farmers should be given the opportunity to regularly participate in further education and training concerning environmental protection,

nature conservation and animal welfare so they can obtain additional qualifications and skills. Publicly funding such measures or tying subsidy payments to proof of proficiency could increase motivation to participate.

- For the purpose of rapid updating of training content, both teachers in technical colleges and trainers in farms and companies should be required to undergo regular further training and be released from work to be able to do so. In farming and food training, sound knowledge of organic farming must be taught and included as an examination topic nationwide. Teachers must receive similar training.

Consultation and advice: The Commission believes the following thematic focus issues are of particular importance in advising farmers and farming businesses:

- Climate change consultations and advice to make the potential for emission-reducing measures on farms both visible and implementable;
- Advice on the conservation and monetisation of ecosystem services such as maintaining and promoting biodiversity in the farming countryside;
- Advice on nutrient-saving fertiliser application and on practices that also promote biodiversity (such as green manuring, permanent ground cover and marginal strips);
- State-provided animal welfare advice for farmers and assistance in establishing networks for farmers who have either converted or are in the process of converting their livestock farming systems – also to aid dissemination of best practice examples;
- Advice on using new technologies and especially digital technologies.

Consulting should increasingly be based on individual farm assessments (sustainability checks, biodiversity checks, animal welfare checks, etc.). The following issues are also important:

- Extend one-on-one psychosocial counselling for farmers in crisis situations triggered by structural and political upheaval;
- Advice on the principles, methods and business opportunities to be had from organic farming, the aim being to enable informed decisions on future farm development based on knowledge of the available options.

As mentioned earlier, there is also a need to expand and promote training and advisory services on markets for farms, farm management and inter-farm cooperation, on risk and liquidity management, on boosting farming resilience and securing farming livelihoods (state support for advisory services for farms in crisis situations), on marriage, inheritance and taxation law, on farm security and farm succession. In all of this, greater attention should be paid to women as potential farm successors and to the possibilities of non-family farm succession.

Successful, systemic transformation of the farming sector depends on application-oriented agricultural research and its translation into practice. It is also reliant on demonstration projects showcasing sustainable agricultural production which can additionally serve as best-practice examples in farming.

Scientific political advice: Like the agriculture and food system itself, related sectoral policies also rely to a considerable extent on highly specialised and interdisciplinary scientific knowledge. The responsible federal ministries thus have resident scientific advisory bodies and promote research by awarding research contracts and by funding research institutes (primarily Leibniz Association institutes) and departmental research facilities.

BMEL's fundamental interest in securing a reliable, effective knowledge base for use in government and administration is reflected in the independent scientific advisory boards established at BMEL and in the output of the BMEL-funded (departmental) research institutions⁶³. It is also expressed in the commissioning of the German Council of Science and Humanities with a further evaluation of the departmental research institutions in the BMEL portfolio and a structural analysis of agricultural sciences at German universities.

The Commission welcomes this situation and also points out that the much-needed systemic transformation of the agriculture and food sector and of its social, political and legal framework will further increase the need for scientific policy consultation and advice. This will also increase the importance of the think-tank functions of departmental research institutions relative to the processing of research contracts awarded by BMEL. The Commission recommends that the ministry leadership make greater use of BMEL's departmental research functions and scientific advisory boards, using them as think tanks with intensified dialogue and exchange.

It is also foreseeable that alongside the well-established and strong research capabilities in the natural sciences, engineering and agricultural economics, there will also be growing demand for research perspectives in political science, administrative science, law, sociology, transformation studies and cultural studies. Finally, it should be borne in mind that any opportunistic cherry-picking of scientific expertise would eventually squander the large legitimacy bonus that policymakers invariably associate with the incorporation of advisory knowledge from scientific advisory boards and research institutions.

⁶³ Wissenschaftsrat (2017): Empfehlungen zur Weiterentwicklung der Ressortforschungseinrichtungen des Bundesministeriums für Ernährung und Landwirtschaft (BMEL), https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Forschung/wissenschaftsrat_ressortforschung.pdf.

Transformative sustainability policy crucially depends on the further development of independent, concurrent implementation and evaluation research. Improved knowledge regarding the introduction, effectiveness and cost-efficiency of individual measures increases their political feasibility and acceptance. A culture of policy impact research must be developed where policymakers approach controlled experiments more boldly and consider it a matter of course to monitor those experiments and assess their success (systematic trials, farm networks, learning by doing, etc.). In each case, both the policy measure and the target criteria need to be specified in advance and the study design must meet scientific standards with appropriate data analysis (such as randomised, controlled studies, and also more 'pragmatic' study designs). Greater use should also be made of the scientific evaluation of international experience to assist policymakers.

3 Environmental areas of action, animal welfare, policy options and recommendations

The agriculture of tomorrow is both sustainable and productive. It produces sufficient quantities to enable environmentally responsible consumption by a growing number of people while taking into account geophysical, biochemical and ethical implications and impact.

Farming can have both positive and negative impact on the environment. It can itself be harmed by negative environmental impact and it can also play a role in solving environmental problems. This complexity, the diverse forms of agricultural production and the myriad environmental interrelationships make it impossible for a single solution, approach or instrument to address all of the negative effects that agricultural production can have on the climate, the environment, biodiversity and animal welfare.

What is needed is a package of targeted political instruments that must also be coherent while avoiding micromanagement and excessive bureaucracy.

3.1 Climate change and its impact on farming

To limit climate change and its environmental and social outcomes, greenhouse gas emissions must be reduced in such a way that the Paris Climate Agreement's 1.5 °C target is achieved. As reaching that goal is inconceivable without transforming the entire economic system towards a low-carbon economy, emission reduction or carbon sequestration strategies must be developed for all relevant sectors to provide the right incentives to bring about structural change in climate protection policy and foster technological innovation. This was underscored by the Federal Constitutional Court in its decision of 24 March 2021, which called on the lawmakers to provide for further measures to reduce emissions and thus protect the basic rights of younger and future generations.

In transforming the entire agriculture and food system, which is impossible to achieve in the shorter term, uncertainties may arise in the course of the transformation process itself – for example, in production and climate-friendly consumption and in designing efficient and effective climate change policy. To avoid those uncertainties as far as possible, interim climate policy targets and measures should be reviewed regularly and, where necessary, readjusted and critically compared with any synergies arising as a result of action taken in other sectors and also with any measures that stand in the way of target achievement.

This does not apply, however, to the provisions of the Paris Agreement. These are binding under in-

ternational law and implemented in the Climate Protection Act (Klimaschutzgesetz), under which climate targets can only be made more stringent.

Both the agriculture and food system and agricultural production processes in particular are linked to climate change in three specific ways:

- Farming, and especially livestock farming, is in itself a major source of greenhouse gas emissions. The share of farming-related emissions in Germany's current annual greenhouse gas emissions balance stands at just under 9 %. Added to this are greenhouse gas emissions from agricultural land use and land-use change (4.4 %).
- Agricultural production is not only constitutively dependent on properly functioning ecosystems. More than almost any other sector, it is also directly and indirectly affected by the impact of climate change. While the effects of global warming on agricultural production are too complex for accurate predictions, there is a reliable prognosis that without adaptation measures – irrespective of cultural and global regional differences – agricultural production would decline overall in the long term.⁶⁴ A significant increase is already being seen in extreme weather events caused by climate change (heavy rain, heat and drought) and in 'stuck' weather patterns, the vegetation cycle is starting earlier, the risk of late frosts is increasing, and harmful organisms are either becoming established or increasing their damaging effects.
- Agricultural production can also be an important tool with which to actively combat global climate change as water, soil and plants can capture and store greenhouse gases from the atmosphere.

3.1.1 Greenhouse gas efficiency, reduction and sequestration

Germany has set itself the goal of becoming climate neutral by 2045. Given the vast short-term savings potential in other sectors, farming and land use will gradually play an increasingly important role in combating climate change. However, it must be remembered that food cannot be produced without some greenhouse gas emissions. But to achieve the climate targets that are enshrined in law, constitutionally required and binding under international agreements, a significant reduction in greenhouse gas emissions from farming, food and land use is needed – as is long-term expansion of the greenhouse gas sequestration function in these sectors. This calls for a variety of measures and activities.

To adequately meet the challenges of climate change mitigation, measures to reduce greenhouse gas emissions from farming that are both immediately implementable and immediately effective must be introduced without delay.

There are a number of ways to reduce greenhouse gas emissions in farming, some of which are already being practised. The focus here is on climate-efficient cultivation, which in many cases is also cost-efficient. In some cases this requires more intensive, publicly funded advisory services than have been needed to date (for example, regular climate checks at individual farm level). Under certain conditions, at least for a transitional phase, targeted public funding should continue to be provided and also scaled up for cultivation methods that serve to reduce greenhouse gas emissions and store carbon. In the farming and land use sectors as elsewhere, the path to climate neutrality will be accompanied by learning and adaptation effects. Provision should therefore also be made for making

⁶⁴ J. R. Porter et al. (2014): Food Security and Food Production Systems, in C. B. Field et al.: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap7_FINAL.pdf.

suitable policy adjustments as the transformation progresses. The following sets out proposed measures according to the types of greenhouse gases involved.

Methane: Most farming-related emissions come from livestock farming and in particular from cattle farming. To reduce methane emissions, it is thus necessary to reduce both consumption and, consequently, production of foods of animal origin.

The Commission therefore recommends:

- Adapting the size of cattle herds to climate targets and focusing on grassland-based cattle farming. This should be accompanied by an adjustment in consumption and the added value per animal must be increased so that, at minimum, farm incomes remain stable;
- Optimising fertiliser and feed management;
- Improving the lifetime performance of dairy cows.

Nitrous oxide: About 80 % of Germany's nitrous oxide emissions come from farming. The use of nitrogen fertilisers causes considerable nitrous oxide emissions and nitrogen use in German farming is only about 50 % efficient. The goal must thus be to reduce the nitrogen surplus to a maximum of 70 kilogrammes per hectare by 2030, as called for in Germany's National Sustainable Development Strategy.

The Commission therefore recommends:

- Introducing incentive schemes for farm-specific optimisation of nitrogen efficiency in agricultural production;
- Rapid implementation of simple, transparent, verifiable material flow balances for individual farms. Only when existing policy measures, such as the Fertiliser Application Ordinance (Düngeverordnung), prove ineffective should supplementary market-based instruments be

considered for nitrogen reduction (see section B 3.2);

- Low-emission fertilisation to prevent nitrogen surpluses;
- Development of appropriate authorisation procedures for nitrification inhibitors and other substances for use in reducing nitrogen losses.

Carbon dioxide: Agricultural soils and peatlands can significantly aid carbon storage in soil. Long-term measures are needed for this purpose.

Humus formation: Given the tremendous additional benefits of creating and maintaining humus with the aim of boosting both farming's resilience to climate change and the fertility of farming soils, and considering the importance of humus creation in relation to other goals (such as biodiversity), increasing humus content in the soil represents a key action area in agri-environmental policy.

There are already a wide range of measures in place to promote humus formation.

The Commission therefore recommends:

- An enhanced programme of state-funded support measures that include, among other things, promotion of extended and humus-building crop rotation, encouragement of intercropping and cultivation of legumes;
- The development of instruments for use in measuring changes in humus content, thus making it possible to remunerate permanent sequestration of carbon in farmed mineral soils;
- Making the maintenance of a good humus balance a legally binding good farming practice.

Peatlands: Peatlands are natural carbon sinks whose agricultural use results in the release of greenhouse gases. Farming thus harbours great potential to contribute to climate change mitigation with action that can be quickly

implemented. This should be appropriately remunerated by society overall. Thus, in close collaboration with the farming sector and nature conservation organisations, the Federal Government and the Länder must develop a national peatland conservation strategy. In line with the goal of climate neutrality by 2045, this should include the large-scale rewetting of farmland that is currently dry-cultivated. Appropriate funding must be made available to compensate for the resulting loss of cultivation.

The Commission recommends the following measures for conserving and restoring peatlands that are currently under agricultural cultivation:

- Converting arable land into grassland, which if of higher conservation value should also be extensively grazed; conserving grassland and supporting products from grassland and pasture farming;
- Rewetting of areas with high restoration and climate change mitigation potential, in combination with production and income opportunities for the farms operating on the areas of land concerned;
- Use of peat substitutes and an EU-wide ban on peat extraction;
- Use and promotion of paludiculture.

Rewetting calls for significant financial effort. Trading of avoided emissions from organic soil is a suitable means of advancing towards climate targets. Given the great complexity of agriculture and the need to monitor farming practices, however, implementing a dedicated emissions trading scheme would be complicated and could not be implemented in the shorter term.

General measures: Various additional measures can also be considered for reducing greenhouse gas emissions and improving climate efficiency.

The Commission thus recommends:

- Income-generating financing of contractual climate measures, including comprehensive and incentive-oriented programmes for conserving and restoring peatlands used in farming (see above);
- Enhance the role of digitalisation in implementing climate targets – technology and digital applications can help reduce carbon emissions in farming;
- In the food sector, in addition to measures designed to combat food waste set out in section B 2.7, exploit the possibility of serving climate-friendly dishes at events and in communal catering in public canteens. As a first step, DGE quality standards for communal catering could be introduced on a mandatory basis in all Länder and expanded to include sustainability criteria;
- In preschools and schools, teach related educational content in conjunction with provided free health-promoting, sustainably oriented school meals;
- Expand publicly funded advisory services and enable farms to identify and realise the opportunities to be had from climate action;
- Across the entire food system, introduce production methods that are at least carbon-efficient and where possible carbon-neutral;
- Research projects and best-practice demonstration projects, for example on agroforestry systems, permanent green cover, non-turning tillage, compost and mulch;
- Efficient, biodiversity-promoting use of agricultural land to cultivate energy crops (while avoiding land-use competition);
- Measures that enable the farming and land use sectors to contribute to climate action by achieving a shared net balance of negative emissions in the longer term.

3.1.2 Agricultural production resilient to climate change

Agricultural production is exposed particularly directly to the impacts of climate change. Heavy rainfall, droughts and other extreme weather events caused by climate change along with soil degradation and soil erosion, the general rise in temperature and shifting of the seasons all pose a threat to arable farming. Appropriate adjustments in agriculture must be supported and promoted at policy level. Particular attention must be paid to:

- A structurally rich farming countryside comprising green vegetation, water retention and, where possible, land under permanent green cover to help prevent soil desiccation and have a positive impact on both the microclimate and the mesoclimate (see also section B 3.2).
- The humus content in soil plays a key role in the development of agriculture with maximum resilience to the impacts of climate change. Soil with a good supply of humus can absorb large amounts of water in a short period of time and make it available during dry periods later on. A good soil structure (uncompacted soil with ‘good tilth’) has the same effect.
- Location and climate-adapted, high-yielding, robust, healthy varieties of high-quality food and feed and processing of the largest possible number of crop species are key in the further development of a resilient, productive agriculture and food system. The EU Green Deal and Farm to Fork Strategy make this even more important. At the same time, increasingly complex demands are placed on breeding (see also section B 4.4).

3.2 Soil, water, air and nutrient cycles

Soil, water, air and nutrient cycles form the basis of all agriculture. They are often severely affected by the farming practices in use today. The transformation towards a sustainable agriculture and food system must reduce the use of these natural resources to a level that is compatible with their limits.

The Commission thus recommends:

- Preventing, or at least reducing, eutrophication of soil and surface waters;
- Improving water quality (among other things in terms of nitrate and phosphate levels and of pesticide and veterinary drug residues);
- Reducing soil erosion and soil compaction;
- Promoting soil fertility;
- Ensuring water availability (presence of water in the landscape; water storage capacity of soils; irrigation systems);
- Securing the availability of agricultural land. Agricultural production is also reliant on the availability of land. The goal set out in the German Sustainable Development Strategy of reducing daily land-take to less than 30 hectares by 2020 has so far been missed by a wide margin. Land take still continues in Germany at more than 50 hectares a day. Soil regeneration should be promoted by means of appropriate funding.

Fertilisers: With regard to fertilising in agriculture, it is particularly important to ensure a sufficient supply of nutrients to plants while avoiding surplus nutrient discharges. Nutrient surpluses from agriculture impact the quality of surface and groundwater bodies, contributing to higher nutrient levels in ecosystems. This results in uniform habitats that tend to foster the dominance of a few nutrient-loving species, which then proliferate rapidly. Species that are

specialised in different habitats with medium or low nutrient levels are displaced. This is a major cause of biodiversity loss. Excessive inputs of nitrogen into the environment lead to the generation of greenhouse gases with their negative climate impacts and of eutrophying and acidifying air pollutants. The European Commission's Farm to Fork Strategy thus sets out a 2030 target of a 50 % reduction in nutrient losses and a 20 % reduction in the use of fertilisers while maintaining soil fertility. However, this needs to be more clearly defined (in terms of baseline and measurement methods). It is also necessary to conduct an impact assessment with regard to agricultural production and the economic viability and competitiveness of farms.

To reduce nutrient discharges, **the Commission recommends:**

- Increasing nitrogen-use efficiency and reducing fertiliser use, for example with field-specific control of fertiliser application rates and more efficient use of farm manure;
- Supporting crop rotation diversity, in particular with the cultivation of legumes;
- Increasing the use of mixed crops, catch crops and undersown crops;
- Providing year-round soil cover with catch crops or vegetation stubble;
- Improving soil fertility by giving priority to the use of, for example, manure and compost and leaving organic residues (such as straw) on the fields – as is common practice on livestock farms;
- Making regular provision for the creation of field margins along watercourses;
- Offering advice on nutrient-saving application of fertiliser and on other nutrient-saving, biodiversity-promoting measures (such as green manure, permanent ground cover and marginal strips).

Options for crop cultivation methods that conserve natural resources also include:

- New fertiliser application technologies (smart farming);
- Use of biostimulants, which improve nutrient uptake at reduced fertiliser use;
- Use of encapsulated fertilisers and nitrification inhibitors;
- Improving soil fertility with new methods of carbon-rich organic fertilising using compost or manure;
- Processes for the treatment of sewage sludge (utilisation of phosphate in a circular economy);
- Develop processes to enable complete treatment of slurry and digestate;
- Cultivation of varieties with lesser nutrient needs or that are able to use nutrients from the surrounding environment by means of symbioses.

Monitoring system and systematic trials for nitrogen surplus pricing: Transparent, regionally adapted reduction and avoidance of surplus nutrients, especially nitrogen, is one of the key challenges in environmentally responsible farming. The above-mentioned target under the Farm to Fork Strategy calls for a uniform, comprehensible monitoring system for agricultural, industrial and municipal nutrient discharges. The current system of small-scale regulatory control of nitrogen surpluses has also proven to be problematic, in terms of both effectiveness and acceptance by farmers.

The Commission thus recommends, in addition to regulatory approaches, the development of market-based instruments to reduce nitrogen surpluses. These should only be used if the governing instruments currently in place (notably the Fertiliser Application Ordinance [Düngeverordnung]) prove ineffective.

Another important source of reduction in overall nutrient surpluses can be created if stakeholders

in the food industry and retail trade align their trade and processing specifications for agricultural products to the sustainable development goals.⁶⁵

3.3 Agroecosystems, habitats and species

Effective action has to be taken quickly to stem the loss of biodiversity in the farming landscape without further delay. Biodiversity loss caused by farming is considerable and must not be allowed to continue to the same extent as in the past. To both conserve and enhance ecosystem functions, it is necessary to halt and reverse the decline in biomass and in the biodiversity of insects and other fauna and flora (including soil organisms) in habitats and landscape features.

The Commission thus recommends:

- Preserving and expanding biodiversity-promoting land use systems;
- Conserving and creating habitats and landscape features in the farming countryside;
- Reducing pollution from pesticides and nutrient inputs (see section B 3.2);
- Establishing and promoting production-accompanying and production-integrated measures to promote biodiversity.

