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Key Stakeholders in the Common Agricultural Policy: Farmers' Economic Well-Being, Attitudes, and Environmental Behavior

Dissertation

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A dream written down with a date becomes a goal. A goal broken down into steps becomes a plan. A plan backed by action makes your dreams come true.

Greg Reid

Summary

The Common Agricultural Policy (CAP) shapes the agri-food sector of the European Union (EU) by mainly regulating the distribution of financial support to agricultural producers. Based on the Treaty of Rome (1957), one of the CAP's objectives is to "ensure a fair living standard for farmers" by increasing the individual earnings of farmers and agricultural employees engaged in agriculture. Since its interception, the CAP has undergone several reforms and has become one of the EU's most regulated and controversial policies. One of the most criticized components of the CAP is the direct payment scheme. Since 2005, the CAP has provided income support for farmers through (decoupled) direct payments paid on the amount of cultivated land (in hectares). These payments are intended to stabilize agricultural incomes and ensure the long-term economic viability of farms. The criticism of the direct payment scheme is directed at its large budget and the ineffective design of income policy instruments.

The European Commission still justifies the continuation of income support by arguing that farmers' incomes remain below the economy's average income, taking only revenues gained from agricultural activity into account. But, increasingly, farms are characterized by multiple income sources and are highly heterogeneous in farm structures ('complex farms'). This calls for considering the farm household income as it comprises both farm and non-farm incomes that would be a better indicator to assess farmers' living standards. Yet, several studies on the so-called "farm income problem" in agriculture have shown that the income disparity between farm and non-farm households is diminishing in the EU. However, the household's income captures only a part of farmers' living standards. Wealth data can also shed light on inequality and stability issues. Yet, approaches contributing to this topic and highlighting the importance of the farm households' income and wealth are still scarce.

In addition, income support payments are conditional on basic agricultural and ecological standards, and farmers must comply with receiving direct payments. Over the years, income support has become increasingly multifunctional, associated with environmental goals and public provision services that will be even stronger with the new CAP reform (2023-2027). Farmers will then face changes in the direct payment scheme, for instance, a reduction of the direct payments per hectare and implementation of more performance-based payments, including higher environmental standards for farmers to receive income support. In this context, farmers have expressed their growing concerns about income policy design through protests in Germany and other European countries. As key stakeholders in the CAP, farmers play an essential role in the performance of the CAPs' instruments by rejecting or applying measures on the farm level. Farmers' decision-making is influenced by behavioral factors, e.g., farmers' attitudes, perceptions, and farmer identity, affecting their behavior on and off the farm. Promoting ecological practices and increasing the uptake of ecological approaches is intrinsic to the success of environmental policies, but this is contingent on farmers' acceptability of these practices. Poli-

cy change thus cannot be executed without a comprehensive understanding of farmer needs and drivers underlying farmers' behavior.

Therefore, this thesis looks at income support in German agriculture. It comprises three studies, providing valuable insights into farmers' economic well-being, their perspectives on direct payments, and environmental behavior. These findings are helpful for policymakers and policy design regarding 1) the improvement of data availability, 2) farmers' response and adjustment to policy change related to income support payments, and 3) farmer decision-making on the farm regarding adopting environmentally-friendly farming practices.

The present dissertation, consisting of five chapters, is organized as follows: Chapter 1 presents an introductory overview of farm income policy and the criticism of direct payments. It then outlines research gaps and objectives.

Chapter 2 provides an empirical analysis by applying an indicator that combines households' disposable income and net wealth consisting of financial assets and real estate using the Income and Consumption Survey (2018). The results reveal that the income available to farm households can support a standard of living equal to that of non-farm (employed) households. Assessing farm households' economic well-being means paying attention to their farm assets because they are highly intertwined with the household. Wealth affects households' economic well-being in both directions: farm households and workers/employees would be better off (wealthier) if only their household income would assess their financial status. The opposite trend occurs for unemployed and pensioners/retirees. Our analysis further indicates that there is currently a lack of statistical data to assess achieving a fair standard of living for the agricultural community. To derive agricultural policy implications, the Income and Consumption Survey misses farm characteristics and a reliable number of farmers' observations to determine their economic well-being over time.

Chapter 3 presents German farmers' attitudes toward the future of direct payments and their understanding of decoupled payments. The study employs a survey of 435 farmers collected from January to February 2021. Using cluster analysis and quantitative content analysis, we identified three distinct groups of farmers: (1) The "Independents" (n=185) are entrepreneurs and have a competitive mindset. The abolishment of direct payments is perceived as independence from policy conditions. (2) The "Conservatives" (n=117) advocate an income policy based on direct payments, and they reject higher environmental standards. (3) The "Environmentalists" (n=131) emphasize a pronounced environmental awareness, favoring an environmentally performance-based approach. All clusters criticize the design of income support payments, and a wish for change is widespread, but from different perspectives. From a policy perspective, a more differentiated design of policy instruments and longer transformation periods are needed to engage farmers in policy change.

Chapter 4 addresses farmers' environmental behavior. How farmers see themselves and want to be perceived by others has gained attention as a driver of adopting environmentally-friendly farming practices. However, there has been little examination of farmer identity's effect on participation in conditional schemes using regression analysis, particularly for Germany. Therefore, we provide a comprehensive sample of 441 German farmers to examine farmers' environmental behavior based on their identity, socio-demographic and farm characteristics. First, we apply Principal Component Analysis to identify groups of farmers' identities. We then use two regression models to compare the effect of farmer identity on participation in Agri-Environmental Measures and Greening. The results reveal three farmer identity groups. Only the 'environmentalist' and 'productivist' identities positively influence farmers' participation in voluntary measures, while the productivist identity also affects farmers' involvement in Greening.

Chapter 5 presents the main findings of the previous chapters and draws overall conclusions. The thesis's conclusions can be summarized as follows: First, the results support the observation that farmer' living standard is similar to those of non-farm households, and the related farm income policies are losing relevance in Germany. Second, data limitations on farm households' income and wealth may lead to misleading policy conclusions and prevent the differentiation between the poor and the non-poor. Therefore, better and more robust data sources are needed to target income support effectively for those in need and with the lowest living standard. Third, farmers with a conservative mindset show low ecological ambitions and highly criticize implementing higher environmental standards conditional to income support. These farmers need to rethink their thought patterns and behavior to meet the changing requirements for multifunctional agriculture. Lastly, farmer identity considerably affects farmers' environmental behavior. Understanding farmer identity would help to motivate farmers to act pro-environmentally as the way they perceive themselves in relation to their occupation considerably affects farmers' behavior. Hence, engaging or even increasing farmers' commitment to policy change toward more environmentally oriented policies requires a more differentiated design of policy interventions that allow flexibility on the farm level and account for the heterogeneous conditions of farmers' scope of action.

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List of Acronyms

AEM	Agri-Environmental Measure
ANOVA	Analysis of Variance
CAP	Common Agricultural Policy
CATI	Computer-Assisted Telephone Interviews
CAWI	Computer-Assisted Web Interviews
EFA	Ecological Focus Area
EU	European Union
EU-SILC	European Union on Income and Living Conditions
EVS	Income and Consumption Survey
GAEC	Good Agricultural and Environmental Conditions
PCA	Principal Components Analysis
PHF	Panel on Household Finances
SMR	Statutory Management Requirements
SOEP	Socio-Economic Panel
VIF	Variance Inflation Factor

1 General introduction

1.1 Background

The Common Agricultural Policy (CAP) has affected farmers' livelihoods, the development of farming practices, and land management in Europe since its interception in the 1960s. Within the European Union (EU), the CAP primarily allocates financial support to farmers and the agricultural community. From the onset in 1957, one of the CAP's objectives was to "ensure a fair living standard for farmers" by increasing the individual earnings of farmers and agricultural employees engaged in agriculture[1] (EEC, 1957).

Initially, a high-price policy supported farm incomes using import levies, stockpiles, and export subsidies to maintain guaranteed minimum prices (LILLEMETS et al., 2022). In 1992, the MacSharry reform significantly changed price and income support architecture (DAUGBJERG, 2003). Support for farm products through market intervention instruments was gradually replaced by direct payments paid per hectare (ha) of cultivated land (known as Single Farm Payment). Agricultural support was decoupled with a further cut in intervention prices and an extension of direct payments through the Agenda 2000. Due to increasing environmental challenges, another innovation was the reinvigoration of the structural policy, emphasizing rural development and Agri-Environmental Measures by implementing Pillar II of the CAP. In 2003, the cross-compliance regulation, which added basic requirements to be eligible for direct payments, introduced the environmental conditionality of income support payments. Then, in 2013, the Single Farm Payment Scheme was converted into a multifunctional support system, including the Basic Payment Scheme and "Greening payments" (Pillar I) (NÈGRE, 2022), increasing the income conditionality on environmental outputs.

Although the share of the EU budget has decreased from 66 % in 1980 to 35 % in 2020 (DG AGRICULTURE AND RURAL DEVELOPMENT, 2021), it is still a considerable share of the overall budget. Direct payments and market-related expenditures account for the lion's shares (approximately 40.4 Million EUR in 2021), and a minor part constitutes rural development and Agri-Environmental Schemes, about 15.3 Million EUR in 2021 (NÈGRE, 2022). However, evidence suggests that direct payments are untargeted (MATTHEWS, 2017), inflating farm rental prices (HENNING & BREUSTEDT, 2018) and failing to deliver "optimal" environmental outcomes (LAKNER et al., 2019; PE' ER et al., 2019). Thus, the direct payment scheme has become one of the CAPs' most criticized components due to its large budget paid per ha and support of inefficient farming methods (CRAMON-TAUBADEL, 2017; ECA, 2017). As a result, many scientists call for phasing out direct payments (ANANIA et al., 2009; GRETHE et al., 2018; WBAE, 2018). Scholars emphasize that the "defendants" of the direct payments have sought new goals to sustain the high level of funding (ERJAVEC & ERJAVEC, 2015). For example, the "greening strategy" in 2013 increased the condi-

[1] This leaves room for interpretations because it is not specified what is meant by a "fair" living standard.

tionality of direct payments to ecological outputs, arguing that farmers provide public goods and environmental services for society (HEINEMANN, 2017).

After the European Commission presented its proposals for the CAP beyond 2020, new regulations have sealed the CAP's future, comprising green architecture to make the EU's economy sustainable and climate-neutral by 2050 (EU COM, 2019). This includes changes in the policy's overall structure, including changes in the direct payment schemes and promoting higher environmental ambitions[2]. Fostering environmentally-friendly farming methods and increasing farmers' uptake is inevitable, determining the success of environmental policies. However, the development of sustainable agriculture also depends on farmers' acceptability of these practices (BARNES et al., 2022). Policy change thus cannot be accomplished without a comprehensive understanding of the drivers underlying farmers' behavior. The political, civil society, and scientific debates on CAP reform, have been (and still are) controversial. Largescale farmer protests in Germany and other European countries against higher ecological standards for nature conservation and animal welfare, as well as lower basic income support, reveal farmers growing concerns about the future of agriculture and their economic future (AGRARHEUTE, 2021; HEINZE, 2021).

In this context, this dissertation takes a closer look at income support in agriculture in Germany. These findings are useful for policymakers and policy design regarding 1) the improvement of data availability, 2) farmers' response and adjustment to policy change related to income support payments, and 3) farmer decision-making on the farm in terms of adopting environmentally-friendly farming practices. In the following, each study is described in more detail.

1.2 Research Gaps and Objectives

Using secondary data from official national statistics, we investigate farmers' living standards to examine the justification of the level of direct payments. Then, we focus on farmers' perspectives on income support based on primary data. Finally, we look at two dimensions of farmers' ecological behavior to gain insights into the drivers of their pro-environmental decisions. While this thesis comprises three independent studies, they all draw a broader picture of income support in agriculture in Germany by tackling this topic from different angles.

[2] Higher environmental standards are set by creating an 'enhanced conditionality', bundling the cross-compliance requirements with the Greening measures as a new baseline to qualify for income support payments. On top of that, at least 25 % of direct payments are linked to eco-schemes, which are (voluntary) measures for the climate, environment, and animal welfare. Farmers will then be (over-) compensated by adopting such methods. In addition, 11 % of funds of Pillar I shall be transferred to Pillar II to support rural development. As a result, the basic payment provision will be reduced from 2023 onward, from 173 €/ha (2020) to 156 €/ha (2023) in Germany and income support funds are thus increasingly conditional on adopting environmentally-friendly farming practices.

1.2.1 Research Objective 1

To ensure a fair standard of living for farmers, the European Commission justifies basic income support by arguing that "farm income is still significantly below the average income of the economy" (EU COM, 2018a, 2018b). Yet, empirical evidence indicates an overall decline in income disparity between farm/non-farm groups (GARDNER, 1992; MISHRA et al., 2002; STEFANI et al., 2012). While some researchers point out the effectiveness of government interventions (MISHRA et al., 2009), others link it to more structural economic changes, including the increased importance of off-farm income sources (KOESTER & LOY, 2016). In fact, farming today is only one of several financial endeavors of farm households (FORSTNER & ZAVYALOVA, 2019). In 2020, 50 % of German farms had other sources of income than farming, diversifying their income (DESTATIS, 2022). Farms are increasingly organized in complex structures, characterized by multiple income sources and multi-business operations (POPPE & VROLIJK, 2019), highlighting household income as more indicative of farmers' welfare. However, in the EU, only a few studies investigate the farm/non-farm disparity income, detecting that the farm households' incomes are not notably lower on average than those of non-farm households (DE FRAHAN et al., 2017; MARINO et al., 2021). These findings question the justification for large amounts of funding for income support for farmers and the alignment of policy in this sector.

In addition, a meaningful comparison between farm/non-farm households must also include a measure of wealth (MISHRA et al., 2002; HILL, 2012) because of its potential to determine the economic welfare of the farming community. Wealth generates income in many forms and provides security and economic power. Thus, wealth data can help identify distributions of assets and liabilities in society and how households respond to financial shocks and other economic changes (HILL, 2012). This information is essential for developing and evaluating policies designed to address the disadvantage of specific population groups (OECD, 2018).

The first study, therefore, focuses on an indicator-based approach to analyze farm/non-farm households' living standards based on their disposable income and net wealth. The general hypotheses are that the standard of living of farm households is similar to non-farm households. The consideration of farm households' wealth would increase their living standard even more than that of non-farm households. Yet, farm households' wealth is firmly neglected in developing agricultural policies addressed to enhance farmers' well-being. Although, wealth is much more unequally distributed than income within society and has thus a major influence on the overall degree of inequality (ALBERS et al., 2020). In the case of Germany, evidence shows that wealth contributes increasingly to households' economic welfare, especially in farm

households (THIELE, 1998). Due to data limitations at the European level[3], we use an official national statistic, the 'Income and Consumption Survey' (FDZ, 2018), that allows detailed comparison between German farm/non-farm households as farm households are categorized separately.

By applying an indicator-based approach, the first study of this dissertation addresses two research questions:

1.1) How does wealth affect a household's economic well-being, especially farm households?

1.2) Is the data on the disposable income and net wealth provided by the EVS sufficient to evaluate farm households' economic well-being to derive agricultural policy implications?

1.2.2 Research Objective 2

Farmers are recipients of income support payments and are thus directly affected by CAP measures and policy changes. Beliefs and attitudes are proposed to influence behavior and are critical components in understanding behavioral intentions (AJZEN, 1991). Farmers' behavior, such as adjusting to a policy change, is thus related to their attitudes (GORTON et al., 2008). Farmers' attitudes toward direct payments have been examined in previous studies, focusing on farmers' dependence on direct payments (MICHELS et al., 2019) or farmers' acceptance of alternative subsidized farm income insurance tools (MÖLLMANN, 2019). Other studies focus on the environmental measures related to income support payments (ZINNGREBE et al., 2017) and capture farmers' views on the future development of the CAP regarding environmental goals (FEINDT et al., 2021). However, these studies capture farmers' attitudes toward a specific topic and rely on relatively small samples, which can only provide a limited overview of German farmers' perspectives on the direct payment scheme.

Thus, the second study focus on farmers' views on direct payment in the context of the realignment of the CAP, which includes changes in the direct payment schemes. Farmers' roles and viewpoints on the policy change process become increasingly relevant as farmers fulfill multifaceted tasks and play an essential role in the performance of agricultural policy measures. Recently, farmers gained increasing public attention by expressing their concerns about agricultural policy development towards the government and society. Examining farmers' attitudes can provide helpful insights into farmers' thinking and adjustment patterns to policy change. However, studies investigating farmers' viewpoints on income support use relatively small samples or do not differentiate between farmer typologies (MICHELS et al., 2020; FEINDT et al., 2021), missing a comprehensive picture of farmers' perspectives. To fill this gap, we thus conducted an online and telephone survey, providing first-hand evidence of German farmers' attitudes

[3] At the European level, official statistics, e.g., EU-SILC, do not allow a detailed comparison of farm and non-farm households because of the aggregation level of household groups. Due to the small number of observations, farm households are aggregated with other household types, limiting its income analysis and the analysis of farm household living standards.

toward direct payments. We apply cluster analysis combined with quantitative content analysis using open-ended questions to offer valuable insights into farmers' perspectives on direct payments to explain these attitudes more precisely. Therefore, the second study addresses the following research questions:

2.1) What typologies of farmers can be distinguished, and how do they differ regarding socio-demographic and farm characteristics?

2.2) What implications can we derive?

1.2.3 Research Objective 3

Besides attitudes, the social-psychological concept of farmer identity has gained attention in affecting farmers' behavior in recent years, particularly in adopting environmentally-friendly farming practices (SULEMANA & JAMES, 2014; DESSART et al., 2019). The concept of farmer identity has been used to understand better how farmers view themselves as they perform their role as farmers (BURTON & WILSON, 2006). How farmer identity influences farmers' environmental behavior is partly understood, and existing literature still requires further research considering that farmers' activities are becoming increasingly multifunctional. An increasing stream of the literature suggests that farmer identity plays a considerable role in farmers' participation in voluntary schemes such as Agri-Environmental Measures (THOMAS & ENGEL, 2019; CULLEN et al., 2020). However, little attention has been paid to conditional measures due to the income conditionality of these measures.

The third study, therefore, focuses on determining factors influencing farmers' environmental behavior. Understanding the drivers of farmers' decision-making in adopting environmentally-friendly farming methods becomes increasingly relevant as farmers contribute to the performance of CAP measures and thus, achieve environmental goals (LASTRA-BRAVO et al., 2015; DESSART et al., 2019). By conducting an exploratory study, we examine the effect of the meta-concept of farmer identity (BURTON & WILSON, 2006) on their participation in conditional Greening Measures and voluntary Agri-Environmental Schemes (AEMs), and also considered farmers' and farm characteristics. Yet, farmers' identities and roles in environmental behavior are still partially understood, and empirical evidence is still scarce in Germany. Based on survey data, we use regression analysis to predict and determine factors that affect farmers' ecological behavior. The third study addresses the following research questions:

3.1) Can farmer identity be distinguished into different types?

3.2) What type of farmer identity affects participation in voluntary and conditional schemes?

Each study contributes to the topic of income support for farmers in Germany, providing valuable insights into farmers' economic well-being, perspectives on direct payments, and environmental behavior. The

main contribution of this thesis is to provide empirical evidence and thus enrich the discussion about direct payments, especially from the farmers' perspectives. Furthermore, it aims to understand better farmers' adjustment to policy change and their scope of action within the agricultural policy framework.

1.3 Thesis Outline

The remainder of this thesis is organized as follows: Chapter 2 presents the first study, which analyses the economic well-being of farm households in Germany. Chapter 3 presents the second study, focusing on farmers' attitudes toward direct payments. Chapter 4 contains the third study, which analyses farmers' participation in AEMs and Greening by considering farmer identity. Finally, Chapter 5 summarizes the main findings, draws overall conclusions, puts them into the broader context, and highlights some limitations of the studies and scope for further research.

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2 The Economic Well-being of Farm Households in Germany

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Abstract

In this study, we explore the economic well-being of farm and nonfarm households in Germany. We applied an indicator that combines households' disposable income and net wealth consisting of financial assets and real estate to data from the Income and Consumption Survey (EVS) 2018. We found that the income available to farm households can support a standard of living equal to that of nonfarm (employed) households. Wealth affects households' economic well-being in both directions: Farm households and workers/employees would be better off if their household income would assess their economic status. The opposite trend occurs for unemployed and pensioners/retirees. However, the analysis of farmers' well-being requires income data for multiple years regarding the income volatility of self-employment in agriculture. Considering wealth to assess farm households' economic well-being means paying attention to their farm assets because they are highly intertwined with the household. The EVS misses farm characteristics and a reliable number of farmers' observations to assess their economic well-being over time to derive agricultural policy implications. Hence, there is currently a lack of statistical data and evidence to achieve the Common Agricultural Policy (CAP)'s second objective to provide income support in a targeted manner.

Keywords: Economic well-being, farm households, disposable income, wealth, the fair standard of living

2.1 Introduction

In 2018, the European Commission proposed a set of amendments to the Common Agricultural Policy (CAP). It justified basic income support for farmers beyond 2020, arguing that "farm income is still significantly below the average income of the economy" (EC, 2018a, 2018b). Around 60% of the CAP budget (41.74 bill. EUR of 58.82 bill. EUR) was spent on income support for farmers in 2018 (EC, 2019). The claim is that the average agricultural entrepreneurial income per family work unit is lower than the average gross wages and salaries in the total economy. However, this is controversial and poorly documented (ECA, 2004, 2016; OECD, 2003, 2004). The Commission only takes farm income into account and overlooks the off-farm incomes that farm households often earn. When considering the need for income support, the Commission also lacks considers households' wealth because it provides a potential command over goods and services (EUROPEAN PARLIAMENT, 2015). This incomplete comparison does not appropriately reflect the intent of the CAP's second objective, "to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture" (ART. 39B; EU, 2009).

