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Farmers are caught in Tri-Dilemma - Objectives and Challenges for Biodiversity in German Nature-Protected Areas

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ABSTRACT

This paper aims to assess farmers' challenges in enhancing biodiversity. The so-called "trilemma" (WBGU 2021) of land use stems from the multiple demands made on land for the benefit of mitigating climate change, securing food, and maintaining biodiversity. Agriculture is accused of maladministration, causing soil contamination, animal cruelty, bee mortality, and climate change. However, farmers play a key role in overcoming upcoming sustainability challenges. While their supportive role is urgently needed, farmers find themselves caught between a "rock" and a "hard place". Consumers call for sustainable production and affordable food products without pesticide residues, demanding enough for all. Farmers are restricted by the wants and needs of consumers who are influenced by interest groups and exposed to interdependent direct and indirect influencing factors. They need to balance the scrutiny of the critical public as well as the regulatory control. In this paper, we collected and surveyed the data of farmers within or close to the 21 selected nature protected areas of the DINA (Diversity of Insects in Nature protected Areas) Project, using a mixed methods approach with a semi-structured questionnaire considering issues' interdependencies and the complexity of today's problems. The conflicts and obstacles faced by farmers were assessed. The results reflect the farmers' willingness and the importance of receiving appreciation for implementing biodiversity measures. These results, complemented by a following quantitative study, are the basis for recommendations for policymakers and farmers in all German nature protected areas.

Keywords: Biodiversity; farmers' drivers; land use dilemma; land use trilemma; mixed method approach, semi-structured questionnaire.

1 Introduction

Within the last 70 years, the structure of the landscape has changed immensely. Small-scale land management has been replaced by large-scale production-oriented agricultural management (Jongman, 2002). The demand for food increased in line with the growth and prosperity of the population, which in turn caused the agricultural sector to expand in terms of intensification and specialisation (Robinson et al., 2002).

As many publications point out, the decline of biodiversity can also be observed in connection with this changing environment. In recent years, public interest in the loss of biodiversity, particularly with regard to the insect population, has grown, at least since the publication of the "Insect biomass decline" paper by Hallmann et al. (2017). In 2019, German farmers protested for better future conditions, i.e. against the increasing environmental regulations and orders issued by the government. The two ministries concerned (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and the Federal Ministry of Food and Agriculture (BMEL)) did not work together, but rather against each other (Radtko,

2021). The agricultural package was adopted by the Federal Cabinet in September 2019. With commitments to new animal welfare labelling, restrictions on the use of pesticides, an action programme for the better protection of insects and further restrictions on animal and plant protection products are the subject of strong objections. New government regulations are partly a response to the European Commission's second infringement proceedings brought against Germany on account of the high levels of nitrate measured in groundwater (Steinbach, 2019). The European Commission had taken Germany to the European Court of Justice back in 2016 due to its failure to take action to address the water pollution being caused by nitrates. The European Court of Justice ruled that Berlin had indeed violated the EU Nitrates Directive, which aims to protect water quality across Europe. In particular, it exceeded the limits set out in the directive due to the excessive use of manure as a fertiliser (Maaß, 2021; Fritz, 2018). It was only in January 2022, after the election and formation of the new government, that the Federal Ministries for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and BMEL announced that they were in agreement with the European Commission, which does not accept the previous approach to fertiliser regulation in the federal states (Michel-Berger, 2022). This implies that farmers must be prepared to deal with further new and stricter regulations in this regard.

Farmers do, however, have reason to be apprehensive about the future, as the economic base of their income has dropped in recent years. They have also been dismayed by a series of strong price competitions they have been forced to contend with due to the Mercosur trade agreement with South America (European Commission, 2019; Burrell et al., 2011) which intends to lessen trade barriers and facilitate access to the European market. The protests had an effect not only on the public, but also on policymakers and authorities, resulting in the establishment and institution of the German Commission on the Future of Agriculture ("Zukunftskommission Landwirtschaft") by the government (Michel-Berger, 2021).

Against the backdrop of these demanding times being experienced by farmers and in the context of the DINA project (Lehmann et al., 2021) a stakeholder analysis, which identified farmers as key actors in relation to biodiversity, was carried out. The farmers' driving forces were determined by literature (Plieninger et al., 2016) and media research, which allowed us to determine that the direct and indirect driving forces at play behind the scenes at every farm are people facing complex decisions.

The perceptions of this target group revealed insights into land use practices and management approaches concerning biodiversity.

The questionnaire used pursued a qualitative approach, namely investigating the measures taken (or not taken) by farmers to enhance biodiversity and the reasons why they chose to implement or not implement those. The numerous press reports published in relation to the various demonstrations held by farmers within the last few years increased social awareness of the issue considerably. Recent studies and the "Fridays for Future" movement show a high level of engagement towards climate protection and thus nature protection, as climate and nature are intrinsically linked. A recent example of this is the publication of the "Pesticides Atlas" in January 2022 (Chemnitz et al., 2022). This publication presented a survey conducted among young adults in October 2021. The results show that this generation is aware of planetary boundaries, demanding more commitment from politicians to ensure that agricultural production is conducted in an environmentally sustainable way. How production is conducted is of widespread interest.

