Developing a Sustainable Agricultural System in the Context of Sustainable Development Goals and Demands in Germany

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Abstract
Agriculture is one of the areas that is significantly contributing to deepening environmental problems and the environmental crisis itself. Therefore, the need to transform agriculture into a sustainable one is still very relevant. The international community has already confirmed this position, as well as the need to transform agricultural systems across the globe, by adopting the 2030 Agenda and the Sustainable Development Goals (SDGs). By this, countries have committed themselves to active solutions at national levels in order to come as close as possible to achieving this ambition. The aim of this paper is to examine in particular the Goal 2 “Zero Hunger” and to look more closely at the commitments that countries in the global community have made. The main part of this paper is then to examine and analyse how these commitments to transform agriculture into a sustainable one have been reflected in the national policies of Germany as a country that is one of the most important agricultural countries in the world and thus potentially one of the biggest environmental harms in this context. Our study will present particular steps and actions taken by the country since 2015 and will assess how the 2030 Agenda’s agricultural intent has been fulfilled so far by this country in the almost 7 years since the adoption of the SDGs.

Keywords: 2030 Agenda, Germany, SDGs, sustainable agriculture, sustainable development

JEL Classification: Q01, Q15, Q18

1. Introduction
Sustainable development (SD) is an increasingly relevant and important concept that is gaining a growing position throughout the international community. A number of problems have already taken on a global character and threaten the whole world, but to different levels and in varying strengths. One of these problems is the growing population and the need to feed an increasing number of people, on the one hand, and the environmental crisis, on the other. This is why, particularly over the last two decades, there has been an increasing effort to develop and implement global rules and goals to promote and ensure sustainable development, combined with sustainable agricultural production and environmental protection. However, this is not an easy task. The aim of the international community is therefore to find a way how to solve or at least mitigate the aforementioned problems, as well as to achieve sustainability in development and to preserve the world in an appropriate form for future generations. However, industrial agriculture is a significant factor in intensifying a number of environmental problems and it is a major contributor to pollution, which needs to be dramatically reduced in order to bring the world closer to sustainability. In this respect, the concept of sustainable agriculture and its promotion and implementation in particular countries is becoming increasingly important as “the growing sociocultural burden of nature connected mainly with the development of consumption economy seriously threatens lives of future generations” (Svitačová & Moravčíková, 2017, p.196).
Due to the urgency of the situation and the failure of previous sustainable strategies, the international community has collectively and unanimously adopted the 2030 Agenda for Sustainable Development (UN, 2015c) together with the new Sustainable Development Goals – SDGs (UN, 2015b) and set clear ambitions on how to achieve sustainability, not excluding the support of sustainable agriculture. The situation is more complex in less developed countries because, although they contribute much less to global problems than more developed countries, they suffer more from their consequences. They are also mostly more populated, so they are dependent on agriculture, thus its transformation to sustainable one is necessary to protect the environment. However, we also know many developed countries in the world that are among the global leading countries in agricultural production, and therefore, even in these countries, the transformation of agriculture is actually even more urgent. The reason is that we assume that these countries, despite being less populated than most developing countries, by their share of agricultural production and their use of various environmentally harmful techniques and facilities, pose a much greater threat to the environment. The responsible approach of governments and applying effective solutions to adapt to the 2030 Agenda and SDGs is of crucial importance in this case. However, the dissemination of knowledge in the field of agriculture and sustainable development has also attained considerable importance, as has the promotion of young people in the field of agriculture and a real effort by all those involved, so that the objective can be effectively achieved.

The aim of this paper is to examine the term sustainable agriculture and in particular Goal 2 "Zero Hunger" (The Global Goals, 2022), as well as to look more closely at the commitments that countries in the global community have agreed on. The main part of this paper is then to examine and analyse how these commitments to transform agriculture into a sustainable one have been reflected in the national policies of Germany as a country that is one of the most important agricultural countries in the world and thus potentially one of the biggest environmental harms in this context. Our study will present the development actions taken by the country since 2015 and will assess how the 2030 Agenda's agricultural intent has been fulfilled so far by this country in the almost 7 years since the adoption the SDGs.

