

German Farmers' Perspectives on Price Drivers in Agricultural Land Rental Markets—A Combination of a Systematic Literature Review and Survey Results

Cord-Friedrich von Hobe ^{*}, Marius Michels  and Oliver Musshoff 

Department of Agricultural Economics and Rural Development, Georg-August-University Göttingen, Platz der Göttinger Sieben 5, D-37073 Göttingen, Germany; marius.michels@agr.uni-goettingen.de (M.M.); Oliver.Musshoff@agr.uni-goettingen.de (O.M.)

^{*} Correspondence: cord-friedrich.hobe@uni-goettingen.de; Tel.: +49-551-39-24836; Fax: +49-551-39-22030

Abstract: Despite the popularity of agricultural land markets as a research topic, a current literature review on price drivers on agricultural land rental markets is missing, which is crucial in order to gain an overview of the status quo. Furthermore, farmers' perceptions of price drivers on agricultural land rental markets have not been considered sufficiently. Therefore, this study combines descriptive results from a survey with 156 German farmers conducted during 2019–2020 using purposive sampling and a systematic literature review. The systematic literature review reveals four important areas acting as price drivers in agricultural land rental markets: policy/Common Agricultural Policy (CAP), bioenergy, climate change, and market prices/competition. Based on the overview, several points of departure for further research are provided. Furthermore, results from the survey show that farmers' perceptions of the relative importance of the price drivers differ from the results of scientific literature. Therefore, perceptions of farmers should be considered for possible policy interventions derived from scientific evidence.



Citation: von Hobe, C.-F.; Michels, M.; Musshoff, O. German Farmers' Perspectives on Price Drivers in Agricultural Land Rental Markets—A Combination of a Systematic Literature Review and Survey Results. *Land* **2021**, *10*, 180. <https://doi.org/10.3390/land10020180>

Received: 21 January 2021

Accepted: 7 February 2021

Published: 10 February 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: agricultural land rental markets; price drivers; German farmers; PRISMA procedure; agricultural policy

1. Introduction

In recent years, there has been much movement on the European markets for agricultural land with an active debate on causes and effects [1]. Many countries, such as France, Germany, and the United Kingdom, have experienced drastic increases in agricultural land prices [2]. Considering the importance of land as a production factor in agriculture, it is not surprising that agricultural land markets have become the subject of extensive empirical research as a result of this trend. Various explanatory approaches to purchase price trends have been used in recent years, such as the attractiveness of farmland as an investment portfolio choice [3], an increased market entry of non-agricultural investors [4], the importance of farmland for renewable energies [5], the auction design of farmland privatization [6,7], and many more. Land rental prices have also risen sharply and are considered a major driver of the substantial increase in purchase prices due to increasing productivity, market prices, and competition between farmers [8]. For instance, the average rental price on German agricultural land increased by 64% between the years 2005 and 2016 [9]. It is important to look at the development of land rental prices not only because there is often a high proportion of rented land under cultivation—in Germany it is over 50%—but also because farmland operators fluctuate much more often through rent than through purchase [10]. As pointed out by Marks-Bielska [11], the rental share of agricultural land has increased dynamically in European countries with well-developed agriculture. Takáč et al. [12] further argue that rental prices can be objectively monitored on the market, while the purchase price often represents the subjective opinion of the

owner. The decision to rent land is usually made on the basis of short- to medium-term considerations, without speculation on an increase in the value of the land [13]. Opposed to expansion via additional land ownership renting additional farmland has also been shown to provide a lower risk opportunity for growth, resulting in a greater ability to repay farm debt [14,15]. Additionally, the higher the transaction costs on the land sale market, the more important land rental markets are for farmers in comparison [16]. Lastly, land rental markets can play an important role in improving efficiency and possibly equity in land use and access for farmers [17].

While many papers look into the price drivers on the buyer's market for agricultural land, which reflects the great interest of agricultural economists, policymakers, and others in this topic, a current overview of the findings in the literature regarding the agricultural land rental market is not available. In addition, the availability of data relating to land rental agreements is considerably poorer. Previous reviews have focused on the development of rental rates in European Union member states [18] or on applied land reforms in 25 countries [19]. Yet, these reviews are now outdated to a certain extent, and did not focus specifically on price drivers on agricultural land rental markets, which are therefore the focus of this review.

Furthermore, the literature review for this article revealed that current studies focusing on farmers' views on the agricultural land rental market are scarce. Specifically, only four studies have analyzed the agricultural land (rental) market and its price drivers from the perspective of farmers. Forbord et al. [20] used qualitative in-depth interviews with 18 farmers in which they focused on ownership and renting agricultural land from the farmers' perspective. In this, they asked the farmers about their intentions to rent more land as well as fragmentation of farmland and farm succession. Marks-Bielska [11] used a standardized questionnaire to survey 943 Polish farmers. Farmers were asked to state their motives to rent land and to buy land. Furthermore, 378 British tenant farmers were surveyed by Ilbery et al. [21] also using a standardized questionnaire. In their study, they focused on the effects of the Common Agricultural Policy on agricultural land markets and their future business pathways. Lastly, Emmann et al. [22] focused on German farmers' perceptions of non-agricultural investors. They showed that the 566 surveyed farmers see themselves in direct competition with non-agricultural investors and wish for political intervention in the land market to protect them from non-agricultural investors. However, none of the studies has focused on farmers' perceptions on more than one price driver affecting the agricultural land rental market. Furthermore, farmers' expectations of the future magnitude of these price drivers have not yet been examined. Lastly, the literature review reveals that a large share of the studies has been conducted on German agricultural land markets. Hence, it is also worthwhile to investigate German farmers' views and expectations towards the identified price drivers since most of the implications for agricultural land markets were based on studies on the German agricultural land market, but without taking farmers' views into account.

The aim of this study is therefore twofold: first, the study depicts the current findings in the literature concerning agricultural land rental markets and their price drivers by applying a systematic literature review. In this, the study focused on results for Europe. A global perspective does not seem feasible, since European farmers operate under fundamentally different conditions with regard to farm structures, climate, agricultural market structures, and agricultural policy [23]. The European rental market appears promising for the assessed research questions due to the high rental shares, the comparatively high political regulation of agricultural production as well as the fact that in no other region have rental prices risen so sharply in recent years [11]. Second, based on the systematic literature review, a standardized online questionnaire was developed in which German farmers were asked to state their current perceptions and future expectations of the agricultural land rental market and its price drivers. The price drivers considered in this study are non-static price drivers that change over time and, thus, have a changing impact on rental prices. The procedure of combining survey data with a literature review and the

discussion of both simultaneously was also used by Michels et al. [24] to capture German farmers' perspectives on direct payments in the European Union. Ergo, the presented study proceeds in three successive steps: first, the systematic literature review is used to identify the price drivers pinpointed in the primary literature. These identified price drivers are then offered to farmers as choices in the survey. Third and finally, the results from the literature review and the survey are compared.

The contribution of this study is therefore the combination of literature and primary survey results in order to capture the status quo regarding price drivers on the European farmland rental markets. More specifically, this review provides an overview of 34 selected articles dealing with agricultural land rental markets, which are classified according to groups of price drivers and the methodological approaches. This is complemented by the analysis of survey data from a sample of 156 German farmers collected in 2020 who were explicitly asked for their opinion on the price drivers on agricultural rental markets. Capturing the status quo is crucial in order to uncover initial (political) fields of action in the short term. Furthermore, points of departure for further research projects are identified, which could provide useful results and implications for potential political intervention on agricultural land rental markets in the long term. Accordingly, the results are of primary interest for researchers in agricultural economics and agricultural policymakers. However, by providing several impulses for further research, the results of this study could also prove beneficial for farmers and agricultural extension services.

The remainder of this article is structured as follows: the systematic literature review and its results are presented in Section 2. Section 3 contains the description of the survey as well as its results. A discussion and implications for further research are provided in Section 4. The article ends with conclusions in section.

2. Systematic Literature Review

2.1. Methodological Approach

For the systematic literature review [25], the study employed numerous keywords and reasonable combinations of the keywords in several databases as shown in Table 1. The keywords were each individually combined with the terms “farmland rental prices”/“agricultural land rental market” as well as “price driver” by means of an “and” search link in order to obtain the most targeted results. During the initial review titles, abstracts and keywords were checked to see if they fit the topic. For instance, articles not focusing on Europe and agricultural land rental markets as well as articles from before 2010¹ were excluded. Furthermore, the reference list of all relevant articles remaining after the initial review were checked [26]. Titles, abstracts, and keywords of suitable articles were reviewed in the same manner. Lastly, the remaining articles in full length were reviewed once again by at least two authors with regard to their individual suitability and their additional value added for the study objective. The final sample of articles then was selected using the “preferred reporting items for systematic reviews and meta-analysis (PRISMA)” procedure [27], which led to the final selection of 38 studies.

2.2. Results

The systematic literature review described in Section 2.1 resulted in 38 scientific papers on price drivers in farmland rental markets, which were included in the final literature analysis and, thus, in the subsequent development of the questionnaire. Figure 1 provides a thematic, methodological, and regional breakdown of the 38 final papers, which are then listed and categorized in Table 2.

¹ It should be noted that there is, of course, literature available on agricultural land rental markets before 2010. However, due to substantial growth in research regarding agricultural land (rental) markets and several other developments (e.g. agricultural policies, support of bioenergy etc.) affecting agricultural land (rental) markets, we focused on the most current research in this review.

Table 1. Databases and keywords applied for the literature review.

Databases	Keywords	
Google Scholar	Farmland rental prices *	Europe
AgEcon Search	Agricultural land rental markets *	Farmer
Elsevier ScienceDirect	Price drivers *	Farmland
Wiley Online Database	Agriculture	Policy
Scopus	Contractual arrangements	Climate change
	Risk management	Common Agricultural Policy
	Bioenergy	

* used in conjunction with the other keywords by an “and” search link.

