Studies in Agricultural Economics 127 (2025) 162-173 https://doi.org/10.7896/j.3123

SCIENTIFIC ARTICLE

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From Small Farms to Large Holdings: The Growing Land Disparity in Estonian Agriculture

ABSTRACT

Rather than supporting small agricultural households and rural communities, governments frequently prioritise top-down, extractive, and resource-intensive approaches to agricultural development. This tendency promotes the expansion of large agricultural holdings, which increasingly undermines the viability of smaller farms. As access to land becomes more difficult and land-related inequality escalates, concerns regarding the sustainability of rural communities intensify. It is crucial for all stakeholders – policymakers, agricultural economists, researchers, and those involved in rural development and land use policies – to acknowledge their responsibilities and address these urgent issues proactively. This study employs the Gini coefficient to examine the fairness of accessibility to agricultural land use at the county level in Estonia. The findings indicate a decline in the number of agricultural households, coinciding with a rapid increase in the average land utilised per holding. Larger agricultural holdings are expanding their use of agricultural land, while smaller holdings are experiencing a reduction in their share. As of 2023, just 1% of all agricultural holdings in Estonia managed to utilise 31% of the total agricultural land area, whereas 74% of holdings accounted for only 9% of the area. These results underscore the pressing need to address issues of land concentration and inequality, underscoring the necessity for substantial changes in political, economic, and legal frameworks to ensure a fair and sustainable distribution of agricultural land.

ARTICLE INFO

Keywords:
land concentration, agricultural land use, land inequality, Gini, Estonia

JEL classifications:
Q1, R110, R140.

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Received: 11 April 2025; **Revised:** 1 August 2025; **Accepted:** 12 August 2025.

Introduction

Global land prices have doubled over the past 15 years, leading to a substantial increase in land inequality. Currently, the top 1% of farms control 70% of the global farmland, and in most countries, this trend continues to worsen (IPES-Food, 2024). Land is a finite and essential resource that is deeply intertwined with the lives of societies and individuals. Moreover, there is an increasing demand for land that is not related to food production (Alexander *et al.,* 2015). The management and control of land have profoundly shaped economies, political structures, communities, cultures, and beliefs of nations and their people for thousands of years. In rural areas, access to land has historically been – and remains – a crucial factor determining life opportunities (Boberg-Fazlić *et al.,* 2024). Many rural labourers face widespread landlessness, and those who do have access to land often possess insecure land rights (Franco and Borras Jr., 2021). Researchers indicate that regions with greater land inequality tend to experience higher rates of emigration (Boberg-Fazlić *et al.,* 2024).

The finite nature of land supply, which serves as the primary resource for farmers, distinctly sets agriculture apart from other economic sectors. Agricultural land plays a critical role in food production, making land policy decisions pivotal to food security and international competitiveness. Research by Moreno-Pérez *et al.* (2024) indicates that small-scale agricultural producers and local food businesses are particularly effective in enhancing food security by offering high-quality, healthy, and sustainable food options.

Land concentration refers to the accumulation of significant tracts of land under the control of a limited number of entities (Jürgenson and Rasva, 2020). This phenomenon raises critical concerns across social, economic, and environmental dimensions. Socially, land concentration often leads to the displacement of small agricultural households and rural communities, diminishing their access to land and livelihoods (Korthals Altes, 2022). Moreover, as land becomes commodified and comes under the control of absentee owners or corporations, traditional land-based cultures and community ties often weaken (Park and Deller, 2021). High levels of land inequality are associated with decreased access to education, credit, and political representation for marginalised groups, further exacerbating social tensions (Yunus *et al.,* 2024).

Research conducted by Bauluz *et al.* (2020) indicates that land inequality significantly impedes investment in education and financial development, ultimately reinforcing

poverty traps and institutional stagnation. The concentration of landownership curtails access to productive assets, thereby limiting opportunities for entrepreneurship and upward mobility among rural communities (Bauluz *et al.,* 2020). The dominance of large landholders can drive up land prices and create barriers to fair competition, making it increasingly difficult for new entrants to access land (Rasva and Jürgenson, 2022). Furthermore, when land is held by non-local investors or utilised for speculative purposes, local economic development and job creation are adversely affected (European Economic and Social Committee, 2015).