1.1 Sustainable agriculture and the concept of sustainable development

The concept of sustainable development – which means the “development that enables to meet the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p.43) – is becoming increasingly important, and have led to ever more sophisticated strategies for achieving it at the level of the international community, but also particular countries. The issue of sustainable development has undergone a considerable evolution since it was first defined. It is now represented by various international documents, and in particular by the 2030 Agenda for Sustainable Development (United Nations Knowledge Platform, 2015) and Sustainable Development Goals (SDGs) as part of it, which draw together all the experiences from previous successful and unsuccessful efforts in achieving it. Those were adopted by the international community in September 2015. The 2030 Agenda and 17 goals with 169 targets (see Figure 1) reflect the world community's efforts to achieve sustainable development and, currently they represent one of the highest priorities for the world. In their content, the SDGs are defined in a quite detailed way and each one is strongly linked to the biggest challenges, which influence (although differently) all the countries of the world.
When we look at the issue of sustainable development and the particular goals, based on the current and most significant global problems of mankind, we can see that the environmental problems can be considered to be the most critical ones today. Many of these problems are greatly intensified by industrial agriculture. Therefore, there is a strong emphasis on transforming agriculture into a sustainable one, and this specifically represents the content of the SDG 2 (Zero hunger); as well as to achieve food security, improve nutrition, and promote sustainable agriculture. Particularly important is the target 2.4 – By 2030, ensure sustainable food production systems and adopt resilient agricultural practices that increase productivity and production, help sustain ecosystems, strengthen adaptive capacity to climate change, extreme weather, drought, floods and other disasters, and progressively improve soil and land quality (UNDP, 2015). Within this also the Indicator 2.4.1 – Proportion of agricultural area under productive and sustainable agriculture is important. The basis of this indicator is to measure the progress in reaching more productive and sustainable agriculture. It is made up of relevant sub-indicators that should provide governments with strategic information for evidence-based policies. This indicator was developed through a multi-stakeholder process involving statisticians and technical experts from particular countries, international organisations, national statistical offices, civil society, and the private sector. It brings together the issues of productivity, profitability, resilience, land and water, decent work, and well-being to reflect the multidimensional dimension of sustainable agriculture (FAO, 2022b).

1.1.1 The importance of sustainable agriculture

Agriculture changed its character especially after World War II. Modern technologies, mechanisation, the use of chemicals, specialisation, and a policy that favoured the maximisation of production emerged. Industrial agriculture produces huge quantities of food at low prices. However, this is only possible through the practices that endanger the environment, health, rural communities, animals, etc. We agree with the opinion that the global environmental crisis as a whole is a consequence of the human strategy of overproduction, accumulation and consumption, the implementation of which is now reaching the limits of natural resources and nature’s ability to absorb the pollution created by this overproduction and consumption (St’ahel, 2016). Thus, despite the positives of industrial agriculture, there are significant associated costs that affect the possibility of reaching SD. The most serious impacts of industrial agriculture on the environment are: depletion of topsoil, contamination of groundwater, degradation of rural communities, worsened conditions for farm workers, increased production costs, etc. Sustainable agriculture not only addresses many environmental and social issues, but offers innovative and economically viable opportunities for farmers,
workers, consumers, policy makers, and many others throughout the food system to grow their crops and produce (UC Davis, 2021). Therefore, today we can see the promotion of "apparent changes in land use and the impact of human activity on the planet's ecosystem and the limitations of human activity that result from the limits of the system" (Šeben-Zaťková, 2015, p.1144).

Especially in recent decades, the increase in world population and the consequent growth in demand for animal products has led to the intensification of farming systems, which leave a huge footprint and cause considerable environmental harm. Sustainable agriculture and food production systems that promote climate-resilient and environmentally friendly practices have significant potential to preserve our valuable natural resources. By following simple practices such as nutrient recycling and not using agricultural chemicals, sustainable farming systems can have a wide reach, allowing countries to feed a growing population without causing irreversible environmental change (Friend of the Earth, 2022b). The basic principle of sustainable agriculture is to maintain a balance between the demands of food production and the preservation of the environment. Sustainable agriculture is therefore a type of agriculture that focuses on the production of sustainable agricultural products without compromising the ability of present or future generations to meet their needs. Furthermore, the use of sustainable agriculture standards and certificates is important here as it is a way of communicating to customers that a product is sustainably produced or grown (Friend of the Earth, 2022a).