Given the importance of wealth to farmers' standard of living, the purpose of this paper is to examine the economic well-being of farm households in Germany. To gain insights into whether farm households are different from other households, we use a nationwide sample of households based on the Income and Consumption Survey (EVS). We combine household income and wealth with an economic well-being indicator to better picture a household's potential consumption-ability. This paper addresses the questions: (1) How does wealth affect a household's economic well-being, especially farm households? (2) Is the data on income and wealth provided by the EVS sufficient to evaluate farm households' economic well-being to derive agricultural policy measures?

Outside the EU, previous studies have focused on examining factors that affect farm households' economic well-being (MISHRA et al., 2002; JONES et al., 2006; MISHRA & EL-OSTA, 2009; ZHANG et al., 2021). In doing so, farm household wealth, expenditures of the households, and the total household income variability regarding their off-farm and on-farm income have been taken into account (MISHRA et al., 2002). Inside the EU, very few studies have recently examined the economic well-being of farm households. Most of the literature focuses on farm income because of data availability constraints and the analyses' agricultural policy orientation (SEVERINI et al., 2016; SALVIONI et al., 2020; FINGER & EL BENNI, 2021). In the early 2000s, it has already been emphasized that households' wealth should not be ignored to assess agricultural policy measures' efficacy (THIELE, 2000). Since then, little attention has been given to this issue and the availability of household data. This is surprising, particularly given the CAP's current realignment and the increasing criticism of the basic income support system for EU farmers (e.g., HEYL et al., 2020).

We aim to contribute to an improved understanding of the current economic well-being of farm households in Germany by providing empirical evidence for the importance of farm households' wealth. Additionally, we draw attention to the available data to analyze the standard of living of farm households considering CAP's second objective.

The remainder of this paper is organized as follows: In Section 2.2, we provide an introductory overview of the contextual background to farmers' economic well-being. In Section 2.3, we introduce the database and the methods of statistical analysis. In Section 2.4, we present and discuss the empirical results of the effect of wealth on economic well-being. In Section 2.5, conclusions are drawn from the analysis.

2.2 Background Information

2.2.1 Contextual Background

The standard of living mentioned in the CAP's second objective is a material concept related to farmers' economic status and economic well-being, determining their consumption possibilities. In recent years, a consensus emerged to consider households as the most suitable observation unit for evaluating living standards. Households have a great command over the consumption of goods and services, ac-

cumulate wealth, and can adopt diversification strategies to cope with increasing instability and risks in the sector (MISHRA et al., 2002; HILL, 2012; VROLIJK & POPPE, 2019).

A farm operator's income obtained from farming is not a reliable guide to his or her household income level because farm households are recipients of substantial amounts of off-farm income (EUROPEAN PARLIAMENT, 2015; HILL & BRADLEY, 2015; LASCHEWSKI et al., 2019). Evidence has shown that farming structures are becoming increasingly diversified as parts of the farm business are legally separated from the original farm (FORSTNER & ZAVYALOVA, 2019). Official statistics providing household data lack comprehensive on-farm and off-farm income data. Consequently, the data quality is increasingly criticized on which policy measures for income support are based (ECA, 2016).

Furthermore, farmers' economic status is not simply dependent on their annual income but also reflects their wealth. It has been pointed out that the CAP aiming to ensure a fair standard of living for farmers should not ignore the wealth position of the intended recipients of income support (THIELE, 1998; HILL, 2012). Yet, the net wealth of farm households is firmly set aside by policy-makers when deciding the shape of agricultural policy. Therefore, information on wealth and income is essential to evaluate agricultural policy measures' effectiveness and efficacy in achieving the CAP's income objectives (EUROPEAN PARLIAMENT, 2015).

2.2.2 Wealth and its Components

Data on household wealth can help understand how certain types of assets or liabilities are distributed within society and how different types of households respond to financial shocks and other economic developments (BALESTRA & TONKIN, 2018). Since the early 1990s, the average household's net wealth in German households has grown more rapidly than the average disposable income (figure 2.1).

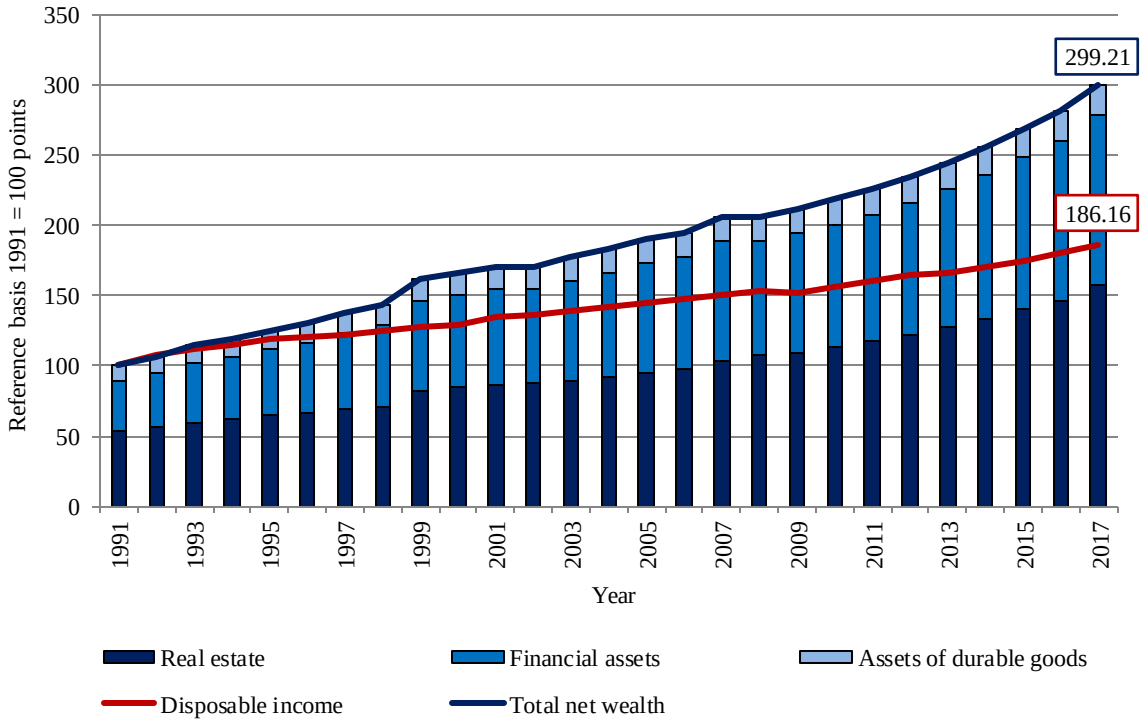

Fig. 2.1: Development of disposable income and net wealth of households in Germany between 1991 and 2017. Numbers are inflation-adjusted.
Source: DESTATIS (2018a), own calculation.

Between 1991 and 2017, total disposable household income has grown by 3.31% p.a., from 1,004.47 bill. EUR to 1,869.92 bill. EUR. In that time, the total net wealth has increased even more by 7.66% p.a., from 4,562.2 bill. EUR to 13,650.5 bill. EUR. Financial assets and real estate account for the most significant household wealth shares, whereas the value of durable goods has remained comparatively stable (DESTATIS, 2018a). This development indicates the increasing importance of wealth regarding the economic status of German households.

When defining households' total net wealth, there is an ongoing discussion about pensions and their functioning as assets. Pensions are the discounted expected present value of future entitlements from the public, occupational, and private pension schemes. It has been argued that pension wealth serves as a substitute for other forms of private savings (BÖNKE et al., 2017). However, pensions function differently than different types of asset values such as financial assets, real estate, or assets of durable goods: Pensions do not provide utility or security against shocks in the present; they do not generate income; and they do not fulfill any inheritance function (GRABKA & WESTERMEIER, 2014). Most German farmers do not participate in public pension schemes. Instead, they mainly accumulate their retirement savings based on farmers' retirement provisions (1994) to cover their post-retirement consumption needs. That means that farmers hold higher amounts of financial assets and real estate and fewer precautionary savings from public pension insurance than members of other professions (THIELE, 1998). Referring to GRABKA & WESTERMEIER (2014), we do not include pension wealth in the following comparative analysis of farm and nonfarm households' economic well-being.

Farm households' wealth has a special position as it is highly intertwined with the farm business (figure 2.2) because production and consumption occur at a central place.

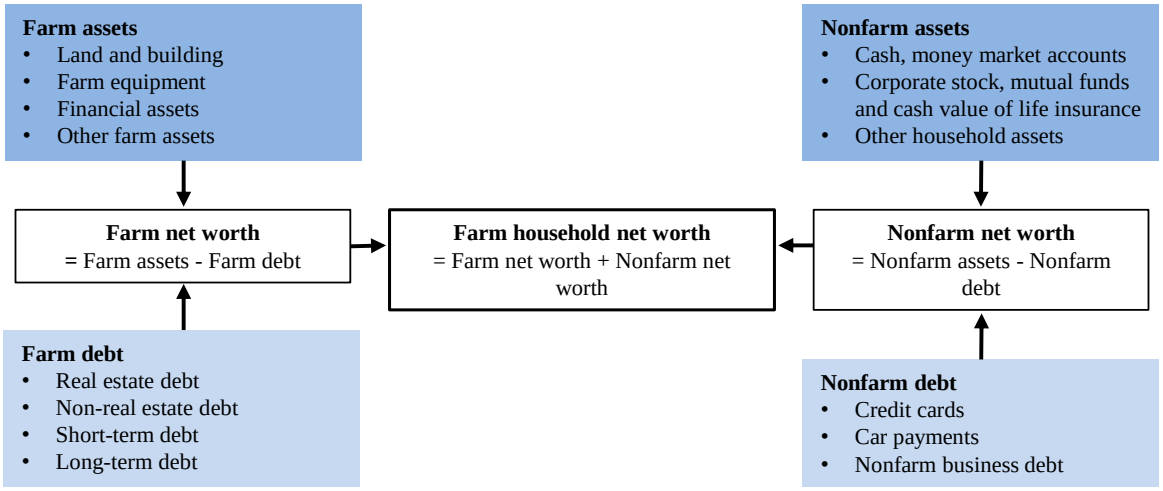

Fig. 2.2*:* Farm household's net worth
Source: Adapted from MISHRA et al. (2002).

The household wealth of farmers combines farm assets (minus farm debt) and nonfarm assets (minus nonfarm debt). Farm households derive their wealth from a variety of sources. It ranges from physical holdings of both the business and household to various types of financial assets, all differing in level of liquidity, capital certainty, and visibility. It may be acquired through savings, inheritance, or household asset appreciation (MISHRA et al., 2002). Within the farmers' group, wealth is more unequally distributed than incomes, and farmers who own land are likely to have a markedly different economic status from those who are tenants. Wealth is significant to strategic decisions, such as staying in or exiting farming (EUROPEAN PARLIAMENT, 2015) or diversifying economic activities on or off the farm (MISHRA et al., 2002; WELTIN et al., 2017). Farms have grown increasingly in size and specialization (EUROSTAT, 2018a), affecting farm financial management and the farm household. Gross capital formation on farm assets depends on the share and degree of specialization, and farm size. In this regard, farm characteristics are crucial for analyzing farm households' wealth and evaluating their economic well-being.

2.2.3 Literature Review on Farms' Economic Status

On-farm diversification is becoming a key strategy for an increasing number of farms (MISHRA et al., 2004; SALVIONI et al., 2020). Considering off-farm activities, approximately half or more of all households that operate farms in the EU also have some other gainful activity (EUROSTAT, 2018a). Depending on the agricultural business and household characteristics, the extension of on-farm and off-farm business activity represents a vital adaptation strategy to cope with the variability in climate, farm income risk, market pressures, shortage of hired labor, and changing political framework conditions (MERANER et al., 2015; WELTIN et al., 2017; SALVIONI et al., 2020). Those risk management

tools stabilize the households' income in developed and developing countries (PIENIADZ et al., 2009; KHANAL & MISHRA, 2015; SENADZA et al., 2018; D'SOUZA et al., 2020).

Since farming today is only one of several economic endeavors of farm households, household income indicates an individual's welfare (HILL, 2018). Looking at the income distribution of households over the last two decades, in many OECD member countries, including EU countries, the average income of farm households did not differ significantly from those of nonfarm households (HILL, 2012; DE FRAHAN et al., 2017; ROCCHI et al., 2020; MARINO et al., 2021). Additionally, evidence has been provided that farm income has played an increasingly minor role in determining farm households' well-being (THIELE, 1998; MISHRA et al., 2002). THIELE (1998) found that considering wealth improves farm households' economic status most significantly compared to other households with different professions (THIELE, 1998). Finally, farm households' net worth acts as a cushion for farm income risk, much as off-farm income does for households operating smaller farms (JONES et al., 2009). Wealth affects farm households' economic well-being by enabling farm households to secure credit, facilitate an intergenerational transfer, and smooth consumption expenditures in times of income shortfall (MISHRA & EL-OSTA, 2009). Estimates of the economic status that combine current income with net worth have not so far taken a significant part in the EU agricultural statistics.

2.3 Data and Method

2.3.1 The Income and Consumption Survey

This study uses data from the EVS, an official statistic on households' living conditions in Germany. The EVS provides statistical information on the provision of consumer goods, income, wealth, debts, and consumption expenditures of households[4] collected every five years (FDZ, 2018). Financial assets and real estate cover wealth. Tangible assets are provided only by the endowment of durable goods. Compared to other statistics on a household-level (cf. Socio-Economic Panel (SOEP), European Union Statistics on Income and Living Conditions (EU-SILC), Microcensus), the advantage of the EVS is that farm households are defined as an individual group. Due to the disaggregation level, we can explicitly assign income and wealth to farmers, allowing us to compare farm households' economic well-being with other groups. The sample consists of households with a monthly net household income of less than 18,000 EUR (FDZ, 2018). The absence of households with an exceptionally high income affects wealth distribution analysis since a vast proportion of wealth is assumed to be owned by households with a high income (PIKETTY, 2015; GRABKA & HALBMEIER, 2019). One limitation of the EVS is that it does not reflect the actual concentration of households' wealth in Germany (FEDERAL STATISTICAL OFFICE BERLIN-BRANDENBURG, 2019). Compared to other official statistics (e.g., the PHF survey of the German Federal Bank, National Accounts), wealth and income from self-employment are underestimated using the EVS. This problem is related to determining revenues from

[4] A household is defined as a single person or a group of relatives or personally related (including non-family) persons who operate household earnings and expenditure jointly.

self-employment, e.g., if business and household assets values or operating costs and private expenses cannot be separated by households (FDZ, 2018).

We use an 80% -subsample[5] of the EVS 2018 with a total sample of 42,226[6] households. As a quota sample, the EVS claims representativeness about three selected quota characteristics: household type, the profession of the main income recipient, and net household income. A quota-controlled sampling procedure based on the Microcensus 2016 is set in place, i.e., these quota characteristics are specified for each federal state of Germany. The results are weighted (generalized regression estimation) using the Microcensus (FEDERAL STATISTICAL OFFICE BERLIN-BRANDENBURG, 2019). It is worth noting that respondents can decide for themselves whether or not to participate in the EVS. This procedure may lead to selection bias. Two aspects justify using a single year for the following analysis: first, wealth is not considered a quota-defined characteristic in the EVS. Second, farm households are relatively underrepresented in the EVS. Considering that respondents participate voluntarily, using multiple-year data to compare farm households' income over time may produce biased estimates of the targeted population. The small sample size does not represent the agricultural community's heterogeneity.

2.3.2 The Economic Well-being Indicator

We now proceed to the economic well-being approach of households developed by WEISBROD & HANSEN (1968). The approach combines both the flow concept of income and the stock wealth to reflect the potential spending power of a household (equation 1).

$$Y_t^* = Y_t^{VE} + V_t^{VE} \times \frac{i_v}{1 - (1 + i_V)^{-n}} \quad (1)$$

Y_t^* = Economic well-being at the time of t

Y_t^{VE} = Disposable income per actual consumable unit at the time of t

V_t^{VE} = Net worth (financial assets and real estate) per actual consumable units at the time of t

i_v = Interest rate for the financial assets and the real estate

n = Life expectancy at the time of t

According to equation (1), the economic well-being (Y_t^*) at a certain point in time t is composed of the addition of the current disposable income (Y_t^{VE}) and an income equivalent to the present value of net worth (V_t^{VE}) evaluated at time t. The disposable income (Y_t^{VE}) is the gross income from gainful employment, income from assets and public and non-public transfer payments, income from subleasing or sale of goods, and refunds minus liabilities, such as compulsory contributions and taxes. Net worth is calculated using financial assets and real estate. Financial assets are calculated from several entries for savings, building loan contracts, and insurance minus obligations as a borrower, such as consumer

[5] Due to the data privacy of the participants given by the Federal Statistical Office.
[6] The number represents a quota sample of 0.2% based of the Microcensus. That is the number of the total sample without applying a multidimensional outlier detection method.

credits (FDZ, 2018). The surveyed household member estimates real estate as a market value, which could have been achieved on January 1st of the respective year (DESTATIS, 2018b). The basic value of properties is inquired to check the market value's plausibility and estimate the actual achievable purchasing price (KOTT & BEHRENDS, 2009). V_t^{VE} is then multiplied by a distribution factor ($\frac{i_V}{1-(1+i_V)^{-n}}$) to split the net worth evenly over the remaining lifetime of a household[7] (DESTATIS, 2020). The underlying assumption is that a household's net worth, including the return of interest (DESTATIS, 2019), is depleted at the end of a person's life. At this point, the limitation of the approach emerges to the extent that it neglects the possibilities of inheritances and donations, which, if they exist, make a considerable contribution to wealth formation (THIELE, 1998; KOHLI et al., 2006). Consequently, this approach does not reflect the actual but rather a possible spending power of a household (WEISBROD & HANSEN, 1968; THIELE, 1998).

Finally, we use the OECD equivalence scale to consider that each household type in the population is assigned a value in proportion to its needs. We adjust the households' income and the income-equivalent of the net worth to the household's size and its members' age. The first person in the household is weighted by 1 and the other adults (aged 14 and above) by 0.5. Children under the age of 14 are weighted by 0.3 because they consume less. Thus, the underlying assumption is that relatively high savings emerge through joint housekeeping by several persons (OECD, 2013).

2.4 Results

2.4.1 Disposable Income and Net Wealth of Households in Germany

We start our analysis by exploring the level of disposable income per month and the net wealth of farm and nonfarm households. We use the main income recipient profession to distinguish among household types and disregard the profession of other employed household members. Based on the EVS 2018, we use the lowest disaggregation level for household types in the analysis: farmers, self-employed, civil servants, workers/employees, unemployed, and pensioners/retirees[8]. By comparing unemployed households and pensioners/retirees with employed households, there is a close link between the demographic characteristics of a household, such as size and composition of a household, age structures, level of education or employment opportunities, and the distribution of households' income (BRANDOLINI & D'ALESSIO, 2001). Before analyzing the level of disposable income and net wealth[9] (BILLOR et al., 2000), we first look into the household characteristics' descriptive statistics (table 2.1).

[7] We assume a life expectancy of 80 years of each household.

[8] Other household types such as students, pupils and "other" were excluded from the sample because of the considerable small sample size and the vague differentiation of potential employment characteristics such as social security or tax contributions.

[9] To identify outliers, we used the Blocked Adaptive Computationally efficient Outlier Nominators (BACON) algorithm. With a parameter of 5% (p= 0.05), a subset of 842 observations was detected as outliers, representing 2.06% of the total sample.

Tab. 2.1: Descriptive statistics of household characteristics of each household type in 2018.

Household characteristics/ household types	Sample size	Average household size(persons/ household)	Average age (in years)	Highest level of education (modus)	Employment (persons/ household)
Farmers	68	3.33	52.42[b]	Apprenticeship	1.96
Self-employed	1,172	2.38	50.97[b]	College	1.56[c]
Civil servants	3,632	2.45[a]	40.71	College	1.61[c]
Workers/Employees	20,889	2.24	44.28	Apprenticeship	1.49
Unemployed persons	1,211	1.62	48.78	Apprenticeship	0.05[c]
Pensioners/Retirees	13,094	1.54	72.42	Apprenticeship	0.05[c]
Total	40,066	2.01	53.63[b]	Apprenticeship	1.50[d]

Source: FDZ (2018), own calculation.

[a] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the average household size of self-employed (standard error (se) = 0.0372; confidence interval (ci) = 2.4595-2.2925) and civil servants (se = 0.0215; ci = 2.4986-2.4024) is not significant. The differences of the average household size of all other household types are statistically significant.

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the average age of farm households (se = 1.2347; ci = 49.5859-55.2479) and self-employed (se = 0.3130; ci = 50.2639-51.6688) and the total sample (se = 0.0838; ci = 53.4394-53.8150) are not significant.

[c] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the employment of self-employed (se = 0.0174; ci = 1.5166-1.5945) and civil servants (se = 0.0101; ci = 1.5834-1.6285) is not significant. The difference between unemployed persons (se = 0.0067; ci = 0.0368-0.0680) and pensioners/retirees (se = 0.0023; ci = 0.0491-0.0594) is not significant.

[d] Only employed household types such as farmers, self-employed, civil servants, and workers/employees are included in the total number.

Farm households are on average significantly more extensive and older than other employed household types. Regarding the level of education, self-employed and civil servants tend to have the highest level of education. Farm households draw their income from approximately two household members. Compared to other employed household types, more household members of farm households contribute to the household income. We use confidence intervals to test the significance of the differences in the household characteristics of all household types. In doing so, the number of observations is explicitly included in the calculation of confidence intervals. The margin errors are more significant for farm households due to the small sample size indicating wider confidence intervals. As a result, the confidence interval estimates for farmers are less precise.

Table 2.2 illustrates the findings of the income distribution for each household type and the total sample[10] (ROYSTON, 1991). Appendix A 2 confirms that the disposable income is not normally distributed for each household type and the total sample.

[10]The absence of homoscedasticity (Levene Test: Income (F = 171.83, df = (5, 40,060), p = 0.0000); Wealth (F = 373.67, df = (5, 40,060), p = 0.0000)) and normal distribution: Pr(Skewness) = 0.0000 and Pr(Kurtosis) = 0.0000 at 5% significance level for both income and wealth) of the data does not allow the analysis of variance.

Tab. 2.2: Descriptive statistics of disposable income (in EUR) per consumption unit in Germany in 2018 by household types.