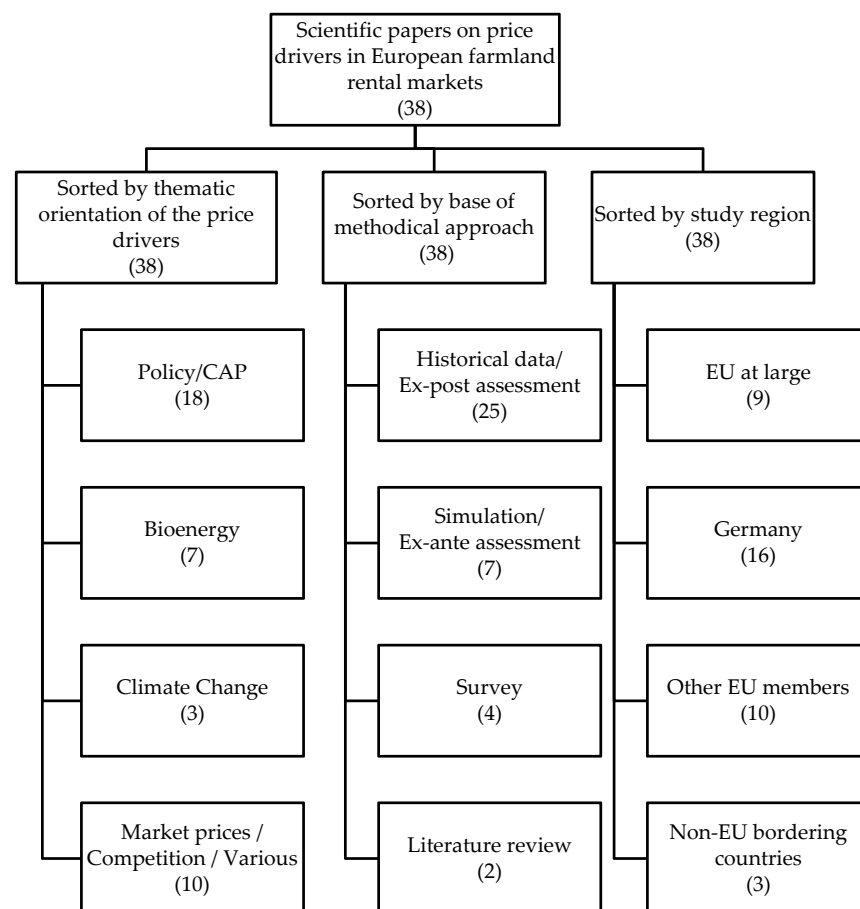


Figure 1. Thematic, methodological, and regional breakdown of the articles selected by preferred reporting items for systematic reviews and meta-analysis (PRISMA). CAP = Common Agricultural Policy; EU = European Union.

Methodologically, the majority of the literature examined uses historical time series data as the basis for the calculations (“Historical data/Ex-post assessment”) or simulates the influence of various price drivers on rental prices using model assumptions (“Simulation/Ex-ante assessment”). Only four of the papers [11,20–22] used a survey to gain insights into farmers’ perceptions. Likewise, recent literature reviews are scarce [18,19], but crucial, in order to gain insights into the current status quo. For this reason, the study is intended to also provide further insights into the assessment of the farmers’ standpoint and the combination of farmers’ views with a literature review. The breakdown of the selected

studies by study region shows the strong regional focus on Germany (16). The other studies are divided between the EU as a whole (9), other EU countries (10), and European non-EU countries (3). Overall, the studies considered therefore show largely comparable conditions, which is why the focus was placed on Europe as a selection criterion. The fact that Germany is strongly represented as a study region supports the further approach of the presented study to survey German farmers.

As shown in Figure 1, the drivers of farmland rental prices in Europe identified in the systematic literature review can be divided thematically into four categories, whereby causal and interdependent relationships exist in between the categories. With 18 of the 38 research papers considered, political drivers play the main role in research on factors influencing farmland rental markets in Europe. In particular, the capitalization of agricultural subsidies under the Common Agricultural Policy (CAP) is a major research area. There are considerable differences between model simulations and empirical results with regard to the question of whether direct payments benefit land tenants or landowners—i.e., to what extent they are capitalized in farmland prices [28]. Ciaian et al. [29] suggest that the Single Payment Schemes (SPS) have a higher impact on agricultural land rents than their predecessor, coupled subsidies. While O'Neill and Hanrahan [30] present opposite results for Ireland and Kilian et al. [31] confirm this finding and further argue that the capitalization of SPS depends on land supply elasticity. Breustedt and Habermann [32] show that in Germany, for each additional Euro in premium payments paid for eligible arable land, the rent increases by €0.38. They also show that regional livestock density, which is indirectly influenced by different policies, is also an important determinant of farmland rents, a point further proven by Hennig and Breustedt [33]. They argue that German rental prices for arable land are strongly influenced by agricultural policy instruments and that policy measures therefore have considerable distributional effects. The capitalization of each additional Euro in premium payments paid for eligible arable land into farmland rents is also quantified by Ciaian and Kanacs [34] (€0.19) and by van Herck et al. [35] (€0.25) for newer EU member states as well as Guastella et al. [36] (€0.22) and Michalek et al. [37] (€0.06–0.10) for all EU member states. However, the latter study revealed strong differences in capitalization between the different member states as well as different forms of direct payments. Strong fluctuations in the level of capitalization were also shown on the individual farm level by Feichtinger and Salhofer [38]. In a recent study, the same authors further illustrate that considerable differences in capitalization exist between different CAP measures and regions depending on yield level, grassland share, and farm size [39]. Additionally, in a different study, Guastella et al. [40] demonstrate a low capitalization of decoupled payments in Italy. In another Italian study, Valenti et al. [41] show that the elasticity of land price with respect to coupled and decoupled subsidies is below one. Particularly, for the latter payments, the degree of capitalization declines with decreasing competition in farmland markets. The simulation of an alternative system of personalized and non-transferable forms of direct payments in Switzerland shows that this can even lead to falling rental prices [42]. In summary, the main mechanism of impact of the policy instruments on the rental price is the capitalization effect, i.e., subsidies are (partly) passed on from the lessee to the lessor, since the lessor adds it to the price of the rent. Other important political price drivers are price restrictions [18], land fragmentation [19], social norms [20], as well as politically established pre-emptive rights in the context of land privatization [11]. Another price driver on European farmland rental markets identified

in the systematic literature review is the increase in the use of bioenergy. Above all, the increased land requirements for substrate used in the process of biogas production have a strong influence on the land (rental) markets in many regions [43]. Operators of biogas plants transfer part of their financial surplus to land values by offering higher rental rates in order to cultivate substrate [44]. In line with this, Appel et al. [45] show that farms that also produce bioenergy offer higher prices on the land lease market and are more competitive. In their study from Northern Italy, Demartini et al. [46] show a non-linear effect of biogas production on land rental prices. Hennig and Latacz-Lohmann's [44] study on the effects of biogas production on farmland rental rates in Northern Germany found that biogas production, in combination with local competition, as well as agglomeration economies resulting from high livestock densities, has a considerable impact on regional farmland rental rates. Their spatial econometric approach estimates the effect of biogas production on farmland rental prices, between 61 and 141 Euros per hectare, depending on livestock density. However, Habermann and Breustedt [47] found a statistically significant increase in Germany only for Western Germany. Here too, the considerably higher livestock density plays a decisive role. Thus, regarding bioenergy production, the price drivers are linked to policy, competition, and agricultural structure (livestock density). The link to politics is due to the fact that European countries, just as many other countries in the industrialized world, promote energy production from biomass through various political instruments such as subsidies or purchase guarantees and minimum prices [44]. Troost et al. [48] show for the case of Germany that these bioenergy subsidies lead to a strong increase in willingness-to-pay for rental farmland. Similarly, Bartoli et al. [49] use the example of Lombardy in Italy to investigate the influence of different bioenergy subsidies on the demand for maize silage and show that less bioenergy production could indirectly lead to lower land rental prices. The mechanism that primarily affects rental prices is based on the fact that biogas plant operators with their financial surpluses, which are granted in part through political support, offer higher rental prices than classic food producers in order to grow the required substrate [43].

The third price driver of land rental prices in Europe observed in the systematic literature review is climate change². Aurbacher et al. [50] calculate future land rental price changes applying a regional climate change model based on historical data, which results in an overall sectoral increase in land rents of 5–6% of German net agricultural income by 2040. In their research outlook, they refer to the need for farmers to adapt to new climatic conditions, which is also one of the issues addressed in the questionnaire. Schmidtner et al. [51] use a similar methodological approach and come to similar conclusions regarding the forecast development of farmland rental prices in Germany. They predict a 10–17% overall increase in rental prices by 2040 resulting from the expected changes in temperature and spring precipitation. However, they also point to a spatially heterogeneous influence, which requires further research, as from a certain temperature increase in the areas with a higher initial temperature, the forecast rental prices decrease again. A recent study from Northern Italy displays a negative influence of climate change on farmland rental prices in regions prone to drought [52]. Accordingly, the main effect on rental prices in terms of climate change is due to regionally specific climatic conditions that are changing in different ways, leading to better or worse growing conditions for farmers, who can pay correspondingly higher (or lower) rents. The fourth and last group of price drivers of

² Other locational factors (e.g., soil quality) that do not change in the short–medium-term were not included in the analysis, as this study focuses on changing drivers over the course of time.