The primary focus in all of this is on achieving a diverse agricultural landscape, targeted use of fertilisers and pesticides, management methods that promote biodiversity and preserving and increasing diversity in livestock breeds and arable crops. Farming itself also benefits from this approach, for example through increased yields due to wind protection from hedges, self-regulation of harmful organisms by means of functional

biodiversity and beekeeping. Such structures can generally be created irrespective of the size of the farm involved.

Biodiversity-enhancing land use systems: Extensive or low-nutrient cultivation can contribute to more biodiversity. Compared with arable farming and a range of special crops, grassland is particularly well suited to biodiversity-promoting cultivation. The proportion of permanent grassland should thus be further increased by means of practicable conservation requirements and targeted support for the creation of new areas of grassland. Its value as a habitat is largely influenced by use intensity. As Germany still has particularly species-rich (residual) areas across the country, their protection and conservation should be prioritised.

First and foremost, this includes:

- Mesophile grassland on organic soil;
- Lowland and upland hay meadows;
- Wet and moist grassland.

Further measures to achieve this goal should take in extensification programmes with reduced fertiliser use, nature-friendly mowing (including strip mowing) and encouraging the restoration of permanent grassland.

In addition, it is necessary to promote the production and marketing of products from grassland use (pasture milk, pasture-raised meat, etc.). This will strengthen the link between livestock production and grassland while also benefiting animal welfare.

Predators: Conflicts between the keeping of grazing animals and protecting predators such as wolves create a need for herd protection and predator prevention measures. Regional manage-

⁶⁵ For example, the last fertiliser application to increase the protein content in wheat can be dispensed with if the wheat could also be marketed as bread grain with lesser protein content. Similar examples in vegetable production involves the leaves of cauliflower and radishes and the intensity of the colour of broccoli and lettuce.

ment plans offer a range of different options whose implementation should be promoted by means of funding. In protecting their livestock against predators, livestock farmers must be supported using a cost-covering, unbureaucratic approach and must receive adequate compensation for livestock losses, consequential damage and the additional costs of herd protection.

Many livestock owners believe that killing wolves that have been sighted is both necessary and permissible in order to protect their herds. For nature conservation and legal reasons, however, such decisions can only be made on a case-by-case basis. Ongoing social dialogue and exchange to address this conflict of interests must be put in place by the state.

Landscape features in the farming countryside:

To reverse the problematic loss of certain landscape features, biodiversity-rich features of sufficient size, sufficient density and appropriate spatial distance must be either introduced or created in the farming countryside to a greater extent than has been the case so far.

The underlying principle here is that preservation of a diverse farming countryside can only be achieved by adopting an approach which, in addition to intensively farmed areas, also includes extensively farmed and non-productive areas. For landscape features, fringe structures and non-productive areas, the aim should be to achieve a minimum 10 % share of the open landscape. It is necessary here to develop the legal framework and the basis for and amount of remuneration for providing such areas.

Biodiversity-rich features should thus be increasingly promoted in the future. First and foremost, these include:

- Landscape features (such as hedges, rows of trees and copses);

- Special features (such as sparse orchards and sandy heaths).
- Small bodies of water;
- Green bridges and small, ecologically valuable field structures.

On arable land, extensively used (partial) areas, sparsely cultivated areas and a more abundant flower and seed supply have positive effects on biodiversity. Hence, the following should be better promoted:

- Fallow land with self-vegetation;
- Biennial and perennial flowering fields;
- Marginal strips and field margins;
- Extensive arable fields/in-field patches.

Many of the necessary procedures and measures have already been tried and tested as agri-environmental measures under the second pillar of the CAP, as future organic schemes under the first pillar of the CAP or as compensation measures under German nature conservation law.

Financing: The current extensive financing of biodiversity-promoting instruments, methods and measures from CAP funds will not be enough to fully meet the needs – even with the necessary restructuring (see section B 4.3.1) – and will have to be supplemented from other funding sources. Nature conservation and landscape management can play a more important role in future in farm business diversification. As a consequence, use of such instruments should not be driven by public funding alone, but should instead be actively supplemented by other funding sources (such as from regional initiatives and, where appropriate, private-sector projects).

Organisation of biodiversity-related agri-environmental measures by cooperatives: In future, the greening of land management will increasingly have to be achieved by means of funded agri-environment-climate measures (AECMs). These also include modified practices and spe-

cific measures, especially as regards biodiversity conservation as this can be more effective with cross-farm approaches (such as lapwing islands or mid-field lark plots) or rededication of land for use in conserving biodiversity (such as flowering areas). Until now, selection, implementation and control of these measures have taken place at individual farm level. That system has a number of weaknesses:

- The choice of measures depends less on nature conservation criteria and more on a farm's structural arrangements, its economic resources and the preferences of the farm manager.
- Agri-environmental programmes offer hardly any advisory services for biodiversity promotion and the implementing farmers lack professional support.
- Some agri-environmental measures require specific equipment for implementation (such as hoeing machines or double-blade mowers). Their purchase usually proves unprofitable for the farm concerned and may also give rise to farming-related conflicts of interests.
- Given the large number of subsidised farms and the small-scale nature of the measures concerned, a high level of effort in monitoring and control is involved on the part of the agricultural administration.
- For the vast majority of agri-environmental measures, funding is granted for compliance with certain requirements (such as a reduction in the quantity of operating resources used) rather than for the achievement of specific results or targets.
- Finally, the measures usually take place without the involvement of other nature conservation interest groups, such as environmental organisations.

Organising agri-environmental measures in this way leads to a low level of acceptance on farms and reduces their effectiveness in the achievement of objectives. Many of these deficits could be avoided by adopting a cooperative approach

to organising agri-environmental measures that cannot be implemented as effectively at individual farm level.

The Commission thus recommends that in the future, agri-environmental measures – which since 2014 have generally been referred to as agri-environment-climate measures (AECMs) – should also be organised via jointly supported cooperatives at regional level (at the level of administrative districts, for example). A legal and organisational framework therefore needs to be put in place for such cooperatives, enabling them to organise selection, implementation and promotion of the measures for member farms.

Their membership can include farms and other nature conservation interest groups, such as environmental and landscape conservation associations. The cooperatives should also have resident experts from the fields of agriculture, environment protection, nature conservation and administration and be coordinated by an appropriately staffed and equipped office. Financing can be provided as a share of the funding granted to each farm or via separate funding instruments (such as similar to the funding of producer associations under the Joint Task for the Improvement of Agricultural Structures and Coastal Protection [GAK]). Intensive dialogue on objectives and measures should be organised among the members.

Selection of the location and scope of AECMs – where decided by the cooperatives – should be made according to nature conservation criteria. This may result in an uneven distribution of measures among member farms. A fixed budget should apply to the overall scope of the measures to be carried out in the area covered by a cooperative. The cooperative should thus also act as the applicant when requesting public funds.

Likewise, a full list of eligible measures should be drawn up and an envisaged level of target achieve-

ment specified that the individual cooperatives can adapt to local circumstances. Funding should not only be awarded for compliance with certain requirements (meeting specified requirements regarding management of agri-environment measures), but – where it makes sense from a technical and organisational perspective – also for the achievement of specific targets. A subsidy for the achievement of a predefined outcome could, for example, be paid as a top-up payment or as the main payment component. The variable share of funding should be based on the probability that the measures will lead to the desired result. For example, an increase in skylark breeding pairs by means of mid-field lark plots is more likely and also easier to assess than the immediate success of a change in crop rotation to protect wild bees. Through close monitoring by the cooperatives, measures can be better assessed for their efficacy and achievement of objectives. They can then be adapted in a targeted way and gradually improve their efficiency. The Commission believes that agricultural administrations have so far been hesitant to embrace such cooperative forms of organisation. The proposed new organisational approach to agri-environmental measures also calls for revision, flexibilisation and streamlining of administrative procedures, including any necessary changes to the applicable legal framework (such as with regard to budgetary law). There are also opportunities for significant simplification of the payment and control processes on account of the smaller number but greater professionalism of the contact persons involved. The necessary greening of agriculture demands considerable effort from all involved and this will also apply to the authorities responsible for agricultural administration.

The Commission recommends that the above-described approach for suitable AECMs to be organised by regional cooperatives in conjunction with stakeholders should be developed and adapted to national and regional conditions in the course of 2021 and then followed up with

extensive pilot trials. If considered appropriate, a suitable federal programme should be set up without delay to develop and test such cooperation-based arrangements between farms and nature conservation organisations. This could build on existing initiatives in cooperation-based nature conservation (such as landscape conservation associations). The changes needed in the legal framework (such as in budgetary law) should likewise be initiated.

The aim should be to enable such cooperatives to be formed throughout Germany within the next funding period.

Crop protection: Securing the sustainability and future viability of the agricultural sector also includes minimising and further reducing the impact of crop protection measures on the environment, biodiversity and human health. An important contribution in this regard involves the creation of stable agroecosystems using integrated crop protection.

First and foremost, this includes:

- Incentives for diversified crop rotation and mixed crops with rotation breaks of the duration required for phytosanitary purposes;
- Breeding and cultivation of varieties that are resistant or tolerant to pests;
- Use of vigorous plant varieties;
- Use of cultivation techniques that are conducive to plant health and functional biodiversity;
- The development and authorisation of biological and natural product-based pesticides and plant strengthening products with only marginal negative impact on biodiversity and the environment;
- Use of innovative solutions in crop protection (modern agricultural technology; digital solutions);
- A consistent approach in combating counterfeit pesticides (currently 10 % of the tonnage in Europe) and use of unauthorised pesticides;

- Farm advisory services and financial incentives for reductions in the use of pesticides.

These can be supported by:

- The further development of biological and physical plant protection methods, with the aim of significantly minimising the risks to the environment and biodiversity posed by any kind of plant protection measures;
- Development and use of effective control mechanisms to ensure comprehensive implementation of integrated pest management – a legal requirement since 2011;
- Creation of attractive incentive systems and markets for biodiversity-promoting farming practices and with the involvement of the food industry and consumers;
- Promoting the necessary technological upgrade in farming, supporting the application of new training techniques and extending advisory services;
- Further development of approval procedures, including the development of approval criteria for plant strengthening agents (biostimulants), biologicals, natural substance-based preparations and low-risk pesticides;
- Development and establishment of environmental damage thresholds to preserve valuable accompanying flora in arable farming (made possible by modern digital technology with image recognition and selective combating of crop damage and disease);
- Nationwide expansion of the digital infrastructure for and facilitation of uniform access to geodata along with its provision to farming businesses free of charge.

Although the regulation of pesticides and their use in farming will continue to require both legislation and effective implementation in practice, innovation and research are also needed to achieve significant reductions in pesticide use such as those envisaged in the Farm to Fork Strategy. This includes rapid

development of non-chemical alternatives in crop protection, inherently stable production systems with resistant varieties and the use of precise application techniques with the aid of digital tools. To create favourable conditions for such solutions, market-based instruments are currently being discussed. These are intended to provide flexible incentives to replace highly toxic substances with less toxic alternatives, develop technical solutions to replace or reduce the cost of active pesticide ingredients, and build stable farming systems that get by with continuously reducing input amounts (such as pesticides).

3.4 Livestock farming

Livestock farming is an extremely important sector, both in environmental and in economic terms and with regard to societal expectations, ethical issues and lifestyles. The increased demands on livestock farming and the rising expectations regarding process and product quality will in all likelihood go hand in hand with a reduction in total livestock numbers. For environmental and climate change mitigation reasons, there is also a need to implement livestock farming that is largely self-sufficient in farm inputs supported by regional and inter-farm nutrient management models.

Effective improvement of animal welfare as a national objective with constitutional status requires a far-reaching restructuring of livestock farming (including farm management). The goal here should be farms that focus on ensuring product and process-oriented quality, that generate sufficient income and are able to operate in a socially acceptable manner over the long term. This restructuring must be promoted, accelerated and accompanied by a wide range of agricultural policy instruments and tools.

These include realigned funding policy, improving and supplementing animal welfare requirements and promoting target-oriented, needs-based technology along with training, further education, counselling and advice.

In addition to successful restructuring of livestock farming, **the Commission thus sees a need for reduced consumption and, consequently, a reduction in the production of animal products.** This in turn assumes the availability of effective mechanisms to secure sufficient income for livestock farmers.

Kompetenznetzwerk Nutztierhaltung: The Commission on the Future of Agriculture welcomes the proposals set out by the Commission on Improvements in Livestock Farming (Kompetenznetzwerk Nutztierhaltung) in which it describes the transformation towards a form of animal husbandry that promotes animal welfare.⁶⁶

The Commission on the Future of Agriculture also agrees with the view put forward by the Commission on Improvements in Livestock Farming that the necessary and highly demanding transformation of farm animal husbandry “cannot be achieved in the foreseeable future purely with market-based measures such as labelling and information directed at consumers”.⁶⁷ The Commission on Improvements in Livestock Farming has thus recommended developing a long-term, comprehensive transformation strategy.

Its recommendations are based on important agricultural policy consensus-building processes which, at their core, combine long-term improvements in animal welfare in livestock farming with a reliable financing solution for livestock farms.

Adopting this consensus, the Commission on the Future of Agriculture recommends that the proposals of the Commission on Improvements in Livestock Farming be implemented immediately and swiftly and that the transformation process be supported by policy provisions to ensure its economic feasibility and public acceptance.

⁶⁶ Empfehlungen des Kompetenznetzwerks Nutztierhaltung (2020), https://www.bmel.de/SharedDocs/Downloads/DE/_Tiere/Nutztiere/200211-empfehlung-kompetenznetzwerk-nutztierhaltung.pdf.

⁶⁷ Ibid., 13.

Animal welfare: To improve animal welfare in livestock farming, the following are needed:

- Introduction of animal welfare testing and approval procedures for mass-produced livestock housing construction systems and slaughter facilities;
- Consistent withdrawal of non-curative interventions;
- Further elaboration and enforcement of the ban on breeding that causes pain, suffering or harm to the offspring (section 11b of the Animal Welfare Act [Tierschutzgesetz]);
- Formulation of legal requirements for animal welfare-friendly slaughter and enforcement of prevailing legal provisions and rules;
- Promotion and legal regulation of more animal-friendly production and slaughter methods;
- Development and implementation of processes or production chains that reduce or eliminate the need to transport live animals, and especially very young animals. To ensure compliance with animal welfare standards under EU law, prevention of animal transports from Germany and the EU to third countries should be aimed for as a matter of principle.

For the proposed measures to actually benefit livestock, the requirement must be better specified for animal welfare self-checks and data collection standardisation, with minimum bureaucratic red tape for farms. In addition, it is necessary to introduce mandatory proof of proficiency, a requirement to provide regular further training for livestock hands and comprehensive state advisory instruments.

Environmental protection: From the perspective of Environmental protection, the size of a farm is less significant than regional livestock density, irrespective of whether animals are kept on several small farms or on just a few larger farms where they may also be housed in multiple barns. In the past, economic incentives (positive

agglomeration and cluster effects) and regulatory deficits have led to some regions in Germany accruing excessive concentrations of livestock.

On the other hand, for reasons of disease prevention, animal welfare (such as in the event of accidents) and pollution control, consideration should be given as to whether a maximum number of animals to be kept at a farm location should be specified along with a schedule for a minimum number of trained livestock hands.

Improving livestock farming systems can also help improve nutrient cycles, limit the spread of antibiotic-resistant bacteria and protect residents living near livestock facilities from the adverse effects of bioaerosols. This calls for appropriate licensing and certification schemes for livestock facilities and equipment, options under building law and consistent implementation of fertiliser law, taking into account actual nutrient levels.

Geographic dispersal: Given the questionable geographical concentration in livestock farming, there is a need to implement livestock farming that is largely self-sufficient in farm inputs supported by regional inter-farm nutrient management models, and to disperse livestock production clusters for a more even geographical spread taking into account the natural suitability of each region.

Positive effects of geographically dispersed livestock production include the potential for more regionally based feed production, less concentrated nutrient emissions, lower emissions from the transport of products and waste, and the scope for better livestock farming systems in terms of improved animal welfare and health.

Decentralisation and regionalisation of the meat industry further along the value chain should also be sought in this connection, for example by promoting regional slaughtering, processing and marketing structures.

On the path to achieving the stated goals, a range of instruments are available, which the Federal Government should assess for feasibility and effectiveness. They include tax law, animal welfare law and regulations on livestock farming systems, building law, pollution control law and financial measures.

Building and pollution control law: Construction of new livestock housing and conversion of existing housing is essential to improving animal welfare in livestock farming. However, the legal and planning approval practices often stand in the way of practical, rapid implementation of such improvements. Effective adjustments to planning approval laws for environment-compatible livestock housing that promotes animal welfare must be sought without delay.

Pollution control laws must be reviewed as in some cases they lead to complications when planning barn modifications, for example when interpreting the term “substantial change” in relation to a building project under section 16 of the Federal Pollution Control Act (BImSchG). When modifications are made to livestock housing, some approval authorities require a reassessment of the entire (former) building project. For the transformation of livestock farming, it would therefore make sense for the national policy level to at least develop clearer guidelines for use in the planning approval process where animal welfare improvements are involved. If farmers face the slightest risk of losing existing building approval, they will not seek permission for modifications to livestock housing.

4 Economic areas of action, policy options and recommendations

Societal expectations of agriculture have changed, partly in light of its impact on the natural environment. Agriculture and rural regions face major structural and economic changes. The *Commission on the Future of Agriculture* takes very seriously the desire of many farmers for clear and realistic targets and for market remuneration and social recognition of their work and their products. Farmers need reliable long-term perspectives to plan for the future, invest, employ workers, prepare to pass on the farm to the next generation and generally grow their business.

At the same time, many farms are stretched to the limit economically, and this is not only reflected in the present-day public discourse (see also Chapter A 1). Longer-term and more coherent strategies by the responsible Federal Government and Länder ministries together with more consistent decision-making by local authorities would enable farmers to better plan for the future in many areas. Higher standards – most of all in environmental protection and animal welfare – market power asymmetries, farmers' comparatively weak position relative to the demand side (such as dairies, slaughterhouses and the agricultural trade) and unequal standards in international trade all result in growing pressure in terms of price and cost.

The overarching goal in transforming the agriculture and food system fundamental to the supply of food is, as far as possible, to avoid negative externalities impacting the climate, the environment, biodiversity, animal welfare and human health. Avoiding such externalities incurs a cost that cannot be borne by farms alone. Meeting that cost is an agenda for society as a whole. The real political challenge is how to spread it fairly across society.

Earnings: The Commission therefore formulates recommendations and measures with the aim of safeguarding the economic viability of agriculture and increasing agricultural value creation. Farms will only be in a position to tackle the changes and challenges in the comprehensive transformation of the agricultural system if farmers – including young farmers and potential farm successors – can rely on there being a future in farming.

That future notably includes the economic opportunities that farms stand to gain from diversification and entering new lines of business (discussed in detail in section B 2.1). Also to be mentioned in this context are new or improved sources of income that, in the course of implementing the Commission's recommendations, are expected to follow from providing agricultural public goods relating to the environment, climate action, biodiversity conservation, animal welfare and care of the countryside. Finally, improving the economic situation of farms necessitates a reliable European framework across many areas, higher market added value and supporting policy measures at national level. The sections that follow address the associated prospects and opportunities.

4.1 Markets

The Commission believes that market mechanisms can be used to assist the transformation towards environmentally sustainable agriculture. For this to work:

- It must be economically attractive for producers to avoid current negative externalities;
- Market opportunities must be closely linked with environmental and social sustainability, thereby making it more important to compete on the basis of product and process quality;
- Public funding must be targeted to fund the provision of agricultural public goods.