Household types	Sample size	Mean	Median[a]	Min	Max	Standard deviation	Gini-coefficient
Farmers	68	2,479.98[b]	2,319.31[c]	793.33	8,056	1,185.34	0.23[d]
Self-employed	1,172	2,725.41	2,340.45[c]	-643.33	9,316.33	1,671.81	0.32
Civil servants	3,632	3,302.93	3,176	623	9,058	1,231.07	0.20[d]
Workers/Employees	20,889	2,648.52	2,404	-165.11	9,222.67	1,219.04	0.24[d]
Unemployed persons	1,211	1,073.87	928.33	-166.67	7,985.33	575.17	0.20[d]
Pensioners/Retirees	13,094	2,126.06	1,899.11[c]	-2,658.33	9,195.78	1,092.11	0.27[d]
Total	40,066	2,444.06[b]	2,203.67	-2,658.33	9,195.78	1,258.77	0.27[d]

Source: FDZ (2018), own calculations.

[a] According to Kruskal-Wallis-Test. the differences of the median among all household types are statistically significant at 5% level (chi-squared = 5,884.77 with 5 d.f., p = 0.0001).

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the mean income of farmers (se = 143.74; ci = 2,150.39-2,809.57) and the total sample (se = 6.29; ci = 2,429.97-2,458.16) is not significant. The differences of the mean income of self-employed, civil servants, workers/employees, unemployed persons and pensioners/retirees to the total sample are significant.

[c] Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences of median income of farmers to self-employed (z = -1.64; p = 0.0502) and pensioners/retirees (z = 0.71; p = 0.2383) are not significantly at 5% level.

[d] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini-coefficient of farmers (standard error (se) = 0.0281; confidence interval (ci) = 0.1698-0.2959) to civil servants (se = 0.0038; ci = 0.1961-0.2131), workers/employees (se = 0.0014; ci = 0.2415-0.2477), unemployed persons (se = 0.0101; ci = 0.1794-0.2246), pensioners/retirees (se = 0.0019; ci = 0.2613-0.2697) and the total sample (se = 0.0011; ci= 0.2706-0.2756) are not significant. The differences between civil servants and unemployed persons are also not significant.

Results presented in table 2.2 show that farm households have the lowest average income per month across all employed household types. There is a significant discrepancy between the mean and median income of all household types. The mean income is noticeably higher than the median income, which indicates a strong positive asymmetry of the distribution. The distribution implies that many households have low incomes, and comparably few households have high incomes (FDZ, 2018). This result is comparable with other official statistics (DESTATIS, 2018b). The median income, being a more adequate measure of the average level of a household's income (GRABKA & GOEBEL, 2018), shows that farm households have an income significantly above the total sample's median income. Compared to the mean income, farmers' median income is not significantly different for self-employed and pensioners/retirees. According to the household characteristics (table 2.1), the income per household member is lower for farm households than for the other employed household types. Household income is relatively equally distributed within all household types, except for self-employed.

Table 2.3 presents the distribution of households' wealth, indicating considerable differences in the distribution of net wealth across the household types. Appendix A 2 confirms that the net wealth is not normally distributed for each household type and the total sample.

Tab. 2.3: Descriptives statistics of net wealth (in EUR) per consumption unit in Germany in 2018 by household types.

Household types	Sample size	Mean	Median[a]	Net Wealth		Standard deviation	Gini-coefficient
				Financial assets (%)	Real estate (%)		
Farmers	68	226,740.2	195,835.7	27.95	72.05	203,210.3	0.46[c]
Self-employed	1,172	174,147.7	109,059	36.48	63.52	197,095.7	0.53[c]
Civil servants	3,632	113,055.5	66,055.34	35.68	64.32	140,006.5	0.55[c]
Workers/Employees	20,889	88,109.19	36,524.16	38.09	61.91	126,671.5	0.59[c]
Unemployed persons	1,211	16,420.11	0	39.85	60.15	60,596.99	0.79
Pensioners/Retirees	13,094	127,535.6	66,666.66	32.85	67.15	159,094.5	0.56[c]
Total	40,066	103,655.9[b]	42,593.89	35.75	64.25	144,526.1	0.59[c]

Source: FDZ (2018), own calculations.

[a] According to Kruskal-Wallis-Test. the differences of the median among the household types are statistically significant at 5% level (chi-squared = 2,202.88 with 5 d.f., p = 0.0001). Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences in the median wealth of all household types are significant.

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the mean wealth of all household types to the total sample (se = 722.04; ci = 102,037.5-105,274.4) are significant.

[c] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini-coefficient of farmers (standard error (se) = 0.4150; confidence interval (ci) = 0.3661-0.5522) to self-employed (se =0.0089; ci = 0.5146-0.5544), civil servants (se = 0.0071; ci = 0.5363-0.5682) are not significant at 5% level. The differences of self-employed, civil servants, and pensioners/retirees (se = 0.0032; ci = 0.5534-0.5678) are not significant. The difference of civil servants and pensioners/retirees are not significant as well as the differences of workers/employees (se = 0.0026; ci = 0.5865-0.5980) and the total sample (se = 0.0019; ci = 0.5844-0.5929).

Farm households have the highest amount of net wealth, which is dominated by real estate. The mean wealth is significantly higher than the median wealth, which points to a positive asymmetry (right-skewed) of the distribution, i.e., only a few households dispose of high net wealth, and many households dispose of a low(er) net wealth (FDZ, 2018). This result corresponds with other statistics on the distribution of wealth in Germany (DIW, 2019). The Gini coefficients for net wealth are higher than the disposable income indicating a higher concentration of wealth across the household types. Table 2.4 depicts the correlation between disposable income and net wealth.

Tab. 2.4: Spearman's rank correlation coefficient for the disposable income and the net wealth.

	Rho p-value[a]	Strength of correlation[b]
Farmers	0.39 0.0010	Weak positive
Self-employed	0.50 0.0000	Moderate positive
Civil servants	0.49 0.0000	Moderate positive
Workers/Employees	0.56 0.0000	Moderate positive
Unemployed persons	0.32 0.0000	Weak positive
Pensioners/Retirees	0.66 0.0000	Moderate positive
Total	0.56 0.0000	Moderate positive

Source: FDZ (2018), own calculations.
[a] The Spearman's rank correlation coefficient rho is significant in all cases at 5% level.
[b] Categories of correlation are adapted from DANCEY AND REIDY (2007).

Spearman's rank correlation is significant in all cases, and both variables are positively correlated. This correlation is weak or moderately positive, and the highest value has been found for pensioners/retirees. Overall, the results show considerable differences in the distribution of disposable income and net wealth across all household types. For employed household types, farm households have the lowest average disposable income and the highest net wealth. In contrast, the other employed household types are characterized by high(er) average income and lower net wealth levels. Unemployed households such as unemployed persons have, on average, the lowest disposable income and net wealth. In contrast, pensioners/retirees have a low average income and a relatively high net wealth.

2.4.2 The Economic Well-being of Households in Germany

In the following section, both disposable income and net wealth are combined into one indicator to investigate the level and the distribution of households' economic well-being (table 2.5).

Tab. 2.5: Descriptive statistics of economic well-being (in EUR) per consumption unit in Germany in 2018 by household types.

Household types	Sample size	Mean	Median[a]	Min	Max	Standard deviation	Gini-coefficient
Farmers	68	2,590.03	2,237.2[c]	250.57	7,703.63	1,386.44	0.28[d]
Self-employed	1,172	3,075.86	2,495.80[c]	-564.87	41,026.25	2,536.39	0.36[d]
Civil servants	3,632	3,321.29	3,139.36	731.38	11,066.02	1,334.70	0.22[d]
Workers/Employees	20,889	2,679.50	2,388.87[c]	-167.53	11,042.37	1,302.69	0.25[d]
Unemployed persons	1,211	1,089.75	931.51	-128.45	9,236.57	639.51	0.21[d]
Pensioners/Retirees	13,094	5,556.10	2,751.57	-2,665.73	77,128.34	8,090.34	0.56
Total	40,066	3,565.77[b]	2,422.54	-2,665.73	77,128.34	4,900.08	0.44

Source: FDZ (2018), own calculations.

[a] According to Kruskal-Wallis-Test, the differences of the median among all household types are statistically significant at 5% level (chi-squared = 3,802.27 with 5 d.f., p = 0.0001).

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the mean well-being of all household types to the total sample (se = 24.48; ci = 3,510.90-3,620.65) are significant.

[c] Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences of the median well-being of farmers to self-employed (z = -1.80; p = 0.0358), and workers/employees (z = -1.85; p = 0.0321) are not significant. The difference of self-employed and workers/employees (z = -0.04; p = 0.4984) is also not significant at 5% level.

[d] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini-coefficient of farmers (standard error (se) = 0.0248; confidence interval (ci) = 0.2226-0.3339) to self-employed (se = 0.0125; ci = 0.3326-0.3891), civil servants (se = 0.0039; ci = 0.2083-0.2256), workers/employees (se = 0.0014; ci = 0.2511-0.2576) and unemployed persons (se = 0.0108; ci = 0.1905-0.2389) are not significant. The differences of civil servants and unemployed persons are statistically not significant.

Farm households have the lowest average economic well-being among employed households. The mean and median well-being of farm households are significantly below the mean and median observed for the total sample. The Gini-coefficients indicate that income and wealth are more equally distributed among farmers, self-employed, civil servants, workers/employees, and unemployed persons than among pensioners/retirees. Income and well-being quartiles are created based on the total sample to investigate the economic well-being distribution across all household types in more detail. We calculate the ranges of households' income and economic well-being to determine the lowest to the highest group (figure 2.3). We then assigned each household type to the ranges. Income quartiles are used as a reference to explicitly show the effect of wealth on the households' economic status. Figure 2.3 illustrates the percentage share of all household types in the income and economic well-being groups from the lowest to the highest.

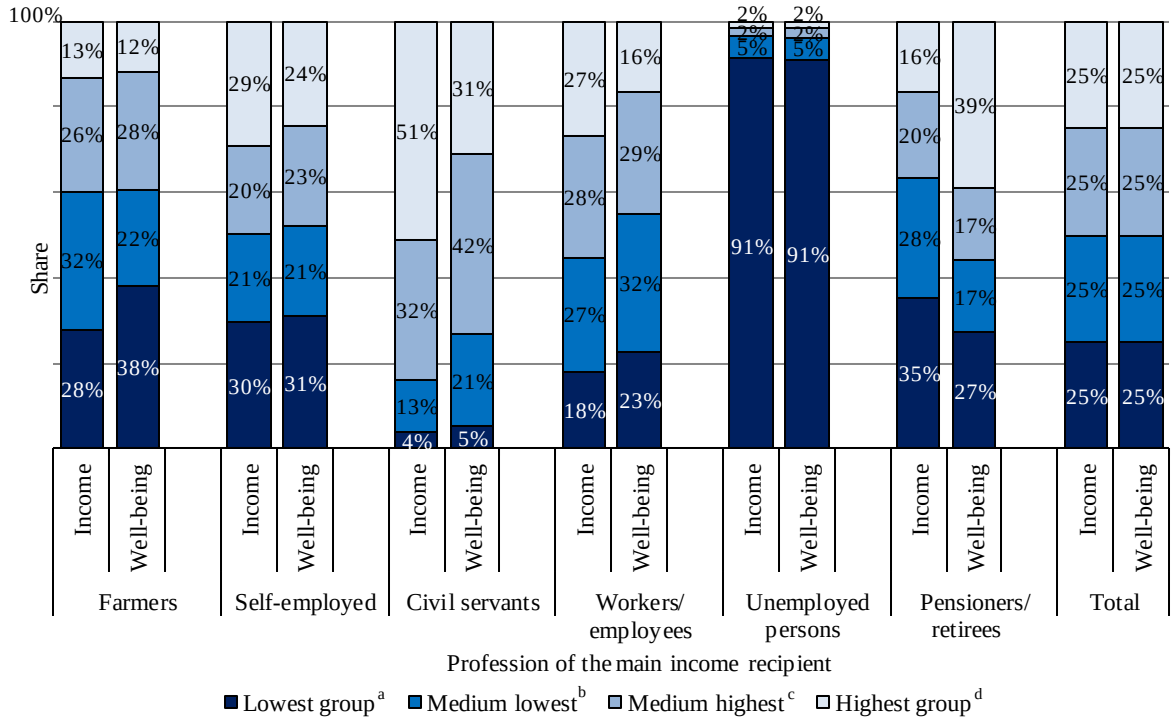

Fig. 2.3: Household types (in %) in income and well-being quartiles.

[a] Income (≤ 1,752.89 EUR) or well-being (≤ 1,870.49 EUR)
[b] Income (> 1,752.89 EUR and ≤ 2,435 EUR) or well-being (> 1,870.49 EUR and ≤ 2,698.67 EUR)
[c] Income (> 2,435 EUR and ≤ 3,321.11 EUR) or well-being (> 2,698.67 EUR and ≤ 3,945.30 EUR)
[d] Income (> 3,321.11 EUR) or well-being (> 3,945.30 EUR)
Source: FDZ (2018), own calculations.

The results indicate that more farm households are ranked in the lowest group considering the economic well-being compared to the disposable income. This trend relatively appears for all employed household types, while the opposite trend occurs for unemployed households. In contrast, considering the economic well-being shows fewer households of civil servants, workers/employees, and self-employed are ranked in the highest group. It appears that considerably more pensioners/retirees are ranked in the highest group for unemployed households, and unemployed persons remain unaltered. The results indicate that civil servants and pensioners/retirees have the highest spending power related to their economic well-being, followed by self-employed and workers/employees. Farm households' economic well-being is relatively low, and farmers would be better off when we assess their economic status based on household income. Overall, wealth affects the standard of living of households differently. It is unclear whether farmers' economic well-being is more affected by their wealth than other household types due to the small sample size of farm households compared to the total sample.

2.5 Discussion and Conclusion

The objective of this paper was to analyze the economic well-being of farm households in Germany based on the EVS 2018. We combined the disposable income and net wealth of financial assets and real estate of farm and nonfarm households to an economic well-being indicator. First, we analyzed the effect of net wealth on economic well-being by using various inequality measures. Second, we

examined the database's quality to evaluate farm households' economic well-being, considering the second objective of the CAP.

The results demonstrate that farm households are a group of low-income and high-wealth. The income available to farm households can support a standard of living equal to that of nonfarm (employed) households. Considering the net wealth, results reveal that economic well-being is affected differently across household types. Our findings are in line with other previous studies within an agricultural context on farmers' income and wealth inside and outside the EU (THIELE, 1998; MISHRA et al., 2002; JONES et al., 2009; MARINO et al., 2021). When assessing farmers' standard of living, we conclude that wealth should be taken into account because it affects the households' economic status.

Using the EVS to examine farmers' economic well-being presents some limitations due to the data's quality. More explicitly, the limitation of the findings is related to the reliability and validity of the results as the analysis refers to one-year data and a small number of observations of farm households. The problem with single-year data refers to the income volatility generated by agricultural activities. As comprehensive data across Europe at NUTS 2 level confirms, the agricultural entrepreneurial income per unpaid annual work unit is highly volatile across years (EUROSTAT, 2018b). It should be noted that the disposable income of farm households, which consists of agricultural entrepreneurial income and income from other sources referring to a single year, does not fully reflect farmers' income from self-employment in agriculture. Another important factor is that the income of farm households includes existing agricultural support payments. Removing these payments would have offsetting effects on input prices and factor markets, most notably land rents. We should bear in mind that income comparisons of farm and nonfarm households consider farm income support.

When analyzing the economic well-being of farm households requires considering the households' income and wealth and the farm itself because both are closely related to each other. We should be aware of the limitations of viewing households' wealth to assess their economic well-being. For instance, evaluating farm investments in assets only provides information on the values of agricultural assets. It does not allow to derive conclusions about the standard of living of farmers directly. The underlying assumption is that gross capital formation depends on the share and degree of specialization and farm size. Those investments may vary from farm to farm, and even farms with high farm investments could have low income. Using the EVS data is lacking on farm characteristics which limits our conclusion of farmers' well-being. Finally, the main limitation of the EVS is the sample size of farm households. With 68 farm households, a quantitative comparison between the agricultural and other sectors is not possible because those farms do not represent farm structures' heterogeneity. There is currently a lack of statistical data and evidence on a national level and a European level to assess farm households' standard of living. This is cause for some concern because lacking statistical data means that we miss relevant information to derive agricultural policy implications from achieving the second objective of the CAP.

In the context of the CAP, income support is channeled through decoupled direct payments paid to all farm households irrespective of whether farming is a secondary source of income or not. It effectively over-compensates those farm families whose income level consists of a high amount of off-farm income (MARINO et al., 2021). However, providing improved statistical data on farmers' economic well-being would allow us to differentiate between the poor and the non-poor. Improving data would make it difficult to justify the current level of direct payments to support farmers' incomes in the future. Also, it would be hard to justify shifting CAP money from farm families who are mainly dependent on farming to households in which income from farming is only a minor part of their total household income. We can conclude that improving data availability at the household level is an important goal for the future to assess the CAP's treaty objective. Ensuring a fair standard of living for farmers requires evidence that income support is effectively targeted to those in need.

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Appendix A 2

Fig. A 2.4: Kernel density estimations of disposable income for household types and total sample

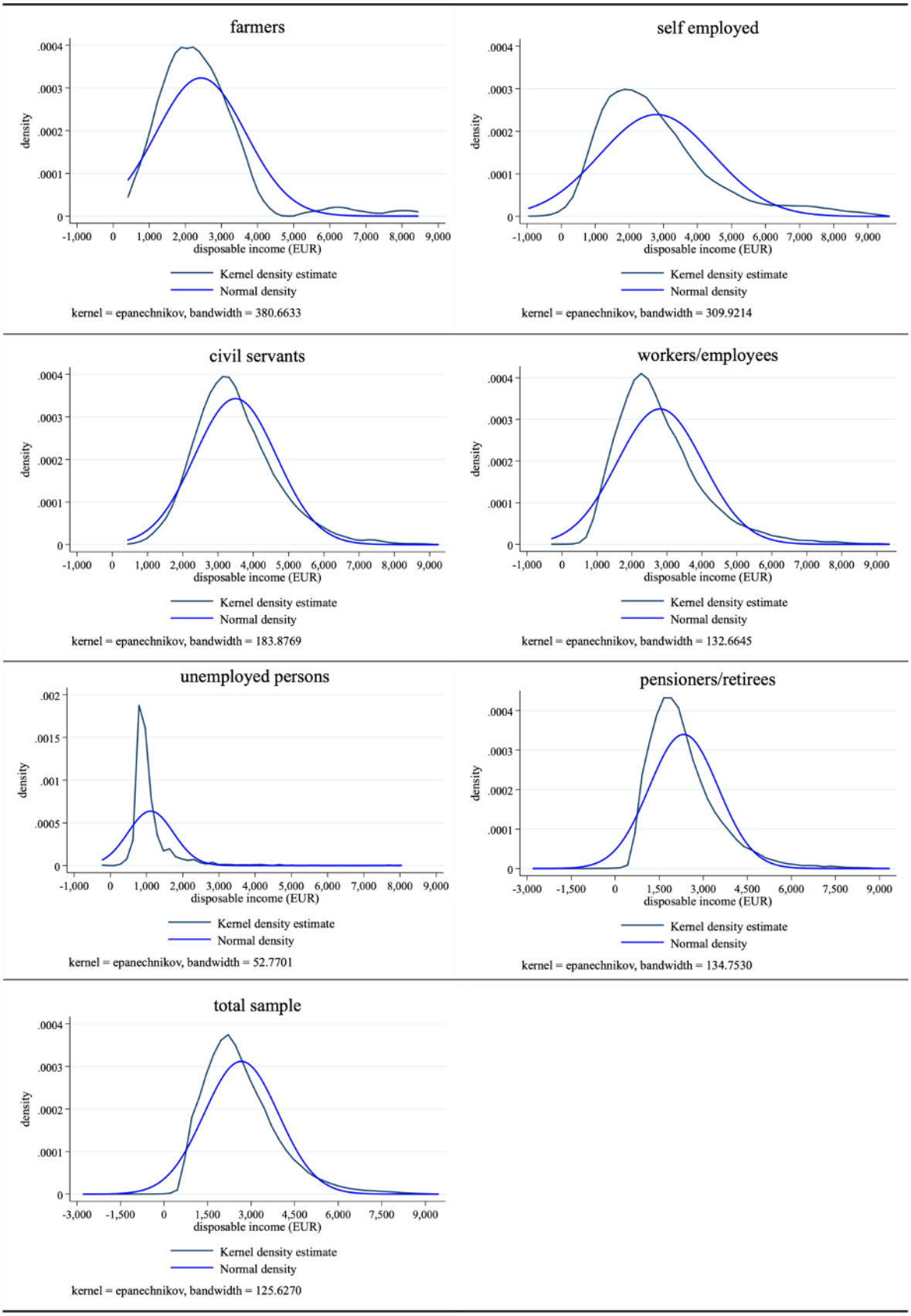
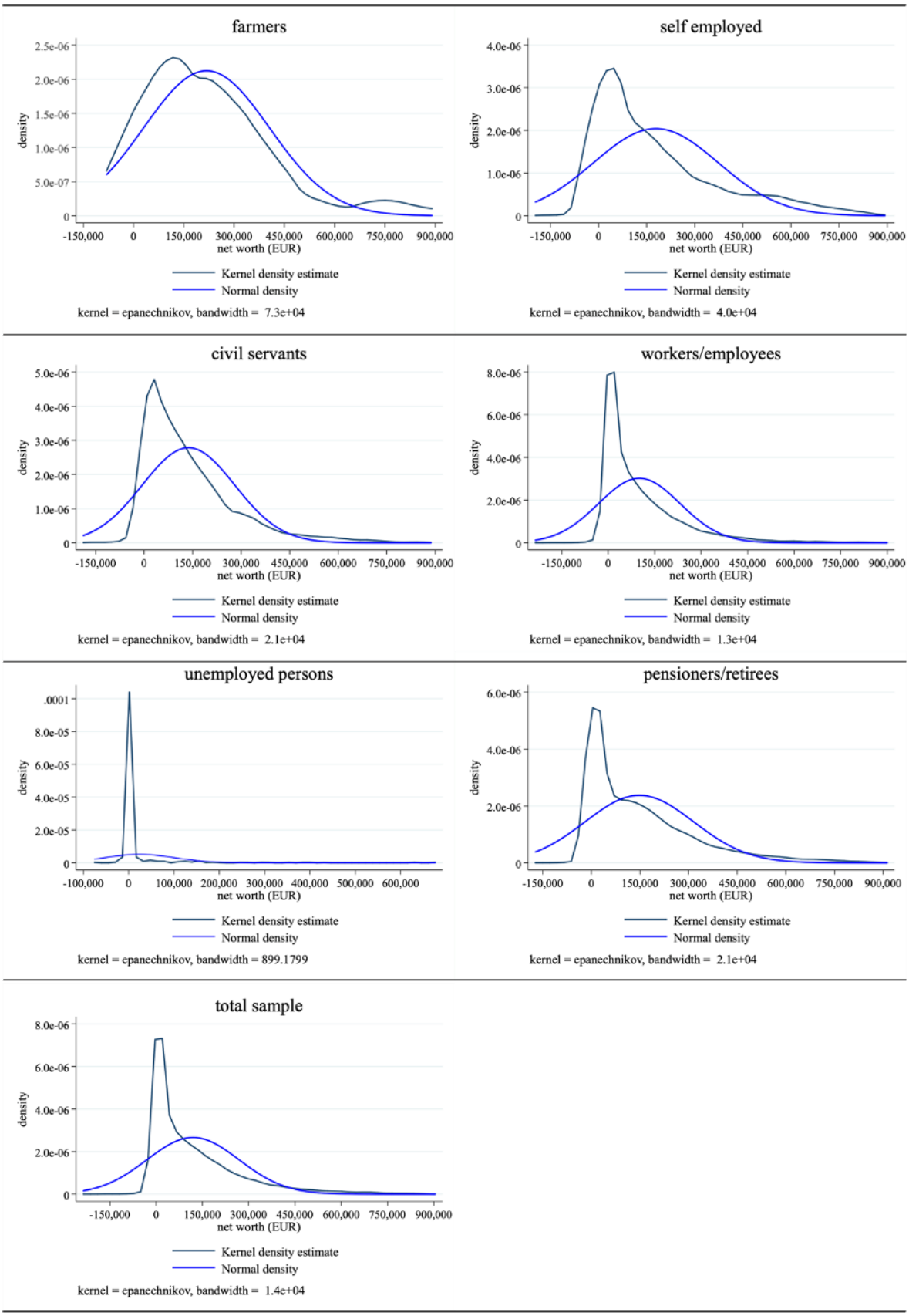