Several environmental risks associated with land concentration must be taken into account. Larger agricultural holdings often prioritise intensive monoculture farming, which can result in a decline in biodiversity and the degradation of ecosystems (Burja *et al.,* 2020). Industrial agricultural practices, characterised by concentrated land use, contribute to soil erosion, water pollution, and deforestation (King *et al.,* 2023). Furthermore, absentee ownership or short-term leasing can hinder sustainable land management, as long-term ecological concerns are often overlooked (Merlet, 2020).

Contemporary agricultural production aims for high efficiency at low cost (Arslan *et al.,* 2019), often resulting in increasing land inequality. The trend, characterised by a diminishing number of households controlling larger tracts of land, poses significant challenges for those dependent on land for their livelihoods (Binswanger-Mkhize *et al.,* 2009). The unequal distribution of agricultural land creates a disconnect between rural communities and their land resources (Korthals Altes, 2022). Research indicates that a more equitable land distribution can foster fairer societies with fewer land-related conflicts, thereby supporting sustained growth and development (Binswanger-Mkhize *et al.,* 2009; Herrera and Guglielma da Passano, 2006; Wegerif and Guereña, 2020). Moreover, when a small fraction of the community controls agricultural land, it diminishes the influence of other community members over its utilisation (Korthals Altes, 2022). Studies reveal that communities with a higher proportion of farmers as a primary occupation tend to experience enhanced overall well-being (Park and Deller, 2021). Even in communities that are less reliant on agriculture, high levels of land inequality can undermine democracy, social cohesion, and environmental health (Binswanger-Mkhize *et al.,* 2009). Recent studies (Bilewicz and Bukraba-Rylska, 2021; Dunlap, 2020; Korthals Altes, 2023; Nowack *et al.,* 2023; Rasva and Jürgenson, 2020) indicate that larger agricultural holdings are expanding, while most small agricultural holdings struggle to access sufficient productive land. Rather than supporting small agricultural households and rural communities, governments worldwide are promoting top-down, resource-intensive development models (IPES-Food, 2024).

Land is essential for the livelihoods of rural communities, with small agricultural households serving as the foundation of rural life (Tomson, 2007). However, as land prices in Central and Eastern Europe have tripled, many of these small agricultural households are rapidly disappearing from the European countryside (IPES-Food, 2024). This situation has raised significant concerns regarding the sustainability of rural communities.

Rural life and agriculture in Estonia are increasingly confronting significant challenges, with recent trends indicating a growing concentration of agricultural land (Jürgenson and Rasva, 2020; Rasva and Jürgenson, 2020, 2022). Consequently, agricultural land prices are rising, and larger companies are progressively acquiring and utilising the land (Rasva, 2023). This trend towards land concentration is resulting in a more polarised land and agri-food system, creating widening disparities between the smallest and largest landholders. Younger generations are encountering considerable obstacles in accessing land and entering the agricultural sector (IPES-Food, 2024). The reluctance of younger individuals to engage in agricultural production is expected to further intensify the trend of increasing farm size and a decline in the number of agricultural households, a pattern that is typical of European and Estonian agriculture as a whole (Raggi *et al.,* 2013; Zagata and Sutherland, 2015). Land, a precious resource and source of sustenance, also carries symbolic meaning for individuals, who often form deep personal connections with it, thereby contributing to the identity of local communities (Jänicke and Müller, 2024).

Understanding agricultural land concentration in Estonia requires an engagement with broader theoretical perspectives on land inequality and rural development. Ricardo's theory of rent highlights the economic power derived from land scarcity and productive differentials, framing rent as unearned income that can exacerbate social stratification. Marx's agrarian critique extends this argument by contending that concentrated land ownership is a fundamental factor that perpetuates rural class divisions and hinders equitable development, thereby advocating for redistributive reform (Finn, 2024). Harvey's theory of accumulation by dispossession elucidates how land becomes concentrated through legal and institutional mechanisms that often marginalise smallholders (Das, 2017). A multidimensional approach to land inequality considers not only land size of the land but also tenure security, land value, access to benefits, and control over its use (Borras Jr *et al.,* 2020). This framework recognises that inequality may persist beneath superficial metrics, such as average plot sizes, and complements the empirical application of Gini coefficients by providing a more nuanced interpretation.