The funding needed for this purpose exceeds both the current market volume and existing public funding in agricultural policy.

The Commission believes that the share of the economy accounted for by the agriculture and food system and the share of household spending accounted for by food must grow, although dietary changes can help reduce costs.

A major proportion of the financial cost in question here is already incurred today, as follow-on costs of poor nutrition for the health system, as expenditure for the remediation of environmental damage (such as water quality and erosion control) and as costs relating to biodiversity loss or climate change.

Sources of funding could in principle include:

- Market revenues from the sale of foods and other agricultural commodities;
- Funds from consumer levies (such as an animal welfare levy);
- Market instruments (such as carbon trading);
- Private-law instruments (such as contract-based nature conservation and impact mitigation banking);

- Public funding (such as under the CAP or GAK and Länder and Federal Government funding);
- Other private or local authority funding;
- Redistribution of avoided externality costs;

4.1.1 Avoidance and internalisation of externalities in agricultural production

Identifying the externalities of agriculture (both negative and positive) poses major methodological challenges. However, studies show that the negative externalities of retaining the current agriculture and food system in its current form amount in monetary terms to an annual sum in the high double-digit billions of euros (see section B 4.5).

The agriculture and food system must be transformed so that these externalities are avoided as far as possible and economically internalised where unavoidable. Positive externalities of agriculture must also be taken into account in the same connection.

Any policy considerations and measures for the internalisation of externalities need as their basis a sound, ideally science-based assessment of the externalities and their costs. Where these cannot be quantified with sufficient precision and detail, policymakers should proceed on the basis of notional values that are transparent, open to scrutiny and consensual.

Policymakers need to decide on and prioritise measures to avoid or internalise various externalities. These include:

- CO₂, CH₄, NH₃ and N₂O emissions versus positive externalities of agriculture such as from carbon sequestration;
- Biodiversity loss versus the contribution of farming to preservation of the cultural landscape and local recreation;

- Eutrophication of waterbodies and groundwater nitrate discharges versus the contribution of agriculture to flood control;
- Negative impacts on animal welfare in livestock farming and the meat industry;
- Health costs of poor nutrition versus food security.

Neither harnessing the positive externalities of the agriculture and food system nor avoiding or internalising its negative externalities is cost-neutral. In total, however, the costs will be significantly lower than those incurred in a business-as-usual scenario (see section B 4.5) – and which incidentally are not sufficiently reflected in farm profitability calculations or market pricing.

Decisively and comprehensively implementing the practical action and policy options listed in section B 3 is not enough to make agriculture sustainable. Economic incentives are also needed in order to avoid or minimise the negative and increase the positive externalities of the agriculture and food system. When developing such incentives, it is necessary to bear in mind that externalities can be internalised in different ways depending on the problem and the industry. There is no one-size-fits-all solution. Instead, it will take a range of instruments out of the agricultural and food policy toolbox, including levies, market instruments and regulation. All policies need to be consistent with economic principles, proportionate, science-based and coherent. That also means no direct government intervention in competitive pricing between market players.

As has already been mentioned, the Commission considers the most important market instruments for avoiding and internalising externalities in agricultural production to be the following:

- Use of market instruments to reduce nitrogen surpluses where previous measures have not been successful (see section B 3.2);

- Introduction of an excise duty on animal-derived foodstuffs such as dairy products, meat and eggs, as proposed among others by the Commission on Improvements in Livestock Farming.

These measures involve adaptation in production and changes in consumption patterns, and take time. Agriculture and food system enterprises need to be able to plan for the future so that they can invest and know they can rely on financial adjustment assistance. Temporary support programmes for the agriculture and food sector can help the transformation. At the same time, the internalisation of externalities should be given a suitable timeframe and enabling conditions so that affected farms can prepare for the changes.

Given the close integration of Germany and the German food system into the EU internal market, all policy measures to promote the internalisation of externalities should be embedded at EU level. In the process, the conditions should be shaped so that production is not relocated outside the EU internal market (see also section B 4.2). Where European harmonisation of such measures is unforeseeable, they should be backed up at national level so as to avoid leakage by production migrating elsewhere within the EU.

Mitigating the welfare impact of rising food prices: The long-term goal and expectation is that avoidance or internalisation will cause the externality costs of food production and consumption to decrease in the areas where they currently materialise, such as in the health system or the environment.

This is more likely to take place over the long rather than the short term, however. For the shorter term, to prevent rising food prices from placing a burden on low-income consumer groups and vulnerable households (such as those receiving transfer incomes), social policy measures and monetary compensation must be

established for such groups. This can be done, for example, by increasing the nutrition component in transfer incomes and by providing annual compensatory payments for increases in excise duties. The long-term savings to be expected by avoiding or internalising negative externalities of the agriculture and food system mean that such a measure would be financially sustainable.

The following instruments – recommended by the scientific community in the June 2020 report of the Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection⁶⁸ at the Federal Ministry of Food and Agriculture – can additionally help cushion the rise in food prices in a socially equitable manner; **the Commission thus recommends:**

- A reduction in the VAT rate on fruit, vegetables and legumes;
- Free and high-quality meals in preschools and schools;
- Adjustments to the standard needs rates in basic income support;
- A reduction in the income tax rate, combined with an increase in benefits for groups who do not pay income tax;
- A separate payment/tax rebate ('sustainability relief') for low-income households as is currently being discussed in connection with proposals for carbon allowances or a carbon tax.

4.1.2 Market power in the food system; competition law issues

One objective of agricultural policy has to be enabling farmers to work profitably as entrepreneurs exercising environmental and social responsibility in an agricultural sector that is competitive in terms of price and quality. Agricultural policy management and assistance instruments must

also be capable of evening out structural competitive disadvantages for farming in the value chain and supporting social policy goals that are not market-compatible.

The food market is a complex network of variously interconnected value creation stages and processes. It is also characterised by great structural asymmetry and divergence in negotiating power. Only a fraction of farm produce is sold directly to consumers, with the great majority making its way to food retailers via the food processing industry. The food value chain in Germany is characterised by substantial concentration on the wholesale and retail side compared with both agriculture and to a lesser degree the food industry. Producers sell their products in a multi-layered economic space, finding buyers in a wide range of different markets (including the food processing, catering and food retail sectors, direct marketing and export). The four largest retail chains in the food retail sector represent some 6,000 food processing and food industry companies and around 263,500 farms. In some if not all product groups, this leads to farms being dependent on the dictates of industry and retailers.

The Commission proposes the creation of a competitive space in which farms, the food processing sector and retailers negotiate fairly and the extra cost of avoiding and internalising negative externalities is shared equally along the entire value chain through to consumers. Key elements of such a competitive space are outlined in the following:

Long-term cooperation and purchasing agreements with retailers, manufacturers, processors and consumers can stabilise producer incomes, cushion risks and allow farmers to plan for the future.

⁶⁸ WBAE (2020): Politik für eine nachhaltigere Ernährung – Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten, https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.html.

Bilaterally negotiated purchase quantities or fixed price models for a portion of output can reduce risks for all parties in highly volatile food markets. Conversely, ongoing state intervention in individual farms' quantity planning and quota arrangements are not realistic options for raising prices. For the event of overproduction leading to price collapse, the policy instrument of temporary voluntary volume reductions in all common market organisation (CMO) products should be established at European level. These market crisis instruments would be capable of avoiding expensive surpluses and large income losses.

In view of increasing concentration among the buyers (processors, wholesalers and retailers) of agricultural products, steps should be taken to spread market risks more evenly along the value chain according to individual capacity and limits. This can be achieved, for example, by promoting the establishment of producer associations or promoting and regulating contractual agreements between the various parts of the system.

The negotiating position of farms in the value chain must be further strengthened beyond current arrangements by giving greater precedence to producers and their marketing organisation in competition law. Sectoral associations spanning multiple stages of the supply chain can help producers promote quality and sales and improve profitability. Cooperation in production and marketing provides a way of sharing costs and pooling strengths.

Consideration should also be given to increasing the scope under competition law for cooperation among small and medium-sized seed breeding companies. Greater scope for such companies to pool research and development and also to cooperate in product marketing could enable them to boost their capacity for innovation, increase their range of species and varieties and offer their products more efficiently. They could then compete with far larger global concerns

to the benefit of users and strengthen their market position in relation to the trade sector (and in particular seed and food wholesalers and retailers).

A further proposal is to increase support for innovative business models for farms (such as community-supported agriculture schemes, direct/online marketing and green care) in order to stabilise and diversify farm incomes. In this connection, it is important to ensure that adopting new business models does not lead to enterprises prematurely ceasing to meet the criteria for farm support.

Consumers increasingly order food online and also buy directly from producers; the COVID-19 pandemic has further strengthened this trend. So that they can serve these growth markets, farmers should have access to technical and strategic consulting to support them in using digital applications for direct marketing. This could usefully include greater integration with online food platforms and other digital business models already on the market. Digitalisation not only opens up new marketing forms and channels, but also provides producers with more targeted (regional, personalised and innovative) ways of engaging in dialogue with consumers about their products.

The greater the degree of cooperation in a regional value chain, the more likely it is that added value will stay in the region. There are opportunities in innovative marketing channels and regional value chains. Regional marketing, including direct marketing, should be promoted by expanding regional programmes and clear origin and region labelling (see section B 4.1.3).

Success with new production and marketing approaches also depends on the presence of favourable conditions. In some respects, farms nearer to urban centres therefore have an

advantage over those located far away from urban markets.

In summary, the Commission believes that there is a need for a systematic reshaping and restructuring of relationships and negotiating positions across the various levels of the agriculture and food system. Direct or digital interaction channels between producers and downstream stages of the value chain help significantly in levelling market power asymmetries.

In this connection, **the Commission thus especially recommends** the promotion of regional and local value chain partnerships (VCPs) and a transparent labelling system based on uniform minimum standards. Farms should be supported in further integrating downstream value creation activities in order to benefit more from greater proximity to customers and the greater share of the value chain covered by the processing and marketing stage (processing instead of just production). New production models and approaches should also be promoted (such as cooperation between farms and startups, regional food processors and regional community catering operators). Also desirable are binding supply contracts specifying quantity, quality, price and term so that producers can plan better for the future. Force majeure clauses excluding producers from liability in the event of inability to deliver at no fault of the producer ('acts of God') should also be a standard feature of such supply contracts.

Overall, cross-sectional approaches involving all parties in the value chain should be intensified and communication stepped up with regard to agricultural production. In the Commission's view, this should also include establishing arbitration mechanisms for conflict resolution and agreeing on a culture of fair conduct (supported, for example, by a code of conduct, an ombuds office and a price monitoring agency).

The Agricultural Organisations and Supply Chain Act (AgrarOLkG), under which Directive (EU) 2019/633 on unfair trading practices was transposed into German law, must be evaluated to determine if it has led to fairer supply chain relationships.

Greater use should also be made of the scope under existing EU competition law (under which associations of producer organisations may be exempted from the prohibition on cartels) in order to enhance negotiating power relative to buyers of agricultural commodities.

Following the adoption of national supply chain legislation, European supply chain legislation could have a positive impact on the competitive situation in the domestic market and make for improvements in environmental and social production conditions in third countries. In view of the contribution to economic, environmental and social sustainability, the Commission is in favour of supply chain legislation at European level.

4.1.3 Market transparency, labelling and certification schemes

Sustainable development of consumption and demand in the entire system requires commitment not only from industry on the supply side, but also on the demand side – right through to end consumers, who must be as fully informed as possible. All involved, from farm to fork, must use resources responsibly. This makes it necessary to enhance consumer sovereignty by reducing information asymmetries.

If policymakers, companies, industry associations and farms better communicate the contribution and potential of the domestic agricultural and food sector, then food production in Germany will benefit in terms of public estimation and hence also of value creation. Understanding the contribution of the food production sector increases people's willingness to pay high con-

sumer prices – all the more so if the additional contribution is communicated unambiguously, clearly and comprehensibly. Where possible, this communication should go beyond individual initiatives by economic operators and provide clear and accurate information about where food comes from and about quality in processing.

Consumers are focusing increasingly on quality rather than price. They attach growing importance to where the food they buy comes from, and this trend is expected to continue and should be supported. Consumers can currently choose from a very wide range of products on the market, including products bearing labels from a large variety of labelling schemes, but no one scheme or programme – with the exception of ‘organic’ – has yet stood the test of time in a comprehensive and widespread form. The plethora of labels also means that consumers are unable to tell what product characteristics they stand for. Significantly improved transparency is needed with regard to quality and process characteristics in the form of trustworthy labelling schemes. Communication of trustworthy information to consumers about food origins, process quality and product quality requires digital technologies, which are becoming increasingly important.

Central to this are consistent labelling policies, investment in the trustworthiness of certification schemes and strengthening of regional partnerships. Voluntary commitment to sustainability standards in purchasing should also be promoted at various levels of the food system. The public sector should lead by example in this regard.

The Commission recommends promoting and supporting public and cooperational quality labels, including increased use of EU quality approaches in Germany; protected designations of origin, which are little used in Germany, hold strong potential for agriculture in this connection to the extent that they enhance competitive

standing. In the outcome, the current proliferation of labelling schemes of varying and not easily ascertainable quality should be reduced in favour of binding EU-harmonised minimum public standards for sustainability labels.

Comprehensible and mandatory labels should be introduced at EU level for the following areas:

- Animal welfare labelling;
- Origin labelling for primary ingredients in processed foods;
- Minimum standards for regional origin labelling;
- Nutritional labelling in the form of a science-based Nutri-Score;
- Further in the future: Sustainability labelling based on scientifically established criteria.

The Commission recommends that a solution for the desired labelling schemes should be sought at EU level. For rapid progress in this area, however, use should also be made of national options, among other things by setting labelling standards for voluntary adoption and publicly promoting the labelling schemes.

Combination with successful existing labelling schemes such as organic certification also makes sense provided that it does not compromise their potential for product differentiation and branding.

Comprehensible, trustworthy and binding labels are key to making sustainability attributes a value proposition. For various reasons, however, it is also clear to the Commission that labelling and consumer information alone are not sufficient to achieve the transformation towards a sustainable agriculture and food system.

4.1.4 Organic farming

Organic farming is a system of agricultural production, food processing and marketing

described in detail by EU legislation with a dedicated process for compliance monitoring and control.

Organic farming has many roles to play in the sustainable transformation of the food system. To begin with, various societal goals are already achieved to a large extent on organically managed farms.⁶⁹ In addition, the limitations imposed by EU law and in some cases sectoral association guidelines force both agricultural production and food processing to develop processes that can cope with significantly reduced use of external inputs and auxiliary materials. The resulting innovations also benefit conventional farms in their development towards greater sustainability. In this way, the organic farming sector can help reduce path dependencies on other production models that are largely the norm.

Many of the innovations in agricultural practice (such as mechanical weed control and mobile chicken coops for laying hens), in food processing (such as reductions in artificial flavourings) and in marketing (from vegetable subscriptions in pioneering online delivery services to solidarity-based farming) have emerged from organic farming and have since been taken up by conventional farming.

Organic farming is the only sustainability programme that has its own significant, extremely dynamic market (annual revenue currently approximately €15 billion). The sector's comprehensively defined process qualities enable consumers to place specific demands on farming via their purchasing behaviour.

Steadily growing demand along with support from the second pillar of the CAP enable a

growing number of farms to secure a living in the organic value chain.

To achieve the expansion targets set by the Federal Government, the Länder and the EU, and in doing so to be able to offer a future to significantly more organic farmers, all relevant policy instruments must be applied coherently. This also requires that the entire value chain be constantly kept in mind.

The Commission recommends that:

- National implementation of EU agricultural policy must ensure that funding to promote farm conversion and retention can be provided in line with the policy aim of expanding organic farming.
- As well as the production side, it is also necessary to strengthen the organic food industry, because the number, structure and diversity of organic food processing companies determine the available sales opportunities for farms.
- On a scale commensurate with the expansion targets, public funding for agricultural research must be dedicated to systemic and interdisciplinary research approaches that involve practitioners from agriculture and the craft trades.
- By means of research and innovation, training and advice, organic farms must be given the resources they need to further increase their contribution to the stated societal goals and also their productivity. Examples include the use of digitalisation, alternatives to the use of copper and broad-spectrum natural insecticides, optimised crop rotation, minimum tillage models, biodiversity-friendly grassland management, more effective organic fertilisers, cultivation of suitable plant varieties and breeding of livestock breeds, and improvements in animal health.

⁶⁹ Regarding the social and environmental benefits of organic farming, see J. Sander, J. Heß (2019): Leistungen des ökologischen Landbaus für Umwelt und Gesellschaft (Thünen-Report 65), https://www.thuenen.de/media/publikationen/thuenen-report/Thuenen_Report_65.pdf.

- The purchasing power of public procurement must also be deployed in favour of organic produce on a scale commensurate with the expansion targets.⁷⁰

In addition, concepts should be discussed and developed which, by using elements of both organic and conventional practices, aim to marry high productivity with high sustainability standards.

4.2 Level competitive playing field in international agricultural trade

Engaging in international trade enables countries to obtain services or goods, such as food, that they do not have themselves or could only produce at significantly higher cost. International trade therefore benefits the economy (including agriculture) and consumers provided that it operates by common rules and promotes sustainable global development.

The international import and export of agricultural and food products has mostly positive effects on prosperity, on security of supply and on food and nutritional diversity, right up to the global scale. Negative environmental and social effects of international trade are an increasing focus of debate, however, for example regarding imports of animal feed. They include the greater difficulty of implementing higher sustainability standards in Germany and elsewhere in the EU, and also negative impact on biodiversity, the climate and food sovereignty in the countries of the global South. Averting such negative effects requires a level playing field in international competition.

Trade agreements are intended to give greater access to markets while safeguarding respect for human rights and ensuring that there is no reduction in the level of protection established by European and German food safety, animal husbandry, environmental and labour standards. They must couple the dismantling of tariff and non-tariff barriers to trade and fair opening of markets with ambitious implementation of common sustainability goals, the onward development of environmental, livestock farming, occupational safety and health, food safety and

⁷⁰ Best-practice models elsewhere, such as in Copenhagen, show that this can support other societal goals (for example in the health sector); see P. Stierand, C. Lünenborg (2018): Zentrum für gute Gemeinschaftsverpflegung (Studie für die Berliner Senatsverwaltung für Justiz, Verbraucherschutz und Antidiskriminierung), <https://www.berlin.de/sen/verbraucherschutz/aufgaben/ernaehrungspolitik/studie-zentrum-fuer-gemeinschaftsverpflegung-mit-erlaeuterungen.pdf>, 12-15.

consumer protection standards and recognition of the European precautionary principle.

Global trade and the implementation of global sustainability goals require multilateral treaties and common rules and institutions. The goal for sustainable foreign trade, including in agriculture, therefore has to be a corresponding multilateral WTO framework.

The Commission recommends, subsequent to raising national and if possible EU sustainability standards, the establishment of a level playing field in international competition in order to safeguard the competitiveness in export markets of agricultural and food products from Germany and elsewhere in the EU internal market, and to prevent the displacement and migration of agricultural production.

Establishing a level playing field while raising sustainability standards is a major challenge, especially for an export-oriented economy. Suitable trade policy enabling conditions need to be developed in close coordination between various Federal Government ministries and the European Commission and should be given high priority. Efficient structures need to be established for this purpose in the ministries concerned. Initial approaches in this regard can be found in the relevant European Commission strategies (the Green Deal and the Farm to Fork Strategy).

The goal of higher sustainability standards in the production of food consumed in Germany can only be achieved if the same standards apply to imported agricultural products. This requires European solutions and internationally recognised sustainability certification systems. These should be introduced for agricultural commodities first and subsequently for processed products. Initially, the focus should be on indicators that are easy to measure, assess and monitor (such as biomass crops). The mid-term aim should be an

EU-wide framework and, to the extent possible, global supply chain due diligence agreements.