Fig. A 2.5: Kernel density estimations of net wealth household types and total sample



3 Farmers' Attitudes toward the Future of Direct Payments: An Empirical Study from Germany

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Abstract

The new Common Agricultural Policy (CAP) reform has met with large-scale protests from farmers throughout Europe, intending to change one of the most controversial components: direct payments. We analyze German farmers' attitudes and understanding of direct payments. The study employs a survey of 435 farmers collected from January to February 2021. Using cluster analysis and quantitative content analysis, we identified three distinct groups: (1) The "Independents" (43.7 %) are entrepreneurs and have a competitive mindset. They would prefer to abolish direct payments associated with more freedom from policy conditions. (2) The "Conservatives" (27.0 %) advocate an income policy based on direct payments, and they reject higher environmental standards. (3) The "Environmentalists" (30.3 %) emphasize a pronounced environmental awareness, favoring an environmentally performance-based approach. The results show that policies are often perceived differently than they are intentionally designed. Improving the effectiveness of the policy measure requires sufficient information about the CAP's objectives for farmers, focusing on more transparent communication strategies. From a policy perspective, a more differentiated design of policy instruments and longer transformation periods are needed to engage farmers in policy change.

Keywords: Direct payments; farmers' attitudes; Common Agricultural Policy; factor analysis; cluster analysis

3.1 Introduction

Discovering a balance between societal demands for high environmental quality and the farm income policy is a key issue in the Common Agricultural Policy (CAP) design. The new reform paves the way for a "greener" and "fairer" development of the CAP (EU COM, 2021). The Farm to Fork Strategy is one strategy within the European Union (EU) that fosters a vision for contributing to biodiversity, reducing agrochemical use, and limiting the ecological footprint of agriculture. Farmers are key actors in this context by affecting the environment and natural resources (EU COM, 2020a). The transition toward higher environmental standards entails changes in the direct payment scheme, including a reduction of basic payments paid per hectare (ha) of cultivated land.

What politicians call a "milestone" (EU2020, 2020) drives farmers onto the streets. Recent large-scale farmer protests in Germany and other European countries are calling against implementing enhanced environmental standards such as the new fertilizer ordinance or reducing direct income support associ-

ated with increasing existential uncertainties for farms (AGRARHEUTE, 2021; HEINZE et al., 2021). This reflects the unprecedented tension between the established policy and farmers' interests, indicating the fundamental problem of balancing policy design. To shed light on farmers' situation within the process of policy reform and to engage them in policy change, investigating and understanding farmers and their perspectives is a crucial prerequisite. Attitude is closely linked to intentions and behavior (AJZEN, 1991), which are useful insights for developing policy measures.

Previous studies examining farmers' perspectives on income support concentrate on drivers affecting the adoption of environmental measures conditional on direct payments (ZINNGREBE et al., 2017; SCHÜLER et al., 2018; BROWN et al., 2021) using a qualitative survey design. Others analyze farmers' acceptance of alternative income tools (MÖLLMANN et al., 2019), their dependence on direct payments (MICHELS et al., 2020), or capture farmers' attitudes toward the environmentally-oriented development of policy design (FEINDT et al., 2021). Direct payments are essential for most farmers' agricultural income (MICHELS et al., 2020), and farmers respond differently to an environmentally-oriented CAP design. FEINDT et al. (2021) find groups of farmers who reject a more ecological development, favor an income policy that primarily protects natural resources, or prefer more market-oriented instruments. However, most of these studies rely on samples not representative of the German farming population concerning farm characteristics and use relatively small samples (MICHELS et al., 2020; FEINDT et al., 2021) or do not differentiate between farmer typologies (MICHELS et al., 2020). As a result, a comprehensive picture of farmers' perspectives and the generalizability of typologies of farmers are limited.

Therefore, the paper analyzes the typologies of farmers based on their attitudes toward the future of direct payments and their perceptions of direct payments using cluster analysis and quantitative content analysis. We aim to understand better farmers' attitudes toward the development of the direct payment scheme to generate insights into likely responses to the upcoming reform. Since direct payments are paid per ha, we consider the farm size as one crucial aspect in examining farmers' attitudes toward direct payments. Therefore, the sampling procedure includes a quota-controlled sampling method based on an official national statistic (FDZ, 2016) for a representative sample of the german farming population.

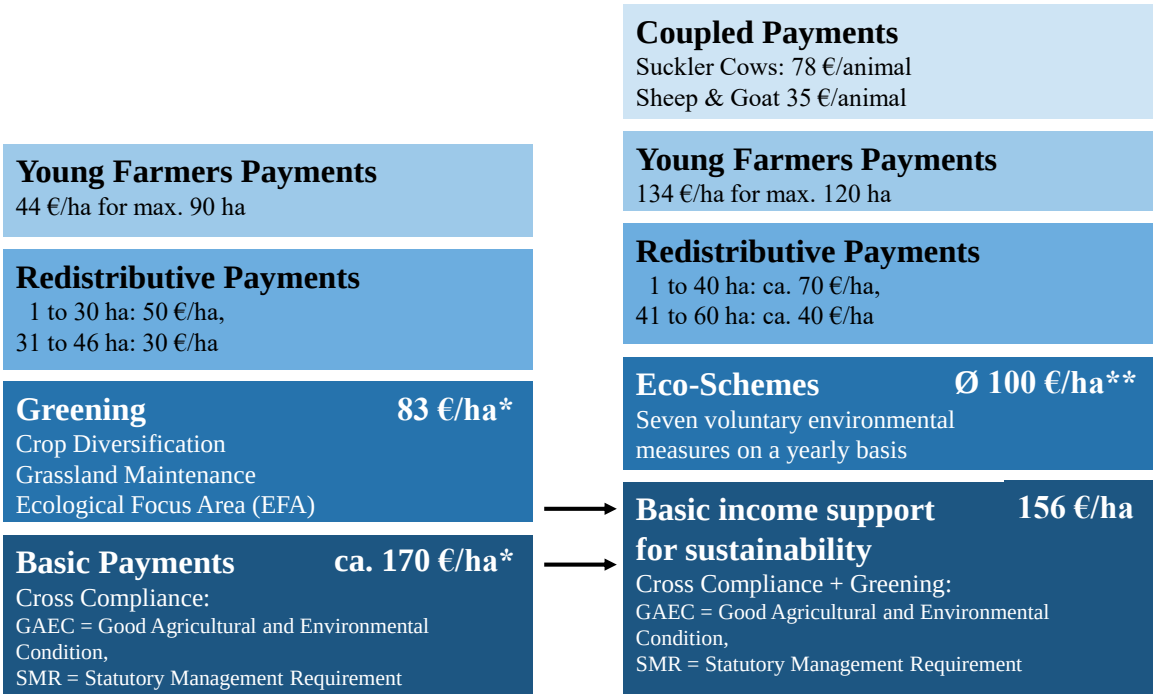
The remainder of the paper is organized as follows. Section 3.2 provides information on the objectives and structure of the CAP. Section 3.3 describes the survey approach and the methods used for analysis. Section 3.4 presents the results, and Section 3.5 discusses the results and draws conclusions.

3.2 Objectives and Structures of the CAP

Direct payments, which account for around 70 % of total CAP spending, are by far the most important agricultural policy instrument implemented in the EU. Currently, direct payments pursue "income objectives", as stated in article 39 of the treaty of Lisbon: "The objectives of the common agricultural policy shall be, […] b) thus to ensure a fair standard of living for the agricultural community, in par-

ticular by increasing the individual earnings of persons engaged in agriculture." (EU COM, 2012). Adding to this, the EU Commission formulated a set of three new objectives ahead of the reform 2021: In the strategy-plan regulation, article 5 states "support from the EAGF and the EAFRD shall aim […] b) to support and strengthen environmental protection, including biodiversity, and climate action […]" (EU COM, 2021). Therefore, direct payments pursue a set of multifunctional objectives. PE'ER et al. (2019, supplementary material) show that some of these objectives are partly conflicting due to the design and implementation of direct payments. From 2014-2020 and the transition years 2021 and 2022, direct payments consist of the Basic Payment Scheme, Greening, the Redistributive Payment Scheme, and the Young Farmer Scheme. In the course of the last CAP-reform 2021, the environmental measures of the Eco-Schemes and Coupled Payments were added and Greening and the former basic payments were transformed into the "basic income support for sustainability", (figure 3.1).

Fig. 3.1: Direct payment scheme in the CAP 2014-2020, the transition years 2021 and 2022, and the CAP 2023-2027 in Germany.



Source: BMEL 2015; BLE 2022; * Payment levels within the CAP 2014-2022 refer to the year 2022; ** Payments for Eco-Schemes (ES) are specific for each measure. The average of 100 €/ha refers to the budget for ES divided by the indicated area for ES.

3.2.1 Stabilizing Farm Incomes

As an income stabilization instrument, farmers receive basic payments (per ha) that reduce farm income volatility and improve farmers' resilience to unexpected income shocks from either production or price variability (EU COM, 2018). From 2016 to 2020, on average, 24 % of European farmers' agricultural income came from direct payments. Germany's average share of direct payments stood at more than 30 % (EU COM, 2022). Thus, direct payments account for a large proportion of farmers'

incomes. However, lowering income variability is more substantial in farms receiving relatively high direct payments and not necessarily facing the most considerable income variability (SEVERINI et al., 2016).

In addition, the distribution of payments shows that most support is concentrated on higher-income farms (SCOWN et al., 2020). In 2020, 2 % of European farms receiving more than 50,000 EUR took a share of 27.5 % of all payments (EU COM, 2020b), indicating a distribution beneficial for larger farms. With the last reform, the Redistributive Payment Scheme with up to 30 % of the national ceiling for direct payments was introduced to grant extra payments for the first ha, thus, providing a higher average rate per ha for smaller farms. However, PE'ER et al. (2019) reveal that in the past, the redistributive measures have not affected the distribution of direct payments throughout the EU. Furthermore, BALMANN & SAHRBACHER (2014) indicate that the redistributed funds are not sufficient for farms to remain competitive over a longer period. Whether the increase of redistributing payments in 2023 could solve the issue of missing farm competitiveness in the longer perspective, is still questionable.

Lastly, it is argued that farmers are not the primary beneficiaries of income support payments. Even though the last reform (2013) focused on limiting payments to active farmers, farmers still capture only a proportion of direct payments (MATTHEWS, 2017). Support benefits are divided into higher land rents or land values, which benefit landowners and other input suppliers who are not necessarily farmers (HENNING & BREUSTEDT, 2018). For Germany, HENNING & BREUSTEDT (2018) calculated that for one Euro of support paid for eligible farming land, the land rent increases by 0.87 EUR to 0.94 EUR. This reduces direct payments' income benefits and raises entry and growth costs for younger and expanding farmers (BRADY et al., 2017). Hence, direct payments can negatively affect farms' competitiveness and the sector's renewal (MATTHEWS, 2017).

3.2.2 Fostering Sustainable Development and Management of Natural Resources

In 2003, direct payments were made conditional upon a set of basic regulatory requirements for farming, animal husbandry, and the environment (cross-compliance), consisting of the statutory management requirements (SMR) and the standards for the good agricultural and environmental condition for land (GAEC). Several of these requirements are also part of national legislation, non-compliance comes with a loss of direct payments and a fine according to the ordinal law.

A second element was introduced in 2013, attempting to link direct payments to more beneficial practices for the environment. The Greening payments tied 30 % of direct payments to crop diversification, ecological focus areas, and the maintenance of permanent grassland to incentive farmers to preserve natural resources and provide public goods. However, Greening measures' design is criticized for failing to achieve ecological goals and protect biodiversity (PE'ER et al., 2014, 2017; BROWN et al., 2021). Small changes in environmental indicators, including nutrient surpluses, crop diversity, erosion, and greenhouse gas emissions, have been observed (LOUHICHI et al., 2018). As a result, the Greening component is a relatively ineffective policy instrument for affecting environmen-

tal outcomes (ECA, 2020). Furthermore, farmers' uptake of environmental management practices eligible for biodiversity support under Greening conditions has been limited (PE'ER et al., 2017). Farmers' motivation to implement environmental measures relies on personal and financial incentives (HOME et al., 2014), and farmers consider Greening a costly constraint (SCHULZ et al., 2014).

In the new CAP, higher environmental standards are created by combing cross-compliance with Greening. Additionally, 23 % of direct payments are linked to eco-schemes, including seven voluntary practices, rewarding those farmers who manage land in an environmental- and climate-friendly way. As a result, the basic payment provision will be reduced from 2023, while farmers will be compensated by adopting eco-schemes (BLE, 2022). At the same time, the level of redistributive payments and payments for young farmers will be increased for a fairer distribution of income support. Thus, farmers have to deal with several policy changes in the income policy system, which require more environmental ambitions and performance to receive income support. Whether a typology of farmers can be distinguished regarding their attitudes toward the changes in the direct payment scheme will be examined in the following.

3.3 Data and Method

3.3.1 Survey Design

To survey farmers' attitudes toward direct payments, we carried out a standardized survey[11] from January to February 2021. After pretesting the survey on 15 selected farmers, a survey company[12] was assigned to recruit farmers for the main sample and conduct the interviews, using Computer Assisted Web Interviews (CAWI), and Computer Assisted Telephone Interviews (CATI). To obtain a representative sample for the characteristics of farm size and regional distribution of the farms, the main sample was randomly selected using a quota-controlled sampling method[13] based on the German Land Use Survey (FDZ, 2016) (table 3.1). The Interview process continued until the quotas were fulfilled and 500 farmers were interviewed. After excluding observations with missing values, we obtained 435 valid questionnaires for further analysis. Missing data were not substituted since there was no systematic pattern of reliable, comparable data to replace them (BACKHAUS & BLECHSCHMIDT, 2009).

Statements of the questionnaire were designed following relevant literature on behavioral economics related to income support and environmental behavior (ZINNGREBE et al., 2017; SCHÜLER et al., 2018; MICHELS et al., 2020; FEINDT et al., 2021) by considering the changes of the new CAP reform. Responses to the attitudinal section were on a five-point Likert scale, from (1) = strongly disagree to (5) = strongly agree. An open-ended question captures farmers' perspectives on the future of direct payments. Socio-demographic data and farm characteristics were also collected (table 3.1).

[11] Funded by the University of Göttingen and the University of Rostock.
[12] The survey company has more than 42.000 addresses. Farmers' addresses are collected by recruiting via phone or e-mail.
[13] Regardless of CATI or CAWI, farmers' addresses were randomly selected. First, farmers were contacted via e-mail to participate in the survey. Farmers who did not respond were contacted by telephone. Then, farmers could choose to complete the interview over the phone or online.

3.3.2 Data Analysis

First, we conducted an explorative factor analysis to capture the central dimensions of farmers' attitudes. To extract factors, we used Principal Component Factor Analysis and varimax rotation. Then, we applied the Kaiser-Meyer-Olkin Criterion (KMO ≥ 0.5), Bartlett's test of sphericity, and the criterion for reliability (Cronbach's alpha: C$\alpha \geq 0.6$) to test the quality of the questionnaire and the variables' suitability for the analysis (BACKHAUS et al., 2016).

Second, we used the hierarchical clustering technique to identify homogeneous groups of farmers with similar attitudes based on the extracted factors. The similarity is defined in terms of the distance between objects. The cluster number is chosen based on a dendrogram, Ward's method, and the Duda/Hart criterion. Prior, the single-linkage method was used to identify and eliminate outliers. Hierarchical cluster analysis results are then compared with k-means clustering and tested for robustness using canonical discriminant analysis. Lastly, to characterize the clusters and prove significant differences among groups, we conducted one-way ANOVA and post hoc estimations assuming no equality of variance (BACKHAUS et al., 2016).

Finally, we conducted a quantitative content analysis to examine farmers' attitudes toward the future of direct payments within each cluster in more depth. We used an open-ended question to explore the variability of farmers' responses because it was impossible to delimit the subject of inquiry beforehand. We first developed a categorization scheme that describes the relevant coding categories directly derived from the textual data. Then, each category is assigned a label, followed by a category definition and examples (BORTZ & DÖRING, 2016). Lastly, farmers' responses are analyzed comparatively to emphasize the differentiation within the clusters.

3.4 Results

3.4.1 Sample Description

Table 3.1 shows the sample's socio-demographic variables compared to the German farmers' population. The sample (n=435) comprises 94 % male and 6 % female farmers, with an average of 53 years. The samples' educational level is above the average for German farmers, as 21 % hold a university degree (GERMAN FARMERS' ASSOCIATION, 2021/2022). Approximately two-thirds of the sample have farming as their primary occupation, while 32 % work part-time in agriculture. In addition, 81 % of the farms are conventional, and 19 % farm organically, of which 44 % are engaged in livestock production. The sample consists of 59 % small farms with less than 50 ha, 22 % have a farm size of 50 to 100 ha, and 19 % are large farms (more than 100 ha). Most farms (49 %) are located in Southern Germany, 39 % are in the North-West region, and 12 % are situated in Eastern Germany, which corresponds to the German average (FDZ, 2016).

Tab. 3.1: The sample's socio-demographics compared to the German farmers' population

Sample characteristics	Sample (n=435) (in %)	German farmers' population (in %)
Sex		
Male	94	90[a]
Female	6	10[a]
Age		
Average age	53	53[b]
Under 45 years	21	25[b]
Over 55 years	48	40[b]
Level of education		
Only practical experience	2	33[b]
Vocational training	77	53[b]
University degree	21	14[b]
Occupation		
Full-time	68	46[b]
Part-time	32	54[b]
Type of farming		
Conventional	81	87[b]
Organic	19	13[b]
Livestock production	44	64[c]
Farm size		
< 50 ha	59	62[d]
50-100 ha	22	19[d]
> 100 ha	19	15[d]
Regions		
[1]North-West	39	38[d]
[2]South	49	51[d]
[3]East	12	11[d]

[1]North-West = Lower-Saxony, Schleswig-Holstein, North Rhine-Westphalia.
[2]South = Baden-Württemberg. Bavaria, Rhineland-Palatinate, Hesse, Saarland.
[3]East = Saxony, Saxony-Anhalt, Thuringia, Brandenburg, Mecklenburg-West Pomerania.
Source: Own estimates. [a] (EUROSTAT, 2020), [b] (GERMAN FARMERS' ASSOCIATION, 2021/2022)
[c] (DESTATIS, 2021), [d] (FDZ, 2016).

3.4.2 Results of Factor Analysis

Based on factor analysis conducted to reduce the dimensionality of variables, 12 variables representing farmers' attitudes toward direct payments are grouped into three factors (table 3.2). A Kaiser-Meyer-Olkin statistic value of 0.73 and the Bartlett Test of Sphericity with a p-value of 0.000 indicate that the variables are applicable for factor analysis. The first factor, 'environmental requirements', relates to farmers' attitudes toward ecological conditions of direct payments. The second factor describes farmers' perception of direct payments, including their (dis-)contentment with these payments. Finally, the third factor relates to farmers' perceived financial dependence on income support.