agricultural farmland rental prices in Europe identified in the course of the systematic literature review consists of market prices and mechanisms, competition on the rental market, and various smaller influencing factors. In addition, this category includes those studies that take a broader approach or consider the agricultural structure as a whole. Ciaian et al. [29] emphasize the positive influence of productivity growth and commodity price developments on farmland rental prices. Dupraz and Temesgen [53] as well as Takáč et al. [12] also show the negative influence of increasing factor prices on the ability to pay rents and thus on the level of rental prices. The latter also examine the influence of geographical conditions (such as distance from the farms to a larger city) and agricultural structural conditions (such as farm density or average farm size) on rental prices. März et al. [54] also consider these factors and uncover potential heterogeneities of the estimated effects across the conditional distribution of rental rates using Bayesian geospatial quantile regression. Marks-Bielska [11] identifies competition among farmers as a price driver. Using historical data from Ukraine, Graubner et al. [55] find empirical support that farms affiliated with an agroholding possess (*ceteris paribus*) more land and set higher land rental prices compared to independent farms. Habermann and Ernst [56] consider the influence of the agricultural structure on rental prices in the case of Germany and show that in regions with higher rent shares and higher competition the farmland rental price level increases. Another influencing factor identified in the literature is the contractual design of rental agreements [57]. Lastly, Emmann et al. [22] showed that farmers perceive themselves to be in competition with non-agricultural investors. Non-agricultural investors can exert pressure on the rental markets, as they use the sale and leaseback method. Farmland is purchased and afterwards leased back to the farmers with the intention of achieving a certain return, whereby investors often have greater financial leeway than competing farmers. To generate a specific return on the investment asset farmland, they often raise the rental prices after purchase. Likewise, Heinrich and Appel [58] used an agent-based approach through simulations with the agricultural structural model AgriPoliS to show that for Germany, a non-agricultural investor could indirectly increase the rental price, as other farmers in the investor's catchment area increase their rental bids for fear of losing their land. In simplified terms, for this group of price drivers it can be said that agricultural rental prices are rising, because farmers are willing (or are forced) to pay higher rents due to increased (perceived) competition, increased productivity, improved structural conditions, or lower factor prices.

The main drivers of farmland rental prices in Europe identified in the systematic literature review were used as a basis for the preparation of the questionnaire, both with regard to the current assessment of the drivers by the farmers themselves and for the preparation of the surveyed possibilities for adjusting farmland rental contracts to external circumstances.

2.3. Statistics on German Land Rental Market

To give a sense of the German rental market for agricultural land, Figure 2 shows the development of average rental prices for arable land and grassland in Germany. In addition, the development of the total number of farms and biogas plants in Germany is presented.

Average rental prices for agricultural land have continued to rise in recent years. For arable land, for example, they increased by 90% between 1999 and 2016. The number of farms continues to decrease. Between 2001 and 2018, the total number of German farms fell by 4%. In the course of structural change, more and more farms are closing down and the remaining farms are growing in size. In order not to be forced to give up, there is a considerable urge for farmers to grow, which increases competition on the land markets [10]. The number of biogas plants has increased considerably since 2000 (+791%). However, the development has flattened out noticeably since 2010.

Table 2. Studies analyzed within the framework of the systematic literature review.

Year	Study	Author	Study Region	Price Driver Category	Methodical Approach Category
2010	EU Land Markets and the Common Agricultural Policy	Ciaian et al. [29]	European Union	Policy/CAP	Literature review
2010	European biomass resource potential and costs	de Wit and Faaij [43]	European Union + Ukraine	Bioenergy	Simulation/ Ex-ante assessment
2010	Assessing the impact of climate change on agriculture in Germany—a Ricardian analysis	Aurbacher et al. [50]	Germany	Climate change	Historical data/ Ex-post assessment
2010	Developments and determinants of farmland rental rates in Germany	Habermann and Ernst [56]	Western Germany	Market prices/ Competition/Various	Historical data/ Ex-post assessment
2010	Property matters: Agricultural restructuring and changing landlord–tenant relationships in England	Ilbery et al. [21]	England	Policy/CAP	Survey
2011	The Incidence of EU Per-Hectare Payments on Farmland Rental Rates: A Spatial Econometric Analysis of German Farm-Level Data	Breustedt and Habermann [32]	Germany	Policy/CAP	Historical data/ Ex-post assessment
2011	Einfluss der Biogaserzeugung auf landwirtschaftliche Pachtpreise in Deutschland	Habermann and Breustedt [47]	Germany	Bioenergy	Historical data/ Ex-post assessment
2012	Impacts of 2003 CAP reform on land rental prices and capitalization	Kilian et al. [31]	Bavaria, Germany	Policy/CAP	Historical data/ Ex-post assessment
2012	The Capitalization of Area Payments into Farmland Rents: Micro Evidence from the New EU Member States	Ciaian and Kancs [34]	New EU member States	Policy/CAP	Historical data/ Ex-post assessment
2012	Key Issues and Developments in Farmland Rental Markets in EU Member States and Candidate Countries	Ciaian et al. [18]	European Union	Policy/CAP	Literature Review
2012	Farmland Rental Rate and Marginal Return to Land: A French FADN Perspective	Dupraz and Temesgen [53]	France	Market prices/Competition/Various	Historical data/ Ex-post assessment
2013	Factors shaping the agricultural land market in Poland	Marks-Bielska [11]	Poland	Market prices/Competition/Various	Survey
2013	Transfer of single farm payment entitlements to farm successors: impact on structural change and rental prices in Switzerland	Mack et al. [42]	Switzerland	Policy/CAP	Simulation/ Ex-ante assessment
2014	Capitalization of the Single Payment Scheme into Land Value: Generalized Propensity Score Evidence from the European Union	Michalek et al. [37]	European Union	Policy/CAP	Historical data/ Ex-post assessment
2014	Land reform and land fragmentation in Central and Eastern Europe	Hartvigsen [19]	Central and Eastern Europe	Policy/CAP	Historical data/ Ex-post assessment
2014	Drivers of change in Norwegian agricultural land control and the emergence of rental farming	Forbord et al. [20]	Norway	Market prices/Competition/Various	Survey
2014	The Capitalisation of Fixed per hectare Payment into Land Rental Prices: a Spatial Econometric Analysis of Regions in EU	Guastella et al. [36]	European Union	Policy/CAP	Historical data/ Ex-post assessment
2014	Capitalization of direct payments in land rents: evidence from New EU Member States	van Herck et al. [35]	New EU member States	Policy/CAP	Historical data/ Ex-post assessment

Table 2. Cont.

Year	Study	Author	Study Region	Price Driver Category	Methodical Approach Category
2015	Do Different Measurements of Soil Quality Influence the Results of a Ricardian Analysis?—A Case Study on the Effects of Climate Change on German Agriculture	Schmidtner et al. [51]	Germany	Climate Change	Historical data/ Ex-post assessment
2015	Charakterisierung und Bedeutung außerlandwirtschaftlicher Investoren: Empirische Ergebnisse aus Sicht des landwirtschaftlichen Berufsstandes	Emmann et al. [22]	Germany	Market prices/Competition/Various	Survey
2015	Climate, energy and environmental policies in agriculture: Simulating likely farmer responses in Southwest Germany	Troost et al. [48]	Germany	Bioenergy	Simulation/ Ex-ante assessment
2016	The Effect of Biogas Production on Farmland Rental Prices: Empirical Evidences from Northern Italy	Demartini et al. [46]	Province Cremona, Italy	Bioenergy	Historical data/ Ex-post assessment
2016	Is there a term structure in land lease rates?	Hüttel et al. [57]	Germany	Market prices/Competition/Various	Historical data/ Ex-post assessment
2016	Analysing farmland rental rates using Bayesian geoaddivitive quantile regression	März et al. [54]	Germany	Market prices/Competition/Various	Historical data/ Ex-post assessment
2016	Decoupled Single Farm Payments of the CAP and Land Rental Prices	Feichtinger and Salhofer [38]	Bavaria, Germany	Policy/CAP	Historical data/ Ex-post assessment
2016	The capitalization of coupled and decoupled CAP payments into land rental rates	O'Neill and Hanrahan [30]	Ireland	Policy/CAP	Historical data/ Ex-post assessment
2016	The impact of different energy policy options on feedstock price and land demand for maize silage: The case of biogas in Lombardy	Bartoli et al. [49]	Province Lombardy, Italy	Bioenergy	Simulation/ Ex-ante assessment
2016	Effects of the German Renewable Energy Act on structural change in agriculture—The case of biogas	Appel et al. [45]	Germany	Bioenergy	Simulation/ Ex-ante assessment
2017	The incidence of biogas feed-in tariffs on farmland rental rates—evidence from northern Germany	Hennig and Latacz-Lohmann [44]	Northern Germany	Bioenergy	Historical data/ Ex-post assessment
2017	Lost in space? The effect of direct payments on land rental prices	Graubner [28]	European Union	Policy/CAP	Simulation/ Ex-ante assessment
2018	The Capitalisation of CAP Payments into Land Rental Prices: A Panel Sample Selection Approach	Guastella et al. [40]	Italy	Policy/CAP	Historical data/ Ex-post assessment
2018	The Incidence of Agricultural Subsidies on Rental Rates for Grassland	Hennig and Breustedt [33]	Western Germany	Policy/CAP	Historical data/ Ex-post assessment
2018	Do investors ruin Germany's peasant agriculture?	Heinrich and Appel [58]	Germany	Market prices/Competition/Various	Simulation/ Ex-ante assessment
2019	Agroholdings and Land Rental Markets: A Spatial Competition Perspective	Graubner et al. [55]	Ukraine	Market prices/Competition/Various	Historical data/ Ex-post assessment

Table 2. Cont.