For transparency regarding international food trade relations, **the Commission recommends** that all products should carry mandatory international labelling that provides consumers with product sustainability information covering at least the main social and environmental criteria and listing the origin of all significant ingredients. Internationally negotiated agreements provide an important basis in this regard. For credibility in conducting those negotiations, Germany must push for mandatory labelling based on such standards within the EU.

To prevent leakage – relocation of production to regions with lower social and environmental standards – it is necessary to safeguard the competitiveness of socially and environmentally sustainable production methods. This involves applying various approaches with regard to low-sustainability products: cross-value-chain funding programmes (such as Initiative Tierwohl in animal welfare), border tax adjustments (such as carbon border adjustments) and long-term cost levelling using specific excise duties, taxes or trade restrictions (customs duties, special import preferences for sustainable products, binding import standards and import bans).

These border protection options should also be open to all other international trade partners under WTO rules. In addition, by means of trade agreements, German policymakers should allow the less developed countries of the global South to protect their markets against food commodity imports where the purpose is to establish their own supply chains for such commodities. Import preferences granted to support agriculture in developing countries must also include processed foods in order to help build value chains and jobs in those countries. German policymakers should vigorously communicate this commitment so as to create a credible basis for trade agreements.

A mutual commitment to high social and environmental standards in agricultural production must be an integral feature of such future agreements. This does not mean identical standards (such as equal wages), but the definition and enforcement of internationally agreed criteria (such as the ILO criteria) in all countries involved, together with the specification of further, more demanding sustainability standards as specific requirements for imports into the EU. Wherever possible, multilateral frameworks should be established through the WTO. In the Commission's view, technical and administrative support for agricultural exports remains a part of everyday foreign trade policy as a matter of course.

4.3 Subsidies

4.3.1 Common Agricultural Policy

In connection with implementing the necessary reforms in regulatory, tax and subsidy law, introducing new instruments and adapting and reforming the framework for trade (standards etc.), a special role as one of the central policy instruments falls to the reshaping of the EU Common Agricultural Policy (CAP) from 2023. The CAP must provide targeted support and corresponding incentives for the transformation processes in agriculture. Support policy should be consistently oriented towards safeguarding the societal contribution of agriculture. If the cooperational approach (public payments for public goods) fails to achieve the specified environmental and animal welfare goals, these goals would have to be pursued by other means (such as taxes, duties, other support measures, sectoral law or regulation).

Development of the Common Agricultural Policy

(CAP): The CAP plays a key role, shaping our agricultural policies and practices with a variety of tools (including the European market organisation, support mechanisms and conditionality requirements) that continue to be evolved to address new and changing needs. Discussions focus here on reform of payments under the first and second pillars of the CAP.

The Commission considers that the CAP must contribute decisively in mastering the transition to a sustainable agriculture and food system in the EU and placing farmers in a position economically as well as in other respects such that they can make the necessary contribution towards achieving the climate, clean air, clean water and biodiversity goals and comprehensively protecting the environment. This is a basic prerequisite for long-term public acceptance and hence for the onward evolution of state support for agriculture and should therefore guide the

further development of the CAP both at EU level and its national implementation from 2023.

Area-based direct payments were introduced in 1992 to offset cuts in intervention prices as a result of the WTO Agreement on Agriculture. This was appropriate at the time in order to adjust to the world market. Today, nearly 30 years later, the rationale of reducing price support no longer applies, but for many farms direct payments make up a significant share of income. Direct payments are made regardless of household or farm income, and large farms tend to benefit disproportionately because they can often produce more cost-effectively than smaller farms due to economies of scale. As a result of pass-on effects, direct payments also increasingly benefit landowners rather than active farmers. Agricultural economics research also indicates that direct payments inhibit innovation.

The main task today is to achieve a large package of environmental and animal welfare goals and to support the agricultural transformation process that is needed for that purpose. This cannot be fulfilled by direct payments in their current form.

The Commission agrees that the current area-based direct payments do not meet future needs and should therefore be reformed.

The Commission has the following recommendations for the further development and shaping of the first and second pillars of the Common Agricultural Policy (CAP):

- Over the course of the next two funding periods, starting in 2023, the current area-based direct payments under the first pillar of the CAP are to be gradually and completely transformed into payments that render it economically attractive to provide specific services benefiting societal goals. This process must be continuous and follow clearly defined steps so that farmers can plan for the future and avoid disruptions.
- The gradual and complete transformation of direct payments must be accompanied by corresponding reductions in conditionality requirements. Instead, farmers should be offered economically attractive programmes aligned to the achievement of social and environmental transformation goals. As many farms as possible, including those in ideal locations, should be encouraged to take part in order to achieve societal goals in all regions. For the payments for eco-schemes and agri-environment-climate measures (AECMs) to be economically attractive, they must represent good remuneration and either be based on the theoretical marginal supplier in an ideal location or vary in line with location quality.
- To provide planning certainty in the agreed continuous transformation path, the share of total payments accounted for by eco-scheme payments should be gradually increased over the funding period on a straight-line basis relative to direct payments. Eco-schemes should be implemented in such a way that they utilise the budgeted funds.
- Transitional arrangements must be provided for the duration of the system transformation. The environmental requirements here must in no circumstances be allowed to fall below those of the previous funding period.
- In the mid-term review of national CAP implementation, the environmental and climate contributions in particular should be reviewed with regard to their impact in order to enable early adjustments to the legal framework.
- When launching the transformation of the CAP system, national increases in ambition over the EU baseline from 2023 for claiming the temporarily remaining area-based payments (conditionality) should be dispensed with if economically attractive area and measure-based eco-schemes and AECMs are made available for target achievement instead.

- During the transition phase, in the CAP funding period starting in 2023, the EU conditionality requirements will have to be complied with in Germany. The transformation is to be rendered income-neutral for farmers by offering eco-schemes that enhance compliance with EU conditionality requirements. Use should be made of the possibility of higher payments for the first hectares as a means of aiding the transition, most of all for smaller farms.
 - To achieve geographically more widespread implementation of biodiversity measures with higher positive ecological impact, top-up payments should be provided if measures are situated so as to link up habitats, landscape features and similar into ecological networks. To the same end, cooperational solutions should be supported where farmers and conservation workers join forces (for example in a biodiversity alliance) to plan and implement biodiversity measures in their area.
 - The funds reallocated from the first pillar to the second pillar should be earmarked for biodiversity and climate protection measures while maintaining the funds already budgeted for AECMs in the second pillar.
 - From 2028 at the latest, funding should be earmarked nationwide for purposes such as paying for (a) compensation for disadvantages of farming in Natura 2000 areas and other specific conservation or enhancement measures in such areas or (b) greenhouse gas-reducing agriculture on organic soils. The Länder can ‘compete’ for this funding with specific programmes. It is to be sourced from the Energy and Climate Fund (Energie- und Klimafonds), part of the reduction in funding from the first pillar and other Federal Government sources of funding.
 - European and national protected areas are a key element of successful biodiversity conservation. The funding necessitated by the European biodiversity and climate targets for adapted management of farmland in protected areas (Natura 2000 areas, nature protection areas and water protection zones) and for the targeted increase in the proportion of organic farming is to be provided under the first and second pillars.
 - Both the eco-schemes and the AECMs should be evaluated with regard to goal achievement and adoption levels and the programmes regularly adjusted. The outcome of the first evaluation, scheduled for 2024, should already be used in shaping the CAP funding period commencing in 2028. For this purpose, an adaptive trial and evaluation system should be established and refined in cooperation with farms. The relationship between reallocations and eco-schemes to the conditionality requirements should also be evaluated.
 - The administrative effort for farms and public agencies as a result of the transformation path and the need for targeted use of public funds should be kept to the necessary minimum. Control systems must be used not to micro-manage farms but to prevent abuse. Greater use should be made of digital tools in order to minimise control and evaluation effort and to adjust the measures more quickly, among other things by faster feedback to and from farms.
- In the remodelling of the CAP, the market organisation instruments should be reviewed with regard to their contribution towards societal goals.
- ### 4.3.2 Federal and Länder funding
- The provision of societal services in the agricultural system will significantly depend on incentives that have to be funded from Federal, Länder, local authority and foundation budgets. Issues involved include nature conservation, climate change mitigation and adaptation, animal welfare, ecosystem restoration and reduction of land-take.
- The Commission identifies a need for substantial extra funding in order to finance the necessary

transformation process. One of the key challenges is deploying such a large volume of funding in a targeted and efficient manner.

In the past, criteria such as a reliable outflow of funds and balanced distribution among the Länder have often predominated in programme design. Focus on clearly formulated goals, review of target achievement and adaptive programme design have sometimes been lacking. In particular, the risk of pass-through to factor prices has not always been given sufficient attention.

The Commission therefore recommends closer adherence to the following principles in funding allocation:

- **Goal orientation: targets are set first on an objective basis before funding allocation begins.**
- **Policy instruments and measures are efficiently aligned to goal achievement in line with priorities.**
- **Monitor free-rider and pass-through risks at all times: pass-through to factor prices such as the price of land or other factors of production should be avoided as far as possible.**
- **Funding is all the more important where sectors of agricultural production are at risk of migrating elsewhere.**
- **Adaptive policy with flexible scope for (financial) adjustment requires timely monitoring.**

In terms of national funding instruments, an important role is played here by the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK). GAK is the most important national funding instrument for the support of agriculture and forestry, rural development and improvements in coastal and flood protection. Including Länder funding, total GAK funding amounts to some €1.9 billion per year, with approximately €35 million per year to date

going to nature conservation funding beyond EU co-financing.

Increasingly extreme weather conditions in connection with the climate crisis, such as late frosts, torrential rainfall, droughts and storms, mean that farms must become more resilient. Alongside adjustments in cultivation systems, financial instruments can also contribute to risk provisioning. One option could be to establish a voluntary insurance scheme with government support. The funding for this would have to come from sources other than the CAP as CAP funding is needed for other purposes. This should be feasible, however, because in most cases it would then be possible to dispense with disaster aid for such risks in future years. It would enable the creation of a basic reserve in order to establish an insurance scheme based on the principles of social solidarity and reciprocity. Farms must also be permitted to accumulate risk reserves free of tax.

Budgeting for the GAK takes the form of four-year framework plans drawn up by the Federal Government and the Länder. A GAK framework plan specifies the goals, measures, funding principles, funding requirements and the nature and amount of funding. The current GAK Framework Plan 2020-2023 includes nine funding areas and four special framework plans.⁷¹ Funding areas include rural development, promotion of agricultural enterprises and marketing structures, contract-based nature conservation and landscape management. One of the special framework plans funds insect protection measures in farming countryside.

The GAK should be further developed with significantly greater focus on and hence increased funding for challenges such as conserving and restoring biodiversity, ecosystem restoration

⁷¹ BMEL (2020): Rahmenplan der Gemeinschaftsaufgabe "Verbesserung der Agrarstruktur und des Küstenschutzes" 2020–2023, <https://www.bmel.de/SharedDocs/Downloads/DE/Broschueren/Rahmenplan2020-2023.pdf>.

and climate change mitigation and adaptation. The German Conference of Agriculture Ministers (September 2019) and the German Conference of Environment Ministers (April 2021) have adopted resolutions in favour of creating a new funding principle within GAK for measures to address climate change impact on agriculture and of establishing a Joint Task on Nature Conservation.⁷²

In an initial step, this could be achieved via special framework plans on biodiversity, ecosystem restoration and reversal of surface sealing and on risk provisioning and climate change adaptation. Once established, these plans should be incorporated as joint tasks in the main funding framework.

The Commission recommends that the GAK should be further developed with significantly greater focus on and hence increased funding for societal challenges such as biodiversity, ecosystem restoration and climate change mitigation and adaptation. In an initial step, this could be achieved via special framework plans on biodiversity, ecosystem restoration and reversal of surface sealing and on risk provisioning and climate change adaptation. Both area-based and investment-based measures should be funded. Once established, these plans should be incorporated as joint tasks in the main funding framework. It is recommended that funding for suitable funding measures should be reduced on a straight-line basis in order to drive the fastest possible transition.

Tax benefits for farming serve to offset natural and economic disadvantages relative to other sectors. They should be reviewed – and if necessary adjusted or refocused within the European context – with a view to their suitability for supporting the sustainable transformation of agriculture.

⁷² Excerpt from the resolution: “The Länder ministers of the environment agree that funding for nature conservation in Germany must be substantially improved by increasing national funding (in addition to EU funding) and that a greater federal contribution is necessary in this regard. They hereby instruct LANA to prepare a proposal for a resolution of the forthcoming Autumn meeting of the Conference of Environment Ministers aimed at federal participation in the costs incurred by the Länder to perform the national, European and international tasks of nature conservation. A suitable option for this purpose is the establishment of a new joint task on nature conservation.”

4.4 Technical progress

Sustainable agriculture in Germany is expected to produce high-quality foods and biomass while safeguarding animal welfare and the natural environment. It will also have to be productive and can help reduce the harmful exploitation of natural ecosystems in Germany and other world regions. Resource-conserving, land-efficient production methods avoid harmful environmental emissions and sequester carbon for the long term to help mitigate climate change. In all this, technological progress is a necessary, though not sufficient, precondition for the transformation process in agriculture.

Technologies and digitalisation: By using the latest science-based, in some cases digital technologies, modern farming methods protect crops and enable low-loss fertiliser application while minimising negative environmental impacts. Ecologically and economically efficient fertiliser and pesticide use makes it possible to apply smaller quantities without compromising productivity. Examples include:

- Innovative forecasting models and decision-making tools for even more economical fertiliser use (remote sensor technologies and precision farming);
- The use of comprehensive geodata for field-specific digitally controlled application of nutrients (automatically allowing for slope, soil type, watercourses, etc.);
- Precision application of fungicides;
- Assessment of the ecological benefits of resource-intensive methods to avoid harmful environmental impacts such as rebound effects.

One element of productive sustainable crop farming thus involves systematically harnessing the benefits of digitalisation and technical advances in agriculture. This requires universal

broadband rollout throughout Germany and, for an interim period, financial support above all for smaller and medium-sized farms to purchase new higher-precision digitally controlled sensor technology and spreading equipment.

Increased digitalisation in livestock farming (such as the use of sensors) can be helpful in terms of animal care and welfare but will not be able to replace the trained human eye for the foreseeable future. Suitable means of achieving better animal welfare include good training, regular professional development, animal health and welfare monitoring and funding measures to support improvements.

The use of new technologies must be accompanied by effective advice on their application with a view to conserving energy, resources and biodiversity. New technologies must be integrated into farmers' training. They must also be appraised to weigh the benefits against limitations and risks. It is also necessary to conduct a full energy and resource assessment. When using new technologies, farmers must remain in charge of the data.

Agrochemical progress: Research and development in agrochemicals make an important contribution to the sustainable transformation of agriculture.

The Commission makes the following recommendations in this connection:

- Urease and nitrification inhibitors combined with precision application of mineral fertilisers can reduce emissions of ammonia and nitrous oxide and thus contribute significantly to reducing agricultural greenhouse gas and nutrient emissions.⁷³ This makes it necessary to press ahead with the development of appropriate approval procedures for nitrification in-

73 H. Flessa et al. (2014): Minderung von Stickstoff-Emissionen aus der Landwirtschaft, https://literatur.thuenen.de/digbib_extern/dn054531.pdf.

- hibitors and other substances that can reduce nitrogen losses and ammonia emissions.
- Biostimulants help crops resist climate change, increase nutrient uptake and improve quality. A clear and innovation-friendly legal framework must be put in place for their approval.
 - Crop protection methods with higher risks for health and the natural environment should be complemented and eventually replaced by low-risk and biological pesticides and natural mineral substances. For more predictable and rapid market launch, this product segment needs adequate and appropriate harmonised European risk assessment and approval criteria.

Plant breeding and seed supply: Location and climate-adapted, high-yield, robust and healthy varieties of the largest possible range of crop plants with high food, feed and processing quality are central to the onward development of a resilient and productive agriculture and food system. The EU Green Deal and Farm to Fork Strategy make this even more important. At the same time, increasingly complex demands are placed on breeding. Producing high-quality seed in the required diversity is an important component within a coherent system.

Development of a new variety takes an average of 10 to 20 years. Many agriculturally and horticulturally important traits are based not on a single gene, but on a combination of many single favourable alleles whose individual impact is only minor. Breeding progress is therefore based on continual recombination by crossing and selecting suitable plants of the species concerned. It is important here to be able to draw upon the entire genetic diversity of that species while safeguarding fair access and benefit sharing. Political effort should be directed at organising the use for breeding of all cultivated species for all agricultural and horticultural purposes under the auspices of the FAO within the International Treaty. Desirable traits also arise from mutagen-

esis. Because of the large timescales involved, research and development must cover a range of future scenarios in order to meet actual future needs. Plant breeding involves a large amount of advance effort.

The internationally unique diversity of small and medium-sized seed breeding companies in the German-speaking countries constitutes a large innovation cluster and prevents agriculture from being dependent on a small number of seed suppliers. Policy instruments must be geared towards supporting this diversity.

It is important to strengthen systems for the conservation, characterisation and use of plant genetic resources for further breeding. This also includes access to proprietary varieties from other breeders and to plant genetic resources from other countries.

The achievement of previously neglected or new breeding goals requires close ties between scientific research and breeding companies together with suitable public funding. This is particularly important with a view to goals and objectives arising from strategies such as the Farm to Fork Strategy and the Green Deal and to targets for the expansion of organic farming. The conservation, evaluation and harnessing of genetic plant resources (primarily in research institutions under the Federal Government and the Länder) are necessary in order to provide breeders with adapted and well characterised material for cross-breeding. Research and breeding must also be consistently oriented towards environment-friendly and climate-friendly cultivation systems.

New prediction and selection methods using AI-based big data analysis of genotypes, phenotypes and the environment, together with new techniques for targeted modification of genetic material, can contribute to the effective breeding of varieties, which in turn can help in the

achievement of climate and environmental goals in the agricultural and food system. However, certain pre-conditions first have to be put in place.

Regarding new prediction and selection methods, public investment is needed in research funding both for data science and artificial intelligence and for data security and above all data sovereignty solutions that satisfy German and European requirements.

With regard to the direct modification of genetic material, methods must be critically analysed according to the resulting modifications and potential impacts of the techniques deployed. It must be ensured that regulation also extends to new genetic engineering techniques such as CRISPR/Cas, including risk assessment and approval in application of the precautionary principle. Similarly, it must also be ensured that EU standards apply equally to imports from third countries. Given the major importance of GMO-free production in Germany, it is also important that developments in the breeding sector do not restrict freedom of choice for farmers and consumers. Industrial property rights and licensing systems must be structured so that all companies have access to techniques, traits and breeding material. Products of essentially biological plant breeding methods and such methods themselves must remain not patentable.

In European and German law, approval of new varieties is regulated under seed marketing legislation. It is based on scientific principles and subject to official oversight. This system must be retained and further improved as part of consumer protection for farmers. Government has great responsibility in this regard.

The advance effort invested in plant breeding is financed using a special intellectual property right called plant variety protection. With regard to further use of protected varieties, plant variety

protection is a free-of-charge, open-source system and thus enables cumulative breeding progress. Plant variety protection is preferable to patent protection and should be further enhanced.

New and long-term support is needed for publicly funded breeding research so as to drive innovation in previously neglected crop species. This requires a sound framework, a clear road-map for transforming cultivation systems and initial funding for research and development. Conditions needed to support breeding in Germany also include testing facilities in sufficient quantity and quality in order for national and regional conditions to be properly taken into account in variety testing.