In the following, dilemma and trilemma of land use is considered. Influencing factors, i.e. framework conditions that farmers have to cope with, are described. This is preceded by the presentation of the first step of the applied mixed method design, the qualitative study. Selected results are discussed providing a more detailed picture of the entanglement.

2 Entanglement of dilemma and trilemma

More than ever, farmers are confronted with the question of whether and how they want to shape their profession and vocation for the future. Increasing social and political demands are threatening the very existence of many farms, especially family farms.

The dilemma faced by farmers is that they have to cope with price erosion and increased production, leaving them little scope to consider environmental aspects (Feindt et al. 2019). The German Advisory Council on Global Change (WBGU) explains that

“the diverse demands made on land for the purposes of climate-change mitigation, food security and the conservation of biological diversity are already in competition with each other....The WBGU calls this the ‘trilemma of land use’ because, at first glance, it appears that any one of these challenges can only be met at the expense of the other two” (WBGU 2021).

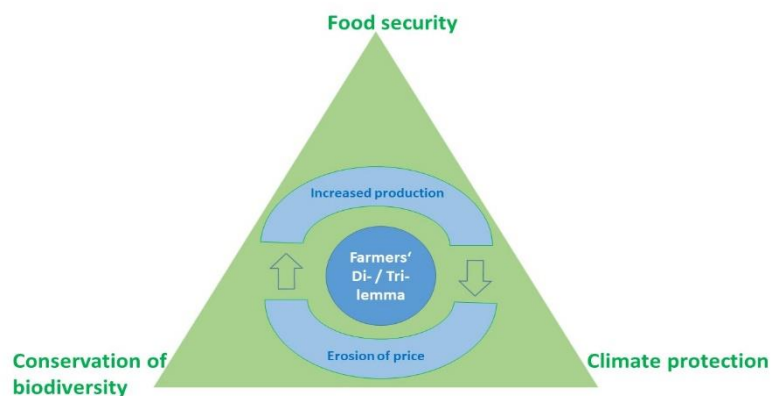


Figure 1. Dilemma - Trilemma problem faced by farmers
Source: Author's elaboration based on WBGU 2021, p. 16.

Combining these framework conditions, farmers move between dilemma and trilemma, which means that they are restricted and are thus influenced by these constraints considerably (Figure 1).

The question does, however, arise as to which factor is the most limiting and which is the least. More research is needed to analyse causes and effects in greater detail.

2.1 Land Use Dilemma

According to figures issued by the Federal Statistical Office of Germany (DESTATIS) in November 2021 (statista, 2021), agricultural land in Germany stood at 16.6 million hectares in 2020, representing a slight decrease compared to the previous year. Most farmland in Germany is used for arable farming, followed by grassland (e.g. pasture farming) and permanent crops (e.g. viticulture). Settlements and transport areas are on the rise. Although about half of Germany's total land area is used for agriculture, the share of agricultural land is slowly declining, while land used for settlements and transport is growing. The loss of agricultural land is particularly noticeable in the areas surrounding urban settlements.

Land use is in the hands of farmers. The intensification of agriculture has strongly increased in recent decades and existing agricultural land is being farmed with higher yields. Farmers achieve this by using pesticides and more resistant crops on the one hand, and less diverse cultivation systems across large areas on the other.

The use of pesticides and monotony of crops is causing biodiversity to suffer and the biological diversity of flora and fauna in the agricultural landscape to disappear. The agricultural land that is cultivated according to conventional methods is mainly criticised for being a cause of the decline in the insect population. The counterpart to conventional farming is organic farming. In 2010, organic farming cultivated an area of 980,851 ha spread across 16,532 farms; by 2013, this had grown to 1,047,000 ha (+6.74 %) across 18,000 farms (+8.88 %), and the trend is increasing.

Society's ideal is that of biological, regional food production and animal welfare, a “wish economy”, a preference for naturalness. Consumers long for naturalness (Zühlsdorf et al., 2012). Farmers, on the other hand, are caught between the ideal and a reality dictated by a price economy (Hauschild, 2018). In short, productivity and naturalness are caught in a “battle” (Kayser et al., 2012).

When focusing on the agricultural production process, farmers are influenced by various direct and indirect factors (Mupepele et al., 2019), which we identified by searching through literature and the media.

2.1.1 Direct Influencing Factors

Figure 2 focuses on the agricultural production process as this is the center of action when it comes to plant protection, fertilisation and crop diversity. Farmers have to strike a balance, taking into account the possibilities offered by site conditions, i.e. habitat occurrence and quality, size, connectivity, soil type and climate.