Thus, in the areas of food security, nutrition, land degradation, desertification, and drought, a strong SDG on food security and agriculture was considered to be crucial to poverty eradication and achieving sustainable development (UN Sustainable Development, 2015). In this respect, within the SDG 2 we can also find a specifically described topic about “Food security and nutrition and sustainable agriculture”. To achieve this, it is really important that agriculture systems globally become more productive and less wasteful. Land, healthy soil, water, and plant genetic resources are key inputs for food production and their increasing shortage requires their sustainable use and management. For example, the restoration of degraded land through sustainable agricultural practices would reduce the pressure to cut down forests for agricultural production. Similarly, the potential benefits of soil restoration for food security and climate change mitigation are huge. Moreover, traditional knowledge of farmers can support productive food systems through wise and sustainable management of soil, land, water, nutrients, and greater use of organic fertilizers (UN, n.d.). Reducing food waste is also key to ensure food security and sustainable agriculture. Because the more food people waste, the more needs to be produced, which puts a burden on soil, water, and ecosystem resources (UN Sustainable Development, 2015). Last but not least, it is the high intention of countries and the whole global community to increase investments in research, development, and technology demonstration to improve the sustainability of food systems worldwide (UN, n.d.).

We agree that industrial agricultural production is highly unsustainable in the context of environmental impact. Thus, the above-mentioned problems in this area can be mitigated through the following principles to guide the strategic development of new approaches and the transition to sustainability:

1) Improve efficiency in the use of resources;
2) Direct action to conserve, protect and enhance natural resources;
3) Promote agriculture that protects and improves rural livelihoods and social well-being;
4) Promote agriculture that enhances the resilience of people, communities and ecosystems, especially to climate change and market volatility;
5) Good governance is essential for the sustainability of both the natural and human systems (FAO, 2022a).

In general, the concept of sustainable agriculture integrates several main objectives – environmental health, economic profitability, social and economic justice. Achieving the goal of sustainable agriculture is the responsibility of all actors in the system. Every person involved in the food system can play a role in ensuring a sustainable agricultural system (UC Davis, 2021). In this context, sustainable agriculture in its simplest sense means the production of food, fibre, or other plant or animal products using agricultural techniques that protect the environment, people, and animals (Grace Communication Foundation, 2021).

Agricultural sustainability is a complex goal with all three dimensions of SD: environmental (good management of the natural systems and resources on which farms depend), economic (a sustainable farm should be a profitable enterprise that contributes to a strong economy), and social (it should treat its workers fairly and have a mutually beneficial relationship with the surrounding community). These include: building and maintaining healthy soils, wise water management, minimising air, water and climate pollution, promoting biodiversity, etc. By following these, farms can avoid harmful impacts without sacrificing productivity or profitability (Union of Concerned Scientists, 2021).

In the context of achieving sustainable agriculture, many new documents and standards have been adopted on international or national level. An important one is, for example, the 2020 Sustainable Agriculture Standard: Farm Requirements. We can agree that the need for sustainable agriculture has never been bigger. By providing a practical framework for sustainable agriculture and a devoted set of innovations, the farm requirements can help farmers develop better crops, adapt to climate change, increase their productivity, set targets for sustainable outcomes, and focus investments to address the biggest threats of the current world (Rainforest Alliance, 2022).

2. Data and Methods

The present work is based on qualitative research that draws on a theoretical analysis of the current status and prospects for achieving sustainable agriculture in the world and the goals that the international community has set and unanimously adopted for this purpose.

The study was carried out within the framework of the Erasmus+ KA2 Strategic partnership project SUSTA (2020-1-PL01-KA203-081980), which aims to create an involving concept of teaching sustainability for students of business related studies which will result in raising the awareness and involvement in the problems of sustainability. The aim of the research in the present study is to theoretically examine the main purpose, particular plans, and the possible outcomes in the direction of achieving sustainable agriculture aimed at significant reduction of the global environmental burden. Consequently, the study focuses on Germany as a highly developed country, which also belongs to the most important and largest agricultural entities in the global community. The next step is then to examine how this country has changed its agricultural practices since 2015 and the adoption of the 2030 Agenda, and how it is progressing towards the SDG 2 Zero Hunger (End hunger, achieve food security and improved nutrition and promote sustainable agriculture).

For this purpose, we used several scientific methods. First, we aimed to map, describe, and identify the importance and essence of sustainable agriculture concept generally and within the 2030 Agenda, as well as the set global goals for achieving sustainable development adopted within this agenda. We then explored, analysed and identified specific mechanisms to promote sustainable agricultural practices in Germany, as one of the most important agricultural
countries globally, as well as the mechanisms that the country has adopted and implemented since 2015 and the adoption of the SDGs.