The central importance of breeding to the future of agriculture and horticulture in Germany should be reflected in a long-term, broad-based political strategy, backed by the necessary resources, which takes a coordinated and coherent approach to the above areas of action in terms of research funding, knowledge transfer, training and the shaping of the legal framework in Germany and the European Union. The Commission also recommends in this connection that the German Research Foundation (DFG) establish a Senate Commission on Plant Breeding.

4.5 Prevention pays: costs and benefits in summary

The goal of the transformation for which the Commission outlines a framework and policy options in this final report is an economically efficient agriculture and food system that, in terms of climate impact, the natural environment and animal welfare, is consistent with the principles of sustainable resource use, is socially compatible, helps people have a healthy diet and consequently enjoys public acknowledgement. Various aspects of that transformation have been presented in the preceding sections. Their economic dimension is outlined in the following.

The existing agriculture and food system creates large negative externalities (external costs). Aside from animal welfare, these primarily relate to climate change, biodiversity and nutrient discharges into groundwater and surface waters. A recent study quantifies the negative externalities of German agriculture – due among other things to air pollution, water pollution and soil degradation – at a minimum of €40 billion a year. Factoring in biodiversity loss (loss of species, genetic and habitat diversity) and the associated loss of ecosystem services, the estimated external costs of agriculture increase by a further €50 billion. German agriculture thus causes external costs of at least €90 billion annually.⁷⁴

If applied to food prices, the authors estimate that internalising those externalities would mean that the producer price of a kilogramme of beef would have to be five to six times more expensive than at present. For other animal products, prices would have to increase by a factor of between two and four. The price increases for plant-based products would be smaller. The outcomes in Kurth et al. are higher than in other studies, such as Pieper et al.,⁷⁵ which only consider climate externalities. Pieper et al. thus estimate that internalising climate-related externalities would increase prices relative to currently prevailing prices by between 6 % (for organically farmed plant-based products) and 146 % (for conventionally farmed animal products).

These calculations do not include costs incurred in the welfare and healthcare system due to poor nutrition and its health impacts (such as obesity). There is broad scientific consensus that poor nutrition has substantial knock-on costs.⁷⁶ The OECD (2019) calculates that they account for about 8 % of total healthcare costs in Germany. In light of this, many preventive measures targeting balanced nutrition and healthy lifestyles overall have a positive economic benefit.⁷⁷

These estimates of the externalities of the agriculture and food system are inevitably subject to methodological uncertainties, as they would also be for other sectors of the economy. Neither the natural resource impact of retaining the status quo (see Appendix 4, Scenario X) nor

74 T. Kurth et al. (Boston Consulting Group) (2019): Die Zukunft der deutschen Landwirtschaft nachhaltig sichern, https://image-src.bcg.com/Images/Die_Zukunft_der_deutschen_Landwirtschaft_sichern_tcm108-234154.pdf.

75 M. Pieper et al. (2020): Calculation of external climate costs for food highlights inadequate pricing of animal products, in *Nature Communications*, doi: 10.1038/s41467-020-19474-6, 1–13.

76 Overview in A. Konnopka et al. (2018): Die Kosten von Übergewicht und Adipositas in Deutschland – ein systematischer Literaturüberblick, in *Gesundheitswesen*, DOI: 10.1055/s-0043-104692, 471-481.

77 OECD (2019): *The Heavy Burden of Obesity: The Economics of Prevention*, <https://doi.org/10.1787/67450d67-en>; Sustainable Food Trust (2017): *The Hidden Cost of UK Food*, <http://sustainablefoodtrust.org/wp-content/uploads/2013/04/HCOF-Report-online-version.pdf>; Meier et al. (2015) estimate the health-related follow-on costs of excessive sugar, salt and saturated fatty acid consumption in Germany at around €17 billion per year. Effertz et al. (2016) put the direct annual costs of obesity in Germany at €29.39 billion and the additional indirect costs at €33.65 billion.

T. Meier et al. (2015): Healthcare Costs Associated with an Adequate Intake of Sugars, Salt and Saturated Fat in Germany: A Health Econometrical Analysis, in *PLOS ONE*, doi:10.1371/journal.pone.0135990; T. Effertz(2016): The costs and consequences of obesity in Germany: a new approach from a prevalence and life-cycle perspective, in *The European Journal of Health Economics*, <https://doi.org/10.1007/s10198-015-0751-4>, 1141–1158.

the resulting costs can be precisely quantified. However, the rough order of magnitude is generally accepted to be an annual figure in the high double-digit billions of euros.

This order of magnitude means that retaining the current agriculture and food system as it stands is ruled out from the outset for both economic and environmental reasons if allowance is made for the interests of future generations, who would otherwise have to shoulder most of the costs involved. It can be shown that even the financial resources needed for a far-reaching transformation of the agriculture and food system will be far below the follow-on costs projected without systemic transformation. The goal of ensuring that the agriculture and food system avoids negative externalities as far as possible in future is therefore also well founded in macroeconomic terms.

Cost calculation for a more sustainable agriculture: The transformation needs outlined in this report require substantial financial resources. So as not to endanger agricultural production in Germany, the costs of the transformation cannot be borne by agriculture alone. Economic incentives are needed to avoid or minimise the negative and increase the positive externalities of the agriculture and food system. This is a challenge for society as a whole: operators in the agriculture and food industry, consumers and ultimately all taxpayers.

Any impact assessment presents major challenges, above all in estimating the costs associated with the needs outlined in this report. It would require precise formulation of the measures needed for goal achievement. Adaptive responses by economic operators and market interactions would also have to be taken into account. All this would go beyond the scope of

the Commission's current remit. Nevertheless, the following section attempts to present approximate orders of magnitude based on studies and rough estimates.

Initial indications are found in studies on the Farm to Fork Strategy. Presented by the European Commission last year as the centrepiece of the European Green Deal, the Farm to Fork Strategy aims to enable and accelerate the transition to a fair, healthy and environmentally-friendly agriculture and food system. For each stage of the food value chain, it proposes targets and measures to make European food systems more sustainable. Targets for agriculture include ambitious reduction goals for pesticide and fertiliser use. Agriculture and the food value chain are expected to contribute proportionately to reducing greenhouse gas emissions. In addition, 25 % of agricultural land in the EU is to be organically farmed by 2030. Reference is also made to the EU Biodiversity Strategy, which sets the minimum target for highly biodiverse landscape features at 10 % of open countryside.

The European Commission has not yet presented an impact assessment on the Farm to Fork Strategy. Initial assessments of its potential economic impact have been done, however, by the U.S. Department of Agriculture's Economic Research Service (USDA ERS) using the Global Trade Analysis Project – AgroEcological Zones (GTAP-AEZ) general equilibrium model of the world economy.⁷⁸ The model focused on the following measures corresponding to Farm to Fork Strategy targets:

- (a) reduction of pesticide use by 50 %,
- (b) reduction of fertiliser use by 20 %,
- (c) reduction of antimicrobial use for livestock by 50 % and
- (d) removal of 10 % of existing farmland from agricultural use.

⁷⁸ J. Beckman et al. (U.S. Department of Agriculture, Economic Research Service) (2020): Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies, <https://www.ers.usda.gov/webdocs/publications/99741/eb-30.pdf?v=2537.2>.

According to the model results, implementing the above measures in the EU would cause EU agricultural production to decline by 12 %, EU producer prices to increase by 17 % and EU GDP to decrease by US\$71 billion (€59.2 billion). Based on Germany's approximate 21 % share of EU GDP (2017-2019), this results in an estimated GDP decrease for Germany of €12.4 billion annually. According to USDA ERS estimates, annual per capita food expenditure would increase by an average of US\$153 across the EU, or a total of about €10.5 billion for the German population.

While these findings provide initial indications of the potential economic impact of the Farm to Fork Strategy, they should not be overstated – firstly because of certain limitations (see below) and secondly because they do not allow for the compensatory payments to farmers recommended and considered necessary by the Commission. A number of scientists point out limitations of the study.⁷⁹ The critique relates on the one hand to sweeping and in some cases implausible or incomprehensible assumptions and on the other to the failure to allow for strategy-induced production adjustments, technical progress and mid-term adjustments in farmland lease prices. Because production systems and food demand are modelled as static, the USDA ERS study is said to indicate an upper limit for the potential impact of the EU strategies on European agricultural production. The size of the projected decline in agricultural production and hence the increase in world market prices for agricultural products, together with the associated welfare loss, are consequently overestimated and cannot be compared to the measures proposed here by the Commission. They do, however, give an initial impression as to possible upper bounds for the resource commitment involved.

Funding requirements for various agri-environmental and animal welfare measures: In the following, the costs of implementing a number of the more prominently discussed measures are quantified in approximate form. It should be noted that these are no more than rough estimates, as no allowance is made for cost-mitigating responses by economic operators or for market interactions (due to factors such as reduced output volume in Germany). This was beyond the scope of the Commission's remit but should be borne in mind so as to put the figures into perspective. In order to take into account the requirements with regard to livestock farming, cost estimates for the various measures are supplemented with the findings of an impact assessment on the recommendations of the Commission on Improvements in Livestock Farming.

Increasing the non-productive proportion of agricultural land: In order for Germany to meet the EU Biodiversity Strategy target of renaturalising 10 % of the area presently used for agriculture (among other things with landscape features), about 8 % to 9 % of that area would have to be taken out of production or heavily extensified (not taking into account existing high nature value areas, which account for just over 11 % of farmland). Assuming proportionate implementation on arable land and grassland and an even geographical distribution, on the basis of regionalised opportunity cost data at community level and including additional annual management costs of €100 to €200 per hectare in Germany, this would entail a total cost of €600 million to €1.0 billion per year.

Implementation of EU nature directives (primarily Natura 2000): Based among other things on

⁷⁹ M. Banse et al. (2021): "Die Folgen des Green Deal für Verbraucher und Landwirtschaft" – Replies to minor interpellation 19/25573 from the Thünen Institute for BMEL (unpublished); G. Richard et al. (2020): Findings and limitations of the USDA-ERS study "Economic and Food Security Impacts of Agricultural Input Reduction under the European Union Green Deal's Farm to Fork and Biodiversity Strategies", https://www.inrae.fr/sites/default/files/pdf/Article%20sur%20rapport%20USDA-ERS-GB_AT_14122020_cy.pdf; Y. Zimmer (2020): EU Farm to Fork Strategy: How reasonable is the turmoil predicted by USDA?, <http://capreform.eu/eu-farm-to-fork-strategy-how-reasonable-is-the-turmoil-predicted-by-usda/>.

studies by the Federal-Länder Working Group on Nature Conservation, Landscape Management and Recreation (LANA), the Federal Government estimates the financial resources needed to implement the EU nature directives in Germany at €1.3 billion to €1.5 billion per year (including open countryside, forests, waterbodies, developed areas and marine and coastal areas).

Rewetting of peatlands/peatland locations:

Peatland rewetting costs are greatly determined by location, both with regard to the opportunity cost of land use cessation and in terms of planning, management and investment costs. The more intensively peatland locations are farmed, the higher the opportunity costs of rewetting. Based on the opportunity costs of rewetting calculated by Röder et al.⁸⁰ using the RAUMIS model, rewetting 400,000 hectares of farmland on peatland locations with the lowest opportunity costs would require funding of €100 million per year. Rewetting 730,000 hectares (about 75 % of farmland on peatland sites) would need €720 million a year. The rewetting of the entire area of agricultural land on peatland sites (some 990,000 hectares) would incur a total opportunity cost of €1.2 billion per year. To this are added planning, management and investment costs which according to Drösler et al.⁸¹ amount to between €800 and €5,500 per hectare depending on peatland type, extent and fragmentation. Assuming an average of about €3,000 per hectare and amortising the costs over 20 years, the funding required is as follows (lowest opportunity cost hectares first):

- 400 000 hectares of agricultural land on peatlands: €160 million per year;

- 730,000 hectares of agricultural area on peatlands: €830 million per year;
- 990,000 hectares of agricultural area on peatlands: €1.35 billion per year;

Expansion of organic farming: The expansion of organically farmed land to 20 % of the agricultural land area by 2030 as targeted by the Federal Government will significantly increase the volume of funding needed for green payments. It presupposes the conversion of an extra 160,000 hectares each year through to 2030. At constant average green payments of €243 per hectare and 3.29 million hectares (20 % of the agricultural land area) under organic farming, this results in a funding requirement of €800 million in the 2030 target year. It should be noted that organic farming is usually only profitable if, alongside the green payments, farmers are also able to obtain higher producer prices. This is because organic farming generates significantly lower yields in some cases according to product and location. For organic wheat farming to generate about the same contribution margin per hectare as conventional wheat farming, for example, the green payments of €243 per hectare would have to be accompanied by a producer price increase of €10.21 per decitonne (about €310 per hectare).⁸² This results in a total ‘greening payback’ of €553 per hectare. If demand for organic produce fails to grow in step with the targeted increase in organically farmed land over the period to 2030, producer prices will fall and commensurately higher green payments will be needed for the 20 % target to be met. In the organic wheat example above, if it were only possible to increase producer prices by €5 per decitonne, the green payments would have to

⁸⁰ N. Röder et al. (2015): Evaluation of land use based greenhouse gas abatement measures in Germany. *Ecological Economics*, 193-202.

⁸¹ M. Drösler et al. (2012): Beitrag ausgewählter Schutzgebiete zum Klimaschutz und dessen monetäre Bewertung (BfN-Skripten 328), <https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript328.pdf>.

⁸² Calculated on the basis of 2017/2018-2019/2020 data for the test farm sample. For simplicity's sake, variable costs were assumed to be the same (although they can vary greatly from farm to farm in both farming regimes). See Thünen-Institut (undated): Betriebe des ökologischen Landbaus im Vergleich zu vergleichbaren konventionell wirtschaftenden Betrieben 2017/18–2019/20, https://www.thuenen.de/media/ti-themenfelder/Oekologischer_Landbau/Quo_vadis_Die_Entwicklung_der_deutschen_OEkobranche/Einkommensentwicklung_im_OEkolandbau/Testbetriebsdaten_Oekolandbau_WJ1920.xlsx.

be at least €401 per hectare. Doubling the green payments would require €1.6 billion in annual funding, while trebling them would result in a funding requirement of €2.4 billion per year.

Non-use of pesticides in arable farming:

Forgoing the use of pesticides results in some cases in substantial reductions in yields. These range on average from 15 % to 50 % depending on the crop. There is strong variation from year to year. The lower yields in some cases result in very large revenue losses. These are partly offset by costs saved on pesticides and fertiliser and by savings in labour costs. To roughly estimate the cost of forgoing pesticides in arable farming in Germany, the organically farmed area was subtracted from the area cultivated with each crop. The available cost estimates for non-use of pesticides on the various arable crops⁸³ were multiplied by the areas under cultivation with each crop and then totalled. For 10 % of arable land, costs could not be determined due to lack of data. Half of this land is green forage such as field grass and clover/grass mix, on which little to no pesticides are normally used. In total, completely dispensing with the use of pesticides on today's conventionally farmed arable land would cost €3.8 billion per year. That figure should be considered the upper end of the range as this 'static' analysis is unable to take account of potential changes in crop rotation, the range of crops cultivated or producer prices.

Assuming 20 % of agricultural land is used for organic farming, with organic farms consisting of 43 % arable land, also taking into consideration that 9 % of arable land is removed from overall production, forgoing use of pesticides from arable farming would incur a (roughly estimated) costs of €3.3 billion per year. This has to be classed as an extreme assumption, however, as

completely forgoing pesticides is not thought feasible, although a substantial reduction definitely would be. If the target is for non-use on a quarter to a third of arable land (including 9 % set aside or brought under high-diversity landscape features and about 9 % of arable land under organic farming), then an additional cost of €787 million to €1.1 billion would be incurred alongside the cost of land set aside for high bio-diverse landscape features and organic farming.

Sustainability, biodiversity, climate and animal welfare checks and sustainability rating systems:

Sustainability, biodiversity, climate and animal welfare checks and sustainability assessment systems comprise an important tool for identifying weaknesses and scope for improvement on farms with regard to the various points covered and also provide a starting point for sustainability consulting. There has been little take-up of such checks so far. These checks (and where applicable the associated consulting) can unlock sustainability potential and it would make sense to fund them. The cost varies according to farm size and complexity and whether site visits are needed (cost range €300 to €3,000). At an average cost of €1,500 per farm and with one-third of farms checked each year (checks conducted in a three-year cycle), this results in a funding requirement of around €133 million per year.

Animal welfare: According to the recommendations of the Commission on Improvements in Livestock Farming, all livestock farms in Germany are to be gradually brought up to a standard of animal welfare significantly exceeding current legal requirements. Substantial additional funding will be needed to support investment and for the animal welfare payments in order to achieve this goal. An impact assessment conducted by the

⁸³ T. De Witte et al. (Thünen-Institut) (2021): Kosten eines einjährigen Verzichts auf chemisch-synthetische Pflanzenschutzmittel. Contribution to a position statement, "Analysen zu Öko-Regelungen der GAP nach 2020", for BMEL (unpublished).

Thünen Institute⁸⁴ identified an average annual funding requirement of between €2.5 billion and €4.1 billion for the period from 2020 to 2040, depending on how the funding is structured.

Total funding requirement: On the basis of this modelling, the total funding requirement for a sustainable transformation of German agriculture as proposed by the Commission amounts to between €7 billion and €11 billion per year. This is composed as shown in the table below:

Measures	Funding required (€)
Landscape features/set-aside land	€600m – €1.0bn
Implementation of EU nature directives in the farming countryside	€1bn
Rewetting of peatlands/peatland locations	€160m – €1.35bn
Expansion of organic farming	€1.6bn – €2.4bn
Non-use of pesticides on 25 % to 33 % of arable land (including 9 % set-aside and 8.6 % of arable land under organic farming)	€787m – €1.1bn
Sustainability, biodiversity, climate and animal welfare checks and sustainability rating systems	€133m
Animal welfare	€2.5bn – €4.1bn

For a large variety of these measures, there may be synergies or overlaps between the land areas involved, for example with regard to Natura 2000, peatland restoration, landscape features or non-use of pesticides. This results in a smaller figure for the total than is shown here.

Funding requirements in the context of funding sources: Not all of the above transformation costs have to come out of public coffers. In particular, for example, the climate change mitigation costs of peatland rewetting could be met from third-party sources (such as other sectors of the economy) by means of greenhouse gas pricing systems.

Ostensibly, the remaining transformation costs of €7 billion to €11 billion annually would be offset by budget appropriations amounting to slightly

more than €6.2 billion a year from the current CAP payments plus about €0.7 billion in related co-financing, and also by funding from Federal Government and Länder programmes (such as the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), parts of the Federal Scheme for Organic Farming and Other Forms of Sustainable Agriculture, the Federal Scheme for Livestock Farming and Livestock Building Conversion and the Federal Scheme for Energy Efficiency in Agriculture and Horticulture). On first impressions, therefore, it looks as if at least the lower end of the scenario could be covered by existing agricultural policy subsidies. This is not the case however for several reasons, at least not in the short term:

- The bulk of first pillar CAP funding for the next few years continues to be earmarked for di-

⁸⁴ C. Deblitz et al. (2021): Politikfolgenabschätzung zu den Empfehlungen des Kompetenznetzwerks Nutztierhaltung (Thünen Working Paper 173), https://www.thuenen.de/media/publikationen/thuenen-workingpaper/ThuenenWorkingPaper_173.pdf.

rect payments for farmers (basic payment per hectare plus higher payments for the first hectares). To this is added the funding for young farmer top-ups. About 25 % of first pillar funding (about €1.1 billion a year) is currently earmarked for eco-schemes. The rechanneling of direct payments recommended in this report⁸⁵ will only gradually release basic payment funding for eco-schemes. A gradual reallocation of funding from the first to the second pillar of the CAP is also planned, with 10 % of the funding expected to be reallocated from 2023 (as against 6 % previously). This funding will then be available for further agri-environment climate measures. As things stand, the percentage is to be gradually increased to 15 % by 2026.