The trajectory of rural development is both influenced by and influences land distribution patterns. Modernisation theory suggests a linear progression from traditional agriculture to industrial productivity; however, its urban-centric assumptions frequently overlook rural agency of rural communities and the context-specific challenges they face (Rostow, 1960). Structural change theory, particularly the Lewis model, anticipates a shift of labour from agricultural activities to higher-productivity sectors (Ansari, 2020). Nevertheless, in the Estonian context, demographic changes and land market dynamics suggest more complex transitions that cannot be explained solely by labour migration.

Dependency theory sheds light on how external economic pressures and historical legacies can shape land concentration (Frank, 1967). Building on this, the sustainable livelihoods approach (Chambers and Conway, 1992)

and the concept of new rurality (Kay, 2008) offer bottom-up perspectives that highlight household strategies, asset portfolios (including land), and adaptive capacities. These frameworks also acknowledge the multifunctionality of rural areas and the increasingly fluid boundaries between urban and rural environments.

Agriculture in Estonia has experienced a significant structural transformation over the years. Since 1919, five major land reforms have profoundly influenced Estonian agriculture. The first reform in 1919 aimed to redistribute land, which was primarily owned and utilised by large farms, predominantly by Baltic Germans, to the peasant class (Jürgenson, 2017). During the interwar period, family farming became increasingly prevalent and played a crucial role in Estonia's agricultural landscape (Grubbström and Sooväli-Sepping, 2012).

In 1940, the Soviet Union occupied Estonia and implemented a new land reform. However, in 1941, Germany took control of Estonia, resulting in the cancellation of the Soviet-initiated reform. After three years, the Soviet Union reoccupied Estonia. It resumed the land reform process, which involved the abolition of private ownership and a shift from small-scale farming to large-scale collectivisation (Hedin, 2005). The prolonged occupation by foreign powers for over fifty years significantly disrupted Estonian rural life prior to 1940, leading to a decline in village communities. During this time, family farming decreased to small-plot farming (Grubbström and Sooväli-Sepping, 2012), which played a crucial role in preserving people's farming experiences during the Soviet period (Abrahams, 1996).

In 1991, Estonia's land reform initiated the dissolution of collective farms, resulting in the distribution of private farmland among numerous landowners, many of whom had little prior involvement in agriculture (Jürgenson, 2017). It was observed that these landowners were committed to preserving family land, despite the impracticality of resuming farming (Holt-Jensen and Raagmaa, 2010). The situation created a divide between commercially focused farms and those farms oriented toward lifestyle or environmental stewardship (Viira *et al.,* 2020). The collapse of the Soviet Union left rural areas with infrastructure poorly adapted for small-scale farming development (Sørensen, 2004), and Estonian village life never fully recovered. Although the trend of migrating to large cities has stabilised in recent years, rural areas have not seen significant benefits from this shift, as families with children increasingly favour small towns on the outskirts of larger cities (Mändmets and Kärk, 2022; Samarüütel *et al.,* 2010).

In the three decades following independence, Estonia has experienced a concentration of agricultural land use within larger households. Monitoring the changes in agricultural land use across Estonia is vital to assess whether the country is moving towards increased inequality in land distribution among agricultural households or if conditions have improved. This paper explores the fairness of agricultural land distribution across various sizes of agricultural households.

Data and Methods

Study Area and Statistical Data

The study area of this research is Estonia, focusing on agricultural land users' holdings, which include all plots utilised for agricultural production across the country. No distinction is made between owned and leased land. Statistical data was sourced from Statistics Estonia[1], while data for agricultural producers' holdings was obtained from the Estonian Agricultural Registers and Information Board (ARIB). Spatial data regarding Estonian counties was obtained from the Estonian Land Board[2]. The data from Statistics Estonia was used to analyse changes in agricultural land use in Estonia, which included details about the number of agricultural households and the area of utilised agricultural land. The dataset spans from 2001 to 2023, covering the years 2001, 2003, 2005, 2007, 2010, 2013, 2016, 2020, and 2023.