Tab. 3.2: Results of factor analysis and descriptive analysis

Factors and statements	Agreement[1] (%)	Neither-nor (%)	Disagreement[1] (%)	Factor loadings
Environmental requirements (ER) (Cα=0.71)				
ER1= Premiums should be linked to environmental services rather than the agricultural area. (μ=0.08; σ=1.41)	37.7	26.4	35.9	-0.7790
ER2= Reducing direct payments to strengthen and protect the environment is reasonable. (μ=-0.63; σ=1.36)	23.0	18.4	58.6	-0.7622
ER3= My farm offers little scope for additional climate-friendly farming methods. (μ=0.04; σ=1.20)	34.3	34.3	31.5	-0.5738
ER4=Additional climate and environmental protection requirements impose too many restrictions on my future farming plans. (μ=0.44; σ=1.32)	52.0	20.5	27.6	0.7723
ER5=Farmers should be allowed to maximize their income irrespective of environmental consequences. (μ=-0.43; σ=1.45)	29.4	18.4	52.2	0.5600
Perception of direct payments (PDP) (Cα=0.61)				
PDP1= Area-based direct payments guarantee fair incomes in agriculture. (μ=-0.66; σ=1.25)	19.8	20.2	60.0	0.6977
PDP2= Farmers should not receive direct payments per ha. (μ=-0.19; σ=1.51)	33.1	21.6	45.3	-0.6173
PDP3= I am content with the current direct payment system of the CAP. (μ=-0.44; σ=1.07)	23.0	30.8	46.2	0.7565
PDP4= Direct payments are working for the welfare of farmers and the sector. (μ=-0.07; σ=1.41)	38.2	21.6	40.2	0.5232
Dependence on direct payments (DDP) (Cα=0.61)				
DDP1= Despite positive profit contributions, I need direct payments to receive an adequate income. (μ=1.04; σ=1.27)	74.0	12.2	13.8	0.8403
DDP2= I would be willing to use direct payments to compensate for gross margins. (μ=0.42; σ=1.36)	55.2	21.4	23.5	0.5293
DDP3= I can keep my farm running even without receiving direct payments. (μ=-0.47; σ=1.47)	29.0	17.5	53.6	-0.8029

Loadings > 0.5 are presented after varimax rotation. Kaiser-Meyer-Olkin: 0.73, Bartlett's Sphericity Test: p=0.000; explained variance=51.3 %; n=435; **bold** = factors. [1]Scale from +2 = "Strongly agree" to -2 = "Strongly disagree". Agreement is summarized by "strongly agree" and "moderately agree". Disagreement is summarized by "moderately disagree" and "strongly disagree". μ= mean; σ = standard error.
Source: own calculation.

Farmers are divided on whether premiums should be linked to environmental services rather than the agricultural area (μ=0.08). 38 % are in favor, and 36 % are in opposition. Almost 60 % disagree with reducing direct payments, and 52 % assess climate and environmental protection requirements as restrictive for their future farming plans. Furthermore, farmers are divided on whether their farm offers little scope for more environmentally friendly farming methods (μ=0.04). In addition, more than 50 % disagree that farmers should be allowed to maximize their income irrespective of environmental consequences. Regarding farmers' perception of direct payments, 60 % disagree that direct payments guarantee fair incomes in agriculture[14], and 33 % think that farmers should not receive direct payments. In addition, 46 % are discontent with the current direct payment system, and 40 % disagree that

[14] In the EU Treaties, the concept of "fair incomes" in agriculture is not clearly defined. Thus, farmers may have different ideas what a fair income means.

direct payments work for farmers' welfare and the sector (μ=-0.07). Most farmers believe that direct aid is imperative to their agricultural income (74 %), and 55 % would use direct payments to compensate for negative gross margins. Lastly, 54 % think receiving direct payments is necessary to maintain their farming activities.

3.4.3 Results of Cluster Analysis

The three factors determined by the factor analysis are used as cluster-building variables to differentiate farmers into groups. A three-cluster solution was chosen using Ward's method in conjunction with the highest Duda/Hart index (0.8977) (table 3.3). The discriminant analysis shows that 85 % of farms were correctly classified, proving an acceptable result (BACKHAUS et al., 2016).

Tab. 3.3: Results of the cluster analysis

Variables and statements[1]	**Cluster A** (n=185)	**Cluster B** (n=117)	**Cluster C** (n=131)	**Total** (n=433[2])
Environmental requirements ***	**0.05^{bc} (.55)**	**0.87^{ac} (.44)**	**-0.83^{ab} (.73)**	**0.01 (.87)**
Premiums should be linked to environmental services rather than the agricultural area. ***	-0.21^{bc} (1.36)	-0.85^{ac} (.95)	1.23^{ab} (.93)	0.06 (1.40)
Reducing direct payments to strengthen and protect the environment is reasonable. ***	-1.07^{c} (1.12)	-1.29^{c} (.91)	0.59^{ab} (1.18)	-0.63 (1.35)
My farm offers little scope for additional climate-friendly farming methods. ***	0.24^{c} (1.12)	0.53^{c} (1.10)	-0.66^{ab} (1.04)	0.05 (1.19)
Farmers should be allowed to maximize their income irrespective of environmental consequences. ***	-0.06^{c} (1.39)	0.03^{c} (1.51)	-1.31^{ab} (1.00)	-0.41 (1.45)
Additional climate and environmental protection requirements impose too many restrictions on my future farming plans. ***	0.99^{c} (1.06)	0.87^{c} (1.03)	-0.88^{ab} (1.00)	0.39 (1.33)
Perception of direct payments ***	**-0.69^{bc} (.91)**	**0.25^{ac} (.63)**	**0.75^{ab} (.71)**	**0 (1.00)**
I am content with the current direct payment system of the CAP. ***	-0.65^{b} (1.09)	-0.01^{ac} (.95)	-0.43^{b} (1.08)	-0.41 (1.08)
Direct payments are working for the welfare of farmers and the sector. ***	-0.61^{bc} (1.23)	0.91^{ac} (1.10)	-0.04^{ab} (1.33)	-0.02 (1.37)
Area-based direct payments guarantee fair incomes in agriculture. ***	-1.18^{bc} (.98)	0.26^{ac} (1.25)	-0.73^{ab} (1.14)	-0.65 (1.25)
Farmers should not receive direct payments per ha. ***	0.29^{b} (1.43)	-1.27^{ac} (1.16)	0.01^{b} (1.38)	-0.22 (1.49)
Dependence on direct payments **	**0.16^{b} (1.05)**	**-0.14^{a} (.80)**	**-0.11$^{n.s}$ (1.06)**	**0 (1.00)**
Despite positive profit contributions, I need direct payments to receive an adequate income. ***	0.74^{b} (1.34)	1.72^{ac} (.61)	0.89^{b} (1.31)	1.05 (1.25)
I would be willing to use direct payments to compensate for negative gross margins. ***	0.17^{b} (1.43)	0.74^{a} (1.25)	0.47$^{n.s}$ (1.23)	0.41 (1.34)
I can keep my farm running even without receiving direct payments. ***	- 0.03^{b} (1.51)	-1.35^{ac} (.99)	-0.30^{b} (1.40)	-0.47 (1.46)

bold = clustering factors; Significance level at * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; Numbers without parentheses: mean values; numbers within parentheses: standard derivations.$^{a-c}$ Significant difference of the mean to the corresponding cluster (Tamhane post-hoc multiple comparison test at significance level α=0.05). $^{n.s.}$= not significant. [1]A five Likert-scale is used with -2= Strongly disagree; -1 =Moderately disagree; 0= Neither-Nor; 1= Moderately agree; 2= Strongly agree. [2]Single-linkage method detected two outliers.
Source: own calculation.

Cluster A - Independents

Farmers in cluster A, the biggest cluster (n= 185; 42.7 %), are more discontent with the current direct payment system than the rest of the sample. They moderately agree that climate and environmental protection requirements are restrictive for their future farming plans. At the same time, they think that direct payments do not guarantee fair agricultural incomes and work for farmers' welfare. They are indecisive about whether their farm offers little scope for additional eco-friendly farming methods or whether farmers should not receive direct payments. However, the positive sign of the last statement indicates a relatively favorable attitude (μ=0.29). Regarding their financial situation, farmers assess themselves as less dependent on direct payments (μ=0.74) than clusters B and C. Thus, farmers in cluster A are identified as the "Independents".

Cluster B - Conservatives

Cluster B contains 117 farmers (n=117; 27.0 %) who oppose higher environmental standards within conditionality. They moderately disagree with reducing direct payments and linking premiums more closely to ecological services than the agricultural area. According to their perception of direct payments, farmers agree that direct aids work for farmers' welfare, and farmers should receive direct payments per ha. Additionally, they strongly agreed to need direct payments to secure their income, and they could not keep their farm running without receiving direct payments. Compared to the rest of the sample, cluster B is more willing to use income support to compensate for negative gross margins (μ=0.74). Thus, farmers in this cluster favor a sectoral income policy, providing income support paid per ha eligible land and fewer environmental requirements. They perceive themselves as more dependent on direct payments than clusters A and C. Thus, farmers in cluster B are characterized as the "Conservatives".

Cluster C - Environmentalists

A pro-environmental attitude characterizes farmers in cluster C (n=131; 30.3 %) as they agree that direct payments should be linked to environmental services and reduced to strengthen the environment. These farmers moderately disagree that their farm offers little scope for other environmental-friendly farming methods, and climate and environmental protection requirements constrain their future farming plans. They oppose that farmers should be allowed to maximize their income regardless of environmental consequences, and direct payments guarantee fair incomes. In addition, they moderately agree that they need direct payments to contribute to their income regarding their financial situation. Farmers in this cluster advocate the CAP's green ambitions but do not express a strong attitude towards income support and their dependence on direct payments. Thus, farmers in cluster C are identified as the "Environmentalists".

The profiles of the three clusters are depicted in table 3.4. The results show significant differences in primary and secondary occupations, farm type, and regional distribution of farms. For example, clus-

ter A comprises significantly more farmers working full-time in agriculture than cluster B. In addition, cluster B has more farms located in Eastern Germany than cluster A, and cluster C contains considerably more organic farms than clusters A and B.

Tab. 3.4: Profiles of three clusters by means and frequencies

Variables	**Independents (Cluster A)** (n=185)	**Conservatives (Cluster B)** (n=117)	**Environmentalists (Cluster C)** (n=131)	**Total** (n=433)
Age (years)[n.s.]	53.19 (10.39)	52.85 (11.16)	54.64 (9.25)	53.54 (10.28)
Male (binary)[n.s.]	0.95 (.22)	0.96 (.20)	0.92 (.28)	0.94 (.23)
[1]Education (scale 1-3)[n.s.]	2.19 (.42)	2.16 (.45)	2.23 (.47)	2.19 (.44)
Fulltime (binary)*	0.74[b] (.44)	0.61[a] (.49)	0.64 (.48)	0.68 (.47)
[2]Diversification (binary) [n.s]	0.29 (.46)	0.19 (.39)	0.24 (.43)	0.25 (.43)
Region				
[3]North [n.s]	85	40	45	170
[4]South [n.s]	88	58	67	213
[5]East*	12[b]	19[a]	19	50
Farm system				
Conventional farms***	163[c]	103[c]	67[ab]	333
Farms with organic branches[n.s]	9	6	4	19
Organic farms***	13[c]	7[c]	55[ab]	75
Farm converting to organic [n.s]	0	1	5	6
Farm size (ha)[n.s.]	85.21 (215.34)	86.46 (120.51)	59.96 (67.38)	77.91 (158.61)
< 50 ha	105	69	82	256
50-200 ha	69	36	41	146
> 200 ha	11	12	8	31
Land tenure (ha)[n.s.]	44.39 (133.27)	44.56 (78.80)	28.21 (40.71)	39.54 (98.93)
< 20 ha	104	69	83	256
20-50 ha	43	22	24	89
> 50 ha	38	26	24	88
Farmers receive direct payments even if they do not cultivate on the eligible land.[n.s]	0.17 (1.52)	-0.07 (1.45)	-0.15 (1.45)	0.01 (1.49)
Farmers receive direct payments because they contribute to environmental protection.***	0.34[b] (1.35)	0.64[ac] (1.20)	0.19[b] (1.38)	0.24 (1.34)

Significance level at * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; Numbers without parentheses: mean values; numbers within parentheses: standard derivations; frequencies in integers. [n.s.] = not significant. [a-c]Significant difference of the mean to the corresponding cluster (Tamhane post-hoc multiple comparison test at significance level α=0.05). Nominal scale: significance according to Chi-square. [1]The level of education is coded as follows: 1=Graduation, 2=Vocational training, 3=University degree. [2]Besides arable farming and animal husbandry, farmers have at least two other sources of income.[3]North = Lower-Saxony, Schleswig-Holstein, North Rhine-Westphalia. [4]South = Baden-Württemberg. Bavaria, Rhineland-Palatinate, Hesse, Saarland. [5]East = Saxony, Saxony-Anhalt, Thuringia, Brandenburg, Mecklenburg-West Pomerania.
Source: own calculation.

In terms of farmers' understanding of direct payments, farmers across clusters are undecided about whether they receive direct payments even if they do not cultivate on the eligible land. This indicates that the term 'decoupled' payments for farmers' average seems rather ambiguous. Instead, the Conservatives believe that farmers receive direct payments due to their contribution to environmental protection, while Independents and Environmentalists are indifferent.

3.4.4 Results of the Quantitative Content Analysis

The following step categorizes and summarizes farmers' responses to highlight their attitudes toward the future of direct payments within the clusters. We conducted a categorization scheme with six categories (table 3.5).

Tab. 3.5: Category system to describe farmers' attitudes toward the future of direct payments

Category	Statements (%)		
	Independents (Cluster A)[1] n=138	**Conservatives (Cluster B)[1]** n=78	**Environmentalists (Cluster C)[1]** n=91
Maintaining direct payments	9	36	8
Competitiveness	9	3	4
Fairness	35	33	31
Environmental protection and animal welfare	8	9	37
Deregulation	8	13	7
Abolishment of direct payments	31	6	13

[1]Statements analysed for each cluster: cluster A= 166; cluster B= 94; cluster C= 104. As some farmers have reported more than one statement, the number of statements exceeds the number of farmers within the clusters.
Source: own calculation.

Maintaining direct payments includes farmers' attitudes toward continuing a sectorial income policy through direct payments without further adjustments. 36 % of all statements could be assigned to this category in cluster B. Most farmers mentioning this issue are located in Eastern Germany. Cluster B is primarily concerned about *"long-term planning, security, reliability" (Cluster B)* for the future of direct payments, and farmers point out their need for direct aid as these payments stabilize their agricultural income. Moreover, farmers emphasize that "*direct payments should remain in place, no reallocation into the 2nd pillar, (and) no disadvantage for conventional farms" (Cluster B)*, underlining their view about the upcoming CAP reform to discriminate against conventional farms.

The second category, **competitiveness**, deals with the competitiveness of farms and the agricultural sector. Due to European environmental requirements, farmers suggest compensating for higher farming standards for European farmers to facilitate the competitiveness of their farms and the agricultural sector compared with non-EU countries. Farmers feel disadvantaged considering the EU's contemporary plant protection and manure requirements. *"Convert direct payments into production aid as originally intended, compensating for higher costs of European food production compared to the world market" (Cluster A).* However, less than 10 % of all statements are designated to that topic, indicating the minor role of the debate for all clusters surrounding farms' competitiveness.

Concerns related to the distribution of CAP payments are summarized in the third category, **fairness**. It includes more financial support for farms in regions with natural constraints and smaller farm structures, the capping of direct payments, and the eligibility for active farmers. More than 30% of the statements in each cluster relate to the distribution of state support, criticizing the current payment system, which is beneficial, particularly for large farms with high incomes. Most comments refer to more support for small and family farms and a stronger consideration of the farms' individual needs (50 % for all three clusters). Additionally, farmers emphasize the capping or degression of direct payments for a fairer distribution of income support (32 % for all clusters), indicating their perception of discrimination against small farms by the current direct payment system. In clusters B and C, most farmers who commented on this issue run a farm with an average size of 30 ha, while farms in clus-

ter A are slightly larger (median=46 ha). Furthermore, farmers point out that smaller farms are subject to economic pressure due to increased demands, but at the same time, working in a more environmentally friendly way since they are smaller in scope, supporting biodiversity. Aside from that, direct payments affect rental land prices and suggest revising payment entitlements to apply for direct payments. *"Direct payments should be paid directly to the active farmer, and not to the landlord" (Cluster A)*. Interestingly, most farmers who commented on this issue are located in Eastern Germany, followed by farmers from Southern Germany.

The fourth category focuses on **environmental protection and animal welfare**. Farmers are concerned about the distribution of direct payments, and linking them to ecological measures would imply a fairer allocation of these payments. *"Environmental measures should play a major role in the disbursement of direct payments; no disbursement of direct payments per hectare" (Cluster C)*. Cluster C suggests that payments should be paid for environmental services and the provision of public goods, emphasizing their pro-environmental attitude (37 % of all statements). Most of the statements come from farmers located in North-West Germany. In addition, several farmers mention the delinking of direct payments from the farming area, mainly found for organic farmers in cluster C. On the contrary, farmers in cluster B criticize existing environmental measures. They favor setting more incentives for environmentally friendly practices: *"Instead of more flower strips, planting trees and hedges at the edges of the farming area should be supported. We need to ensure food security and not set aside arable land. What we need are higher incentives" (Cluster B)*. To a minor extent, farmers engaged in animal husbandry favor a stronger linkage of direct payments on requirements for animal welfare, which only appears for clusters B and C.

The next category, **deregulation**, highlights the reduction of regulations, management requirements for farming, and the application for direct payments. For example, a high level of bureaucracy and existing environmental conditions that farmers must comply with are overburdening, mostly perceived by cluster B (13 %) and farmers located in Eastern Germany. *"Reduce bureaucracy! We want clear and reliable long-term regulations" (Cluster B)*. This illustrates the existing discontent of farmers with the administrative burden and, at the same time, the desire for stability and planning security. On the contrary, cluster A would prefer to abolish all farming requirements and related payments to be more independent from policy interventions by the EU: *"Fewer agricultural restrictions! I want more freedom of action on my land again!" (Cluster A)*.

Lastly, the **abolishment of direct payments** deals with farmers' desire to be more independent of direct payments. *"All premiums should be abolished, and fair product prices for the products I produce should be introduced. Living from work and not from the alms of the state!" (Cluster A)*. Primarily, cluster A comments on that issue (31 % of farmers' statements) and farmers who are located in North-West and Southern Germany. Instead of receiving direct payments, they would prefer higher prices for their products. *"Stop direct payments! The farmer would like to negotiate its product prices*

fairly" (Cluster A). Unfortunately, farmers are less clear about their ideas of the 'fair' prices they would like to receive.

Overall, different concerns are raised within clusters regarding the future design of direct payments. As cluster A (Independents) criticizes policy support design and would prefer to be more independent in their farming decisions, cluster B (Conservatives) advocates the maintenance of direct payments without a stronger linkage to environmental conditions, including higher ecological standards and the deregulation of management requirements. On the other hand, cluster C (Environmentalists) favors a more environmentally oriented development of the CAP, mentioning delinking direct payments from the farming area to receive a fairer distribution of policy support. Finally, the distribution of direct payments concerns farmers across clusters similarly, in particular farmers located in Eastern Germany, suggesting an equitable allocation for smaller farms and the capping or degression of direct support.

3.5 Discussion and Conclusion

This paper investigated German farmers' attitudes toward the future of direct payments and their understanding of these decoupled payments. Based on a comprehensive sample of 435 German farmers, we applied multivariate analysis methods and identified three distinct groups. The *Independents* have an entrepreneurial mindset, and policy and environmental regulations are seen to constrain their future farming plans. Therefore, abolishing direct payments is perceived as gaining freedom from policy conditions, which provides them with more entrepreneurial activity. These farmers have relatively large farms, mainly working full-time in agriculture and adhering to conventional farming methods. Independents are characterized by competitive farms, which are less dependent on income support for their farming activity than farmers in other clusters. Next, the *Conservatives* farm primarily conventional, work part-time more often and are located in Eastern Germany. They believe that their farms' survival depends on policy support. They perceive policy and environmental conditions stipulated by the CAP are overburdening, indicating that Conservatives feel less competitive than the Independents. Accordingly, concerns about existential uncertainties emerge from the new CAP reform. Finally, the *Environmentalists* show a pronounced environmental awareness and are open to higher environmental standards within the CAP. These farmers farm organically on smaller farms compared to the Independents and Conservatives.

Across clusters, farmers criticize the unfair distribution of direct payments and refer to the capping or degression of payments. Interestingly, farmers from Eastern and Southern Germany mainly comment on this issue, suggesting that political opinions and perceptions on that issue vary across regions. Overall, the statements highlight the political importance of the debate about the distribution of income support and fairness in general. The increase in redistribution payments for the first ha in 2023 in Germany could be regarded as an attempt to address the uneven distribution of income support payments. From a scientific perspective, there remain doubts about the effectiveness and the general

objective of redistributive payments in their current shape (SAHRBACHER et al., 2015, PE'ER et al. 2019).

While each group of farmers expresses different concerns about the direct payments scheme, on average, farmers have not fully internalized that direct payments are decoupled from production and solely linked to the eligible land. This indicates that the farmers' average is not sufficiently informed about the CAP. This misinformation could undermine the effectiveness of CAP measures when policy instruments are perceived differently than intended, as farmers could handle direct payments differently. For instance, if farmers treat the payments as 'coupled' by spending at least some of those payments to subsidize non-competitive production activities (BRADY et al., 2017), this would maintain the production- and market-distortive effects of coupled payments as observed before the Fischler-Reform (2003).

Thus, improving the effectiveness of policy measures requires sufficient information about the CAP's objectives for farmers, communicated to farmers in a precise and understandable way. For example, an ex-ante analysis of the impact of the policy on farmers could be carried out by asking farmers specifically about a planned policy measure. In this way, farmers' understanding of policy instruments could be improved. There are opportunities to facilitate greater support for the farming community which includes focusing on transparent and direct communication strategies with farmers.