- Funding under the second pillar of the CAP is available to the Länder for rural development programmes (EAFRD). 30 % of this funding must be used for agri-environment-climate measures. In recent years, the Länder have spent 47 % of EAFRD funding on environment, climate and forestry measures (approximately €1.0 billion per year). The other half of EAFRD funding is needed for other societal goals, such as flood/coastal protection and rural development. This will also remain unavailable for greening in the future, as rural areas will continue to need support in the interests of equal living standards.

There remains a (short-term) funding deficit of about €5 billion to €9 billion a year, although the environmental and animal welfare measures outlined above will also only be implemented gradually over time. In future years, meaning after the transformation of the CAP and assuming constant funding volumes under it, the remaining

additional expenditure amounts to **€1.5 billion to €5.5 billion per year**.⁸⁶

The funding volumes set out above can also serve as a starting point for political debate. This is because they demonstrate that:

- The annual cost to society of a thorough transformation to a sustainable and publicly accepted agriculture and food system is far below the figure in the high double-digit billions of euros represented by the externalities of retaining the status quo; this still applies if, as is naturally the case, the measures recommended by the Commission do not fully eliminate the agriculture and food system's externalities;
- The public funding currently available in the agrisystem is not enough to meet this transformation cost;
- In the long term, the development of a functioning market for sustainably produced foods will also play a key role in determining the level of public transfer payments;
- The public funding needed in the interim must be structured so as to not hinder the development of such markets.

Whether, and to what amount, the initial additional total of €5 billion to €9 billion per year has to be met out of government programmes, what proportion can be covered by consumers being willing to pay higher prices and what has to be met in other ways – as well as how the funding requirements will change in the mid-term – all substantially depends on the design of the funding system and the policy framework. Positive impacts of greening on ecosystem services are also expected to offset some of the initial productivity losses. This applies, for example, to set-aside land and non-use of pesticides.

⁸⁵ Under the current arrangements, a substantial portion of direct payments is passed on to landowners. This results among other things in inflated land lease prices. As leases usually run for several years, there will be a time lag before lower direct payments lead to lower lease prices. A sudden reduction in direct payments would therefore be inequitable and they should instead be reduced gradually (see section B 4.3.1).

⁸⁶ €7 to €11 billion less €5.5 billion (comprising €4.5 billion in the first pillar – excluding young farmer top-ups and less favoured area top-ups – and €1.0 billion in the second pillar).

However, the Commission is unanimous in the conviction that it is not feasible for the funding of the transformation to rely primarily on farms or on the willingness of consumers to pay more via market solutions.

Additional cost to the general public: In all of this, the general public faces higher costs in the form of increased taxation and, in the long term, rising product prices. This additional cost burden is offset in the mid to long term by the health and environmental costs avoided as a result of the measures to transform nutrition recommended by the Commission. If agrisystem sustainability and the attendant substantial additional payments to farmers can be combined with significant progress towards healthier nutrition, then two key steps towards a more sustainable agriculture and food system come together in a fair deal for all.

This applies all the more if the transformation process succeeds in avoiding externalities that go beyond the healthcare system. Environmental and climate externalities must also be offset somewhere else, which leads to higher prices. If this can be avoided or mitigated, there is also a positive impact on costs for consumers.

Low-income households are affected disproportionately by price increases because they have to spend a larger share of their income on food. The food budgets provided for in transfer payments are already insufficient for a healthy diet (WBAE 2020). Accompanying welfare measures and monetary compensation are needed in order to prevent the changes proposed by the Commission from placing a further burden on vulnerable groups (see section B 4.1.1).

Given the magnitude of nutrition-related healthcare costs outlined earlier, almost all effective interventions to reduce the healthcare costs of poor nutrition are economically beneficial. The main stumbling block is the effectiveness of cur-

rent policies. A number of policy measures (such as labelling) are relatively inexpensive, whereas others such as excise duties can either be made cost-neutral (if consumers are able to recoup them) or generate additional public revenue. Reducing the societal cost of unhealthy nutrition is therefore primarily a question of effective and economically viable interventional policies.

Conclusion: The process of transforming the agriculture and food system is currently still in its early stages. For long-term success, it has to be understood and implemented as an agenda for society as a whole. The Commission's foresight process has shown this comprehensive approach to be the most effective (see Appendix 4).

The fact that prevention makes economic sense has been amply demonstrated by the COVID-19 pandemic. Also, the prevention paradox that has entered the broad public awareness as a result is an established finding of public health research: Even though preventive investment and action makes economic sense, it still has a hard time gaining political acceptance. The 24 March 2021 decision of the Federal Constitutional Court on Climate Change refers to "an objective duty to protect future generations". As transformation of the agriculture and food system is likewise an agenda for society as a whole, that decision spotlights the constitutional imperative of pushing for agricultural, food, environmental and animal welfare policies that are sustainable in the sense of the vision that was jointly developed by the two youngest members of the Commission and that guides the recommendations of this final report.

APPENDICES

1 Cabinet resolution establishing the Commission on the Future of Agriculture

Cabinet resolution of 8 July 2020 Establishment of a Commission on the Future of Agriculture

- (1) Our agricultural sector is systemically important. Its task is to produce food while safeguarding the natural foundations of life. Societal expectations of agriculture have changed, partly in light of its impact on the natural environment. Agriculture and rural regions face major structural and economic changes. At the same time, there is a strong public interest in agriculture and nutrition. Issues relating to the environment, nature, climate change and animal welfare are a major focus of public debate, as is the economic outlook of farming. Not infrequently, the public discourse is marred by polarisation and sweeping judgements. It is necessary here to establish objectivity and, from a sound basis of fact, address the problems and goal conflicts with solutions that are economically viable, environmentally and socially compatible and publicly acceptable.
 - (2) The Federal Government hereby establishes a Commission on the Future of Agriculture with the task of drawing up recommendations and proposals to ensure that agriculture in Germany is environmentally, economically and socially sustainable into the future.
 - (3) The Commission reflects the full range of societal groups relevant to agricultural policy with the involvement of the scientific community. Taking this into account, it is composed of a Chair and 31 other members. The Future Commission may establish additional working groups on specific topics and call in external experts. It is to adopt its own rules of procedure. The Commission is to make decisions by consensus.
 - (4) A first written interim report is to be submitted to the Federal Government by autumn 2020. The Commission will submit a final report in early summer 2021.
 - (5) The Federal Government will support the Commission in its work. For organisational support, the Federal Government will establish an office at the Federal Ministry of Food and Agriculture.
- Representatives of the Federal Chancellery, the Federal Ministry of Finance, the Federal Ministry of the Interior, Building and the Community, the Federal Ministry for Economic Affairs and Energy, the Federal Ministry of Justice and Consumer Protection, the Federal Ministry of Food and Agriculture and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety have the right to participate in the meetings of the Commission as non-voting participants at any time (one representative per agency).

(6) A large number of initiatives and plans relating to the future of agriculture already exist both at EU level and nationally and should be taken into account in the Commission's work. At EU level, these include the proposals for the Common Agricultural Policy beyond 2020 and the European Green Deal presented by the European Commission including the Farm to Fork Strategy; at national level in Germany, they include the Action Programme for Insect Protection and the Climate Action Programme 2030, the arable farming strategy provided for in the coalition agreement and the livestock strategy, including animal welfare labelling, and the recommendations of the Commission on Improvements in Livestock Farming.

The Commission will base its work on the following non-exhaustive list of priorities:

Future agricultural policy

- Objectives of agricultural support
- The role of the EU Common Agricultural Policy
- The importance of agriculture for liveable rural regions

Economic viability of agriculture

- Approaches to increase added value in agriculture
- Market power in the food value chain
- The role of consumers
- Globalisation, market opening and trade agreements
- The tax framework for agriculture

Agriculture and the environment

- Fertilisers and protection of waters
- Biodiversity in the farming countryside
- Cooperation between agriculture and nature conservation
- Sustainable arable farming systems
- Pesticides

Agriculture and climate change

- Impact of climate change – adaptation strategies
- Renewable energy sources
- Contribution of agriculture to achievement of climate targets

Future of livestock farming

- Animal health
- Animal welfare and stipulations for livestock farming
- Animal welfare and labelling
- Compatibility with building and environmental requirements

(7) The following are appointed as members of the Commission:

Chair: *Prof. Dr. Peter Strohschneider*

- | | |
|--|--|
| <u>Agriculture</u> | |
| – <i>Hubertus Paetow</i> | President of the German Agricultural Society (DLG) |
| – <i>Joachim Rukwied</i> | President of the German Farmers Association (DBV) |
| – <i>Petra Bentkämper</i> | President of the German Association of Rural Women (DLV) |
| – <i>Stefan Mann</i> | National Chairperson of the Association of German Dairy Farmers (BDM) |
| – <i>Kathrin Muus</i> | National Chairperson of the German Rural Youth Association (BDL) |
| – <i>Dirk Andresen</i> | Spokesperson, Land schafft Verbindung e.V. |
| – <i>Dr. Felix Prinz zu Löwenstein</i> | Chairperson of the German Association of Organic Farmers (BÖLW) |
| – <i>Elisabeth Fresen</i> | National Chairperson of the German Family Farmers Association (AbL) |
| – <i>Jürgen Mertz</i> | President of the German Horticultural Association (ZVG) |
| – <i>Ute Volquardsen</i> | Vice President of the Association of Chambers of Agriculture (VLK) |
|
<u>Business and consumers</u> | |
| – <i>Franz-Josef Holzenkamp</i> | President of the German Raiffeisen Federation (DRV) |
| – <i>Manfred Hudetz</i> | President of the German Agrochemical Industry Association (IVA) |
| – <i>Stephanie Franck</i> | Chairperson of the German Plant Breeders Association |
| – <i>Philipp Hengstenberg</i> | President ⁸⁷ of Food Federation Germany (LMVD) |
| – <i>Dr. Christian von Boetticher</i> | Chairperson of the Federation of German Food and Drink Industries (BVE) |
| – <i>Klaus Müller</i> | Chairperson of the Federation of German Consumer Organisations (vzbv) |
| – <i>Miriam Schneider</i> | Head of Brussels Office, Federal Association of the German Food Trade (BVLH) |
| – <i>Susanne Dehmel</i> | Member of the German Advisory Council for Consumer Affairs (SVRV) |

⁸⁷ Until 24 June 2021.

Environment and animal welfare

- *Prof. Dr. Kai Niebert* President of the German League for Nature and Environment (DNR)
- *Jörg-Andreas Krüger* President of the Nature and Biodiversity Conservation Union (NABU)
- *Olaf Bandt* Chairperson of Friends of the Earth Germany (BUND)
- *Christoph Heinrich* Chief Conservation Officer, World Wide Fund For Nature (WWF) Germany
- *Thomas Schröder* President of the German Animal Welfare Federation (DTSchB)
- *Myriam Rapior* Member of the National Executive Committee, Young Friends of the Earth Germany (BUNDjugend)
- *Martin Kaiser*⁸⁸ Member of the Board, Greenpeace Germany

Academic community

- *Prof. Dr. Manfred Niekisch* Deputy Chairperson of the German Advisory Council on the Environment (SRU)⁸⁹ (University of Göttingen)
- *Prof. Dr. Achim Spiller* (University of Göttingen)
- *Prof. Dr. Hiltrud Nieberg* (Johann Heinrich von Thünen Institute)
- *Prof. Dr. Ute Knierim* (University of Kassel)
- *Prof. Dr. Ramona Teuber* (University of Giessen)
- *Prof. Dr. Dr. h. c. Vera Bitsch* (Technical University of Munich)

⁸⁸ Member until 19 March 2021.

⁸⁹ Until 30 June 2020.

2 Rules of procedure

Rules of procedure of the Commission on the Future of Agriculture

§ 1 Section 1 Membership and duration

- (1) The Federal Government established the Commission on the Future of Agriculture (hereinafter 'the Commission') by resolution of 8 July 2020.
- (2) Membership of the Commission is a personal honorary office. Representation by substitutes is not normally permitted. In justified exceptional cases, a member may be represented by a substitute with the prior consent of the Chair.
- (3) Members may declare their resignation in writing to the Commission Chair at any time.
- (4) The Commission's work ends with presentation of the final report.

§ 2 Section 2 Composition

- (1) The Commission comprises a chair and 31 other voting members. The Commission is chaired by Prof. Dr. Peter Strohschneider.
- (2) The Chair has a vote. In the event of a tie, the Chair has the casting vote.
- (3) The Chair represents the Commission externally and coordinates the work internally.
- (4) Statements relating to the Commission and its work are given by the Chair.
- (5) The Chair prepares the meetings of the Commission. In urgent exceptional organisational matters, the Chair may act on behalf of the Commission. The Chair must then report to the Commission without delay.

§ 3 Section 3 Office

- (1) For organisational support, an office is established at the Federal Ministry of Food and Agriculture.
- (2) The office coordinates its work with the Chair.
- (3) Tasks performed by the office include organising day-to-day communication between the Chair, the Commission and the Federal Government and supporting the Chair in Commission work.

§ 4 Section 4 Meetings

- (1) The Chair determines the time and place of meetings and proposes the agenda. The Chair recommends a work plan to the Commission. The Chair must convene a meeting if more than one third of members so request.
- (2) Meetings are chaired by the Chair of the Commission. The agenda and any consultation documents are to be sent to members no later than ten working days before the date of a meeting. Requests for amendments to the agenda must be submitted to the office at least seven working days before the date of a meeting.
- (3) Representatives of the Federal Chancellery and of the Federal Ministries BMF, BMI, BMWi, BMJV, BMEL and BMU (one representative for each department) at state secretary level and members of the office have a right to attend Commission meetings as non-voting guests and a right to speak.
- (4) Meetings are normally held *in camera*. Individual meetings may be held in public by resolution.
- (5) The Commission may invite other participants and outside experts to meetings in order to consult with them and conduct hearings.

- (6) The Commission may recommend that ministries commission opinions on specific issues within their remit.
- (7) At the proposal of the Commission Chair, the Commission may establish working groups that report on a regular basis to and submit their findings to the Commission. The work of the working groups is governed by the Commission's Rules of Procedure.

§ 5 Section 5 Resolutions

- (1) The Commission is quorate if more than half of its voting members are present.
- (2) Except as provided in section 6 (2), resolutions are passed by a two-thirds majority of the votes of the voting members present. The adoption of and amendments to the Rules of Procedure require a two-thirds majority of the votes of Commission members.
- (3) In individual cases, resolutions may also be adopted in writing by circulation (by postal mail or email). The deadline for responses is then seven days.

§ 6 Section 6 Reports

- (1) On the basis of the establishing resolution, the Commission submits its findings to the Federal Government in an interim and a final report.
- (2) In departure from section 5 (2) sentence 1, the Commission will endeavour to adopt its reports consensually, as the success of its work ultimately depends on broad consensus.
- (3) If consensus is not reached on a material subject matter of the report, the dissenting opinions are to be appended to the report.
- (4) The final report will be published by the Federal Government.

§ 7 Section 7 Minutes

- (1) The office prepares minutes of each meeting that are approved by the Chair and then sent by the office to the members of the Commission and the ministry and Federal Chancellery representatives.
- (2) The outcomes of votes are generally to be recorded in the minutes solely by number of votes (for/against/abstain).
- (3) Commission members will receive a copy in electronic form within seven working days. The minutes are confidential. Unless objections are raised, they are deemed accepted two weeks after distribution. Otherwise, they are to be adopted in the next meeting or by circulation in accordance with section 5 (2).

§ 8 Section 8 Confidentiality

- (1) The members of the Commission, the federal ministry and Federal Chancellery representatives, outside experts and the members of the office (section 3) are bound to secrecy with regard to all consultations, including any documentary submissions. The duty of confidentiality also applies to information provided to the Commission outside of meetings and designated as confidential.
- (2) To aid Commission members in their personal opinion-forming process, confidential internal use of information received is permitted within their own organisation provided that the information concerned cannot be linked to specific individuals.

§ 9 Section 9 Reimbursement of travel expenses

- (1) The members of the Commission act in a pro bono capacity. Meeting allowances and necessary travel expenses will be reimbursed on application in accordance with the applicable provisions on compensation for members of advisory boards, committees, commissions

and similar bodies within the remit of the Federal Government.

§ 10 Section 10 Entry into force

- (1) These Rules of Procedure enter into force on adoption by the Commission.

3 The Commission's work and working groups

The Commission on the Future of Agriculture held a total of ten plenary meetings, most of them as video conferences:

7 September 2020

Launch meeting with Chancellor Merkel, Berlin

20 October 2020

Second plenary meeting, Berlin and online

9 November 2020

Third plenary meeting, online

14 December 2020

Fourth plenary meeting, online

1 February 2021

Fifth plenary meeting, online

9 March 2021

Sixth plenary meeting, online

16 March 2021

Special session with Chancellor Merkel, Berlin

26 April 2021

Seventh plenary meeting, online

31 May/1 June 2021

Eighth plenary meeting, online

28/29 June 2021

Final meeting, Rangsdorf

On 7 September 2020, the Commission additionally established three working groups, initially planned as an ad-hoc arrangement, on the economic, environmental and social dimensions of agriculture and food. The working groups met by video conference in close succession through to mid-May 2021 and their work results comprised the main basis for preparation of this final report. In addition, a CAP Working Group and a Futures Working Group were established at the second meeting; their work results are also documented in Appendices 4 and 5. The representatives of Young Friends of the Earth Germany (BUNDjugend) and of the German Rural Youth Association (BDL) jointly developed the Vision for the Future of Agriculture.

The Commission plans further events in autumn 2021 to communicate the outcomes of its work in the political arena.

Especially in terms of creating a culture of trusting communication within the Commission, an important role in coordinating the various working groups and the diverse consultation processes during preparation of the final report was played by a group of Critical Friends of the Chair comprising Petra Bentkämper, Elisabeth Fresen, Philipp Hengstenberg, Kai Niebert, Hubertus Paetow and Achim Spiller.

The work of the Commission would not have been possible without the attentive and dedicated work of the office headed by Brigitte Beyer, to whom all Commission members and in particular the Chair owe a great debt of gratitude.

4 Documentation of the work outcomes of the Futures Working Group: Scenarios for sustainable agriculture in Germany

The work process on which this documentation is based had the aim of developing a range of sustainable future scenarios for the food and agriculture system in Germany using the strategic foresight method. With methodological guidance from the Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI), the working group developed and analysed examples reflecting the complex interrelationships and interdependencies between various influencing factors in the food and agriculture system and then used the outcomes as the basis for developing coherent development options for the system. Four alternative development paths/scenarios were analysed at societal level and provided a means of testing the consistency and robustness of the Commission's findings and recommendations.

dominantly driven by market instruments with some regulation', by contrast, is characterised by policy changes that bring about a transformation of the market while presupposing lesser changes in consumption patterns.

Scenarios A and B model future situations that differ significantly in terms of the selected factors from Scenario X, 'General conditions predominantly unchanged, minor progress towards sustainability'. Both of them (and also combinations of Scenarios A and B) chart a target corridor that the members of the working group consider aspirational. They do not appear feasible under all conditions, however. To a certain extent, both require changes in the international framework for trade in agricultural products. Whereas Scenario A additionally presupposes general societal change, a European framework geared to a dynamic innovation drive would favour Scenario B.

4.1 Summary

Four scenarios were selected for presentation to the Commission, each outlining an imaginable agriculture and food system in 2030. Three scenarios correspond in varying degrees to criteria of sustainable agriculture, while one basically reflects a continuation of current trends without any strategic reorientation.