Year	Study	Author	Study Region	Price Driver Category	Methodical Approach Category
2019	Land rent values determinants: a Hedonic Pricing approach at local scale	Mazzocchi et al. [52]	Region Milan, Italy	Climate change	Historical data/ Ex-post assessment
2020	The Factors Affecting Farmland Rental Prices in Slovakia	Takáč et al. [12]	Slovakia	Market prices/Competition/Various	Historical data/ Ex-post assessment
2020	Regional differences in the capitalisation of first and second pillar payments of the CAP into land rental prices	Salhofer and Feichtinger [39]	Germany	Policy/CAP	Historical data/ Ex-post assessment
2021	The capitalization of CAP payments into land rental prices: a grouped fixed-effects estimator	Valenti et al. [41]	Italy	Policy/CAP	Historical data/ Ex-post assessment

Source: Compiled and designed by authors, CAP = Common Agricultural Policy; EU=European Union.

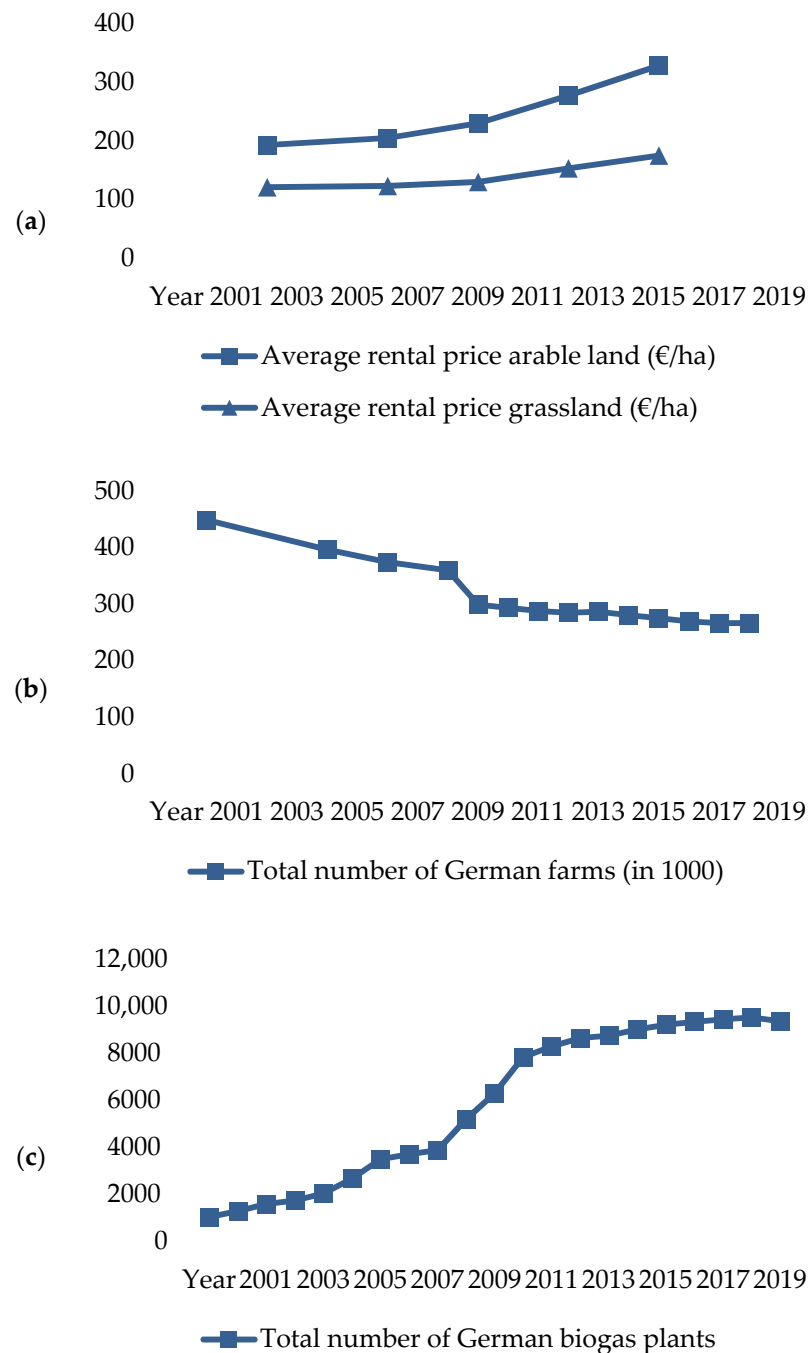


Figure 2. Development of (a) the average rental prices for arable land and grassland, (b) total number of German farms, and (c) total number of biogas plants (2000–2020). Source: German Farmers Association [10] and Federal Statistical Office of Germany [59,60].

3. Survey

An online survey addressed to German farmers was created after the fully executed literature review described in Section 2 to ensure the questionnaire fits the results of the literature review. After conducting a pre-test with selected farmers³, the invitation to the survey was distributed via social-media and online-forums dedicated to agriculture, from November 2019 to January 2020. Precondition to take part in the survey was to be active in arable farming. By purposive sampling for arable farmers, it was ensured that

³ Results of the pre-test were deleted and the farmers who had participated in the pre-test were asked to not take part again in the survey.

farmers are able to understand and evaluate the farmland rental market. The questionnaire for this study can be divided into two parts. In the first part, the farmers were asked to provide sociodemographic and farm related characteristics. With regard to the farm related characteristics, questions were also asked about the agricultural land rental situation, e.g., the amount and duration of the rental contract on the farm. The second part deals explicitly with farmers' perceptions of the current and future situation on agricultural land rental markets. More specifically, farmers were asked to state which factor has the strongest influence on the agricultural land rental market. In addition, farmers were asked if they expect that the magnitude of each influencing factor will decrease, stay the same, or increase in the future. Lastly, four statements concerning farmers' ability to act on the agricultural land rental market had to be evaluated on equally-spaced five-point Likert scales (1 = strongly disagree; 5 = strongly agree).

3.1. Descriptive Results of the Sample

After the removal of incomplete or unreasonable surveys⁴, 156 usable questionnaires remain for the analysis. Table 3 and Figure 3 show the descriptive statistics of the final sample. The average age of the farmer in the sample is 44 years, which is below the German average of 53 years. Fifty percent of the farmers in the sample have an agricultural university degree, which surpasses the German average of 12%. A total of 578 hectares of arable land and 73 hectares of grassland were cultivated on average by the farmers in the sample, which also surpasses the German average of 65 hectares of arable land and 34 hectares of grassland, respectively. Ninety-two percent of the farmers in the sample are male, which is very close to the German average of 90%. Likewise, the proportion of leased land of total land managed (55%) is very close to the German average of 59% [10].

Table 3. Descriptive statistics (N = 156).

Variable	Description	Mean	SD	Min	Max	Ger. Avg. ^a
Age	Farmers age in years	44.26	12.83	23	65	53
AgriUni	1, if the farmer has an agricultural university degree; 0 otherwise	0.50	-	0	1	0.12
ArableLand	Hectares of arable land	578.33	709.23	5	3360	65
Gender	1, if the farmer is male; 0 otherwise	0.92	-	0	1	0.90
GrassLand	Hectares of grass land	72.91	153.40	0	967	34
Invest	1, if the farmer has made an investment in the agricultural holding worth more than €100,000 in the last five years; 0 otherwise	0.88	-	0	1	n.a.
Leased	% of leased arable land of total land managed	0.55	0.23	0	1	0.59
Objective	Objectives in the operation of the agricultural holding					
	"I would like to reduce my farming activities"	0.02	-	0	1	n.a.
	"I would like to maintain the level of my farming activities"	0.47	-	0	1	n.a.
	"I would like to expand my farming activities"	0.51	-	0	1	n.a.
Precipitation	Precipitation in mm per year	684.42	170.58	250	1255	730
SoilQuality	Soil quality of arable land given in the soil quality index (7;100)	47.96	15.20	18	91	n.a.
Successor	1, if the agricultural holding succession has been clarified; 0 otherwise	0.56	-	0	1	n.a.

^a German Farmers Association [10]; SD = Standard deviation, Ger. = German, Avg. = Average, n.a. = not available.

⁴ For a plausibility check of the answers, a test question was integrated into the survey, for which the answer was provided. Eight participants who answered the test question incorrectly were removed from the sample.

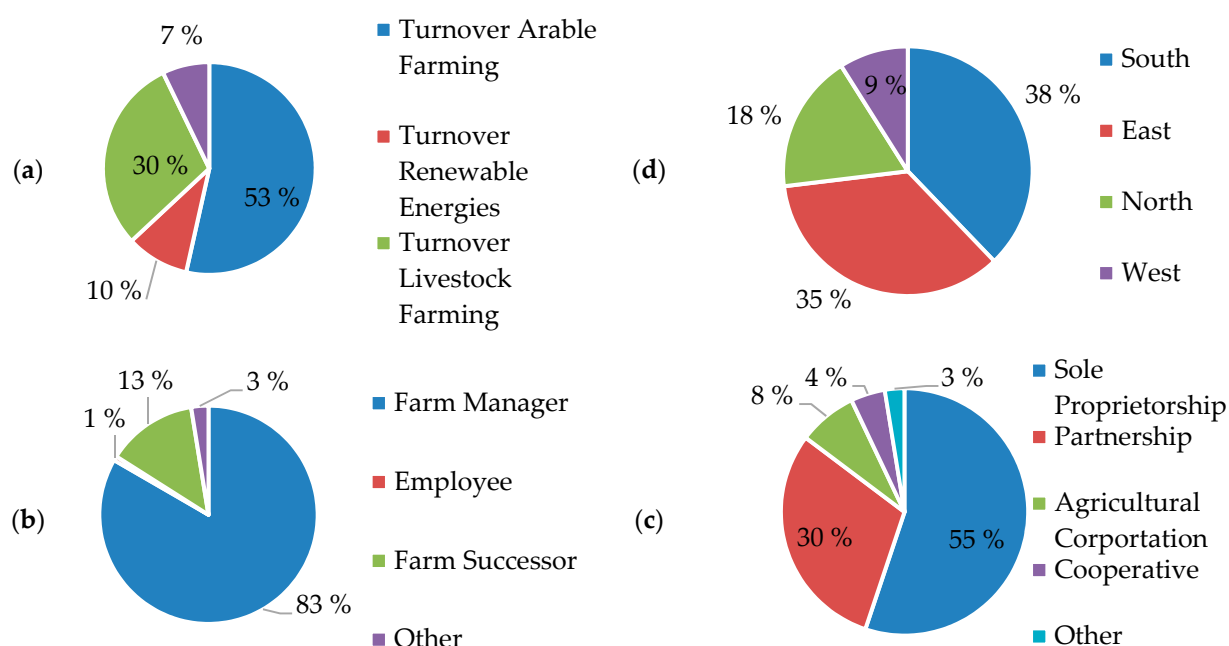


Figure 3. Descriptive statistics for the share of (a) each turnover in the total, (b) respondents' position on the farm, (c) legal form of the agricultural holding as well as (d) regional distribution across Germany. East = farm location in Brandenburg, Saxony, Saxony-Anhalt, or Thuringia, North = farm location in Schleswig-Holstein, Lower Saxony, or Mecklenburg Western Pomerania; South = farm location in Baden-Württemberg or Bavaria; and West = farm location in North Rhine-Westphalia, Hesse, Rhineland Palatinate, or Saarland (German average: East = 0.07, North = 0.20, South = 0.47, and West = 0.25).