The study utilised the data from the Agricultural Registers and Information Board (ARIB) to analyse shifts in agricultural land use across Estonia and its counties between 2011 and 2023. Using GIS software (ArcGIS Pro), agricultural producers were categorised into six groups based on the size of their landholdings: 0–<2 ha, 2–<40 ha, 40–<100 ha, 100–<400 ha, 400–<1000 ha and >1000 ha. The data was analysed according to these size groups. This classification comes from the Farm Accountancy Data Network (FADN), which initially grouped agricultural land area into four size groups (0–<40 ha, 40–<100 ha, 100–<400 ha, >400 ha). To gain a more detailed understanding of the smallest agricultural land users, the FADN size group 0–<40 ha was subdivided into 0–<2 ha and 2–<40 ha. Likewise, the FADN group of >400 ha was split into two groups 400–<1000 ha and >1000 ha to better characterise the largest agricultural land users. This methodology has previously been employed to analyse changes in agricultural land use in Estonia (Rasva and Jürgenson, 2020, 2022).

The ARIB data layer was combined with the county layer from the Estonian Land Board to assess agricultural land use changes at the county level. Spatial information was linked to land plots to investigate structural changes in agricultural holdings categorised by size groups within each county.

Gini Coefficient

Estonia has undergone significant transformations in agricultural land use and ownership, characterised by growing concentration of land in the hands of fewer individuals. Regional inequality can be analysed through various methods. This study explores the disparities in agricultural land utilisation among agricultural households of differing sizes by utilising the Gini coefficient. The Gini coefficient effectively captures these spatial and structural inequalities at both national and county levels. Table 1 presents the criteria used to evaluate land utilisation patterns based on the Gini coefficient.

[1] https://andmed.stat.ee/et/stat
[2] https://geoportaal.maaamet.ee/est/ruumiandmed/haldus-ja-asustusjaotus-p119.html

Table 1: The standard to assess different levels of the agricultural land use structure.

Gini coefficient	<0.2	0.2–0.3	0.3–0.4	0.4–0.5	>0.5
Level	absolutely equal	relatively equal	reasonable	relatively unequal	absolutely unequal

Source: Own composition

The Gini coefficient is a widely recognised statistical measure of inequality, typically used to assess income or wealth distribution. Its application to agricultural land use offers a valuable method for quantifying disparities in land ownership or utilisation across different regions. Facilitating comparison across counties and over time, it reveals important trends. Identifying regions with high levels of land inequality, the Gini coefficient supports evidence-based policymaking, particularly in the context of rural development. Furthermore, this coefficient provides a single, intuitive value that effectively summarises the degree of inequality, making it easily understandable for both researchers and policymakers.

While the Gini coefficient is a valuable tool, it has several limitations when applied to land utilisation. It focuses solely on the quantitative distribution of land, neglecting qualitative factors such as land fertility, location, and productivity. The results are heavily influenced by the accuracy and granularity of the data used; thus, aggregated or outdated records can distort the coefficient. Furthermore, a single Gini value may correspond to multiple distribution patterns; for instance, two counties might exhibit the same coefficient but have significantly different landholding structures. It is also crucial to note that traditional Gini calculations often exclude individuals without land, which may lead to an underestimation of inequality. Additionally, the coefficient does not differentiate between private, corporate, or state-owned land, each of which has distinct implications for rural development.

The Gini coefficient is determined by analysing the agricultural land usage area alongside the number of producers within various size groups. Below are the steps taken to calculate the Gini coefficient:

- *Data collection.* Data for the Gini coefficient, calculation was provided by ARIB, encompassing information about land users and their land use areas. These land users were divided into six groups based on the extent of their agricultural land.
- *Data sorting by county.* Each land user is classified within one of the six size groups, and their land and plots were assigned to one of 15 counties based on geographical location. The information regarding the size group associated with each plot is retained. The data for each county was sorted in ascending order according to the land use area.
- *Cumulative calculation for each county.* Cumulative calculations were conducted for each county, focusing on both the cumulative share of land usage and the cumulative share of land users. It involved aggregating the land usage of each size group with that of the preceding groups. Similarly, each number of users was added to the previous number of users.

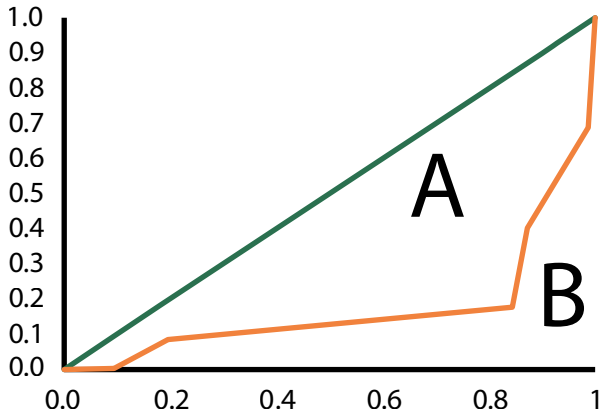

Figure 1: Example of calculating the Gini coefficient according to the Lorenz curve.