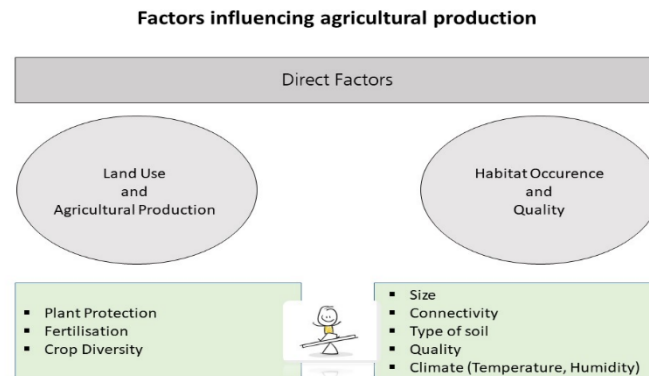


Figure 2. Land Use Dilemma - Direct Factors
(Source: Author's elaboration based on Mupepele et al., 2019, p. 343.)

Farmers have to pay attention to all of these factors each and every day and adjust their day-to-day work accordingly. An example is the recent droughts, which had a direct impact on farming and land use.

2.1.2 Indirect Influencing Factors

Changes in land use need to be framed within a socio-economic, political and legal framework that is beyond the immediate control of individual farmers (Anton et al., 2018). The indirect influencing factors and framework conditions play a non-negligible role. Keywords are economy (i.e. the market), policy and society (Figure 3).

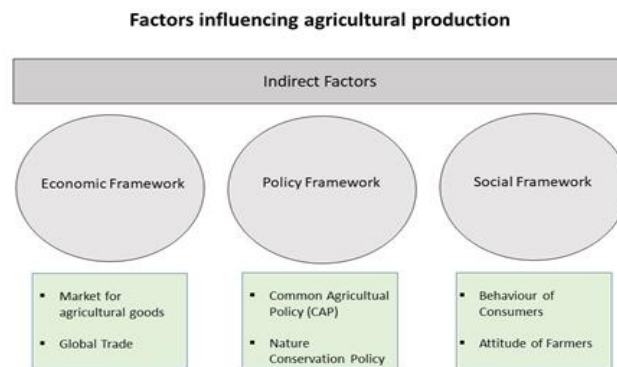


Figure 3. Land Use Dilemma - Indirect Factors
(Source: Author's elaboration based on Mupepele et al., 2019, p. 343.)

The economic framework involves sectoral peculiarities such as the high capital intensity and the need to develop towards stronger market orientation and entrepreneurial orientation in agricultural markets that have been regulated for a long time. This also concerns the increasing regulatory density, i.e. the political framework.

Economic necessities, nature conservation regulations and agricultural policies (at the European Union (EU) and German level) do, of course, also have an influence on the farmers' decisions. Also, a wide range of societal expectations with regard to consumer protection, sustainability, as well as animal welfare and biodiversity pose challenges for farmers. In addition, societal behaviour, the esteem in which farmers are held and public opinion exert an impact on farmers' decisions. Further key issues that farmers have to deal

with are structural change, land pressure, supply chain and food retailing. A lack of planning certainty, changes in policy due to the government elections in September 2021, falling pig prices and the significant rise in input prices are also causing concern among farmers (Deter, 2022).

All in all, a complex system involving active currents and interdependencies. The three indirect factors identified are presented and discussed further below.

2.2 Economic framework

The German agricultural production market has evolved over past decades. Agricultural farms should be able to generate an income through their operations and try to continue farming by adjusting their approaches to farm management and crop cultivation. When marketing their products, however, they often encounter a lack of understanding with regard to the unequal conditions of competition they have to contend with, not only at EU level, but all across the globe. Trade liberalisation, growing price competition and quality requirements are disturbing the market which is regulated by the EU (Canenbley et al., 2004). Farmers perceive increasing globalisation as real threat, as agriculture in Germany and the EU is closely integrated in global supply chains.

The prices that farmers are paid for food is an intensely discussed topic. They are supposed to be fair, ensure an adequate agricultural income, encourage sustainable consumption and regulate supply and demand. However, farmers feel that prices are not fair, as they are a result of a complex situation of quality and mass market, of supply and demand, and of power and powerlessness within the supply chain. Faced with low producer prices and additional requirements related to environmental protection and animal welfare, farmers started to protest in 2019.

2.3 Policy framework

Agricultural policy framework mainly comprises the EU's Common Agricultural Policy (CAP) and its regulatory framework. Many reforms have been implemented since the earlier negotiations concerning the formation of the European Economic Community in the 1950s (Feindt et al., 2019).