The results allowed us to assess the current state of the analysed area towards a realistic and effective implementation of SDG 2 in particular and the achievement of sustainability in agriculture, which is still one of the most important priorities towards reducing global environmental burdens and pollution.

For our scientific interest, we chose to work with the most commonly used worldwide scientific information databases and search engines, such as Google Scholar, SCOPUS, Web of Science and ResearchGate, as well as other available resources, especially the websites and data of the United Nations and various other global organizations focused on sustainable development and the sustainable agriculture model, as well as databases and websites containing information and data on Germany, its political practices and regulations set up to achieve sustainability in agriculture related to the SDGs.

3. Results and Discussion

According to BMEL (Federal Ministry of Food and Agriculture), Germany while being a land of engineering ingenuity and industry, has always maintained a strong agricultural sector. Despite a high population density, half of the land is farmed. Almost a million workers produce goods worth more than 50 billion euros a year in around 275,400 agricultural enterprises (BMEL, 2022a; BMEL, 2020c). The way in which agriculture and forestry (on more than 80% of land) are operated has a major impact on nature and the environment (BMEL, 2020b). Germany's farming sector is among the four largest producers in the EU, mainly due to animal husbandry. In order to feed the livestock (over 200 million animals), more than 60% of agriculturally used land is utilized for growing nourishment for them. Some of these and other crops are also dedicated to the production of renewable energy (BMEL, 2022a; BMEL, 2020c). Germany has for many years been the world's third largest exporter of agricultural goods, while one third of the agriculture goes into exports, and the food industry generates one third of its total revenue in export activities (BMEL, 2020a).

The national Sustainable Development Strategy of Germany (GSDS) created in 2002, with measures adopted in 2010 and regularly updated (indicators every two years and progress reports every four years), was radically revised in 2016 to align it with the 17 SDGs of the Agenda 2030, with additions and updates in 2018 and 2021 in response to the COVID-19 pandemic (The Federal Government, 2021b). Even before this agenda was adopted in 2015, the German Government was working on making the transformation of the agricultural and food sector more sustainable. Examples in agriculture include the development of strategies for arable and livestock farming, amendments to the Fertiliser Application Ordinance, the Strategy for the Future of Organic Farming, and the ongoing changes to the EU's Common Agricultural Policy (The Federal Government, 2021a, p.58).

The Federal Statistical Office (Destatis – Statistisches Bundesamt) evaluates the progress of GSDS national and international measures on the basis of 65 indicators and the country's sustainable development policy is regularly monitored by an international group of experts by peer review (Zech, 2019). In March 2021, Destatis checked to what extent the Federal Government achieved its goals for 2020. In the 72 DNS target areas, twelve goals were to be specifically achieved by 2020 (Destatis, 2021). In July 2021, Germany reported to the United Nations High-Level Political Forum on Sustainable Development (HLPF) on its national activities to implement the 2030 Agenda based on the GSDS (The Federal Government, 2021c). The new GSDS was refined assisted by all ministries and the public was involved
through an extensive dialogue process during several months. The updated strategy introduced six decisive transformation areas on which future sustainability politics will focus, including sustainable agri-food systems. Transformative measures have been established in this area, including soils and forests acting as carbon sinks, the 2035 arable farming strategy and the organic farming future strategy among others (BMEL, 2022a).

Within the focus of SDG 2, it is covered in the GSDS by three indicators in two categories (see Table 1 and details below; The Federal Government, 2021d).

**Table 1: Indicators of SDG2 within GSDS**

<table>
<thead>
<tr>
<th>Field</th>
<th>Category</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Field 2.1</td>
<td>Farming (Environmentally sound production in our cultivated landscapes)</td>
<td>2.1.a Nitrogen surplus in agriculture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1.b Organic farming</td>
</tr>
<tr>
<td>Field 2.2</td>
<td>Food security (Realising the right to food worldwide)</td>
<td>2.2 Support for good governance in attaining appropriate nutrition worldwide</td>
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Within initiatives for responsible agriculture, the GSDS sets a target of reducing the nitrogen surplus (which contaminates soils and groundwater) on agricultural land to 70 kilograms per hectare per year by 2030 (Umwelt Bundesamt, 2021). However, this development is heading in the wrong direction based on the GSDS update 2021, although the fertiliser legislation was already tightened in 2017 and further steps were taken in 2019 (BMEL, 2020b).