Source: Own composition

- *Plotting the Lorenz Curve for each county.* The Lorenz curve was then plotted using these cumulative percentages. The X-axis represents the cumulative share of producers (%), while the Y-axis illustrates the cumulative share of land use area (%). This curve provides a visual representation of the concentration of land usage.
- *Calculating the Gini coefficient for each county*. The Gini coefficient for each county was calculated based on the area between the Lorenz curve and the diagonal line. This coefficient measures the degree to which the Lorenz curve deviates from the "line of equality" by comparing areas A and B (as shown in Figure 1). The Gini coefficient is calculated using the formula: Gini coefficient = A / (A + B)

The Gini coefficient measures inequality, with values ranging from 0 to 1, applicable to a nation or any specific group. In this context, a coefficient of 0 indicates that all size groups share an equal amount of agricultural land, while a coefficient of 1 indicates that a single size group possesses all the agricultural land. However, it is essential to note that this coefficient alone does not provide a comprehensive understanding, and it has its limitations, as previously noted.

Results

The number of agricultural households in Estonia has steadily decreased over the years. In 2001, there were 55,748 agricultural holdings; however, by 2023, this number had dropped to just 10,518 (Figure 2), representing an 81% decrease over 22 years. Interestingly, despite the decline in agricultural households, the extent of utilised agricultural land has increased by 11%, rising from 795,640 hectares in 2001 to 978,364 hectares in 2023.

Over the past 12 years, inequality in the distribution of agricultural land use among different size groups in Estonia has increased. The Gini coefficient rose from 0.30 in 2011 to 0.38 in 2023.

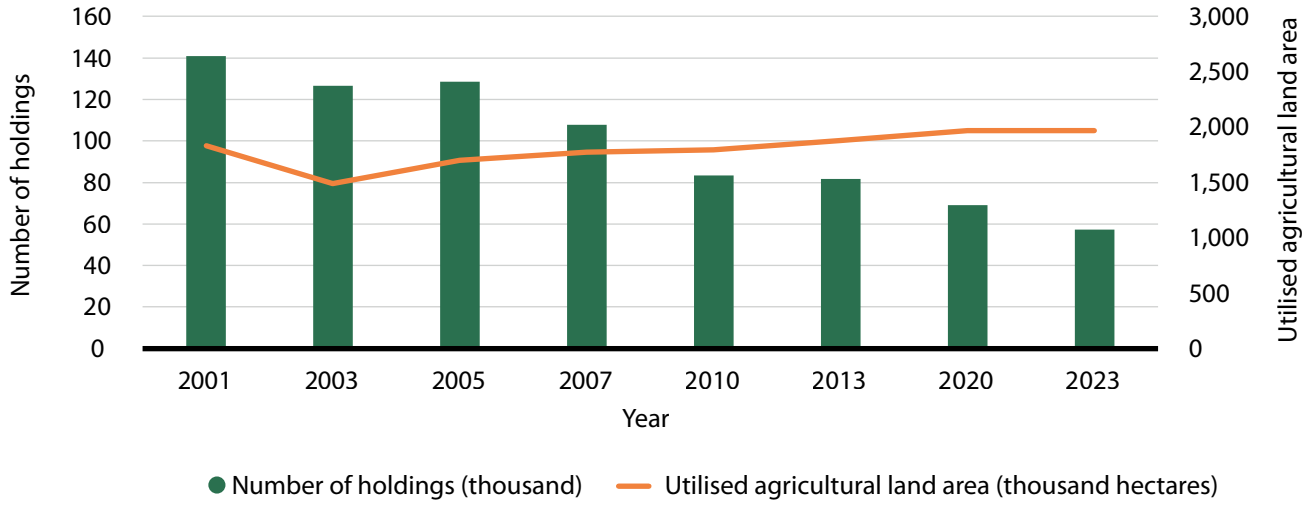

Figure 2: The number of agricultural holdings and area of utilised agricultural land in Estonia between 2001 and 2023.
Source: Own composition based on Statistics Estonia