The recent 2013 CAP reform (originally planned to be valid until 2020) links the payment of 30% of direct payments to requirements to set aside 5% of a farm's arable area as an "ecological focus area", for crop diversification and to maintain permanent grassland (so called "greening" as part of the first pillar). A close link between agricultural and environmental policy, income policy and environmental integration is the subject of interest. The next reform of the CAP, which will cover the period from 2023, emphasises even more climate and biodiversity topics with its "European Green Deal" programme and "Farm to Fork" strategy. The respective EU countries must present their strategies, but Germany is lagging behind as it has not submitted its strategic plan for the CAP on time.

The transitional regulation, agreed by the European Council and the European Parliament, states that direct payments and support programmes under the second pillar will continue under the current CAP rules until December 2022. This, in turn, has an impact on farmers and the way in which they plan and manage their production.

Farmers are extremely concerned about the constant introduction of new political guidelines for agriculture. Major worries concerning the content of new regulations/conditions are very pronounced and far-reaching, as farmers feel that their very existence is at risk. This is reflected in the protests where concerns, worries and the lack of social recognition by the wider public are expressed (Heinze et al. 2021). Due to the many tightening regulations that have been introduced in the past, farmers have no planning security and are distrustful of policymakers and their institutions (in particular the European Commission and BMEL). The ever-increasing number of requirements scare them.

One example is the Fertiliser Ordinance, which transposes the EU Nitrates Directive into national law. It is part of Cross Compliance (CC). This means that, in the event of infringements, in addition to fines, single farm payments are usually reduced by 3%. Violations of the Fertiliser Ordinance are also considered an administrative offence. Fines are threatened in the event of non-compliance with the regulations (Michel, 2022; Bockholt, 2022).

Another example is the agricultural package presented by BMEL (Julia Klöckner) and BMU (Svenja Schulze) ministers and approved by the Cabinet in 2019. The package comprised an insect protection programme, animal welfare labelling and a restructuring of direct payments for 2020. The insect protection programme, in particular, entails cuts for conventional agriculture. Both ministers left no doubt that insect protection measures are necessary, with Schulze explaining that "*We can use them to turn the tide against insect mortality*". However, Klöckner also stressed that the use of plant protection products must continue to be necessary and possible in principle, stating that "*There will be exceptions, even in protected areas*". The Federal Government intends to provide additional funds for the new special framework plan, with farmers

receiving hardship payments to compensate for additional production requirements and income losses due to plant protection legislation (Insect Protection Act) from January 2022 onwards (LZ Rheinland, 2021). By early February 2022, however, no agreement had been reached by the responsible planning committee. It was expected to be in place by the end of 2021 and is thus inexplicable for the farmers concerned (Awater-Esper, 2022).

2.4 Social framework

People's initiatives have achieved great success, like the "Save the Bees!" campaign in 2019, which became the most successful petition for a referendum in Bavaria's history. More than 1.7 million people signed the petition insisting on the government to take action, and the demands made their way into law (Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten, 2020). In the very same year, similar requests were launched in the federal states of Baden-Württemberg (BW) and North Rhine-Westfalia (NRW). However, in the absence of the support of at least 10% of eligible voters in BW, its 2020 endeavour was not as successful. Something similar happened in NRW and the state parliament rejected the request. Nature conservation associations in Brandenburg (in 2019) and Lower Saxony (in 2020) also launched referendums, and a series of major debates ensued. These proceedings attracted the attention of the press and the general public – a milestone for nature conservation. Farmers did, however, criticise the requests as they threatened to deprive them of the basis for their farming practices.

Farmers are also influenced by consumers' behaviour as the demands is not supported by a willingness to pay/willingness to buy. This is known as the *"attitude-behaviour gap"* (Terlau et al., 2015). The awareness of society is growing, but it is not reflected in consumer spending behaviour. The consumer and the food retailing companies are adding to the dilemma as society has a *"tight is right"* or *"the cheaper the better"* mentality.

The agricultural sector is increasingly being blamed for issues such as pesticide residues in food, farm size structure, monocultures, the use of pesticides, animal husbandry and the distribution of farming premiums. However, the detachment from society combined with the discussions that are taking place internally in both the consumer market and the agricultural sector are presenting farmers with a new set of challenges (Berkes et al., 2019). They also have to grapple with how to go about processing this criticism and try to participate in dialogue with society.

2.5 Land Use Trilemma

In the present, areas of anthropogenic land use are in high demand: both food security and climate protection, not to mention biodiversity, are in strong competition with each other. The impossibility of ensuring these three aspects simultaneously is clear. They all have one thing in common: planetary boundaries. The Earth's surface area is limited! An inescapable "trilemma" of land use exists and agricultural land use is its nucleus.

With their wide-ranging yet vital goals, climate protection, biodiversity conservation and food security are vying for land use. The significant role of land use is demonstrated, among other things, by the scientific analyses presented by the Intergovernmental Panel on Climate Change (IPCC) in the Special Report on Climate Change and Land (Shukla et al., 2020).