With regard to the location factors, the average soil quality amounts to 49 and average precipitation to 684 mm per year. Moreover, 88% of the surveyed farmers have made an investment worth more than €100,000 in the last five years. This is also reflected in the objective indicated by the respondents regarding the development of farm activities for the agricultural holding. Only 2 percent of the farmers stated they want to reduce their farming activities while the rest of the farmers want to maintain (47%) or expand (51%) their farming activities. Lastly, 56% have already arranged the succession of the farm.

Figure 3 shows further descriptive statistics of the sample. On average, more than 50% of the total turnover is generated with arable farming (54%) followed by livestock farming (30%). Most of the respondents are the farm manager (83%) or farm successor (13%). With respect to the legal form of the agricultural holdings, most holdings are sole proprietorship (55%) or partnership (30%). Most of the participating farms are located in the region South Germany (38%) followed by region East Germany (35%), which may partly explain the large range of farm sizes (5 up to 3360 hectares of arable land) and the far above average farm size in the sample. Very few of the participating farmers are located in the region north Germany (18%) and West (9%).

As shown in Table 3 and Figure 3, this sample is not representative of German agriculture at large and the results should therefore be interpreted as representing younger, well-educated farmers from larger farms. Nevertheless, the sample can be described as valid with regard to the objective of this study as the share of leased land of total managed land is close to the German average. Furthermore, the farms can be described as future-oriented agricultural holdings since most of the respondents have invested more than €100,000 in the last five years. In addition, on more than half of the farms surveyed, farm succession has already been clarified. Lastly, most of the farms want to maintain or expand their farming activities. Therefore, providing the status quo on these farmers' perspectives on the land rental market is relevant to agricultural policymakers and to exploring new research areas on agricultural land rent markets, which can in turn be beneficial for the future development and consulting of these farms.

3.2. Results on Agricultural Land Rental Market

Table 4 shows descriptive statistics on farmers' lease agreements. On average, the rent paid in existing rental agreements was €484 per hectare arable land and year in the sample, which exceeds the German average of €328 per hectare arable land and year, according to figures recorded during the last full agricultural statistics survey in 2016. The average lease period is about 9 years, with the maximum in the sample being 30 years. Twenty-six percent of the farmers use some form of flexible cash lease agreement. More than half of the farmers in the sample state that they consider the currently paid rent to be somewhat too high (41%) or too high (10%); moreover, 46% of the farmers in the sample consider the rent to be fair.

Table 4. Descriptive statistics on farmers' lease agreements (N = 155) ^a.

Variable	Description	Mean	SD	Min	Max
Rent	Rental amount in € per hectare arable land and year (existing rental agreements)	484.43	241.38	91	1494
Duration	Term of lease in years	9.21	2.91	2	30
FlexRent	1, if the farmer uses a flexible cash lease agreement; 0 otherwise	0.26	-	0	1
PriceLevel	The rent I am currently paying is what I perceive to be ... ^b	3.61	0.69	2	5
	... too low	0	-	-	-
	... somewhat too low	0.01	-	-	-
	... fair	0.46	-	-	-
	... somewhat too high	0.41	-	-	-
	... too high	0.10	-	-	-

^a One farmer indicates having no leased land; ^b Evaluation of the statement with an equally-spaced 5-point Likert scale (1 = too low; 5 = too high); SD = Standard deviation.

Figure 4 shows the results of farmers' perceptions of the strongest influencing factors on the agricultural land rental market. The strongest factor with 47% approval is the competition among farmers. The second strongest factor perceived is the presence of non-agricultural investors on the agricultural land (rental) market (19%), followed by the influence of agricultural policy guidelines (17%).

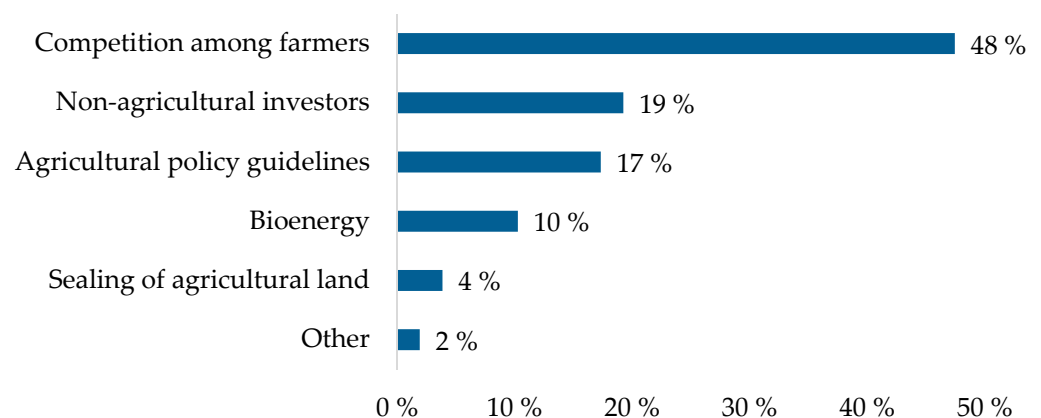


Figure 4. Farmers' perceptions on the strongest influencing factor on the agricultural land rental market (N = 156). Note: Multiple answers were not possible.

With respect to the several factors possibly influencing the agricultural land rental market, Figure 5 shows how farmers perceive the future development of the strength of these factors on the agricultural land rental market. The strongest increase in the strength of influence is expected for agricultural policy guidelines (79%) and non-agricultural investors (56%). In contrast, the strongest decrease in strength of influence is observed for bioenergy (35%). Combining the results of Figures 4 and 5, the results imply that while the current strongest factor is competition among farmers, the future drivers of the agricultural land

rental markets will be agricultural policymakers and non-agricultural investors from the farmers' point of view.

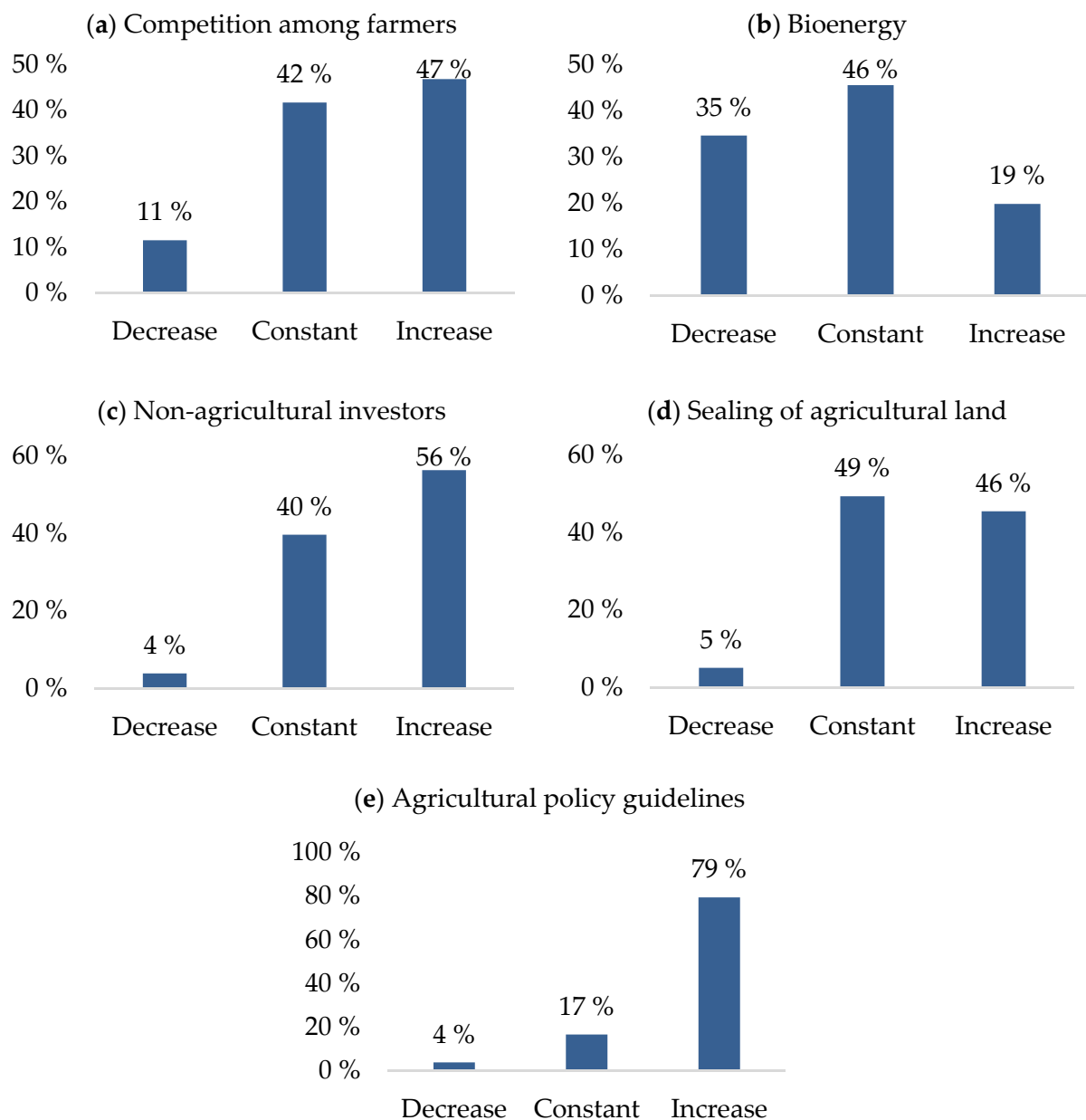


Figure 5. Farmers' perceptions of the future development of the magnitude of the factors influencing the agricultural land rental market (N = 156): (a) Competition among farmers, (b) Bioenergy; (c) Non-agricultural investors; (d) Sealing of agricultural land; (e) Agricultural policy guidelines.