Scenario A, 'Change predominantly societal' is characterised by a transformation to greater sustainability and the active support of all stakeholders enabling that transformation to rapidly gain momentum. Scenario B, 'Change pre-

Scenario C, 'Change predominantly driven by regulation' likewise models an agriculture system that contributes substantially to biodiversity and climate change mitigation. The working group nevertheless did not consider this an aspirational scenario, as extensive regulatory measures restrict farms' choices and in some cases could lead to agricultural production migrating abroad. Scenario C differs only in parts from Scenario X, 'General conditions predominantly unchanged, minor progress towards sustainability'. It could arise if sustainable agriculture has to be achieved as rapidly as possible by means of regulation (for example because of pressure from the European Union or societal pressure in Germany).

Scenario X models a trend that leads to significant problems with regard to biodiversity, is accompanied by the migration of agricultural production from Germany, and was not found to be sufficiently sustainable. With regard to compatibility with wider developments, it was

discussed that implementation of the European Green Deal could not be made to fit with this scenario. Future international sustainability goals could lead to inconsistencies with Scenario X and would have a far better fit with Scenarios A, B and C.

Alternative trends in the next 10 years					
		Scenario A Change predominantly societal	Scenario B Change predominantly driven by market instruments with some regulation	Scenario C Change predominantly driven by regulation	Scenario X General conditions predominantly unchanged, minor progress towards sustainability
1	Biodiversity	Biodiversity as central issue	Biodiversity as central issue	Biodiversity with focus on insects and wildlife	Biodiversity a marginal issue with disruptive negative trends and extinctions
2	Animal welfare	Livestock farming declines and conforms with societal expectations	Sharp decline in meat demand; livestock farming fails to meet societal expectations; meat alternatives	Parts of livestock farming migrate from Germany	Parts of livestock farming migrate from Germany
3	Value chains	Regionalisation of value chains	Diversified market; biotechnology significant	Diversified/segmented market	Extreme market segmentation; internationalisation and industrialisation of value chains

Alternative trends in the next 10 years					
4	Externalities	Large-scale internalisation of externalities (possibly using notional values), including use of carbon allowances	Carbon allowances, supplemented by regulation	Extensive regulatory intervention	Externalities paid for out of public funds or exported abroad
5	Agricultural support	Agricultural support aligned with societal goals	Basic area-based payments supplemented with payments for contribution to societal goals	Agricultural support remains at status quo	Agricultural support remains at status quo
6	Environmental policy	Combined form with large proportion of market incentives	Combined form with compensation for regulatory intervention	Environmental policy with focus on regulation	Environmental policy with focus on regulation
7	Consumption patterns	Sustainability-conscious consumption	Consistent sustainability-based pricing	Patchwork of diversified consumption patterns, price-driven consumption and sustainability-based pricing	Patchwork of diversified consumption patterns and price-driven consumption
8	New products and processes	Sustainability-driven innovations	Cost savings from sustainable products and processes	Sustainability-driven innovations	Two domains of innovation

As Scenarios A, B and C show, sustainable agriculture in Germany can be structured and achieved in different ways. In each case, however, fundamental changes are required relative to the status quo. The target corridor for a sustainable agriculture and food system outlined by Scenarios A and B includes changes in all factors that define the system and thus constitutes a system transformation.

4.2 Initial situation and methodology

The Commission on the Future of Agriculture's Futures Working Group addressed the task of portraying potential sustainable futures for the agriculture and food system in Germany. These futures were developed in a process that was supported and scientifically validated by members of the Commission. Making use of existing findings and foresight methods, the intensive, interactive work process delivered tenable results in a space of just three months. The futures were developed using the scenario method established in foresighting. Due to the limited timeframe, they partly built on existing work outcomes.

The Fraunhofer ISI applies a four-step approach to address potential futures and deal with uncertainty:

- (1) **Broaden the horizon:** To counter perceptual bias and expand the space of possible futures, factors and trend assumptions for the future are identified and evaluated in a process that incorporates interdisciplinary expertise.
- (2) **Systematically include interactions:** After scanning for a large set of signals of social and technological trends, the most relevant factors are picked out and their drivers identified. To reflect the systemic complexity of the socio-technical transformation, interactions between factors are taken into account in the further analysis and evaluation.
- (3) **Make differing expectations explicit:** Despite detailed analysis of science-based findings and expert opinions, uncertainty still persists in most cases with regard to the future development path for individual factors. However, those development paths can often be narrowed down to three or four alternatives that are plausible and conceivable for all involved.

(4) **Develop alternative scenarios:** To make the space of possibilities as big as possible, the alternative development paths for each factor are formulated in comparison with the status quo and then subjected to impact analysis to assess the interrelationships between them. This information forms the basis for the development of specific scenarios.

As the aim is to develop futures that fulfil the sustainability goals, the focus was placed on such scenarios. Based on the presentation of possible development paths in individual areas and the interactions between them, all stakeholders involved selected combinations of development paths that represent aspects of sustainable development (or non-sustainable development, as the case may be). The scenarios presented here were then derived from that selection.

4.3 Scenario A Change predominantly societal

4.3.1 Biodiversity as central issue

By 2030, conserving and fostering biodiversity is a central public issue – a trend reversal has taken place. People increasingly recognise the importance of agrobiodiversity and in particular its role in providing ecosystem services. An optimum policy mix means that measures to foster biodiversity gain traction and the extinction trend that Germany has seen in the last decades is broken. As a result, many species can recover from remnant populations and previously lost habitats can be restored. Provision of ecosystem services (pollination, pest regulation, recreational value, tourism and so on) is stable and continually increasing.

Agriculture contributes significantly to this trend as economic incentives have been ratcheted up in a targeted manner and because innovations (in areas such as digitalisation and plant breeding) are leveraged to farm more resource-efficiently and to replace harmful practices. While approval conditions have been adjusted for pesticides, use is also being made of many more alternatives. There is an increasing focus on diversity in livestock farming. Supplemented by further changes in farming methods, livestock farming as now practised is publicly accepted.

4.3.2 Livestock farming declines and conforms with societal expectations

The approach recommended by the Borchert Commission (the Commission on Improvements in Livestock Farming) has been applied and societal expectations have been implemented in an economically viable manner. Higher welfare farming methods bring animals back out into the countryside and breed diversity is increasing.

Grazing livestock helps preserve grassland, which is highly important to biodiversity.

Meat consumption and also livestock production have decreased significantly in Germany overall, although there are more farms, each with greater diversity and fewer head of livestock. The changes in livestock farming have led to a shift in numbers between the species farmed.

4.3.3 Regionalisation of value chains

Agriculture, the food industry and the wholesale and retail trade rely to a far greater extent on regional and distributed food production and processing, making the value chains for a significant number of foods shorter and more regional. Direct marketing by farms has also increased, and covering a greater share of the value chain makes for higher revenues.

Greater variety in arable crop rotation, more native vegetables and fruits, more diverse production and less standardisation have increased the diversity of agricultural products. Exploiting comparative advantages in the cultivation of regionally adapted varieties bolsters the economic viability of the business model. Effective infrastructure in rural regions means that all farms are supported and cooperate.

Market power is more evenly shared out along the value chain and the supply chain features long-term contractual cooperation and purchasing relationships (including risk mitigation). Profits are also more evenly distributed along the value chain. Improved welfare standards for workers may lead to a labour shortage and promote digitalisation. Increasing use of robots restructures the division of labour and work design in farming.

4.3.4 Large-scale internalisation of externalities (possibly using notional values), including use of carbon allowances

Societal goals are clearly specified in policy, making it possible to realign both consumption and production by means of large-scale internalisation of externalities. Both positive and negative effects are transparent for the entire system and can be quantified as costs. A policy mix is implemented that in addition to regulation also includes import duties at the EU's external borders and minimum standards. Examples of additional duties relate to carbon emissions, sugar and pesticides. Innovations and technologies that help reduce negative externalities – such as low-cost alternatives to pesticides – are increasingly important and receive public funding.

This results in significant shifts in working capital costs, product costs and consumption. Agriculture sets an example in internalising externalities and other industries follow suit.

Carbon trading plays an important part in climate change mitigation and is supplemented in some areas by regulatory measures. These include contract-based nature conservation, the provision of compensation areas for biodiversity and regulatory requirements concerning the eutrophication of waterbodies.

4.3.5 Agricultural support aligned with societal goals

The regionalisation of value chains has been brought about in part by gearing agricultural support to the furtherance of various societal goals. Agricultural support is shaped by goals such as regional development, eliminating urban-rural disparities, welfare aspects and jobs in agriculture, animal welfare or environment protection.

4.3.6 Combined form with large proportion of market incentives

Agricultural support and environmental protection are well coordinated and a combination of regulatory requirements and market incentives has been implemented. Regulation is used in policy areas where target achievement is precisely measurable in the short term and for penalising excesses and societally detrimental practices. For measures with a high proportion of social and less target-driven aspirations, on the other hand, the cooperational approach is used as this provides incentives to find creative solutions and rewards positive efforts. Farms have received compensatory payments for the extra effort and expense of implementing animal welfare, environment protection and climate change mitigation measures.

4.3.7 Sustainability-conscious consumption

A further cornerstone is sustainability-conscious consumption, reflecting a broad social consensus. Consumption patterns are dominated by sustainability-conscious and healthy dietary choices. This has also led to increased appreciation of and willingness to pay for sustainable foods produced to higher animal welfare standards. Consumption of animal products has decreased (with more vegan/vegetarian food consumption) and food waste is also down. The majority of consumers demand high levels of transparency and labelling for a wide range of criteria (such as climate impact, organic, sustainability, fair trade, global equity including global land footprint, regional production and animal welfare) as a basis for purchasing and consumption decisions.

4.3.8 Sustainability-driven innovations

The transition to sustainable agriculture has been enabled by sustainability-driven innovations in terms of the innovation process, products and methods, with due account given to interrelationships within the system. Under the new conditions, innovations have been geared towards lower resource consumption, reducing food waste, replacing potentially higher-risk processes, conserving biodiversity, enhancing animal welfare, good working conditions and better work-life balance for farmers.

European research funding has contributed significantly to the development of alternatives to previous monopolies/oligopolies. In plant breeding, access to genetic resources has been secured in order to enable further breeding progress. This has prevented the emergence of monopolies in breeding material, technologies and traits. Verification and labelling of new genome technologies are ensured by public risk assessment, safety testing and approval for technology, product and process safety. Technology transfer from the public to the private sector takes place with broad inclusion and open innovation systems or using an open-source approach.

The scenario assumes a modified international framework for trade in agricultural products, a general societal shift toward greater sustainability and changes in consumption patterns.

4.4 Scenario B

Change predominantly driven by market instruments with some regulation

4.4.1 Biodiversity as central issue

By 2030, conserving and fostering biodiversity is a central public issue and it has been possible to reverse the trend towards biodiversity loss. Biodiversity also includes diversity in livestock farming. An optimum policy mix has meant that measures to foster biodiversity gain traction and the extinction trend seen in the last decades has ceased. As a result, many species can recover from remnant populations and recolonise regions where they were previously wiped out. Provision of ecosystem services (pollination, pest regulation, recreational value, tourism and so on) has been safeguarded.

Agriculture contributes significantly to this trend as economic incentives have been created and because innovations (such as in digitalisation and plant breeding) are leveraged to replace unsustainable practices (for example by adapting approval requirements for pesticides). Agrobiodiversity is also promoted because diversity of plant varieties and livestock breeds is the only way of safeguarding biodiversity.

4.4.2 Sharp decline in meat demand; livestock farming fails to meet societal expectations; meat alternatives

By 2030, it has not yet been possible to implement societal animal welfare expectations economically on a large scale. Existing, widespread intensive livestock farming methods continue to be rejected by the public and there is a significant fall in demand for meat. This has also resulted in a sharp decline in livestock farming in Germany. Publicly acceptable livestock farming and meat production – among other

things with grazing livestock – does exist in Germany but is a niche market. Higher welfare meat is consequently a luxury product. People meet most of their daily protein requirements with alternative protein sources such as legumes, insects or in-vitro meat from bioreactors.

4.4.3 Diversified market; biotechnology significant

The food market continues to be highly diversified. Products on offer range from regional, organic alternatives to low-priced products with little information on process quality or origin. There is also diversification on the agricultural production side. Among other things, there has been a rise in new forms of ownership and organisation (such as community-supported agriculture schemes) that share costs, risks and returns with consumers. Food production on the basis of bioengineering is also significant.

4.4.4 Carbon allowances, supplemented by regulation

In order to make agriculture sustainable, minimum standards have been ensured by regulation and certain areas (such as preventing eutrophication) are also subject to regulatory stipulations. This is complemented by incentives for beneficial practices on the basis of market mechanisms (such as labels) and other measures to internalise externalities. However, quantifying all externalities and fairly allocating them along the value chain has proved too complex and difficult. The authorities have therefore settled on transparent notional values. As a climate change mitigation measure, agriculture has been integrated into carbon trading. Contract-based nature conservation has been introduced to secure the promotion of biodiversity, among other things resulting in the provision of more compensation areas. An excise duty has been imposed on meat, partly for animal welfare purposes and partly to encourage healthier nutrition.

4.4.5 Basic area-based payments supplemented with payments for contribution to societal goals

Agricultural support is based on a mix of support elements. Alongside a basic area-based payment set at a low level by today's standards, the majority of agricultural support comprises financial incentives and payments for environmental services and agricultural contributions to other societal goals.

4.4.6 Combined form with compensation for regulatory intervention

In environment policy, regulation is used for climate and environment policy areas where target achievement is precisely measurable in the short term and for penalising excesses and societally detrimental practices. Subsidies or compensatory payments are provided on a transitional basis to eliminate any competitive disadvantages due to the additional effort and expense of implementing corresponding environmental and climate measures. In the case of societal goals whose achievement is hard to measure, a cooperational approach is used that provides market and profit-oriented incentives for creative solutions and rewards positive efforts.

4.4.7 Consistent sustainability-based pricing

With regard to consumption in this scenario, price-consciousness and sustainability are combined with consistent sustainability-based pricing. Price remains the main determinant of consumption, but the sustainability and environmental performance of a product or production process is priced in by government to nudge consumption patterns towards sustainable consumption. Consumers rely on state regulation to safeguard animal welfare and protection of the natural environment. Retailers support these activities in various product segments by promot-

ing sustainable products and by product portfolio adjustments. A range of different sub-markets and distribution channels emerge, such as vegan, regional, unpackaged and unprocessed versus highly processed and cheap.

4.4.8 Cost savings from sustainable products and processes

The market is oriented towards sustainability primarily by way of prices, which are largely determined by sustainability-based pricing and the internalisation of externalities at notional values. This encourages the development of sustainable processes and products that deliver cost savings.

Protection for the Internal Market was deemed necessary in Scenario B as in Scenario A. A European framework geared to a dynamic innovation drive may favour Scenario B.

4.5 Scenario C

Change predominantly driven by regulation

4.5.1 Biodiversity with focus on insects and wildlife

By 2030, conserving and fostering biodiversity is a central public issue and it has been possible to reverse the trend towards biodiversity loss. An optimum policy mix has meant that measures to foster biodiversity gain traction and the extinction trend seen in the last decades has ceased. As a result, many species can grow back from remnant populations and recolonise regions where they were previously wiped out. Provision of ecosystem services (pollination, pest regulation, recreational value, tourism and so on) has been safeguarded.

Agriculture contributes significantly to this trend as economic incentives have been created and because innovations are leveraged to replace harmful practices. However, activities focus on insects and wildlife without explicitly fostering the biodiversity of flora and fauna used or potentially used for agriculture.

4.5.2 Parts of livestock farming migrate from Germany

Livestock farming, and most of all conventional livestock farming, is being displaced from Germany/Europe on a large scale because farmers are unable to meet social expectations of livestock farming in an economically viable manner and increasing price pressure in the international context drives migration. The decline in livestock farming in Germany is also fuelled by growing conflicts between farmers and other societal groups. Publicly acceptable meat production is only practised in Germany as a niche activity. Meat consumption has hardly changed, however,

with meat that falls short of higher animal welfare standards being imported on a large scale.

4.5.3 Diversified market; biotechnology significant

Products on the market range from sustainably produced regional organic products to low-priced products with little information on process quality. There has been a rise in forms of operation that share costs, risks and returns with consumers, including new models of ownership and organisation in farming (such as community-supported agriculture schemes). A strong surge in biotechnology approaches has resulted in conventional agriculture being substituted in parts by bioreactor-produced products (such as lab-grown meat).

4.5.4 Extensive regulatory intervention

Externalities are limited by standards and regulation on a large scale, meaning that widespread use has been made of regulatory instruments in all areas. There has been virtually no change in agricultural support relative to 2020, with the bulk of support still based on area-based payments to safeguard farmers' incomes. This is supplemented in part by regulatory requirements and other payments (such as for fostering biodiversity).

4.5.5 Environmental policy with focus on regulation

Climate change mitigation and environment protection are likewise implemented in agriculture by means of regulation. There are numerous rules and regulations, with infringements penalised.

4.5.6 Agricultural support remains at status quo

The economic viability of farming is ensured either by creating a level playing field at a higher regulatory level (including trade protection) or by paying compensation for measures that involve land expropriation. One example is the rewetting of peatlands for climate change mitigation, where land expropriated by the state is compensated for with payments at the standard land value.

4.5.7 Patchwork of diversified consumption patterns, price-driven consumption and sustainability-based pricing

With regard to consumption in this scenario, price-consciousness and sustainability are combined by means of consistent sustainability-based pricing. Price remains the main determinant of consumption, but the sustainability and environmental performance of a product or production process is priced in by government. Consumers rely on state regulation to safeguard animal welfare and protection of the natural environment. Retailers support these activities in various product segments by promoting sustainable products and by product portfolio adjustments. Polarisation among consumer groups and low public appreciation of parts of agriculture have led to the emergence of an extreme range of different sub-markets and distribution channels, such as vegan, regional, unpackaged and unprocessed versus highly processed and cheap.

4.5.8 Sustainability-driven innovations

The transition to sustainable agriculture has been aided by sustainability-driven innovations in terms of the innovation process, products and methods, with due account given to interrelationships within the system. Under the new conditions, innovations have been geared

towards lower resource consumption, reducing food waste, replacing potentially higher-risk processes, conserving biodiversity, enhancing animal welfare, good working conditions and better work-life balance for farmers.

European research funding has contributed significantly to the development of alternatives to previous monopolies/oligopolies. In plant breeding, access to genetic resources has been secured in order to enable further breeding progress, thus preventing the emergence of monopolies in breeding material, technologies and traits. Verification and labelling of new genome technologies have been ensured by public risk assessment, safety testing and approval for technology, product and process safety. Technology transfer from the public to the private sector now takes place with broad inclusion and open innovation systems or using an open source approach.

Concerning interactions with wider developments with regard to this scenario, special attention must be given to the legal framework at EU level as this could act both for and against the scenario.

4.6 Scenario X

General conditions predominantly unchanged, minor progress towards sustainability

4.6.1 Biodiversity a marginal issue with disruptive negative trends and extinctions

Measures to foster biodiversity largely continued after 2020 but have had little effect and the extinction trend has continued through to 2030. Gains in some animal species (such as storks) initially masked the general trend of biodiversity loss. It is becoming increasingly clear, however, that tipping points have been passed with the loss of source populations that could be used for recolonisation. Ecosystem services are failing in some regions by 2030 (such as the loss of pollination services). This is partly offset by using technology to provide ecosystem services (as with drones for pollination), albeit with very limited success. At the same time, the use of technology results in the loss of further ecosystem services and the recreation value of the farming countryside is compromised. In livestock farming, economic conditions lead to breeding for maximum performance, breed diversity is in continuous decline and closed livestock housing systems predominate.