The complex interactions between the demand for and use of resources and claims over land use are spiralling: with the growth of the population, the pressure to meet food demands are rising which, in turn, implies the need for higher production and more cultivated land. But land area is finite. Conversion of land (e.g. for wind power) and high-priced land are the results. Although the use of pesticides and fertilisers boosts agricultural production, this leads to further irrevocable loss of biodiversity and contributes to climate change which, in turn, affects productivity and the availability of arable land.

Which aspect of trilemma takes priority – why or when? The controversy of all three aspects has to be considered and we need to think about which issues are competing against one another. Conflicts of goals arise, and the only way out is to scrutinise the respective aspects and their impacts. However, farmers are at the center of this trilemma.

Human nutrition is dependent upon agricultural products. That is why agriculture and the food industry were declared systemically relevant and part of the critical infrastructure during the coronavirus pandemic (Revermann, 2020).

Furthermore, the pressure on the agricultural land market has increased enormously since the financial crisis of 2008. Land has become an object of speculation; the many different interests in land use with non-agricultural capital are driving up prices drastically in many places. Small and medium-sized farms (often family farms) can no longer hold on to their land and the transfer and establishment of farms are failing due to a lack of financing. Less intensive, organic farms, in particular, are increasingly at risk of ceasing to

exist. Besides providing food, these farms fulfil many other important functions for society, such as groundwater and soil protection, structural and species diversity and provide spaces for social interactions and transfer of knowledge.

3 Mixed Method Approach

Due to the current fast pace of economic and political developments, knowledge generation is key.

Because of, in part, the global situation, triggered by the pandemic and situations within the EU and Germany, topics such as the Common Agricultural Policy (CAP), the European Green Deal, the Fertiliser Ordinance and the Agricultural Package (action programme on insect protection, animal welfare labels, redeployment of direct payments) have a dynamic that requires adapted action in the ongoing investigation.

The "mixed-method design" approach used here (Auer-Srnka, 2009) to investigate the complex problematic issues relating to the challenges faced by farmers in relation to nature-protected areas promises such a pragmatic approach. "Mixed-method design" is a method that has recently been met with an increasingly positive response (Becker et al., 2019) because it allows both quantitative and qualitative measures to be taken as a scientific method (Kuckartz, 2014). The use of the qualitative data generated through this approach supports the design of the quantitative study carried out later down the line and helps to refine subsequent questions.

The use of a semi-structured questionnaire initiated the qualitative assessment of the challenges that farmers face in relation to nature-protected areas. According to the mixed-method design, the resulting insight into the concerns of farmers will later be transferred to the quantitative study. Linking together all the information collected will generate practice-oriented knowledge of farmers' aspects with regard to nature-protected areas.

The qualitative study was carried out in 21 selected nature protected areas (NPAs) in Germany. The process for selecting these project areas proceeded as follows. From a total of 8,805 nature-protected areas and 4,544 flora and fauna habitat (FFH) areas in Germany, 5,225 NPA areas were selected in an initial step which overlap with FFH areas. In a further step, the land use classification of the areas adjacent to the NPAs was determined. Taking further criteria (area size, proportion of forest, length to adjacent farmland, etc.) into consideration, the number of NPAs could be reduced to about 200. There was also a desire to ensure that these areas were distributed relatively evenly across the country. The main cause of problems was the inconsistency of demarcations (NPA/FFH), as land use data and federal state-specific NPA demarcations were not always accurate. In another step, a more precise differentiation between arable land and grassland as well as a fine analysis of land use was carried out. Fine selection and problems such as hedges and shrubs as flight barriers for insects and too short distances to the centre of NPAs further reduced the numbers of NPAs to be selected (Eichler et. al 2022).

The survey carried out is not representative as a consequence of the number of selected project areas and hence participants involved.

4 Assessment of Selected Qualitative Research

Evaluations of selected questions of the qualitative study, which describe the entanglement of dilemma and trilemma in more detail, are presented below.

4.1 Farmers' Attitude

A change in agriculture, the so called "Strukturwandel" or structural transformation, is obvious: the number of farms decline steadily in recent years. Small farms with a small area are disappearing, while the number of large farms with an area of over 200 hectares is on the rise. Due to the globalised market, competition is increasing, in which agricultural enterprises are "battling" to keep up with an efficient cultivation of their land (statista, 2021).

This is due to increasing regulations, animal welfare debates, price dumping by food retailers and imports from third countries whose products are produced to much lower standards. In addition, more and more people are concerning themselves with the way in which farmers manage their land. Farmers are facing harsh criticism and are speaking out, expressing that they feel that they are the "scapegoat" for an agricultural policy that has been misguided for years.

One respondent stated the following:

'Our profession is receiving less and less recognition. As a result, the concentration of farms will increase and family farms will be destroyed.'

One objective of the study is to find out how willing farmers are to use more ecological, biodiversity friendly farming methods (i.e. attitude). Other objectives are to analyse preparedness, the related obstacles and the importance of acceptance.