Organic farming, along with conventional farming, is considered an important pillar of the country’s agricultural and food industries. The Federal Ministry of Food and Agriculture has therefore developed the Strategy for the Future of Organic Farming, which is to be used as a guideline to significantly improve the development opportunities for organic farming and food management and thus enabling also the participation of domestic agriculture in market opportunities (BMEL, 2020c). Although over the past few years the share of organically farmed area has steadily increased, its rate has not been fast enough (in 2020, only 9.6% of utilised agricultural land was farmed organically). In this case, the target of increasing the share to 20% by 2030 might not be achieved (BMEL, 2020b), therefore 24 measures along five pivotal lines of action are being implemented (designing a viable and coherent legislative framework; facilitating access to organic farming; fully utilizing the demand potential and expanding it further; improving the productivity of organic farming systems, and rewarding environmental services adequately (BMEL, 2020c).

As for food security, funds disbursed for the application of the guidelines and recommendations of the UN Committee on World Food Security (CFS) are to be increased appropriately as a percentage of total spending on food security by 2030 (The Federal Government, 2021a).

Agricultural production is also reliant on the availability of land. The GSDS goal of reducing daily land-take to less than 30 hectares by 2020 has so far been missed by a wide margin (currently at more than 50 hectares a day). Soil regeneration should also be promoted by means of appropriate funding (ZKL – Commission on the Future of Agriculture, 2021). In 2019, the European Commission’s (2020) Farm to Fork Strategy set an ambitious target for 2030 of reducing nutrient losses by 50% and fertiliser quantities by 20% while maintaining soil fertility
levels (ZKL, 2021). The aim of the Federal Conservation Act in conjunction with the GSDS is therefore to reflect the special importance of soil (BMEL, 2020b).

The biodiversity and quality of life indicator surveyed as part of the GSDS is still far from the targeted 100% for 2030 for agricultural landscapes and currently stands at 59.2% (ZKL, 2021). On the other hand, among the renewable energy resources, bioenergy continues to play an important role (in 2019, about 15% of the primary energy used in the country originated from renewable energy resources). Of this, bioenergy alone supplied around 58%. It is forecasted that bioenergy from domestic sources alone would have sustainable potential to provide 17% of Germany’s primary energy in 2050 (BMEL, 2020c).

4. Conclusion

We can summarize that there is high pressure for countries all over the world to transform their agricultural practices into sustainable ones. The international community have agreed on 17 SDGs and one of those is necessarily aimed at implementing sustainable agriculture in practice, with several particular targets to be achieved within this objective. Those are prepared and described in detail and represent the task and responsibility for each country. However, they have even greater importance when we are talking about the greatest agricultural countries in the world (including Germany), as those are harming the environment through industrial agricultural practices the most.

As for lessons learned, areas requiring action and anticipated priority areas, the Arable Farming Strategy (for making arable farming sustainable) and intensified efforts to make the transition to organic farming are identified as key ones by the German Government. On several requirements for the accelerated achievement of targets, there is added urgency due to the COVID-19 pandemic to combine economic recovery measures with specific actions, in order to foster the development of multi-stakeholder partnerships as well as to promote organic farming worldwide. The GSDS is designed to be continuously revised and further developed. The concept provides guidelines for viable policies for the future across the board. The ambitious update in 2021 adopted by the Federal Government was an important step for German sustainable development policy, as it clearly defines priority spheres of action in six areas of transformation. By late 2023/early 2024, it should be comprehensively updated in a process involving all society stakeholders.

The implementation of sustainable agriculture requires new efforts in development, research, and also implementation. One of the most important in this regard is specialized and wise management as well as commitment at the highest government levels. This must be connected with an action programme that addresses the needs of agricultural producers and farmers in the context of the environment and public awareness. There is a great need to promote sustainable agriculture, to create a market for sustainable food and to formulate demands for the reform of agricultural policy and regulation. Defenders of industrial agriculture claim that only this type of agriculture can feed such a huge world population, but this is not entirely true. According to the data and analyses, proper implementation of sustainable agriculture practices can be more effective in achieving this goal and can also protect and sustain the environment. It is therefore necessary to promote the dissemination of knowledge and information about this new strategy among people, groups, entire nations, and their decision-making bodies and adapt the national policies of particular countries to achieve this goal commonly in the highest extent as possible.
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