From a policy perspective, several policy instruments would address farmers in each cluster, for instance, the Independents would respond well to policy instruments that combine environmental protection with entrepreneurship that offer economically rewarding agricultural production. The Conservatives advocate an income policy based on direct payments, rejecting a stronger environmental-oriented development. Reducing bureaucracy hurdles and higher incentives to apply climate-friendly practices would be needed to address them. Additionally, peer learning groups of farmers (GREEN et al., 2020) or contact with agricultural advisors (DAXINI et al., 2020) have been recognized as a means to encourage farmers toward a positive change in their thought patterns and behavior regarding the implementation of environmental standards. Finally, the Environmentalists favor a more ecologically oriented CAP that rewards their ecological ambitions. An income support system that is more performance-oriented, increasing the income conditionality on environmental action and gearing direct payments towards the protection and provision of public goods, could be suitable for these farmers. Overall, as a multifunctional policy design does not apply to all farmers in the same way, engaging farmers in policy reforms requires a more differentiated design of policy interventions that allow for a certain degree of flexibility, and longer transformation periods (WBAE, 2018) to account for the heterogeneous preferences within the farming sector as outlined in this paper.

Although the present sample is representative of the German farming population in terms of farm size and regional distribution of farms, there are still limitations in interpreting the results. Farmer characteristics such as age and educational level influence their attitudes and behavior (BURTON, 2014). Old-

er and highly educated farmers are slightly over-represented in our sample, affecting the survey's results. However, this study offers a good starting point for further research. Based on that knowledge, more attention should be paid to farmers' acceptance of alternative and practical income stabilization tools. Furthermore, a similar approach could be applied in other European countries to compare farmers' perspectives on direct payments to investigate the need for concrete policy adjustments.

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Appendix A 3

Information on the Survey Design and Description Variables used for Factor and Cluster Analyses

Survey Introduction

In the following survey, you will be asked various questions about your attitude towards direct payments and the new environmental and climate regulations after 2020. As farmers, you are directly affected by the proposals from Brussels, and at the same time, you are stakeholders in agricultural policy discussions. Therefore, we would like to investigate your attitude towards agricultural and climate policy instruments to evaluate the implementation of agricultural policy measures in a practice-oriented way.

Variables on Farm Characteristics:

Fulltime

Do you run your farming business on a full-time or part-time basis?

O Full-time O Part-time O Not specified

Diversification

Are you currently engaged in any other business activities? Please name them, if possible with sizes (e.g. photovoltaics [kWp], biogas [kW], forest [ha], horticulture, farming store, apartments for vacation, or similar activities).

_____

_____

_____

Farm System

What type of farming do you currently run your business?

O Conventional farming
O Conventional farming with individual organically managed farm branches
O Organic farming
O Converting from conventional to organic farming
O Converting from organic to conventional
O Not specified

Farm Type

How can your farm business be specified?

O Cash crops O Forage production O Specialized farm O Permanent crops
O Mixed farm O Horticulture O Not specified

Land Tenure

Have you rented land? Please state the total area leased in percent or hectares.

O Yes, _____ percent/ _____ hectares are rented
O No
O Not specified

Livestock Production

Are you engaged in livestock production? Please indicate the number and type of animal husbandry.

O No
O Yes (pig farming - number, cattle farming - number, poultry farming - number)
O Not specified

Direct Payments

Do you receive direct payments? If so, how much did you receive in total according to the last approval (Please, consider the basic premium, greening premium, and redistributive payments without the young farmer premium)?

O I have not received any direct payments
O Less than 500€
O 500€ - 1.250€
O 1.251€ - 2.000€
O 2.001€ - 5.000€
O 5.001€ - 10.000€
O 10.001€ - 20.000€
O 20.001€ - 50.000€
O 50.001€ - 100.000€
O 100 001€ - 150.000€
O 150.001€ - 200.000€
O 200.001€ - 250.000€
O 250.001€ - 300.000€
O More than 300.000€
O I don't know
O Not specified

Did you receive payments to support young farmers according to the last approval?

O Yes O No O Not specified

Have you used the small farmers' scheme in the last five years?

O Yes O No O Does not apply to me O Not specified

Income

What is your annual net income? (If you are running your farm part-time, please indicate your total net income).

O Less than 20.000€
O 20.001 – 30.000€
O 30.001€ – 40.000€
O 40.001€ - 50.000€
O 50.001€ - 60.000€
O 60.001€ - 70.000€
O 70.001€ - 80.000€
O 80.001€ – 90.000€
O 90.001€ - 100.000€
O More than 100.000€
O Not specified

Variables on Farmers' Attitudes:

What do you think about the following statement? "Farmers have a strong positive influence on climate and environment through their professional activities."

O I strongly agree
O I moderately agree
O Neither-nor
O I moderately disagree
O I strongly disagree
O I don't know

Are you content with the current system of direct payments under the Common Agricultural Policy?

O Very satisfied
O Rather Satisfied
O Partly
O Rather dissatisfied
O Not at all satisfied
O I don't know

We would like to ask you to rate various statements on a scale according to your opinion on the subject of direct payments. Would you please mark the value on the scale most closely corresponds to your opinion? 1 stands for 'Not at all' and 5 for 'Completely'.

Attitude	Not at all **1**	**2**	**3**	**4**	Completely **5**	Don't know
Area-based direct payments guarantee fair incomes in agriculture.	O	O	O	O	O	O
Farmers should not receive direct payments per hectare of farming area.	O	O	O	O	O	O
Farmers receive direct payments even if they do not cultivate on the eligible land.	O	O	O	O	O	O
Farmers receive direct payments even if they do not cultivate on the eligible land	O	O	O	O	O	O
Farmers receive direct payments because they contribute to environmental protection.	O	O	O	O	O	O
Reducing direct payments to strengthen and protect the environment is reasonable.	O	O	O	O	O	O
Premiums should be linked to environmental services rather than the agricultural area.	O	O	O	O	O	O
My farm offers little scope for additional climate-friendly management practices.	O	O	O	O	O	O
Despite positive profit contributions, I need direct payments to receive an adequate income.	O	O	O	O	O	O
I would be willing to use direct payments to compensate for negative gross margins.	O	O	O	O	O	O
Additional climate and environmental protection requirements impose too many restrictions on my future farming plans.	O	O	O	O	O	O
I can keep my farm running even without receiving direct payments.	O	O	O	O	O	O
My farm offers little scope for additional climate-friendly management practices.	O	O	O	O	O	O
Farmers should be allowed to maximize their income irrespective of environmental consequences.	O	O	O	O	O	O

What do you wish for the future of direct payments?

_____

_____

_____

_____

Variables on Farmers' Characteristics:

Age

How old are you?

_____ years O Not specified

Male

What is your gender?

O Male O Female O Divers O Not specified

Region

In which federal state is your farm located?

_____

_____

Educational Level

Have you completed an agricultural apprenticeship?

O Yes O No O Not specified

What is your highest education level?

O Doctor degree
O University degree (Dipl. Ing., Bachelor, Master)
O University of Applied Sciences degree (Dipl. Ing., Bachelor, Master)
O Master's degree
O Technician degree (agricultural technician)
O Technical college/technician degree (state-certified)
O Completed apprenticeship
O No further education after graduation
O Other
O Not specified

Thank you very much for taking the time to participate in the survey!
Please let us know if you have any additions, comments on the questionnaire, or other thoughts on "Direct payments and regulations on the environment and climate after 2020".
_____ _____ _____ _____

4 The Effect of Farmer Identity on Environmental Behavior: Evidence from Germany

Abstract

This study examines farmers' environmental behavior by considering farmers' identities. How farmers see themselves and want to be perceived by others has gained attention as a driver of adopting environmentally-friendly farming practices. However, there has been little examination of farmer identity's effect on participation in conditional schemes using regression analysis, particularly for Germany. Thus, we provide an explorative study with a comprehensive sample of 441 German farmers to examine farmers' environmental behavior based on their identity, socio-demographics, and farm characteristics. First, we apply Principal Component Analysis to identify groups of farmers' identities. We then use two regression models to explore the effect of farmer identity on participation in Agri-Environmental Measures and Greening. The results reveal three farmer identity groups. Only the 'environmentalist' and 'productivist' identities positively influence farmers' participation in voluntary measures, while the results for conditional schemes should be taken with caution.

Keywords: Farmer identity, Agri-Environmental Measures, Greening, Farmer behavior, Agricultural Policy

4.1 Introduction

Agricultural practices widely affect several ecological outcomes (WESTHOEK et al., 2013). The central role of the environmental goals in the Common Agricultural Policy (CAP) reform (2023-2027) exemplifies these challenges (LAMPKIN et al., 2020), emphasizing the ambition to increase farmers' uptake of environmentally beneficial practices in Europe (EU COM, 2020). The perspectives of farmers and the farm community are crucial to achieving policy goals, as they may accept or reject recommendations of standards for practices. The development toward adopting ecological practices both from within and outside the farm is determined by farmers' perception of whether these practices meet or conflict with their beliefs and values (BARNES et al., 2022).

The relevance of behavioral factors in explaining farmers' pro-environmental decisions and adopting sustainable farming methods is increasingly recognized in the literature (DESSART et al., 2019b). Behavioral factors gain attention as they can complement, fine-tune, and enrich economic analyses of farmer decision-making (TROUSSARD & VAN BAVEL, 2018). The concept of farmer identity is one approach that tries to understand the interrelation of motivation and perceptions and links these elements with each other. How farmers see or think about themselves in relation to their occupation and how they want to be perceived by others affects their decision-making on the farm (BURTON, 2004).

Farmers can participate in voluntary and conditional schemes, which promote sustainable agriculture in the CAP. The role of farmer identity in adopting voluntary measures, such as Agri-Environmental

Measures (AEMs), received particular attention. It has been argued that if farmers take a particular action voluntarily and without external pressure (e.g., income reduction sanctions), they consider this action part of their 'self' (LOKHORST et al., 2011). Several studies reveal a considerable effect on farmers' adoption of AEMs (THOMAS & ENGEL, 2019; LEONHARDT et al., 2021). Conditional practices are tight to income support. For the 2014-2020 funding period and continued in the current transition period 2021-2022, Greening[15] was introduced as conditional income support payments. It is proposed that farmers are mainly motivated to apply Greening requirements by avoiding income reduction sanctions (SOLAZZO & PIERANGELI, 2016). However, primarily qualitative studies emphasize that other factors, such as farmer identity, and social and ecological factors beyond economic circumstances, affect farmers' decision to apply practices within Greening measures (PE'ER et al., 2016; ZINNGREBE et al., 2017; BROWN et al., 2019; 2021).

Yet, little emphasis has been paid to examining farmer identity's effect on participation in conditional schemes using survey data. This study attempts to contribute to this gap by providing a comprehensive sample of 441 German farms and exploring the effect of farmer identity on two dimensions of environmental behavior. First, we examine the appearance of different identity groups of farmers. We then examine the effect of farmers' identity on their involvement in voluntary and conditional schemes. Thus, we analyze whether farmers' identity affects their participation in AEMs and Greening using two different regression models. We do not examine the effectiveness of environmental instruments but rather farmers' current participation in such schemes. Lastly, we discuss the findings and conclude the results with future research needs.

The remainder of the paper is organized as follows: Section 4.2 presents an overview of farmers' identity and existing farmer typologies. Section 4.3 describes the data and methodology. Next, Section 4.4 presents the results of regression analyses. Finally, we discuss the findings and draw conclusions in Section 4.5.

4.2 Literature Review

4.2.1 Farmer Identity and Farmer Types

BURTON (2004) initially developed the concept of farmer identity in explaining farmers' adoption behavior of environmentally-friendly farming practices. The concept of identity is based on Stryker's Identity theory (1968, 1994). A person's identity is defined by how they perceive themselves concerning the criteria for any societal role they fulfill. This is related to a particular behavior that reflects how they see themselves as fulfilling those criteria (STRYKER & SERPE, 1994). Identity thus describes how a person defines themselves related to their social role. Social identity emerges from interacting with a group or community. Individuals, such as farmers, form and internalize an understanding of the im-

[15]From 2023, changes in Greening measures will be made and enhanced conditionality, which comprises all of the current Greening requirements and "good agricultural and environmental conditions" (GAEC), will be implemented. In addition, eco-schemes as a new form of (voluntary) environmental measures are introduced, fully funded by the EU as a part of Pillar I funds.

portance of this specific group's objects, attitudes, and behaviors while adopting an identity that refers to this group (BURTON, 2004).

Extending the idea of "farmer identity", BURTON and WILSON (2006) developed a typology of farmers based on several studies. Initially, they categorized farmers into four types: The conservative productivist, who maintains traditional farming practices; the agribusiness person, who focuses on profit incentives; the conservationist, who is mainly driven by environmental and lifestyle concerns; and the entrepreneur or diversifier, who is interested less on agricultural production and more on off-farm income sources (BURTON & WILSON, 2006). Since then, farmer typologies have been examined and varied in the literature. Farmer typologies have been investigated on farmers' attitudes and perceptions about themselves (e.g., CULLEN et al., 2020; LEONHARDT, 2021), while other studies focus on their actual farming practices and motivations (e.g., MICHEL-GUILLOU & MOSER, 2006; GREINER & GREGG, 2011). Typologies differ between studies, but productivist, environmentalist, and conservative identities are common in research (SULEMANA & JAMES, 2014; MCGUIRE et al., 2015; THOMAS & ENGEL, 2019).

Farmer identity and types are complex and cannot always be delineated. A farmer with a salient identity, i.e., the predominant identity, may also have characteristics that belong to another farmer type (BURTON & WILSON, 2006). In that sense, the idea of a salience hierarchy within farmer identities is discussed. For example, MCGUIRE et al. (2013) demonstrate that farmers' identity is multifaceted, and they have more than one identity, with the most salient identity established through farmers' behavior and management methods. The more an individual enacts a particular identity, the more salient this identity is. The concept of farmer identity is a more general and overarching construct than attitudes, attempting to link several social-psychological factors such as belief systems, perceptions, and motives (SULEMANA & JAMES, 2014).

4.2.2 Voluntary and Conditional Schemes of the CAP

The promotion of sustainable agriculture was added to the CAP to tackle agriculture's adverse effects on the natural environment. In 1992, the European Commission introduced AEMs as a voluntary instrument to encourage farmers to adopt more environmentally friendly practices. Farmers can enroll in sustainable farming through these government-funded service programs and receive compensation payments for implementing such measures, from simple prescriptions to complex methods (EU COM, 2005; BMEL, 2020). These voluntary programs, situated in Pillar II of the CAP, have expanded over a series of CAP reforms to cover more and more environmental domains. As a result, these measures account for an increasing share of the overall CAP budget (EU COM, 2021).

In 2013, Greening measures were introduced, which linked income support payments to three mandatory actions: crop diversification, the maintenance of permanent grasslands, and the introduction of Ecological Focus Areas (EFAs). As a result, 30 % of the direct payments were conditional on these environmental management practices (about 85 EUR/ha in Germany). Specifically, crop diversifica-

tion required farms with arable land over 10 or 30 ha to cultivate at least two or three crops. Maintenance of permanent grasslands allowed a maximum loss of 5 %[16] and the promotion of EFAs on at least 5 % of the arable land on conventional farms with 15 ha. Farming units farmed organically and entitled to this direct aid are excluded from requirements and any additional practices. Non-compliance was sanctioned with a fine or farms to increase the incentive to apply such measures (EU, 2013; BMEL, 2015).

4.2.3 Drivers of Farmers' Environmental Behavior

According to DESSART (2019a), farmers across Member States of the E.U. have different perceptions about whether Greening is voluntary or mandatory. The obligatory character of Greening is prominent due to the income support payments applied to the scheme. However, farmers understand the possibility of voluntarily opt-out of Greening, emphasizing the voluntary character of the scheme. Thus, there is no consensus among farmers about the nature of Greening, and farmers disregard the concept of conditionality completely.

For farmers' response to Greening, some studies show that most farms apply the Greening constraints, but some do not comply with it, giving up a part of payments. For example, SOLAZZO & PIERANGELI (2016) find that approximately 20 % decide not to fully comply with Greening using a Farm Accountancy Data Network sample of Northern Italien farms. In Germany, LAKNER & HOLST (2015) show that 10 % of farms do not meet Greening requirements, especially crop diversification. Reasons for non-compliance are seen primarily by economic-related motives. However, beyond pure economic reasoning, PE'ER et al. (2016) argue that farmer identity matters in adopting Greening measures. An essential criterion for farmers' decision-making in choosing EFA is their perception of 'productivity' in land management. For example, farmers in Germany prefer EFA options that are cost-effective and productive, while farmers neglect EFA options that are beneficial for biodiversity (LAKNER et al., 2017). Furthermore, a qualitative study by BROWN et al. (2021) suggests that farmers choose practices that maximize their income and productivity, and they even reject pro-environmental beliefs while selecting EFA options.

On the contrary, farmers' participation in AEMs is motivated differently. For example, several studies find that farmers' involvement in biodiversity programs is strongly correlated with their pro-environmental attitudes (CULLEN et al., 2020), while a productivist mindset negatively correlates with farmers' engagement in AEMs (KVAKKESTAD et al., 2015; BROWN et al., 2021). Furthermore, THOMAS & ENGEL (2019) find that conservative identity[17] negatively affects farmers' pro-environmental behavior related to voluntary practices. Based on the literature, we derive the following hypotheses:

[16] In relation to the reference year of 2012.
[17] Thomas & Engels (2019) call it work-centered identity.

H1: Environmentalist identity is more likely to affect farmers' participation positively in AEMs than in Greening.

H2: Productivist identity is more likely to influence farmers' participation positively in Greening than in AEMs.

H3: Conservative identity is more likely to affect farmers' participation positively in Greening than in AEMs.

In addition, socio-demographic and farm characteristics influence farmers' adoption of environmentally beneficial farming practices (LASTRA-BRAVO et al., 2015, BROWN et al., 2021). Still, the findings vary in the literature and even indicate some contradictions. For example, considering farmers' age, younger farmers seem to be more willing to try new farm management options (PEERLINGS & POLMAN, 2009). At the same time, other studies report that older farmers seem to take advantage of new opportunities more readily (DEFRANCESCO et al., 2008). In addition, lower adoption rates are found for farms managed by females than males (ŜPUR et al., 2018), while other studies find mixed results regarding the behavior among males and females (BARTKOWSKI & BARTKE, 2018). Furthermore, VAN VLIET et al. (2015) show that farmers farming part-time are more likely to adopt environmentally-friendly practices, while GATTO et al. (2019) find that full-time farmers are more likely to be involved in ecological measures. Finally, a high educational level is associated with farmers' uptake of environmentally beneficial farming practices (BROWN et al., 2021).

Regarding the farm characteristics, farm size and type are identified as relevant variables for farmers' participation decisions. Due to their land's suitability for such schemes, large farms are more likely to adopt sustainable farming methods (ZIMMERMANN & BRITZ, 2016; CULLEN et al., 2020). However, other studies find no significant effect (DUCOS et al., 2009) or even contrasting results (WALDER & KANTELHARDT, 2018). Regarding the farm type, there is a greater willingness among livestock farmers to participate in AEMs compared to arable farms (CAPITANIO et al., 2011). Furthermore, for livestock-producing farms, a farmer in extensive farming systems adopts more likely environmentally-friendly farming methods than intensive farming systems (HYNES & GARVEY, 2009; ZIMMERMANN & BRITZ, 2016). Considering the literature, we derive the following hypotheses:

H4: Young farmers are more likely to participate in AEMs and Greening.

H5: Male farmers are more likely to join in AEMs and Greening.

H6: Full-time farms are more likely to be involved in AEMs and Greening.

H7: More highly educated farmers are more likely to participate in AEMs and Greening.

H8: Large farms are more likely to be engaged in AEMs and Greening.

H9: Farms with livestock production are more likely to join AEMs and Greening.

4.3 Data and Method

4.3.1 Survey Data

From January to February 2021, we carried out a standardized survey using Computer Assisted Web Interviews (CAWI) and Computer Assisted Telephone Interviews (CATI). The first section of the survey collected information on farm characteristics (e.g., farm size, livestock production) and on eligible ha enrolled for Greening, including arable land for crop diversification, permanent grasslands, and EFAs. The following section includes questions about farmer identity. Based on literature research (BURTON & WILSON, 2006; THOMAS & ENGEL, 2019), farmer identity was conceptualized based on variables related to environmental aspects, work orientation, food production, and animal husbandry. Farmers were asked to select the variables they link to their work as a farmer, and they could choose among seven variables relevant to farmer identity. The third section gathered data on farmers' participation in AEMs, and the last section collected data on farmer characteristics (e.g., age, and educational level).

A quota-controlled sampling method ensured that the sample was nationally representative by farm size and regional distribution of the farms. At each sampling point, farmers were interviewed, followed by a quota control system based on the German Land Use Survey (FDZ, 2016), considering farm size and region. After pretesting the survey on 15 selected farmers for the main sample, we interviewed 500 farmers across Germany in collaboration with a professional survey company. After excluding observations with missing values, we obtained 441 valid questionnaires for further analysis. Missing data were not substituted since there was no systematic pattern of reliable, comparable data to replace them (BACKHAUS & BLECHSCHMIDT, 2009).

4.3.2 Data Analysis

We apply Principal Components Analysis (PCA) with orthogonal varimax rotation to determine farmers' identity dimensions from survey data. As a dimensionality-reduction method, PCA identifies the number of correlated components (values above 0.4) that still contain the most variation and information (JOLLIFFE & CADIMA, 2016). We then use these components as explanatory variables in the following regression analyses.