4.1.1 Willingness to collaborate with farmers to provide ecological services

Organic farming is a particular resource-conserving, environmentally sound and sustainable form of agricultural production, and therefore makes an important contribution to preserving biodiversity. It has gained traction as the income prospects of organic farms have increased due to the growing demand for organic, biologically produced food (DESTATIS, 2021). However, organic farming is supposed to be not sufficiently competitive because the sale of organic food alone does not cover the additional costs associated with this farming method. In addition, the revenues generated are not enough to compete with imported products or the high lease prices (German Environment Agency, 2022).

The participants were asked about their willingness to cooperate with other farmers to provide ecological services (Figure 4). Out of 17 respondents, 12 stated that they would be open to collaborating in this field or doing so already. Against the background of the announcement by the new BMEL and BMUV ministers of a strategic alliance (Lemke, 2022) it gives an insight into willingness with the aim of solving the key challenges of farmers – with instead of against each other (as seemed to often be the case in the previous period of government).

4.1.2 Willingness to reduce the use of plant protection products and nutrients

Plant protection is a challenging topic. The need to safeguard yields and produce high-quality and diverse food against a background of population growth, climate change, resistance and the urgency to conserve resources means that plant protection products and high-quality nutrients are an indispensable part of farmers' problematic use of these products and are showing a willingness to reduce their use of them as much as possible. As figure 5 shows, 15 participants would be prepared to reduce the use of plant protection products and nutrients, while only 2 would not.

The reduction in the use of synthetic chemically produced plant protection products is an essential effort towards ecological farming, where the use of these products is prohibited. (Sievers-Langer, 2018).

4.1.3 Willingness to enrich landscapes with small structures such as hedges and field margins

Over the course of several decades, natural and semi-natural habitats such as hedges, orchards, small woods, shrubs and field rows have been removed and converted for arable or grassland use (Feindt et al., 2019). Such landscape features serve as habitats for plant and animal species (Scheper et al., 2013). They vary from region to region and have a positive effect on agricultural land use. They protect farmland from wind and water erosion and delay water loss from the soil during dry periods. Humus is produced by foliage improving soil quality.

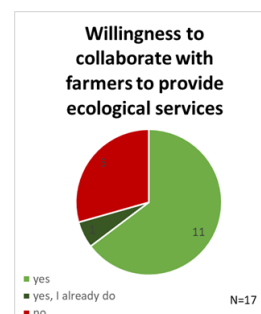


Figure 4. Question: Would you be willing to collaborate with other farmers to provide ecological services?

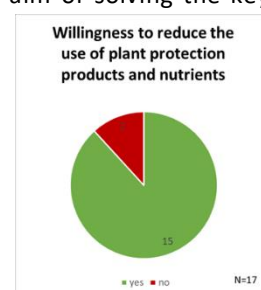


Figure 5. Question: Would you be willing to reduce the use of plant protection products and nutrients?

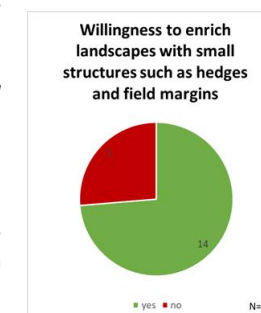


Figure 6. Question: Would you be prepared to enrich the landscape with small structures such as hedges and field margins?

The connection to nature is an influencing factor for conservation efforts as shown by the respondents' answers (Figure 6). Farmers are aware of it and apprehend the importance of it. The vast majority of respondents (14 participants) would be prepared to enrich the landscape with small structures such as hedges and field margins. Only 4 respondents would not be prepared to do so.

4.1.4 Desire to participate in the development and implementation of nature conservation measures

Farmers are resenting about the lack of and incorrect political framework conditions in place. They ask for policymakers to make reliable, consistent and forward-looking decisions in order for them to operate their farms economically and sustainably with consensus to animal welfare and nature protection. Most farmers are willing to play an active part, are open to change and have ideas to realign. The desire to cooperate is evident – see Figure 7. Almost 75% of respondents are eager to be part of the process, they want to be involved, and want their opinions to be heard by policymakers and decision-makers. They demand “to be talked to and about”.

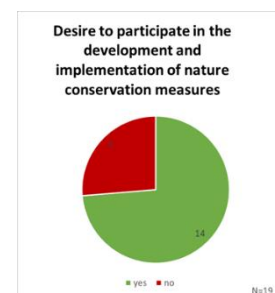


Figure 7. Question: Do you wish to participate in the development and implementation of nature conservation measures?

4.2 Recognition of farmers' work

One central aspect of the social framework as an indirect influencing factor is the recognition that farmers perceive for their work, the appreciation they feel. Consumers certainly become more cognizant when they see convoys of tractors that farmers used for the many protests starting in 2019. The relationship between town and countryside, between man and nature, has become imbalanced. Consumers, i.e. society, have not yet undergone the transformation into today's dominant understanding of agricultural farm management, many still believe in a romantic image of a farm. But not only farmers vanish, so is biodiversity. Society benefits from cheap food but forgets that farmers have a right to exist. Farmers are advocating for consequences and denouncing society for the current system that is hanging nature out to dry. They know that they have to represent and speak up for ecosystems.