Table 5 provides further insights into what other factors influence farmers' ability to act on the agricultural land rental market from farmers' perspectives. Weather events and the image of agriculture in society are perceived as not restricting the ability to act on the agricultural land rental market. Besides agricultural policy reforms, price risks are perceived as influencing farmers' ability to act on the agricultural land rental market.

Table 5. Descriptive statistics and distribution of responses concerning the ability to act on the agricultural land rental market for Likert scales (1 = strongly disagree; 5 = strongly agree), (N = 156).

Statement	Relative Frequencies %					Mean
	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)	
Increasing extreme weather events have an influence on my actions on the regional agricultural land rental market	0.19	0.26	0.20	0.23	0.09	2.76
Political reforms have an influence on my actions on the regional agricultural land rental market	0.08	0.25	0.18	0.32	0.26	3.52
The social image of agriculture has an influence on my actions on the regional agricultural land rental market	0.30	0.33	0.11	0.16	0.08	2.38
Fluctuating prices for agricultural products and inputs have an influence on my actions on the regional agricultural land rental market	0.07	0.21	0.16	0.40	0.15	3.35

Note: The most frequently mentioned answer is marked in bold.

4. Discussion and Implications

As shown in Figure 4 competition among farmers is perceived as the strongest influencing factor on the agricultural land rental market. This was also observed by Forbord et al. [20] and Marks-Bielska [11], as most of the surveyed farmers intend to expand farmland. Competition among farmers, regarding land expansion, was explained by farmers' seeking to realize economies of scale. März et al. [54] show in detail that an increase in farm size also leads to a higher willingness to pay for an additional hectare of rented farmland, which they also attribute to economies of scale. However, März et al. [54] also emphasize that this depends on the share of rented land a farmer already operates. With a decreasing share of rented land farmers' willingness to pay for an additional hectare rises while farmer with a high share of rented land have a lower willingness to pay. This can be attributed to the fact that the latter farmers have to annually cover fixed rental payments [56]. Other reasons named in the literature are for instance to gain feeding areas for farm animals or land for manure dispersal [20]. This is congruent to März et al. [54] who show that in regions with higher livestock density farmers are willing to pay higher rental rates.

In addition, non-agricultural investors were perceived as the second-strongest factor on the agricultural land rental market. This result confirms the observations of Emmann et al. [22]. However, Odening and Hüttel [61] analyzed over 10,000 purchase cases of agricultural land in the period between 2007 and 2015 in Eastern Germany and showed that, contrary to the prevailing opinion, non-agricultural investors were only involved in a few auctions and their bids differed only slightly from those of agricultural investors⁵. Hence, it can be concluded that their role on the agricultural land rental market is also diminishingly small, since these investors are commonly more interested in buying agricultural land. Thus, results from the literature are contrary to farmers' perceptions. Figure 4 also shows that the majority of the surveyed farmers expect the effect of competition among farmers on agricultural land rental markets will be constant or increase in the future. The results of Habermann and Ernst [56] provide an explanation for this finding. They show that, especially in areas with few income alternatives besides agriculture farmers are willing to pay higher rents as they feel obligated to stay in agriculture. März et al. [54] further demonstrate that organic farmers are willing to pay higher rental prices compared to their conventional counterparts. As the conversion to organic farming is politically subsidized, farmers might also perceive a higher competition level among each other. Forbord et al. [20] show that the presence of potential farm successors also increases farmers' intention to increase their farmed area in order to provide a sufficient basis for their successors. With respect to the influence of non-agricultural investors, farmers expect an even higher increase of rental prices. If one considers that, for instance, young farmers are (especially) disadvantaged in terms of monetary power to act on the agricultural land rental market, it could be interesting to investigate the potential effect of political intervention on agricultural rental land markets with the aim to aid young farmers. However, with respect to the influence of non-agricultural investors, it should be clarified to farmers that these only play a minor role in the agricultural land rental markets. Thus, the presence of non-agricultural investors should not be used as a reason for political intervention in the agricultural land market. Increased transparency on the land market is necessary in order to reflect farmers' perceptions, for example, with regard to the role of non-agricultural investors. An improved database that contains the complete disclosure of rental agreements could be a solution in this area. Lastly, competition among farmers appears to be a mounting issue. Follow-up studies should focus more on the individual effects (e.g., manure dispersal, expansion of feeding area) and farmers' perceptions regarding the strength of these individual effects.

The effect of agricultural policy was perceived as the third strongest factor (17.31% approval, Figure 4). Likewise, Ilbery et al. [21] showed that a majority of tenant farmers

⁵ Heinrich and Appel [58] conclude based on a simulation that the presence of a non-agricultural investor increases the rental prices in the considered region. However, it should be clearly stated that the non-agricultural investor in this case invested in bioenergy and, thus, does not act directly on the land rental market.

is rather uncertain what effects can be expected from the CAP. Nevertheless, Figure 5 shows that farmers expected that the effect of agricultural policies will increase the most. Likewise, Table 5 shows that farmers feel that political reforms inhibit their action on the agricultural land rental market. The literature review also shows that subsidies under CAP have a strong effect on the rent prices [29,30]. Schulz et al. [62] analyzed German farmers' acceptance of greening measures in the CAP using a discrete choice experiment. They showed that farmers also believe the introduction of the Greening measures would lead to an increase in land rent. Hence, it could be interesting to investigate farmers' reactions to specific agricultural policy changes on the agricultural land rental markets, especially under the CAP. For instance, Hermann et al. [63] have shown incentivized extra-laboratory experiments can be used to ex-ante evaluate possible effects of the introduction of policy measures.

Bioenergy was also identified as a price driver on agricultural land rental markets in the literature review. However, farmers do not perceive bioenergy as an important price driver (Figure 4) and also expect that its influence will decrease in the future (Figure 5). This can be explained by the fact that support for bioenergy like biogas plants is also decreasing in Germany (see Figure 2). Furthermore, biogas is less and less accepted by the population in Germany [64].

Table 5 also provides evidence that farmers' actions on the agricultural land rental market are influenced by fluctuating input and output prices but not by extreme weather events. On the one hand, the results in Table 5 confirm the observations of Möllmann et al. [65], who showed that volatile prices in particular have led to income losses, which ultimately limit farmers' ability to act on the agricultural land rental market. On the other hand, the same authors showed that weather events, such as drought, have also led to loss of income for over 88% of the German farmers that they surveyed. Still, the farmers in our sample did not consider weather events to have a strong influence on their ability to act on the agricultural land rental market. However, as shown in the literature review, Aurbacher et al. [50] pointed out that increasing temperatures lead to an increase in land rents and that farmers need to adapt to the new climatic conditions. In this case, it could be interesting to conduct further research on flexible cash lease agreements, which can be coupled to several (off-farm) indicators. For instance, Buchholz et al. [66] conducted a discrete choice experiment to investigate farmers' preferences to rent or buy agricultural land. This could be expanded by also including flexible cash lease agreements. Furthermore, it could be interesting to investigate the landlord's point of view regarding flexible cash lease agreements.

5. Conclusions

The study at hand provides a snapshot of the state of current research in literature on agricultural land rental markets and their price drivers by applying the PRISMA procedure as a systematic literature review. Subsequently, based on the results of the systematic literature review, we developed a standardized online questionnaire in which 156 German farmers were asked in 2019/2020 to state their current perceptions and future expectations on the agricultural land rental markets and their price drivers. The sample was the result of purposive sampling with the precondition that the respondents are actively engaged in arable farming. The drivers of farmland rental prices in Europe identified in the systematic literature review can be divided thematically into the four categories "policy/CAP", "bioenergy", "climate change", and "market prices/competition/various" whereby causal and interdependent relationships exist in between the categories. In the course of the survey, these identified price drivers were again revealed as the main drivers from the point of view of German farmers. However, farmers perceive internal agricultural competition as well as competition with non-agricultural investors as the main drivers. Policy is only perceived as the third most important driver; however, this is the subject on which most of the identified existing research is concentrated. Nevertheless, with regard to policy as a driver, German farmers expect this to experience the greatest increase in

significance for the development of agricultural land rental prices in the future. Particularly with regard to the influence of non-agricultural investors, the findings of existing studies and the perception of farmers contradict each other.