We apply two regression models to explore how farmer identity affects environmental behavior considering voluntary and conditional schemes. Following CULLEN et al. (2020), we model farmers' decisions to participate in AEMs by assuming that a farmer is a utility maximizer. Participation in AEMs is defined by a farmer comparing the amount of utility gathered from non-participating, U_n, against the amount of utility gained from participating, U_p. This is expressed in the following two equations:

$$U_n(N_i, 0; Z_i) \tag{1.1}$$

$$U_p(N_i + P_i - C_i, E_i; Z_i) \tag{1.2}$$

For a farmer, i, utility from not participating in AEMs is a function of farm income, N_i, and farm and farmer characteristics, Z_i. Participation gains utility in terms of receiving payments for adopting measures, P_i, which creates, at the same time, opportunity costs, C_i, and finally requires effort, E_i. Farm and farm characteristics determine the level of income, payments, opportunity cost, and effort. Farm and farmer characteristics, Z_i, are shown as:

$$Z_i(F_i, S_i, I_i) \tag{1.3}$$

where Z_i is a function of farm characteristics such as farm size and type, F_i, farmers' characteristics such as farmers' age, educational level, S_i, and farmer identity, I_i. The decision, D_i, is thus a function of:

$$D_i = U_n(N_i, 0; F_i, S_i, I_i) - U_p(N_i + P_i - C_i, E_i; F_i, S_i, I_i) \tag{1.4}$$

As we use a dichotomous index (0 = non-participation/1= participation),

$$D_i^* = \begin{cases} 0 \; for \; D_i^* > 0 \\ 1 \; for \; D_i^* < 0 \end{cases} \tag{1.5}$$

we model the decision function by applying a binary logistic model.

$$D_i^* = X_i\beta + \varepsilon_i \tag{1.6}$$

X_i is a vector of the observed determinants of D_i, β is a parameter vector and ε_i is a random component. A farmer's likelihood of participating is presented as:

$$\Pr(D_i^* = 1) = \frac{1}{1+\exp(-\beta X_i)} \tag{1.7}$$

Taking the log of the odds of participating over not participating in AEMs, we create a linear function of the dependent variable:

$$\log\left[\frac{P_r(D_i^*=1)}{1-P_r(D_i^*=1)}\right] = \beta' X_i \tag{1.8}$$

Where β' determines the change in the probability of participating in AEMs relative to non-participating with a unit change in the independent variable (WOOLDRIDGE, 2009; CULLEN et al., 2020).

To investigate farmers' participation in Greening in the next step, we use the eligible ha enrolled in Greening as the dependent variable, including ha for crop diversification, the EFAs, and permanent grasslands. Given that farmers are utility maximizers, the data shows that 97 farmers have no ha enrolled for Greening[18] and 21 farms use the total farming land for Greening (the histogram is attached in appendix A 4, Fig. A 4.1).

[18]Organic farms and farms with less than 10 ha were excluded from the analysis because these type of farms are exempt from the Greening conditions.

To account for that, we apply the fractional probit model after PAPKE & WOOLDRIDGE (1996), a quasi-maximum likelihood method based on the Bernoulli log-likelihood function, which is presented as:

$$l_i(\beta) = y_i log[G(x_i\beta)] + (1 - y_i) log[1 - G(x_i\beta)] \quad (2.1)$$

where the dependent variable can be greater than or equal to 0 and less than or equal to 1. $0 \leq y_i \leq 1$ denotes the continuous variable of the eligible ha enrolled in Greening, converted into percentage points, and (the 1 × k vector) x_i refers to the explanatory variables such as farm and farmers' characteristics and farmer identity (see Section 4.2) of each farmer i. Typically, $G(\cdot)$ is a nonlinear function such as the logistic function $G(z) = \frac{\exp(z)}{1+\exp(z)}$, satisfying $0 \leq G(\cdot) \leq 1$ and draws z to the (0, 1) interval (PAPKE & WOOLDRIDGE, 1996). With this method, we estimate the conditional expected value of the response value rather than predict the probability of occurrence of a specific event (GALLANI & KRISHNAN, 2017).

We used the variance inflation factor (VIF) to test for multicollinearity between the independent variables. A VIF greater than 10 indicates a probability of a collinearity problem between the independent variables. A mean of 1.54, ranging from 1.03 to 2.25, shows no problems with multicollinearity, and independent variables are used for both regression analyses. Correlation analysis confirmed this result (Appendix A 4, Tab. A 4.1).

4.4 Results

4.4.1 Principal Component Analysis and Farmer Identity Types

The PCA revealed three identities: A conservative, an environmentalist, and a productivist identity (table 4.1). The Kaiser-Meyer-Olkin statistic of 0.763, Cronbach's Alpha of 0.694, and the high significance of Bartlett's Sphericity (p-value=0.000) indicate that the variables are suitable for further analysis. Following GORTON et al. (2008), THOMAS & ENGEL (2019), and CULLEN et al. (2020), we used an eigenvalue cut-off value of 0.9 to choose which components to retain.

Tab. 4.1: Factor loadings of the three retained components after applying varimax rotation

Variables	Conservative	Environmentalist	Productivist
Hard and demanding work	**0.6183**	-0.1648	0.1407
Financial risks	**0.5927**	0.0526	0.0028
Expertise in dealing with heavy machinery	**0.4846**	0.1485	-0.1448
Shaping the landscape and rural areas	0.1320	**0.5831**	-0.2661
Protection of natural resources and the environment	-0.1080	**0.6893**	0.2824
Food production	-0.0052	0.3607	**0.4795**
Responsible for handling animals	0.0373	-0.0523	**0.8053**
Eigenvalues	2.49594	1.02528	.905242

In **bold** = Loadings > 0.4; KMO=0.763; Bartlett's Sphericity Test p=0.000, Cronbach's Alpha=0.694; explained variance: 63 %; n=441.

As shown in table 4.1, the conservative identity is determined by variables relating to hard work, financial risks, and dealing with heavy machinery that indicate a more pessimistic view of the profession's financial conditions. Next, the environmentalists' identity can be described by variables shaping the landscape and rural areas and protecting the environment[19]. Lastly, the productivist identity is identified by statements about producing food and responsible handling of animals that focus on the farmer's identity as a predominantly producer.

We normalized the PCA results of the farmer types with a mean of zero and a standard deviation of one to enhance the interpretability of the results. This was done to incorporate them as explanatory variables in the regression analyses. The following section presents the variables to examine farmers' participation in AEMs and the share of eligible Greening ha.

4.4.2 Descriptives Statistics

The sample (n=441) comprises 96 % male and 4 % female farm operators, with an average age of 53. In addition, 17 % of farmers have graduated from school and have reached an apprenticeship. Most farmers, 63 % have vocational training, and 20 % hold a university degree. This indicates that their level of education is above the average for German farmers (14 %) (GERMAN FARMERS' ASSOCIATION, 2021/2022). Approximately two-thirds of the sample have farming as their primary occupation, while 31 % work part-time in agriculture. Furthermore, the sample consists of 57 % small farms (10-50 ha), 35 % medium-sized farms (50-200 ha), and 8 % large farms (>200 ha), which is similar to the distribution of the national average (GERMAN FARMERS' ASSOCIATION, 2021/2022). Most of the farms are cash-crop farms (41 %), followed by forage-production farms (20 %), mixed farms (18 %), permanent-crop farms (10 %), and specialized farms in processing (10 %). Most forage-production farms are cattle rearing, and most specialized farms are in pig production. Most farms (78 %) are conventional and 16 % are organic. 6 % are farms with organic branches or converting to organic farming. Of the 441 farmers included in the survey, 74 % of farmers participate in AEMs, and 26 % are not involved in voluntary schemes. The number of ha enrolled for Greening measures describes farmers' participation in Greening. 26 % of conventional farms with a farm size of more than 10 ha do not comply with the Greening requirements and have no ha enrolled for Greening.

Table 4.2 presents the dependent and independent variables used in both regression models. We created dummy variables for categorical variables. Starting with farmers' age, we selected the oldest age category (65+) as the reference group for the following analyses. We assume that older farmers tend to be more cautious when adopting management practices and, thus, are less likely to adopt new environmentally-friendly farming methods (HYNES & GARVEY, 2009). Furthermore, we chose the lowest category of education (graduation from school and apprenticeship) as the reference group as more educated farmers are more likely to adopt environmentally beneficial methods (PEERLING & POL-

[19]The variable "food production" correlates to some extent with the variables that determine the environmentalist identity, highlighting the farmer identity are not mutually exclusive from each other. For further analysis, we used a cut-off value of 0.4 to obtain results that are applicable and delineated from each other.

MAN, 2009). For farm characteristics, we selected the smallest category for farm size (10-30ha) as the reference group to analyze farmers' participation. A small farm does not have the same economies of scale in applying management practices as a large farm with more land suitable for such systems. Thus, small farms receive lower payments and are less likely to participate in schemes (ZIMMERMANN & BRITZ, 2016). Finally, we chose farms with cash crops as the reference group for analysis as livestock-producing farms are more willing to adopt environmentally-friendly farming methods (HYNES & GARVEY, 2009).

Tab. 4.2: Summary of the variables used in the regression models

Variables	Description	Mean	Standard deviation
AEM participation	=1 if participated in AEM, 0= if not	.737	.441
Share of eligible Greening ha	Percent points of ha enrolled for Greening	.235	.301
[a]Age	Age of the farm operator (1= Under 45, 2= 45-65, and 3= Over 65)	2.066	.554
Gender	Gender of the farm operator (1= Male, 0= Female)	.957	.203
[b]Education level	Level of education of the farm operator (1= School graduation and apprenticeship, 2= Vocational training, and 3= University degree)	2.034	.608
Occupation	(1= Full-time, 0= Part-time)	.692	.462
[c]Farm size	(1= 10-30ha, 2= 30-200ha, and 3= More than 200ha)	1.798	.574
[d]Farm type	(1=Cash crops, 2= Forage production, 3= Specialized in processing, 4= Permanent crops, and 5= Mixed farms)	2.442	1.538
Work-orientated	Latent variable based on seven variables (normalized)	0	1
Environmentalist	Latent variable based on seven variables (normalized)	0	1
Productivist	Latent variable based on seven variables (normalized)	0	1

N=441. [a] Age over 65 as the reference group; [b] School graduation and apprenticeship as the reference group; [c] Farm size 10-30 ha as the reference group; [d] Cash crop farming as the reference group.

4.4.3 Farmer Types and Farmer Environmental Behavior

To test the relevance of the three farmer identity types for environmental behavior, we first analyze the effect of identity on farmers' participation in voluntary schemes. Table 4.3 shows the results of the binary logit model on farmers' participation in AEMs. We present odds ratios, $\exp(\beta')$, which points to a value greater (or less) than 1, farmers are more (or less) likely to participate in AEMs.

As shown in table 4.3, farmer identity is positively associated with farmers' decision to participate in AEMs. In particular, the environmentalist and productivist identities significantly affect farmers' involvement in AEMs. Farmers with a higher standard deviation of environmentalist identity are 28.8 % more likely to be involved in AEMs. Farmers with a salient productivist identity are 59.6 % more likely to have participated in AEMs. In contrast, the conservative identity shows no significant effect on participation. Similar results for environmentalist identity could be found in the literature (THOMAS & ENGEL, 2019; LEONHARDT et al., 2021), highlighting the influence of farmers' identity, particu-

larly farmers' strong pro-environmentalist identity, on participation in AEMs. However, the findings differ for productivist identity, where no significant effect was found (THOMAS & ENGEL, 2019; CULLEN et al., 2020).

For farm characteristics, participating in an AEM is also determined by farm type, particularly for farms specialized in processing, such as dairy and specialized livestock farms, and for permanent crop farms, e.g., vineyards or orchards. Permanent crops and specialized farms are negatively associated with participation, and the effect is significant at the 1 % level for specialized farms and the 5 % level for permanent crops. The likelihood of involvement in AEMs is 62.9 % less likely for specialized farms and 71.5 % less likely for permanent crop farms than for the reference group of cash crop farms. Similarly, previous studies found that relatively intensive farming types are less likely to participate in AEMs (HYNES & GARVEY, 2009; ZIMMERMANN & BRITZ, 2016; CULLEN et al., 2020). For farmers' characteristics, the results are not significant on farmers' participation in AEMs.

Tab. 4.3: Results of binary logistic regression for the prediction of farmers' participation in AEMs

Explanatory variables	Odds ratio	Std. err	p-value	95 %-Confidence interval	
Farmer characteristics					
[a]Age under 45	.597	.235	0.190	.276	1.291
Age 45-65	.586	.261	0.230	.245	1.402
Male	.614	.414	0.469	.164	2.301
[b]Vocational training	.789	.263	0.477	.410	1.516
University degree	1.124	.458	0.775	.506	2.496
Full-time	1.060	.326	0.851	.579	1.938
Farm characteristics					
[c]Farm size 30-200ha	1.194	.347	0.542	.676	2.111
Farm size > 200ha	1.389	.737	0.536	.491	3.929
[d]Forage production	.729	.258	0.372	.364	1.460
Specialized in processing	.285	.123	0.004	.122	.664
Permanent crops	.371	.154	0.017	.164	.838
Mixed livestock	.625	.224	0.190	.310	1.262
Identity groups					
Conservative	1.008	.113	0.942	.809	1.257
Environmentalist	1.288	.164	0.047	1.004	1.652
Productivist	1.596	.219	0.001	1.219	2.090
Validity					
Constant	11.020	9.075	0.004	2.194	55.358
Model chi-square (15)	37.61				
Prob > chi-square	0.0010				
Log-likelihood	-232.01743				
Pseudo R^2	0.0750				
% correctly classified	74.6%				

Significance levels $p<0.01$; $p< 0.05$; $p<0.1$. N=437 (four outliers detected).
[a] Reference group for age is the group 65+.
[b] Reference group for the educational level is school graduation and apprenticeship.
[c] Reference group for the farm size is 10-30ha.
[d] Reference group for the farm type is cash crop farming.

Next, we analyze farmers' participation in Greening using a continuous variable of all ha enrolled for Greening measures, including ha for arable land for crop diversification, EFAs, and permanent grasslands. Farms farming organic are exempt from the Greening requirements. To account for that, we

excluded these farms from the analysis, resulting in a sample of 370 farms[20]. Table 4.4 presents the results of the fractional probit regression model. The coefficients are positive for conservative and productivist identities, while a negative coefficient appears for environmentalists. However, the effect is only significant for productivist identity at the 5 % level. As shown by the magnitudes of the average marginal effects, productivist identity influences the expected share of ha enrolled in Greening, indicating a weak positive effect of 3.2 % on Greening participation.

Farmers and farm characteristics are found to be determinants of participating in Greening. Socio-demographic variables negatively affect the share of ha enrolled in Greening. Surprisingly, high-education levels have an adverse effect on the share of ha enrolled for Greening compared to the reference group. For farm characteristics, farm size positively affects Greening. For example, large farms positively influence the proportion of ha enrolled in Greening than smaller farms (10-30 ha). This means that the larger the farm size, the higher the number of ha enrolled for Greening. The effect is significant at a 5 % level. The influence of large farms compared to the reference group is 9.1%, indicating a relatively weak effect on Greening. For the farm type, forage production and mixed farms show a positive and significant effect on the share of ha enrolled in Greening. The effect of the farm type is strong for forage production farms (40.1%) at the 1% significance level. Specialized farms show no effect on Greening participation.

[20]To compare the results and check for robustness, a second fractional probit model is attached to the appendix A 4, including organic farms with ha eligible for Greening (Tab. A 4.2).

Tab. 4.4: Fractional probit model explaining the share of eligible ha enrolled in Greening

Explanatory variables	Coefficients (Std. dev.)	AME[1]	p-value	95 %-Confidence interval	
Farmer characteristics					
[a]Age under 45	-.103 (.174)	-.024	0.554	-.445	.238
Age 45-65	-.268 (.198)	-.060	0.176	-.655	.120
Male	-.392 (.252)	-.089	0.120	-.886	.102
[b]Vocational training	-.303 (.133)	-.074	0.022	-.563	-.044
University degree	-.322 (.145)	-.078	0.026	-.607	-.038
Full-time	-.006 (.132)	-.001	0.965	-.263	.252
Farm characteristics					
[c]Farm size 30-200ha	.143 (.138)	.029	0.299	-.127	.414
Farm size > 200ha	.409 (.179)	.091	0.022	.059	.759
[d]Forage production	1.307 (.139)	.401	0.000	1.035	1.580
Specialized in processing	-.244 (.172)	-.037	0.156	-.581	.093
Permanent crops	-.257 (.297)	-.039	0.388	-.840	.326
Mixed livestock	.588 (.128)	.143	0.000	.337	.840
Identity groups					
Conservative	.003 (.047)	.001	0.946	-.089	.096
Environmentalist	-.044 (.052)	-.010	0.396	-.147	.058
Productivist	.143 (.050)	.032	0.005	.044	.241
Validity					
Constant	-.731 (.318)		0.022	-1.354	-.107
Wald chi-square (15)	200.09				
Prob > chi-square	0.0000				
Log pseudolikelihood	-150.50713				
Pseudo R^2	0.1880				

Significance levels: $p<0.01$; $p<0.05$; $p<0.1$. N=370; Standard errors in parentheses. [1]AME= Average marginal effects.
[a] Reference group for age is the group 65+.
[b] Reference group for the educational level is school graduation and apprenticeship.
[c] Reference group for the farm size is 10-30ha.
[d] Reference group for the farm type is cash crop farming.

4.5 Discussion and Conclusion

Using PCA, we identified three farmer identities: Conservative, environmentalist, and productivist identity. The results from the regression analyses indicate that farmers' identity affects their environmental behavior, particularly for voluntary schemes rather than conditional schemes. Contrary to our expectations (H1), environmentalist and productivist identities similarly affect farmers' participation in AEMs. The proportion of ha enrolled in Greening is affected considerably by productivist identity (H2). Farmers with a predominantly conservative identity show no effect on environmental behavior in terms of voluntary and conditional environmental schemes, contrary to our expectations (H3). We would have expected that conservative farmers would positively affect the share of ha enrolled in Greening due to the income conditionality of such measures. Farmers with a conservative identity associate their profession primarily with financial risks and hard work, indicating a more pessimistic view of their daily activity than the other farmer types. Financial fears related to farmers' work appear to reduce their willingness to adopt (additional) environmentally friendly farming practices, as we could show in a previous chapter (BETHGE & LAKNER, 2022). Instead, environmental conditions provided by the policy are seen as restrictive and burdening or costly, constraining farmers' pro-environmental behavior, especially for participating in voluntary schemes.

The study's results emphasize the importance of productivist identity in enhancing the probability of participating in AEMs and positively affecting the share of ha enrolled in Greening. Farmers with a salient productivist identity see themselves primarily as producers with a strong farm-oriented view. As the productivist narrative has been examined in the literature, those farmers mainly choose environmental measures that allow them to maximize income and productivity, e.g., nitrogen-fixing crops or catch crops, focusing on ways that improve their business (SULEMANA & JAMES, 2014; CULLEN et al., 2020). Farmers with a salient productivist identity focus more on business-related factors and less on environmental factors (BROWN et al., 2021), influencing their choice of measures and thus affecting environmental outcomes (LAKNER et al., 2017).

Nevertheless, the analysis shows some limitations concerning Greening. Considering farmers' commitment to implement the three conditional measures, some farms use all, others only a part of the ha of cultivated land for crop diversification or grassland, showing differences in their participation in Greening. These results, however, do not directly indicate the effect of farmers' identity in their participation in Greening but rather how farmers implement conditional measures due to their farm structures. Thus, the results for Greening should be taken with caution. Furthermore, financial incentives for Greening are relatively high while the costs for farmers implementing those measures are relatively low. This could be one of the main reasons for farmers to implement Greening, which may reduce the influence of farmers' identity compared to voluntary schemes.

Environmentalists perceive themselves as stewards of nature, believing that protecting the environment is more critical than economic-related factors. Pro-environmental values and beliefs are part of their self-perception and profession, determining high ambitions for voluntary, environmentally friendly behavior (BURTON & WILSON, 2006; SULEMANA & JAMES, 2014). Thus, a farmer with a salient environmentalist identity is mainly motivated to adopt sustainable farming practices due to ecological benefits rather than economic factors. Therefore, we expected that the effect of environmentalist identity on farmers' participation in AEMs would be more likely than productivist identity. However, our results indicate that environmentalist and productivist identities differ slightly in influencing farmers' participation in AEMs, and the probability of participating is even more likely for productivists.

One explanation could be that farmers' compensation levels for any losses due to changes in their farming management are perceived as high, having a (perceived) positive income effect on their farms (DEFRANCESCO et al., 2008). MENNIG & SAUER (2020) even criticized such compensation payments as relatively overcompensating for farmers. Therefore, involvement in AEMs has, to some extent, a positive income effect if these payments are higher than the costs incurred. Accordingly, productivists might evaluate the practices required in AEMs as profitable for their farm that provide enough income compensation for losses that might occur, increasing the likelihood of participation.

Secondly, the pro-environmental values of productivist farmers have been underestimated or changed over time in relation to growing environmental concerns. Given the increasing public scrutiny of envi-

ronmental protection issues and the 'greening' of agricultural policy, farmers must deal with environment-related topics daily. Farmers depend on natural resources and increasingly face ecological challenges such as droughts and related pest infestations, increasing their awareness of environmental and climate protection issues. For instance, MCGUIRE et al. (2013) show that farmers with salient productivist or environmentalist identities similarly support measures for stronger soil and water resources protection.

Lastly, it is vital to bear in mind that farmer identities are not mutually exclusive, and a farmer with a salient productivist identity can also possess traits of the environmentalist identity (BURTON & WILSON, 2006), showing pro-environmental ambitions and behavior despite a distinct productivist-oriented identity. According to HAMMES et al. (2016), productivists can take action to improve ecological conditions even at a financial cost, following their specific economic rationality. Thus, farmers with a salient productivist identity can also be concerned about nature and act not per se profit-oriented.

Farm and farmers' characteristics show some effects on the two dimensions of farmers' environmental behavior. However, socio-demographic variables, such as farmers' age, gender, and full-/part-time farms, show no significant effect (H4, H5, H6). Furthermore, the general educational level shows only some effect for Greening measures, and higher educated farmers negatively affect farmers' involvement in Greening, contrary to our expectations (H7). Similarly, the farm size shows some effect on farmers' participation in Greening measures, and, as we expected, larger farms are more likely to be involved in Greening than small farms (H8). Finally, we found that livestock-producing farms, such as forage production and mixed farms, positively affect Greening (H9). However, specialized farms in processing have a negative effect on farmers' participation in AEMs and no effect on Greening. Specialized farms in our sample are mainly specialized in pig production, supporting the findings that AEMs are more likely to be adopted in low-intensive production systems (ZIMMERMANN & BRITZ, 2016). Considering the literature (LASTRA-BRAVO et al., 2015; BROWN et al., 2021), socio-demographic and other farm-related are rather context-related and dependent on several circumstances regarding farmers' uptake of environmentally-friendly farming methods.