4.2.1 Recognition from society of farmers' work in relation to the importance of recognition perceived by the farmers

The bar chart in Figure 8 illustrates the respondents' perceived recognition from society. Not a single farmer in the sample has the feeling that he receives much recognition from society for his work as a farmer. Three participants feel that they get adequate recognition. Of these, two are of the opinion that recognition for their work is important, whereas the other participants think the opposite. However, 14 participants believe to receive only little recognition from society. Of these, twelve are of the opinion that recognition for their work is important.

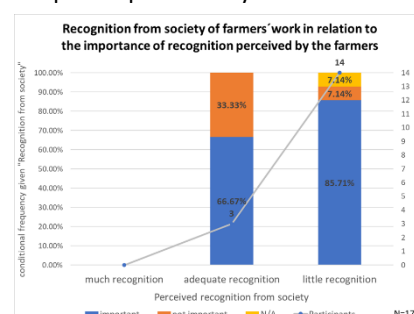


Figure 8. Combined Questions: How important is recognition of your work to you and how much appreciation of your work do you get from society?

4.2.2 Recognition from policymakers of farmers' work in relation to the importance of recognition perceived by the farmers

Farmers feel that environmental and agricultural policies are endangering family farms, they are fighting back against the constant “bashing” of farmers by policymakers and environmental organisations. Due to the fact that this was a very current topic at the time of the survey, the question of appreciation (recognition) arose.

The bar chart in Figure 9 illustrates the respondents' perceptions of recognition by policy makers. Of the farmers who feel that they receive a lot of recognition for their work from policymakers, both consider the recognition of their work to be important. Only one farmer feels to receive enough recognition from policy makers and considers the recognition of work to be very significant. However, of the 16 farmers who believe to receive little recognition for their work from policymakers, only two consider the recognition of their work as not important, while 13 believe the opposite.

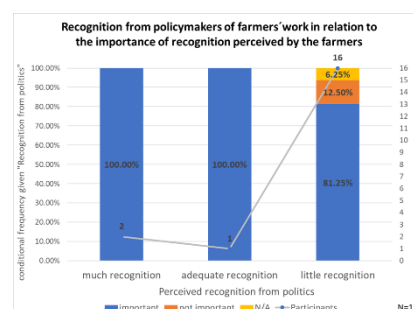


Figure 9. Combined Questions: How important is recognition of your work to you and how much appreciation of your work do you get from politics?

The results show that the respondents believe to receive too little recognition for their work, but this criterion is important to them. Recognition is thus a factor that can influence farmers' attitudes and indirectly affect agricultural production.

4.2.3 Financial recognition of farmers' work in relation to the average total cultivated area

The farmers were asked how they perceive the financial recognition of their work. Not one participant expressed a given high financial recognition for their work. On the other hand, four participants stated that they perceive the financial recognition of their work to be adequate. However, the vast majority, a total of 14 participants, feel that they receive little financial recognition of their work as farmers, which underlines the above statement.

The bar chart (Figure 10) also shows that the average cultivated area of participants who claim to receive adequate financial recognition of their work is significantly larger (934.4 ha on average) than that of those who claim to receive only low financial recognition (601.22 ha on average).

Nonetheless, agriculture, i.e. farmers, do need and ask for recognition of their work, which also implies economic gain. Farmers do not get the recognition they actually think to deserve. The many protests held in front of food retail centres in recent years just show evidence that farmers are troubled by price dumping and unfair trade practices (Federal Ministry of Food and Agriculture, 2019).

4.3 Farmers' Challenges

More animal welfare, more climate protection, more biodiversity – farmers have little to complain about when it comes to policy goals, but they are critical of the path set to be taken to achieve these goals. In recent debates, farmers have expressed that they anticipate and fear incredible challenges. Strict political requirements, lack of planning security and rise in production costs, which are offset by low producer prices, are demanding. If farmers want to go on, they need to invest in their future, which is usually done with the help of loans. Because of the ever-changing regulations and ever-tighter requirements, farmer have no idea what will be valid in ten years' time and are scared of being caught in a debt trap. The half-life of investments is getting shorter and shorter, and the depreciation of invested capital within a given period is significantly challenging. In addition, possible and planned interdictions inhibit key investments. Last but not least, the purchase or lease of land ties up important capital.