Several implications for research and policy could be derived from the current study. Especially competition among farmers, which is perceived by farmers as a particularly decisive factor, should be scientifically examined more closely. The potential explanations provided in the discussion regarding perceived competition could thus be further verified and lead to more precise implications. It would also be interesting to investigate whether (and to what extent) the discrepancy between existing literature and farmers' perceptions applies to purchase prices. This would be likely on the basis of our results, but should be verified scientifically. The relatively broad focus on various drivers (due to the orientation of this study as fundamental research) should be broken down more precisely in future studies. For example, a distinction should be made in the assessment of policy between the effects of fertilizer reforms, direct payments, and second pillar greening measures in order to be able to make more precise statements on the effects of various political interventions and regulations on farmland rental prices. Competition between farmers should be evaluated separately according to the respective causal background (e.g., economies of scale, manure, or feedlot), in order to find further explanations for the development of land rental prices. A finer breakdown of individual factors also allows for spatial differentiation in further research work, which is also advantageous for more precise predictions and analyses.

However, the aim of the present study was not to show the implications of the individual price drivers; these can be found in the primary literature examined. Rather, this study refers to the new implications resulting from the discrepancy between the scientific literature and the survey of farmers regarding agricultural land rental markets. This discrepancy reveals the need to include the perceptions of farmers themselves in the policy impact assessment. This is imaginable in two ways: The implementation of an ex-ante policy impact analysis among farmers, in which farmers are specifically asked about a planned policy measure or the integration of subjective perceptions into objective policy impact assessment ex-post. In the latter case, however, the accuracy of the survey would have to go far beyond the type of fundamental research carried out here, as a different aim would be at hand.

As has been shown, farmers' perceptions can differ fundamentally from the results of model calculations. While studies based on historical data naturally lag behind current developments, farmers feel these developments much more directly. A survey of these farmers can therefore reveal short-term effects more quickly. Then again, econometric analyses and model calculations based on time series data provide important statistical evidence and are often more objective. Against this background, a combined approach of both methods appears to be advantageous. Studies based on our fundamental research should therefore also consider a combined approach to cover a wider range of findings. Currently, a variety of political interventions in European agriculture is being discussed, for example, in relation to fertilizer use, land markets, and animal welfare. The continuing demonstrations by farmers for more say in policymaking, and the discrepancy between society and agriculture also show how important it can be to integrate different opinions and data sources into decision-making processes. We therefore recommend that policymakers derive procedures from combined methodological approaches to anticipate unexpected short-term reactions of farmers. In particular, the perception of farmers should be considered for possible policy interventions that could be derived from scientific evidence. Otherwise, if farmers assess the causes differently from the scientific findings, a reaction diverging from the anticipated behavior as a result of intervention would be possible. We recommend this not only for the case of Europe, but also to test further in other regions, whether a similar discrepancy exists, which could be counteracted by a combined approach of model calculations and surveys.

Author Contributions: Conceptualization, all authors; methodology, C.-F.v.H., and M.M.; formal analysis, C.-F.v.H. and M.M.; resources, O.M.; data curation, C.-F.v.H.; writing—original draft preparation, all authors; writing—review and editing, C.-F.v.H.; visualization, C.-F.v.H. and M.M.; supervision, O.M. All authors have read and agreed to the published version of the manuscript.

Funding: We gratefully acknowledge financial support from Deutsche Forschungsgemeinschaft (DFG) and by the Open Access Publication Funds of the Göttingen University for the APC.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The dataset analyzed for the present article is available from the corresponding author on reasonable request.

Acknowledgments: We acknowledge the valuable comments and suggestions of four anonymous referees and the editors of Land.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Van der Ploeg, J.D.; Franco, J.C.; Borras, S.M. Land concentration and land grabbing in Europe: A preliminary analysis. *Can. J. Dev. Stud./Revue Canadienne D'études Du Développement* **2015**, *36*, 147–162. [CrossRef]
2. Yang, X.; Odening, M.; Ritter, M. The Spatial and Temporal Diffusion of Agricultural Land Prices. *Land Econ.* **2019**, *95*, 108–123. [CrossRef]
3. Baker, T.G.; Boehlje, M.D.; Langemeier, M.R. Farmland: Is It Currently Priced as an Attractive Investment? *Am. J. Agric. Econ.* **2014**, *96*, 1321–1333. [CrossRef]
4. Tietz, A.; Forstner, B.; Weingarten, P. Non-Agricultural and Supra-Regional Investors on the German Agricultural Land Market: An Empirical Analysis of their Significance and Impacts. *Ger. J. Agric. Econ.* **2013**, *2*, 86–98. [CrossRef]
5. Myrna, O.; Odening, M.; Ritter, M. The Influence of Wind Energy and Biogas on Farmland Prices. *Land* **2019**, *8*, 19. [CrossRef]
6. Hüttel, S.; Wildermann, L.; Croonenbroeck, C. How do institutional market players matter in farmland pricing? *Land Use Policy* **2016**, *59*, 154–167. [CrossRef]
7. Croonenbroeck, C.; Odening, M.; Hüttel, S. Farmland Values and Bidder Behavior in First-Price Land Auctions. *Work. Pap.* **2018**. [CrossRef]
8. Deininger, K.W.; Byerlee, D. *Rising Global Interest in Farmland. Can It Yield Sustainable and Equitable Benefits?* World Bank: Washington, DC, USA, 2011; ISBN 9780821385913.
9. Federal Statistical Office of Germany. Statistisches Jahrbuch 2018: Deutschland Und Internationales. 2018. Available online: https://www.destatis.de/DE/Themen/Querschnitt/Jahrbuch/statistisches-jahrbuch-2018-dl.pdf?__blob=publicationFile (accessed on 12 December 2020).
10. German Farmers Association. Status Report 2019/2020. 2020. Available online: <https://www.bauernverband.de/situationsbericht> (accessed on 12 December 2020).
11. Marks-Bielska, R. Factors shaping the agricultural land market in Poland. *Land Use Policy* **2013**, *30*, 791–799. [CrossRef]
12. Takáč, I.; Lazíková, J.; Rumanovská, L.; Bandlerová, A.; Lazíková, Z. The Factors Affecting Farmland Rental Prices in Slovakia. *Land* **2020**, *9*, 96. [CrossRef]
13. Koester, U.; Cramon-Taubadel, S.V. Preisbildung auf dem Bodenmarkt. Discussion Paper No. 181. 2019. Available online: <http://hdl.handle.net/10419/191813> (accessed on 12 December 2020).
14. Escalante, C.L.; Barry, P.J. Farmland leasing decisions and successful debt repayment strategies. *J. ASFMRA* **2003**, 9–18. Available online: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.628.4407&=rep1&type=pdf> (accessed on 12 December 2020).
15. Nicholas, D.P.; Gary, D.S.; Paulson, N. Farmland rental markets: Trends in contract type, rates, and risk. *Agric. Financ. Rev.* **2013**, *73*, 32–44. [CrossRef]
16. Vranken, L.; Swinnen, J. Land rental markets in transition: Theory and evidence from Hungary. *World Dev.* **2006**, *34*, 481–500. [CrossRef]
17. Sadoulet, E. Access to land via land rental markets. In *Access to Land, Rural Poverty, and Public Action*; Oxford University Press: Oxford, UK, 2001; pp. 196–229.
18. Ciaian, P.; Kancs, A.; Swinnen, J.F.M.; van Herck, K.; Vranken, L. Key Issues and Developments in Farmland Rental Markets in EU Member States and Candidate Countries. *Cent. Eur. Policy Stud. Work. Pap.* **2012**. [CrossRef]
19. Hartvigsen, M. Land reform and land fragmentation in Central and Eastern Europe. *Land Use Policy* **2014**, *36*, 330–341. [CrossRef]
20. Forbord, M.; Bjørkhaug, H.; Burton, R.J.F. Drivers of change in Norwegian agricultural land control and the emergence of rental farming. *J. Rural Stud.* **2014**, *33*, 9–19. [CrossRef]
21. Ilbery, B.; Maye, D.; Watts, D.; Holloway, L. Property matters: Agricultural restructuring and changing landlord-tenant relationships in England. *Geoforum* **2010**, *41*, 423–434. [CrossRef]