Overall, we found that farmer identity, particularly productivist identity, affects farmers' environmental behavior, particularly for voluntary rather than conditional measures. Farmer identity is crucial to promoting ecological practices and increasing the uptake of environmentally-friendly farming approaches. At the same time, multifunctional agriculture is not for every farmer type as conservative farmers show fewer environmental ambitions that need to be considered. From a policy perspective, designing and adopting policies based on broader knowledge of farmer identity could improve the efficacy and farmers' acceptability of environmental measures (THOMAS & ENGELS, 2019).

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Appendix A 4

Information on the Survey Design and Description Variables used for Analysis

Variables for Farmer Identity

What do you personally associate with your work and profession as a farmer? Multiple answers are possible.

O Shaping the landscape and rural areas

O Food production

O Hard and demanding work

O Financial risks

O Sustainable production to protect natural resources

O Competence in handling heavy machinery

O Responsible for handling animals

O Additionally, _____

O Not specified

Variables on Farmer Environmental Behavior:

Agri-Environmental Measures

Do you currently participate in agri-environmental and climate measures?

O Yes O No O Don't know

Greening

How many hectares of agricultural land does your farm have? Please divide into the arable land, Greening (including grassland/permanent pastures), and catch crops (without forest).

O Total _____ hectares (ha) O Not specified

Of which _____ ha are arable land

_____ ha for greening (incl. grassland/permanent pastures)

_____ ha for catch crops

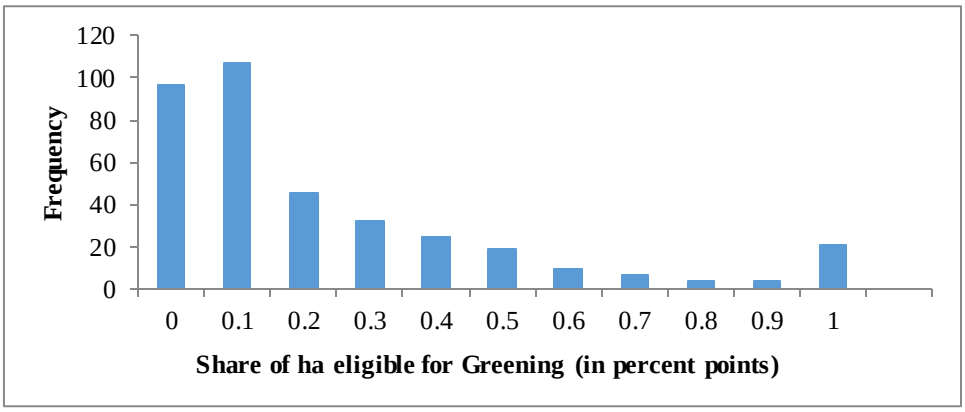

Fig. A 4.1: Histogram of the share of ha enrolled in Greening (in percentage points.)

Tab. A 4.1: **Correlation matrix**

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Work-orientated	1.0000																	
2	Environ-mentalist	-0.0000	1.0000																
3	A. Productivist	0.0000	0.0000	1.0000															
4	Age < 45	0.0474	0.0237	0.1547	1.0000														
5	Age 45-65	0.0190	-0.0357	-0.0588	-0.7136	1.0000													
6	Male	-0.0716	0.0675	-0.0588	-0.0109	-0.0583	1.0000												
7	Full-time	0.1348	-0.1139	0.1344	0.1398	-0.0219	-0.0413	1.0000											
8	Voc_trai	0.0679	0.0013	0.1317	0.0226	-0.0234	-0.0012	0.2461	1.0000										
9	Uni_deg.	-0.0455	0.0615	-0.0950	-0.0808	0.0902	0.0571	-0.0997	-0.6266	1.0000									
10	Size 50-200ha	0.1117	-0.0565	0.0681	0.1243	-0.0410	0.0641	0.2401	0.1852	-0.0108	1.0000								
11	Size >200ha	0.0332	0.0334	-0.0183	0.0427	-0.0178	-0.1240	0.1929	-0.0305	0.1392	-0.2104	1.0000							
12	Forage f.	0.0410	-0.0464	0.144	-0.0061	0.0754	-0.1043	0.0599	0.0944	-0.0996	0.1120	-0.0468	1.0000						
13	Processing	-0.0447	-0.1937	0.2378	0.0674	-0.0481	0.0769	0.1100	0.0252	-0.0006	0.0809	-0.0773	-0.1693	1.0000					
14	Permanent crops	-0.0416	0.1185	-0.1789	-0.0110	0.0466	0.0539	0.1629	-0.0073	0.0001	-0.2360	-0.0671	-0.1893	-0.1312	1.0000				
15	Mixed farms	0.0664	-0.1004	0.1560	-0.0084	0.0213	-0.0615	0.0458	-0.0085	0.0223	-0.0078	0.0710	-0.2319	-0.1607	-0.1796	1.0000			
16	Org. branches	0.0205	0.0580	-0.0172	0.0276	-0.0197	0.0491	-0.1055	-0.0974	0.0295	-0.0580	0.0122	0.0020	-0.0393	0.0145	0.0965	1.0000		
17	Conv. f.	0.0484	-0.0529	-0.0751	-0.0429	0.0534	0.1653	0.0457	0.0928	-0.0299	0.0722	-0.0574	-0.0855	0.0915	0.0211	-0.2108	-0.4129	1.0000	
18	Converting	0.0195	-0.0183	0.0692	-0.0915	0.0956	-0.1574	-0.0443	0.0122	0.0406	0.0443	-0.0358	0.0901	-0.0404	-0.0451	0.0980	-0.0258	-0.2224	1.0000

Tab. A 4.2: Results of the fractional probit model for the share of ha eligible for Greening with organic farms

Explanatory variables	Coefficients (Std. dev.)	AME[1]	p-value	95 %-Confidence interval	
Farmer characteristics					
[a]Age under 45	-.144 (.155)	-.036	0.355	-.448	.161
Age 45-65	-.360 (.179)	-.085	0.045	-.712	-.009
Male	-.580 (.215)	-.139	0.007	-1.001	-.159
[b]Vocational training	-.329 (.119)	-.086	0.006	-.563	-.095
University degree	-.407 (.134)	-.103	0.002	-.669	-.145
Full-time	-.138 (.122)	-.033	0.258	-.377	.101
Farm characteristics					
[c]Farm size 30-200ha	-.012 (.156)	-.036	0.937	-.318	.294
Farm size > 200ha	.235 (.184)	.044	0.201	-.125	.595
[d]Forage production	1.413 (.129)	.442	0.000	1.160	1.665
Specialized in processing	-.120 (.171)	-.020	0.480	-.455	.214
Permanent crops	-.111 (.267)	-.019	0.678	-.634	.413
Mixed farms	.718 (.115)	.186	0.000	.493	.943
Identity groups					
Work-orientated	.024 (.043)	.006	0.573	-.060	.109
Environmentalist	-.036 (.047)	-.009	0.454	-.128	.057
Productivist	.141 (.049)	.034	0.004	.045	.236
Validity					
Constant	-.227 (.296)		0.443	-.807	.353
Wald chi-square (15)	260.88				
Prob > chi-square	0.0000				
Log pseudolikelihood	-189.71084				
Pseudo R^2	0.2115				

Significance levels: $p<0.01$; $p<0.05$; $p<0.1$. N=441; Standard errors in parentheses. [1]AME= Average marginal effects.
[a] Reference group for age is the group 65+.
[b] Reference group for the educational level is school graduation and apprenticeship.
[c] Reference group for the farm size is 10-50ha.
[d] Reference group for the farm type is cash crop farming.

5 General Conclusion

Low and unstable farm incomes are the primary rationale for agricultural policy interventions in the EU. However, empirical evidence revisits the issue of the low-income prevalence between farm/non-farm households (STEFANI et al., 2012; MARINO et al., 2021), indicating that low incomes are diminishing in the farming community. Nevertheless, the European Commission still justifies income support payments due to the alleged low farming incomes (EU COM, 2018). Despite the criticism of the ineffectiveness of direct payments, the CAP funds are mainly intended to support incomes in agriculture and remain in the next funding period, 2023-2027. Sectoral income policy and the integration of cross-policy goals such as environmental protection, nature conservation, and animal welfare are seemingly in tension in the CAP (FEINDT et al., 2021). The development toward more multifunctional agriculture, including higher ecological ambitions and practices, has driven many farmers into the streets, expressing their resentment about increasing standards they comply with to receive direct payments. However, the agricultural sector is a major contributor to environmental degradation. Overcoming these challenges requires a change of thinking and practice, at least for some farmers.

The present dissertation analyzed income support mechanisms in the German agricultural landscape to gather a comprehensive picture of the current situation of farmers and offer policymakers and stakeholders insights and policy implications. Accordingly, the three studies tackle three research areas derived from the existing literature in this broad research field. The empirical work is based on primary and secondary data from Germany, specifically a national official socio-economic survey (FDZ, 2018) and an online survey interviewing farm operators. Data were collected from January to February 2021 based on a quota-controlled sampling procedure using quotas based on the official German land use survey (FDZ, 2016), considering the farm size and the regional distribution of the farms. In this final section, we summarize and discuss our main findings in light of the existing literature, draw overall conclusions, and highlight some limitations of the studies and scope for further research.

5.1 Main Findings

The first study explores the income disparity between farm and non-farm households as well as the economic well-being of farm households in Germany. Two research questions are addressed: Firstly, it is interested in the effect of wealth on the economic well-being of farm households, and secondly, the suitability of deriving policy implications based on the socio-economic survey. We found that the income available to farm households is equal to non-farm (employed) households. These findings align with previous studies (DE FRAHAN et al., 2017; MARINO et al., 2022). Taking wealth into account to determine the households' economic well-being reveals that farm households have the highest net wealth, which is dominated by real estate, improving the farm households' living standard even more than other household

types. Thus, evaluating farmers' standard of living, as stated in the CAP's second objective, requires considering wealth because it affects the farm households' economic status.

By exploring the data availability in Germany, only the Income and the Consumption Survey (FDZ, 2018) allows an explicit comparison of farm/non-farm households. However, using this socio-economic survey to examine farmers' economic well-being reveals some limitations related to the reliability and validity of the results. The analysis relies on (1) cross-sectional data of one-year[21], which does not account for the high volatility of the agricultural entrepreneurial income and does not fully reflect farmers' income from self-employment in agriculture (HILL, 2012; EUROSTAT, 2018). (2) The sample consists of a small number of observations (68 farm households) that do not represent the heterogeneity of farm structures. (3) Comparing the income of farm/non-farm households faces some difficulties in comparing the types of incomes. The income distribution needs to be examined for households with diverse income mixes (STEFANI et al., 2012), and income support payments must be considered for farm households. The data of the EVS and explanation material published (FDZ, 2019) gave no further insights into the amount of income support payments and other subsidies. Thus, the data quality of the Income and Consumption Survey (FDZ, 2018) is insufficient to analyze farm households' standard of living.

Direct payments account for more than 30 % of the average farmers' incomes[22] (EU COM, 2019), conditional on adopting environmental practices. Concerning changing framework conditions of income support, the second study investigated farmers' attitudes toward direct payments. It addressed two research questions: First, we explored different farmer typologies within a comprehensive sample of 435 German farmers to gain insights into farmers' perspectives on income support payments. Second, we derive implications based on the results. The results reveal that within the analyzed sample of German farmers, we identified three clusters based on farmers' attitudes: First, the "Independents" with an entrepreneurial and competitive mindset see policy and environmental regulations as restrictive for their future farming plans. Therefore, abolishing direct payments is perceived as gaining freedom from policy conditions, allowing them more entrepreneurial activity. Accordingly, these farmers are less dependent on income support for their farming activity, have relatively large farms, and adhere to conventional farming methods. Second, the "Conservatives" believe that their farms' survival depends on policy support and prefer maintaining direct payments paid per ha. They perceive policy and environmental conditions stipulated by the CAP as overburdening, and they are less willing to adopt more environmentally-friendly farming methods in the future. Lastly, the "Environmentalists" emphasize a pronounced environmental awareness. They favor an environmentally oriented CAP design that rewards farmers for adopting sustainable farming methods.

[21]The Income and Consumption Survey is conducted every five years and is based on the voluntary participation of household members. Thus, it is not guaranteed that the same households are interviewed each year.
[22]For the years 2015 to 2019.

From a policy perspective, different policy approaches would address farmers in each cluster. The Independents would respond well to policy instruments that combine environmental protection with entrepreneurship that offer economically rewarding agricultural production. The Conservatives advocate an income policy based on direct payments, rejecting a stronger environmental-oriented development. Reducing bureaucracy hurdles and higher economic incentives to apply climate-friendly practices would be needed to address these farmers. Finally, the Environmentalists favor a more ecologically oriented CAP that rewards their environmental protection contribution. The performance-based approach implemented in the new CAP should suit these farmers.

Lastly, the third study examined two dimensions of farmers' adoption of environmental practices, considering farmer identity. It addresses two research questions: First, it is interested in identifying different types of farmer identities, and second, its effect on farmers' environmental behavior. Using principal component analysis, we found three distinct farmer identities in the sample: conservative, environmentalist, and productivist identities, which are also determined in the literature (SULEMANA & JAMES, 2014; THOMAS & ENGELS, 2019).

The findings support the importance of farmer identity on environmental behavior, particularly for voluntary schemes. Farmers with salient environmentalist and productivist identities are more likely to participate in AEMs. The proportion of ha enrolled in Greening is affected considerably by productivist identity, however, these results are taken with caution due to the limitations of the analysis. Farmers with a predominantly conservative identity show no effect on participation in voluntary and conditional environmental schemes.

5.2 Discussion

Comparing these studies reveals some interesting insights. Our findings support the observation that the economic well-being of farm households is similar to or even greater than non-farm households. This indicates that farm income policies are losing relevance, as supported by other studies (ROCCHI et al., 2020; MARINO et al., 2021). However, the lack of data availability is cause for some concern because lacking statistical data overlooks relevant information to design effective and targeted agricultural policy interventions, such as direct payments. Data limitations on farm households' income and wealth prevent differentiating between the poor and non-poor, which is required to effectively target income support for those with the lowest living standard. In addition, as long as agricultural income[23] is used as a proxy for farmers' economic well-being in agricultural policy decisions, the CAP supports farmers in a way that is ineffective in securing a "fair" standard of living.

[23]Only income from agricultural activity is taken into account to assess income disparity among groups.

Taking farmers' perspectives into account shows that for some farmers, income support is less important for their agricultural activity ("Independents"), while others depend on direct payments ("Conservatives"). A heterogeneous endowment with production factors, abilities, skills, and differences in the biophysical environment influence income opportunities across farm households, affecting income disparity among farm households (HILL, 2012; DE FRAHAN et al., 2017). Although our results indicate a relatively equally distributed household income for farm households (Gini-coefficient = 0.23), the analysis relies only on single-year data and a small sample, missing the income volatility in agriculture and the heterogeneity of farms. Accordingly, our results are limited in assessing the income disparity among farm households. Income inequality among German farm households thus calls for further investigation.

Considering the distinct farmer typologies, the changes in the direct payment system will affect farmers differently. As the design of income policy is increasingly oriented toward public and environmental provision services, conservatively minded farmers will have to rethink their thought patterns and farming behavior to catch up with the changing requirements. Some scholars argue that social influences affect farmers' unwillingness to adopt sustainable farming methods and to improve their environmental outlook (MCGUIRE et al., 2013; KUHFUSS et al., 2016), overlooking the strong effect of financial fears on farmers' views and decision-making. However, peer learning groups of farmers have been recognized as a means to encourage farmers toward a positive change in their behavior through social influences (GREEN et al., 2020; BAKKER et al., 2021; O'CONNOR et al., 2021). In addition, contact with an agricultural advisor positively affects farmers' decision-making related to ecological behavior (DAXINI et al., 2018; CULLEN et al., 2020). Therefore, there are opportunities to facilitate greater support for the farming community regarding sustainable farming methods (BARNES et al., 2022), which should focus on more transparent and direct communication strategies for farmers, promoting farmers' peer discussion groups, and extension training for advisors. In this way, more environmentally-friendly farming actions and perceptions could be embedded among farmers.

Understanding the drivers underlying farmers' behavior is evident in achieving environmental objectives. As a multifunctional agricultural policy does not apply to all farmers in the same way, policy programs should be developed which include farmers in addressing their motivation to adopt environmentally beneficial practices. Hence, engaging farmers in policy change thus requires a more differentiated policy design that allows a certain degree of flexibility to meet farmers' needs to enhance their motivation to adopt (more) environmentally-friendly farming practices. In this regard, understanding farmer identity would help motivate farmers to act pro-environmentally as the way they perceive themselves in relation to their occupation considerably affects farmers' behavior. Thus, creating a tool for identifying farmer types could be a crucial starting point for future policy debates and design.

5.3 Limitations and Suggestions for Future Research

The studies in this thesis provide broad insights into income support in agriculture in Germany. Nevertheless, some limitations need to be mentioned. Due to data security reasons and constraints, we could not provide individual or federal state data in the first study nor compare farm households regarding the distribution of income and wealth that would have gained more insights into disparities among farmers. Further, the households' economic well-being only refers to financial assets and real estate in our study. The analysis misses other sources of wealth, such as durable assets or pensions, due to data limitations and survey methodology, resulting in an underestimation of such asset values. However, pensions function differently than other types of assets: Pensions do not provide utility or security against shocks in the present, do not generate income, and do not fulfill any inheritance function (GRABKA & WESTERMEIER, 2014). Therefore, the debate on how to treat pensions is still ongoing. But taking into account that farmers in Germany are included to a limited extent in the compulsory pension insurance system, they mainly accumulate their own retirement savings (Law on the retirement provision of farmers, 1994) in financial assets and real estate, indicating a minor effect of pensions on farmers economic well-being (THIELE, 1998).

The methodological approach in the second and third studies is affected by arbitrariness in the cluster analysis approach and the selection of variables determining farmer identity. Cluster analysis, in general, is data-driven and not meaningful without contextual interpretation. Measures of similarity and distance are to be specified by the researcher, which provides space for "fine-tuning" the results. Nonetheless, the two-step approach, combining a hierarchical with non-hierarchical clustering algorithm and discriminant analysis, as well as the Duda-Hart criterion and ANOVA, as applied in the second study, are scientifically well-established procedures to reduce arbitrariness and provide meaningful results.

Further, the choice of farmer identity dimensions is a general weakness in the research field since no coherent set of identity dimensions has existed so far (DARNHOFER & WALDER, 2013; GROTH & CURTIS, 2017). To account for that, we chose farmer identity variables following the approach by BURTON & WILSON (2006) and THOMAS & ENGEL (2019) that has already been examined and implemented in a lab-in-the-field experiment applied to Lower Saxony. Adding an open text field for farmers' impression of further aspects linked to their occupation accounts for missing other elements essential for farmer identity. Nonetheless, we should keep in mind that the concept of farmer identity is complex, and reducing it to seven variables might miss some in-depth information.

Finally, social desirability bias may have affected survey approaches in the second and third studies. These biases refer to respondents' tendency to answer in a socially desirable way instead of choosing answers that reflect their genuine thoughts. This response tendency should be bear in mind, but according to

our survey results, it is rather low as a much stronger trend toward pro-environmental decisions would have been expected.

Regarding future research possibilities, several aspects deserve further investigation based on the results. First, more research is needed to examine the distribution of income and wealth among farm households based on household panel data to gain more insights into the heterogeneity of farm households and their economic well-being. This would help improve developing policy instruments, measuring the achievement of policy objectives, and farm households' response to policy change. Second, based on the clusters, further research should investigate farmers' acceptance of environmentally-friendly farming practices, considering the changing policy framework in 2023, to gather insights into farmers' preferences in each cluster. Third, further studies should pay more attention to farmers' motivation to adopt sustainable practices and the incentives provided to address farmers' motivation. This is of particular interest for farmers refusing additional environmentally-friendly farming practices. Finally, studying how the salient identity is influenced or activated could be an exciting area of further research. This could help in developing policy programs enhancing farmers' acceptance of sustainable practices.

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List of Publications

Published Paper in Peer-Reviewed Journals:

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Bethge, S. & S. Lakner "Farmers' Attitudes towards the Future of Direct Payments: An Empirical Study from Germany" conditionaly accepted for publication in *German Journal of Agricultural Economics*.

Conference Presentations:

Bethge, S. (2019). The private wealth of farm households in Germany and its influence on their social position. 171th EAAE Seminar *Measuring and evaluating farm income and well-being of farm families in Europe*, September 5-6, 2019, Tänikon, Switzerland.

Bethge, S. (2019). Farmers' perception of change in organic farming in Germany. 29th Annual Conference of the Austrian Society of Agricultural Economics *Perspectives on Values-based Supply Chains*, September 19-20, 2019, Innsbruck, Austria.

Declaration of own Contribution

Hereafter, I declare the parts I contributed to two of the three studies presented in this dissertation.

The first study, "The Economic Well-being of Farm Households in Germany", was written in collaboration with Jost-Frederick Wendt and Prof. Dr. Sebastian Lakner. The conceptualization, investigation, data curation, methodology, and formal analysis of the paper, as well as the writing of the original draft and visualization in collaboration with my colleague Jost-Frederik Wendt. Prof. Dr. Sebastian Lakner gave helpful advice for the review and editing.

In the second study, "Farmers' Attitudes toward the Future of Direct Payments: An Empirical Study from Germany", a collaboration with Prof. Dr. Sebastian Lakner, I was responsible for the following parts: development of a conceptual framework in collaboration with Prof. Dr. Sebastian Lakner, preparation and implementation of the survey in collaboration with a survey company (Kynetec - former Kleffmann Group) from January to February 2021, statistical analysis, interpretation of the results and writing of the original draft including visualization. The original draft was reviewed and edited by Prof. Dr. Sebastian Lakner.

Affidavit

I hereby declare on oath that:

1. This work has not already been submitted in the same or a similar form to other examination offices.

2. I have not applied for a doctoral degree at any other university.

Göttingen, August 5, 2022

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(Signature)

I hereby declare on oath that this dissertation was written independently and without undue assistance.

Göttingen, August 5, 2022

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(Signature)