In the survey, farmers were asked to describe the challenges they face today and expect to face in five and ten years' time in an open question, multiple answers were possible. With the help of inductive categorisation according to Mayring (Mayring, 2015), the farmers' descriptions of their challenges were grouped into the following categories: Economy, Ecology, Society and Politics/Governance, which describe the causes of the challenges farmers are facing. The "Economy" category includes challenges relating to profitability, producer prices, available manpower and future viability regarding an increasing concentration of farms. The "Ecology" category describes challenges such as drought, water shortages, precipitation, climate change, wolves and the development of plant resistance. The "Politics" category includes challenges such as funding policy, increasing requirements, fertiliser regulations and plant protection product requirements. The "Society" category describes challenges such as young talent, the coronavirus, recognition and tourism. Given the complexity and scale of the challenges, it is not one single aspect that is making the situation difficult, but a variety of levels within the agricultural system that need to be considered.

It is striking that farmers perceive the challenges they face both today and in ten years' time in almost the same way, except for the fact that the ecological aspect, mainly described by climate change, is more present today. This may be due to the fact that the questionnaire was carried out at the time of the protest against the "Aktionsprogramm Insektenschutz" (insect protection programme), and a time when the fertiliser ordinance, animal welfare and the German Commission on the Future of Agriculture were under discussion – not only within the agricultural sector, but in society, too. Figure 11 illustrates the various aspects years to come.

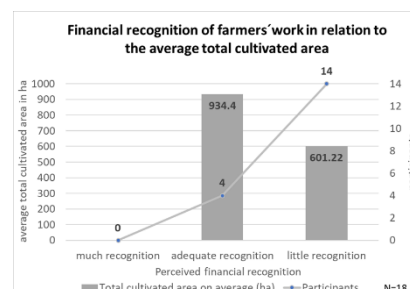


Figure 10. Combined Questions: How much appreciation for your work do you get financially and how many hectares do you cultivate in total?

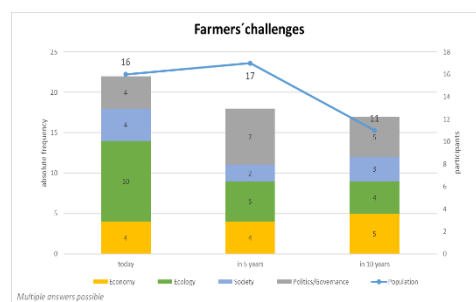


Figure 11. Question: What challenges do you face this year as well as five and ten years from now?

5 Results of assessment

The results of this analysis indicate that indirect driving forces exert pressure on farmers. Driven by work and rising costs, and stigmatised by interest groups, farmers are struggling not only to secure their economic existence, but also to achieve recognition. Farmers lack support, financing strategies and planning security. Increasing regulatory framework has a negative impact on farmers' willingness to enhance biodiversity. As the results of the assessment of farmers' willingness indicate, farmers are ready to participate in biodiversity enhancement measures if framework conditions are acceptable and agreed upon. In concrete terms, this means swiftly implementing the recommendations of the Borchert Commission and the German Commission on the Future of Agriculture for a socially supported agriculture and further developing the German strategic plan for the Common Agricultural Policy (CAP) with regard to social justice, ecology and animal welfare. Farmers are willing to "play their role". Clear framework conditions are necessary and need to be adapted to suit today's time. Demands on politics have been made clear and, above all, must be reliable in the long term in order to resolve the existing conflict of objectives faced by farmers.

6 Conclusion

To answer the introductory question of which factor is the most limiting and which is the least, it is not just a matter of identifying individual factors that need to be improved in order to encourage farmers to increase biodiversity in agriculture. It is about the interconnections between the direct and indirect factors, i.e. the entanglement of dilemma and trilemma, in which farmers find themselves, which must be resolved are essential in this complex subject area.

In order to meet challenges, entrenched behaviours, norms and ways of working need to be altered. This concerns society, policymakers and the regulatory system. The cross-cutting challenges – related to the management practices adopted by farmers both within or around NPAs – need to be addressed urgently if we are to make a concerted effort to enhance biodiversity. Emergency to environmental measures and urgency of human action are needed immediately in order to halt or even reverse the loss of biodiversity.

There is also a loud call for policy action. As the German National Academy of Sciences Leopoldina stated in the summer of 2020, a reliable and long-term framework for agriculture is necessary (Anton et al., 2020). In October 2021, a statement issued by the Sustainable Development Solutions Network Germany (SDSN Germany) read as follows: *"without fundamental, global course correction in politics, society and the economy, global warming of more than three degrees and a dramatic loss of biodiversity and habitats are imminent"* (SDSN Germany, 2021). Sustainable Development Solutions Network (SDSN) Germany also wrote an open letter to the coalition partners in October 2021 (Schnappauf et al., 2021) appealing to make sustainable development the guiding principle of the new legislative period and to approach the necessary modifications with courage. This requires a holistic and multidisciplinary approach to environmental and social sciences, a framework for land use and its resource use. Society must also be prepared to play its part. The long-term challenge is to build and maintain trust between all levels of stakeholders (farmers, consumers, policy makers, public authorities). Conducting this study, it has become increasingly clear that much more dialogue is required, not only about the subsidy landscape in general, but also about the complexity of the subject itself.

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