Disruptive negative trends are also conceivable, with a widespread collapse of biodiversity and the failure of ecosystem services such as pollination. It is unclear whether action between 2020 and 2030 would be enough to stop this. Pest explosions, pandemics or invasive species from other world regions could result in a massive shift in the species spectrum.

4.6.2 Parts of livestock farming migrate from Germany

Parts of society reject the dominant form of livestock farming – which has not fundamentally changed since 2020 – and the fact that farmers generally are unable to meet societal expectations in an economically viable manner leads to migration internationally. As a result, meat consumption is increasingly served by imports that fall short of higher animal welfare standards.

4.6.3 Extreme market segmentation; internationalisation and industrialisation of value chains

The market is extremely segmented due to conflicting trends.

4.6.4 Externalities paid for out of public funds or exported abroad

Externalities have not been internalised and have to be borne retrospectively with the aid of public funds or are exported outside the EU.

4.6.5 Agricultural support remains at status quo

There has been virtually no change in state support for agriculture relative to 2021, with the bulk of support still based on area-based payments to safeguard farmers' incomes. This support is supplemented on a small scale by regulatory requirements and other payments (such as for fostering biodiversity). Climate change mitigation and environment protection likewise continue to be implemented in agriculture by means of regulation.

4.6.6 Environmental policy with focus on regulation

Short-term regulatory intervention has become necessary to comply with EU requirements and

contain particularly adverse impacts (policy adjustment under pressure). There have been sharp increases in the global land footprint of products consumed in Germany and in the market share of imported food.

4.6.7 Patchwork of diversified consumption patterns and price-driven consumption

Food prices have stayed low and companies are given little incentive to avoid or reduce externalities. Other sectors of the economy source low-cost substrate from agriculture (such as the use of food biomass for energy generation or as an industrial feedstock) and the negative externalities are offset retrospectively using public funds. There is increasing division between agriculture and society. This trend is reinforced by the fact that shopping largely takes place online, anonymously and with an international bias.

The most important buying criteria for the majority of consumers are price followed by taste appeal. These take clear precedence over other criteria (such as climate impact, sustainability, fair trade, global equity including global land footprint, regional production and animal welfare). There has been a marked increase in the proportion of industrially processed foods and highly processed convenience products have gained market share.

Consumers whose buying criteria include sustainability as well as price face a lack of information about climate and sustainability impacts or about the indirect costs of foods. Food labelling is patchy and confusing. Consumers are consequently unaware of the 'true price' of food and food waste remains high as a result. Demand for sustainable products has increased only very slowly through to 2030. Healthy and sustainable dietary choices are only important to specific segments of the population, resulting in widening

discrepancies with regard to diet-related health status.

4.6.8 Two domains of innovation

Innovation geared to the segmented market results in two innovation 'domains' side by side: innovations monopolised by big business on the one side and open-source innovations on the other.

Scenario X does not fit with a state of affairs in which the Green Deal targets are assumed to be fully implemented because this assumption precludes retaining the status quo on agricultural support. A large-scale shift in values internationally could place German agriculture under pressure to transform, which would also not be compatible with Scenario X.

5 Draft paper by the CAP Working Group

Note: This draft paper by the CAP Working Group is a working paper not formally adopted by the Commission. As it documents a particularly important part of the consensus-building process within the Commission, the paper is reprinted here for the sake of completeness.

Paper by the Commission on the Future of Agriculture (ZKL) on the reform of the Common Agricultural Policy (CAP) focused on the first and second pillars Presented at the meeting of the Commission on 26 April 2021

The Commission agrees that the area-based direct payments do not meet future needs and should therefore be reformed. The process of planning and organising this reform should begin now and will also be part of the Commission's final report.

The aim is to gradually transform the current area-based direct payments under the first pillar of the CAP over the course of the next two funding periods into payments that reward the provision of specific public goods. This process must be as continuous as possible and follow clearly defined steps so that farmers can plan for the future and avoid disruptions.

This complete transformation of direct payments includes the abolition of conditionality requirements. Instead, farmers should be offered economically attractive programmes aligned to the achievement of social and environmental transformation goals. Transitional

arrangements must be provided for the duration of the system transformation. The level of funding for environmental measures here must in no circumstances be allowed to fall below those of the previous funding period.

The funding necessitated by the European biodiversity and climate targets for Natura 2000 areas and nature protection areas and for the targeted increase in the proportion of organic farming is to be provided under the first and second pillars.

The financial resources required for these transformation processes substantially exceed the scope of CAP funding. Additional funding must therefore be sourced elsewhere. This can include consumer prices, business-led industry initiatives, additional duties and public budgets. Care must be taken to ensure that the costs of the transformation are equitably distributed.

Introduction

Our agricultural sector is systemically important. Its task is to produce food while safeguarding the natural foundations of life. Societal expectations of agriculture have changed, partly in light of its impacts on the natural environment. Agriculture and rural regions face major structural and economic changes.

The Commission on the Future of Agriculture takes very seriously the desire of many farmers for clear and realisable targets and for market remuneration and public appreciation of their work and their products. Farmers need security to plan for the future, invest, employ workers, prepare to pass on the farm to the next generation and for general business planning.

Goals and roadmaps for such changes are set out in numerous European and national frameworks and strategies. These notably include the transformative requirements outlined in the EU Farm to Fork Strategy and the Biodiversity Strategy and those which follow from the Paris Climate Agreement. The urgency of climate change, restoring biodiversity, clean air and water policies and safeguarding animal welfare requires immediate action that charts and follows a clear development path. At the same time, as reflected multiple times in the public discourse, many farms are stretched to the limit economically. A lack of long-term and coherent strategies by the responsible Federal Government and Länder ministries compounds matters and makes it hard to plan for the future in many areas. Higher standards – most of all in environmental protection and animal welfare – the purchasing power of retail chains, farmers' comparatively weak position relative to the demand side such as dairies, slaughterhouses and the agricultural trade and unequal standards in international trade all result in growing price and cost pressure.

In the necessary mix of reforms in regulatory, tax and subsidy law, introducing new instruments and adapting and reforming the framework for trade (standards etc.), a special role as one of the central policy instruments falls to the reshaping of the EU Common Agricultural Policy (CAP) from 2023. This must provide targeted support and corresponding incentives for the above-mentioned transformation processes in agriculture. Support policy should be consistently oriented towards safeguarding the social contribution of agriculture. If the cooperation-based approach (public payments for public goods) fails to achieve the specified environmental and animal welfare goals, these goals would have to be pursued by other means (such as taxes, duties, other support measures, sectoral law or regulation).

Development of the Common Agricultural Policy (CAP)

The CAP plays a key role, shaping our agricultural policies and practices with a variety of tools (such as the European market organisation, support mechanisms and conditionality requirements) that continue to be evolved to address new and changing needs. Discussions currently focus on reform of payments under the first and second pillars of the CAP.

The Commission considers that the CAP must contribute decisively in mastering the transition to a sustainable food system in the EU and placing farmers in a position such that they can make the necessary contribution towards achieving the climate, clean air, clean water and biodiversity goals and comprehensively protecting the environment. This is a basic prerequisite for long-term public acceptance and hence for the onward evolution of state support for agriculture and should therefore guide the further development of the CAP both at EU level and its national implementation from 2023.

For many farms, area-based direct payments under the first pillar make up a significant share of farm income. Direct payments are made regardless of household or farm income, and large farms tend to benefit disproportionately because they can often produce more cost-effectively than smaller farms due to economies of scale. As a result of pass-on effects, direct payments also increasingly benefit landowners rather than active farmers. Agricultural economics research also indicates that direct payments inhibit innovation.

Area-based direct payments were introduced in 1992 to offset cuts in intervention prices as a result of the WTO Agreement on Agriculture. This was appropriate at the time in order to adjust to the world market. Today, nearly 30 years later, the rationale of reducing price support no longer applies. The main task is to achieve a large package of environmental and animal welfare goals and to

support the agricultural transformation process that is needed for that purpose. This cannot be provided by direct payments in their current form.

In this paper, the Commission on the Future of Agriculture underscores the special role of CAP funding in agriculture. Despite this special role, it is evident that even CAP funding will not be sufficient to finance the above-mentioned agricultural transformation processes. Additional funding must therefore be sourced elsewhere. This can include consumer prices, business-led industry initiatives, additional duties and public budgets. Care must be taken to ensure that the costs of the transformation are equitably distributed.

The Commission has the following recommendations for the further development and shaping of the first and second pillars of the Common Agricultural Policy (CAP):

Architecture

- The area-based direct payments system does not meet future needs and should therefore be reformed. The aim is to gradually transform the current area-based direct payments under the first pillar of the CAP over the course of the next two funding periods into payments that reward the provision of specific public goods. This process must be as continuous as possible and follow clearly defined steps so that farmers can plan for the future and avoid disruptions.
- To this end, a predictable and continuous roadmap must be quickly adopted that sets out the key points for implementing each step. The gradual reform of agricultural support must remain economically manageable for farmers and enable them to plan ahead.
- The gradual and complete transformation of direct payments must be accompanied by corresponding adjustments to the conditionality requirements. Instead, farmers should be offered economically attractive programmes

aligned to the achievement of social and environmental transformation goals. Transitional arrangements must be provided for the duration of the system transformation. The environmental requirements here must in no circumstances be allowed to fall below those of the previous funding period.

- On top of sectoral law, farmers should be offered programmes that are economically attractive and aim for participation by as many farms as possible, including those in ideal locations, in order to secure specific public goods in all regions. For the payments for eco-schemes and agri-environment-climate measures (AE-CMs) to be economically attractive, they must represent good remuneration and either be based on the theoretical marginal supplier in an ideal location or vary in line with location quality.
- The future EU-wide conditionality requirements for access to area-based direct payments are currently the subject of trilogue negotiations. According to the current status, they include:
 - 3 % to 5 % unfarmed agricultural land area (such as landscape features, fallow land and hedges) comprising ecological focus areas;
 - Minimum crop rotation requirements;
 - Ban on converting or ploughing grassland on ‘environmentally sensitive’ Natura 2000 grassland sites.
- When launching the transformation of the CAP system, national increases in ambition over the EU baseline from 2023 for claiming the temporarily remaining area-based payments should be dispensed with if economically attractive area and measure-based eco-schemes and AE-CMs are made available for target achievement instead.
- During the transition phase, in the CAP funding period starting in 2023, the EU conditionality requirements will have to be complied with in Germany. The transformation is to be rendered income-neutral for farmers by offering eco-

schemes that enhance compliance with the EU conditionality requirements. Use should be made of the possibility of higher payments for the first hectares as a means of aiding the transition, most of all for smaller farms.

Eco-schemes

- The primary aim of eco-schemes is to achieve climate and biodiversity goals. It should also be possible to trial new methods for the conservation of biodiversity while keeping productivity constant. A broad range of eco-scheme measures is needed in view of variation in regional conditions in terms of grassland, arable land and permanent crops and variation in environmental policy needs. It would also be possible in this connection to try out or further develop the idea of fixed payments for public goods or sustainability services. Intensive use should be made of the possibility of programming and awarding multiple-year eco-schemes with guaranteed minimum payments in order to enable farms to plan for the future and increase the benefits for biodiversity. To achieve geographically more widespread implementation of biodiversity measures with higher positive ecological impact, top-up payments should be provided if measures are sited so as to link up habitats, landscape features and similar into ecological networks. To the same end, cooperational solutions should be supported where farmers and conservation workers join forces (for example in a biodiversity alliance) to plan and implement biodiversity measures in their area.
 - The share of total payments accounted for by eco-scheme payments should be gradually increased on a straight-line basis relative to direct payments over the funding period (note: the basic rate applicable EU-wide is currently still the subject of trilogue negotiations). Eco-schemes should be implemented in such a way that they use the budgeted funds while not putting the basic payment at risk in order to provide planning certainty throughout the agreed continuous transformation path.
- ### **Second pillar**
- The funds reallocated from the first pillar to the second pillar should be earmarked for biodiversity and climate protection measures while maintaining the funds already budgeted for AECMs in the second pillar.
 - From 2028 at the latest, part of the funding removed from the first pillar should be directly earmarked nationwide for purposes such as paying for (a) compensation for disadvantages of farming in Natura 2000 areas and other specific conservation or enhancement measures in such areas or (b) greenhouse gas-reducing agriculture on organic soils.
 - European and national protected areas are a key element of successful biodiversity conservation. The funding necessitated by the European biodiversity and climate targets for adapted management of farmland in protected areas (Natura 2000 areas, nature protection areas and water protection zones) and for the targeted increase in the proportion of organic farming is to be provided under the first and second pillars.
 - Second pillar measures should also support the following in a more targeted manner than in the past:
 - Cooperational approaches between agricultural and societal groups at regional level;
 - Regional product marketing initiatives;
 - Marketing initiatives to label and remunerate added value in products (such as a biodiversity label or pasture-raised milk).
 - AECMs involving cooperation between multiple farms (biodiversity alliances based on the ‘Dutch model’) should be made available as universally as possible. Such approaches are particularly conducive to the implementation of AECMs with better goal focus as the scope for recruiting subject-matter experts creates

a good basis for advising farms and monitoring the measures locally. The goals and measures should be jointly developed, evaluated and revised by conservation professionals and farmers in the region. Special focus should be placed on creating ecological networks of connected habitats. Existing landscape plans and landscape master plans can be used as guidance in this connection.

Administration

- Both the eco-schemes and the AECMs should be evaluated with regard to goal achievement and adoption levels and the programmes regularly adjusted. The outcome of the first evaluation scheduled for 2024 should already be used in shaping the CAP funding period commencing in 2028. For this purpose, an adaptive trial and evaluation system should be established and refined in cooperation with farms. The relationship between reallocations and eco-schemes to the conditionality requirements should also be evaluated.
- The scope for national flexibility contained in the EU framework from 2023 should be used to make allowance for variation in regional situations and to resolve any goal conflicts in the structuring of both the eco-schemes under the first pillar and the agri-environmental measures under the second pillar (for example by differentiating according to location quality). For agriculture administrations, this may mean additional effort in terms of programme design and management, which is acceptable with a view to the transformation path and better goal focus.
- The administrative effort for farms and public agencies as a result of the transformation path and the need for targeted use of public funds should be kept to the necessary minimum. Control systems must be used not to micro-manage farms but to prevent abuse. Greater use should be made of digital tools in order to minimise control and evaluation effort and to adjust the measures more quickly, among other things by faster feedback to and from farms.
- Enhancing goal focus: Where it is possible to do so with reasonable administrative effort, eco-schemes and AECMs should be geared more closely to the achievement of specific goals and top-up payments also tied to indicators such as breeding success and number of flowering plants.
- Lump sum payments should also be offered to remunerate non-area-based maintenance activities (such as pollarding willows or building dry stone walls).
- All support measures – such as investment support – included in the national framework under the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK) are to be geared to the provision of public goods (such as higher standards of environment protection or animal welfare). This includes funding for emission-reducing and more environment-friendly and biodiversity-friendly practices. It is also necessary to examine whether the definition of agricultural activities in the Agriculture Act should be supplemented to include the provision of public goods.
- A policy mix is required to support the transformation of livestock farming and the shift in livestock holdings (see recommendations of the Commission on Improvements in Livestock Farming). The aim is to improve animal welfare in livestock farming, improve incomes from it, reduce livestock emissions and eliminate the excess load on the natural environment. Funding for the measures needed for this purpose should be provided as proposed by the Commission on Improvements in Livestock Farming.
- In forthcoming discussions on CAP reform, it is also necessary for the market organisation to be reviewed with a view to the achievement of societal goals and competitive European agriculture (as outlined among other places in the Farm to Fork Strategy).

6 Table of abbreviations

AECMs	Agri-environment-climate measures	BMWi	Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy)
AgrarOLkG	Gesetz zur Stärkung der Organisationen und Lieferketten im Agrarbereich (Agrarorganisationen- und Lieferketten-Gesetz) (Agricultural Organisations and Supply Chain Act)	BVerfG	Bundesverfassungsgericht (Federal Constitutional Court)
AVV	Allgemeine Verwaltungsvorschrift (General Administrative Regulation)	CAP	(EU) Common Agricultural Policy
BEUC	Bureau Européen des Unions de Consommateurs (European Consumer Organisation)	CMO	Common Market Organisation (Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products [...])
BlmschG	Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge (Bundes-Immissionsschutzgesetz) (Federal Pollution Control Act)	CO ₂ -e	Carbon dioxide equivalents
BMEL	Bundesministerium für Ernährung und Landwirtschaft (Federal Ministry of Food and Agriculture)	CRISPR/Cas	(Clustered Regularly Interspaced Short Palindromic Repeats [CRISPR]/CRISPR-associated Protein [Cas]) – molecular biology-based method to selectively cut and modify DNA
BMF	Bundesministerium der Finanzen (Federal Ministry of Finance)	Destatis	Statistisches Bundesamt (Federal Statistical Office)
BMI	Bundesministerium des Innern, für Bau und Heimat (Federal Ministry of the Interior, Building and Community)	DFG	Deutsche Forschungsgemeinschaft (German Research Foundation)
BMJV	Bundesministerium der Justiz und für Verbraucherschutz (Federal Ministry of Justice and Consumer Protection)	DGE	Deutsche Gesellschaft für Ernährung (German Nutrition Society)
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)	DüV	Verordnung über die Anwendung von Düngemitteln, Bodenhilfsstoffen, Kultursubstraten und Pflanzenhilfsmitteln nach den Grundsätzen der guten fachlichen Praxis beim Düngen (Düngeverordnung) (Fertiliser Application Ordinance)
		EAFRD	European Agricultural Fund for Rural Development
		ETS	(EU) Emissions Trading System
		EU	European Union

FAO	Food and Agriculture Organization of the United Nations	SDGs	Sustainable Development Goals
Fraunhofer ISI	Fraunhofer-Institut für System- und Innovationsforschung (Fraunhofer Institute for Systems and Innovation Research)	SVLFG	Sozialversicherung für Landwirtschaft, Forsten und Gartenbau (Social Insurance for Agriculture, Forestry and Horticulture)
GAK	Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes (Joint Task for the Improvement of Agricultural Structures and Coastal Protection)	UN	United Nations
GTAP-AEZ	Global Trade Analysis Project – AgroEcological Zones	USDA ERS	United States Department of Agriculture Economic Research Service
HNV	High nature value	UTP Directive	Unfair Trading Practices Directive (Directive (EU) 2019/633 of the European Parliament and of the Council of 17 April 2019 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain)
Ibid.	Ibidem (in the same source)		
IFS	International Featured Standards		
ILO	International Labour Organization		
ITW	Initiative Tierwohl (German animal welfare initiative)	VAT	Value added tax
LANA	Bund/Länder-Arbeitsgemeinschaft Naturschutz, Landschaftspflege und Erholung (Federal-Länder Working Group on Nature Conservation, Landscape Management and Recreation)	VCPs	Value chain partnerships
LEADER	Liaison Entre Actions de Développement de L'Économie Rurale ("Links between actions for the development of the rural economy" – EU programme of measures under the EAFRD)	WBA	Wissenschaftlicher Beirat für Agrarpolitik (BMEL Scientific Advisory Board on Agricultural Policy) (predecessor of WBAE)
NEC Directive	National Emission Ceilings Directive (Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants)	WBAE	Wissenschaftlicher Beirat für Agrarpolitik, Ernährung und gesundheitlichen Verbraucherschutz (BMEL Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection)
OECD	Organisation for Economic Co-operation and Development	WTO	World Trade Organization
QS	Quality assurance kitemark of QS Qualität und Sicherheit GmbH	ZKL	Zukunftskommission Landwirtschaft (Commission on the Future of Agriculture)
RAUMIS	Regionalisiertes Agrar- und Umweltinformationssystem ("Regionalised Agriculture and Environment Information System")		