22. Emmann, C.H.; Surmann, D.; Theuvsen, L. Charakterisierung und Bedeutung außerlandwirtschaftlicher Investoren: Empirische Ergebnisse aus Sicht des landwirtschaftlichen Berufsstandes. In *No 1504, DARE Discussion Papers*; Georg-August University of Göttingen, Department of Agricultural Economics and Rural Development: Göttingen, Germany, 2015.
23. Anastassiadis, F.; Feil, J.-H.; Musshoff, O.; Schilling, P. Analysing Farmers' Use of Price Hedging Instruments: An Experimental Approach. *J. Agric. Food Ind. Organ.* **2014**, *12*, 181–192. [\[CrossRef\]](#)
24. Michels, M.; Möllmann, J.; Musshoff, O. German Farmers' Perspectives on Direct Payments in the Common Agricultural Policy. *EuroChoices* **2019**, *19*, 48–52. [\[CrossRef\]](#)
25. Higgins, J.P. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [Updated March 2011]. The Cochrane Collaboration. 2011. Available online: www.cochrane-handbook.org (accessed on 12 December 2020).
26. Longhi, S.; Nijkamp, P.; Poot, J. A meta-analytic assessment of the effect of immigration on wages. *J. Econ. Surv.* **2005**, *19*, 451–477. [\[CrossRef\]](#)
27. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G.; Prisma Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med.* **2009**, *6*, e1000097. [\[CrossRef\]](#)
28. Graubner, M. Lost in space? The effect of direct payments on land rental prices. *Eur. Rev. Agric. Econ.* **2018**, *45*, 143–171. [\[CrossRef\]](#)
29. Ciaian, P.; Kancs, A.; Swinnen, J.F.M. *EU land markets and the Common Agricultural Policy*; CEPS Paperbacks; CEPS: Brussels, Belgium, 2010.
30. O'Neill, S.; Hanrahan, K. The capitalization of coupled and decoupled CAP payments into land rental rates. *Agric. Econ.* **2016**, *47*, 285–294. [\[CrossRef\]](#)
31. Kilian, S.; Antón, J.; Salhofer, K.; Röder, N. Impacts of 2003 CAP reform on land rental prices and capitalization. *Land Use Policy* **2012**, *29*, 789–797. [\[CrossRef\]](#)
32. Breustedt, G.; Habermann, H. The Incidence of EU Per-Hectare Payments on Farmland Rental Rates: A Spatial Econometric Analysis of German Farm-Level Data. *J. Agric. Econ.* **2011**, *62*, 225–243. [\[CrossRef\]](#)
33. Hennig, S.; Breustedt, G. The Incidence of Agricultural Subsidies on Rental Rates for Grassland. *Jahrbücher Für Natl. Stat.* **2018**, *238*, 125–156. [\[CrossRef\]](#)
34. Ciaian, P.; Kancs, A. The Capitalization of Area Payments into Farmland Rents: Micro Evidence from the New EU Member States. *Can. J. Agric. Econ. Rev. Can. D'agroeconomie* **2012**, *60*, 517–540. [\[CrossRef\]](#)
35. Van Herck, K.; Swinnen, J.; Vranken, L. Capitalization of direct payments in land rents: Evidence from New EU Member States. *Eurasian Geogr. Econ.* **2013**, *54*, 423–443. [\[CrossRef\]](#)
36. Guastella, G.; Moro, D.; Sckokai, P.; Veneziani, M. The Capitalisation of Fixed per hectare Payment into Land Rental Prices: A Spatial Econometric Analysis of Regions in EU. In Proceedings of the 2014 Italian Association of Agricultural and Applied Economics (AIEAA) Conference, Alghero, Italy, 25–27 June 2014. [\[CrossRef\]](#)
37. Michalek, J.; Ciaian, P.; Kancs, D. Capitalization of the Single Payment Scheme into Land Value: Generalized Propensity Score Evidence from the European Union. *Land Econ.* **2014**, *90*, 260–289. [\[CrossRef\]](#)
38. Feichtinger, P.; Salhofer, K. *Decoupled Single Farm Payments of the CAP and Land Rental Prices*; Discussion Paper; Institute for Sustainable Economic Development, Department of Economics and Social Sciences, University of Natural Resources and Life Sciences: Vienna, Austria, 2016.
39. Salhofer, K.; Feichtinger, P. Regional differences in the capitalisation of first and second pillar payments of the CAP into land rental prices. *Eur. Rev. Agric. Econ.* **2020**, *48*, 8–41. [\[CrossRef\]](#)
40. Guastella, G.; Moro, D.; Sckokai, P.; Veneziani, M. The Capitalisation of CAP Payments into Land Rental Prices: A Panel Sample Selection Approach. *J. Agric. Econ.* **2018**, *69*, 688–704. [\[CrossRef\]](#)
41. Valenti, D.; Bertoni, D.; Cavicchioli, D.; Olper, A. The capitalization of CAP payments into land rental prices: A grouped fixed-effects estimator. *Appl. Econ. Lett.* **2021**, *28*, 231–236. [\[CrossRef\]](#)
42. Mack, G.; Möhring, A.; Ferjani, A.; Zimmermann, A.; Mann, S. Transfer of single farm payment entitlements to farm successors: Impact on structural change and rental prices in Switzerland. *Bio-Based Appl. Econ.* **2013**, *2*, 113–130.
43. De Wit, M.; Faaij, A. European biomass resource potential and costs. *Biomass Bioenergy* **2010**, *34*, 188–202. [\[CrossRef\]](#)
44. Hennig, S.; Latacz-Lohmann, U. The incidence of biogas feed-in tariffs on farmland rental rates—evidence from northern Germany. *Eur. Rev. Agric. Econ.* **2016**, *44*, 231–254. [\[CrossRef\]](#)
45. Appel, F.; Ostermeyer-Wiethaup, A.; Balmann, A. Effects of the German Renewable Energy Act on structural change in agriculture—The case of biogas. *Util. Policy* **2016**, *41*, 172–182. [\[CrossRef\]](#)
46. Demartini, E.; Gaviglio, A.; Gelati, M.; Cavicchioli, D. The Effect of Biogas Production on Farmland Rental Prices: Empirical Evidences from Northern Italy. *Energies* **2016**, *9*, 965. [\[CrossRef\]](#)
47. Habermann, H.; Breustedt, G. Einfluss der Biogaserzeugung auf landwirtschaftliche Pachtpreise in Deutschland: Impact of Biogas Production on Farmland Rental Rates in Germany. *Ger. J. Agric. Econ.* **2011**, *60*, 85–100. [\[CrossRef\]](#)
48. Troost, C.; Walter, T.; Berger, T. Climate, energy and environmental policies in agriculture: Simulating likely farmer responses in Southwest Germany. *Land Use Policy* **2015**, *46*, 50–64. [\[CrossRef\]](#)
49. Bartoli, A.; Cavicchioli, D.; Kremmydas, D.; Rozakis, S.; Olper, A. The impact of different energy policy options on feedstock price and land demand for maize silage: The case of biogas in Lombardy. *Energy Policy* **2016**, *96*, 351–363. [\[CrossRef\]](#)

50. Aurbacher, J.; Lippert, C.; Krimly, T. Assessing the impact of climate change on agriculture in Germany—A Ricardian analysis. In Proceedings of the 2010 International Trade Research Consortium, Stuttgart-Hohenheim, Germany, 26–29 June 2010. [\[CrossRef\]](#)
51. Schmidtnr, E.; Dabbert, S.; Lippert, C. Do Different Measurements of Soil Quality Influence the Results of a Ricardian Analysis?—A Case Study on the Effects of Climate Change on German Agriculture. *Ger. J. Agric. Econ.* **2015**, *2*, 89–106. [\[CrossRef\]](#)
52. Mazzocchi, C.; Borghi, A.; Monaco, F.; Gaviglio, A.; Filippini, R.; Demartini, E.; Sali, G. Land rent values determinants: A Hedonic Pricing approach at local scale. *Aestimum* **2019**, 235–255. [\[CrossRef\]](#)
53. Dupraz, P.; Temesgen, C. Farmland Rental Rate and Marginal Return to Land: A French FADN Perspective. In Proceedings of the 86th Annual Agricultural Economics Society Conference, Coventry, UK, 16–18 April 2012. [\[CrossRef\]](#)
54. März, A.; Klein, N.; Kneib, T.; Musshoff, O. Analysing farmland rental rates using Bayesian geoaddditive quantile regression. *Eur. Rev. Agric. Econ.* **2016**, *43*, 663–698. [\[CrossRef\]](#)
55. Graubner, M.; Ostapchuk, I.; Gagalyuk, T. Agroholdings and Land Rental Markets: A Spatial Competition Perspective. In Proceedings of the 165th EAAE Seminar Agricultural Land Markets, Berlin, Germany, 4–5 April 2019. [\[CrossRef\]](#)
56. Habermann, H.; Ernst, C. Developments and determinants of farmland rental rates in Germany. *Ber. Über Landwirtsch.* **2010**, *88*, 57–85.
57. Hüttel, S.; Ritter, M.; Esaulov, V.; Odening, M. Is there a term structure in land lease rates? *Eur. Rev. Agric. Econ.* **2016**, *43*, 165–187. [\[CrossRef\]](#)
58. Heinrich, F.; Appel, F. Do investors ruin Germany's peasant agriculture? In Proceedings of the 2018 International Association of Agricultural Economists Conference, Vancouver, BC, Canada, 28 July–2 August 2018. [\[CrossRef\]](#)
59. Federal Statistical Office of Germany. Anzahl der Landwirtschaftlichen Betriebe und Bauernhöfe in Deutschland bis 2019. Available online: <https://de.statista.com/statistik/daten/studie/36094/umfrage/landwirtschaft---anzahl-der-betriebe-in-deutschland/> (accessed on 20 January 2020).
60. Federal Statistical Office of Germany. Anzahl der Biogasanlagen in Deutschland in den Jahren 1992 bis 2020. Available online: <https://de.statista.com/statistik/daten/studie/167671/umfrage/anzahl-der-biogasanlagen-in-deutschland-seit-1992/> (accessed on 21 January 2021).
61. Odening, M.; Hüttel, S. Müssen landwirtschaftliche Bodenmärkte vor Investoren geschützt werden? Eine ökonomische Perspektive. *Policy Brief* **2018**. [\[CrossRef\]](#)
62. Schulz, N.; Breustedt, G.; Latacz-Lohmann, U. Assessing farmers' willingness to accept "greening": Insights from a discrete choice experiment in Germany. *J. Agric. Econ.* **2014**, *65*, 26–48. [\[CrossRef\]](#)
63. Hermann, D.; Sauthoff, S.; Musshoff, O. Ex-ante evaluation of policy measures to enhance carbon sequestration in agricultural soils. *Ecol. Econ.* **2017**, *140*, 241–250. [\[CrossRef\]](#)
64. Sauthoff, S.; Danne, M.; Mußhoff, O. *To Switch or not to Switch? Understanding German Consumers' Willingness to Pay for Green Electricity Tariff Attributes*; DARE Working Paper; DARE Diskussionsbeiträge, Department für Agrarökonomie und Rurale Entwicklung (DARE), Universität Göttingen: Göttingen, Germany, 2017.
65. Möllmann, J.; Michels, M.; von Hobe, C.-F.; Mußhoff, O. Status quo des Risikomanagements in der deutschen Landwirtschaft: Besteht Bedarf an einer Einkommensversicherung? *Ber. Über Landwirtsch. Z. Für Agrarpolit. Und Landwirtsch.* **2018**, *96*, 1–25.
66. Buchholz, M.; Danne, M.; Musshoff, O. An experimental analysis of German farmers' decisions to buy or rent farmland. *Work. Pap.* **2020**. [\[CrossRef\]](#)