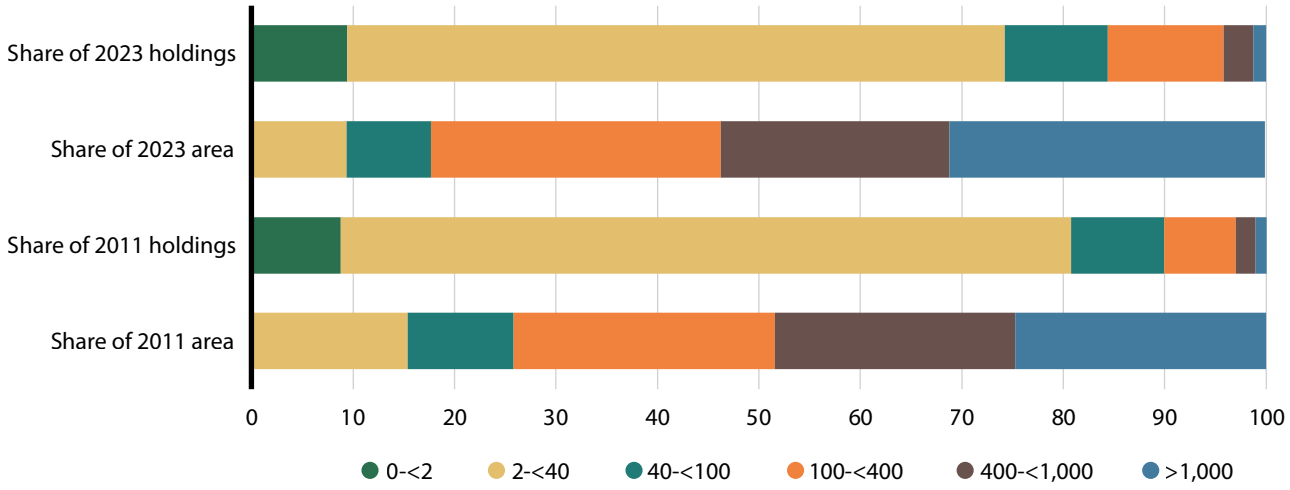

Figure 3. Share of agricultural area and agricultural holdings in size groups in Estonia in 2011 and 2023.
Source: Own composition based on ARIB data

The area of agricultural land utilised by larger groups has expanded (see Figure 3). In 2011, the combined share of agricultural land used by size groups of 400–<1000 hectares and those exceeding 1000 hectares was 49%; by 2023, this figure reached 54%. These larger holdings represented 3% of all agricultural holdings in 2011 and 4% in 2023. Controversially, the share of agricultural land used by smaller groups – those ranging from 0 to <2 hectares, 2–<40 hectares, and 40–<100 hectares – has declined. In 2011, these size groups accounted for 25% of agricultural land use, which decreased to 17% in 2023. These holdings constituted 88% of all agricultural holdings in 2011 and 35% in 2023.

In 2011, the Gini coefficient was highest in the counties of Järvamaa, and Lääne-Virumaa, with values ranging from 0.42 to 0.50 (see Figure 4). In Jõgevamaa, the Gini coefficient was 4.1. In contrast, Raplamaa and Pärnumaa recorded the lowest Gini coefficient, with values between 0.26 and 0.29.

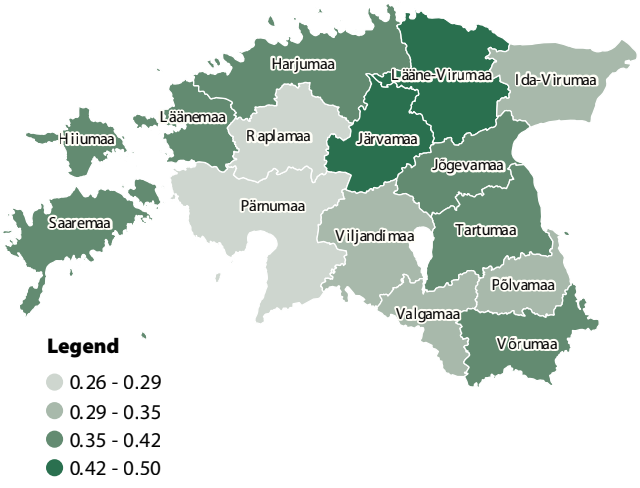

Figure 4: Gini coefficient in Estonian counties in 2011.
Source: Own composition based on ARIB data

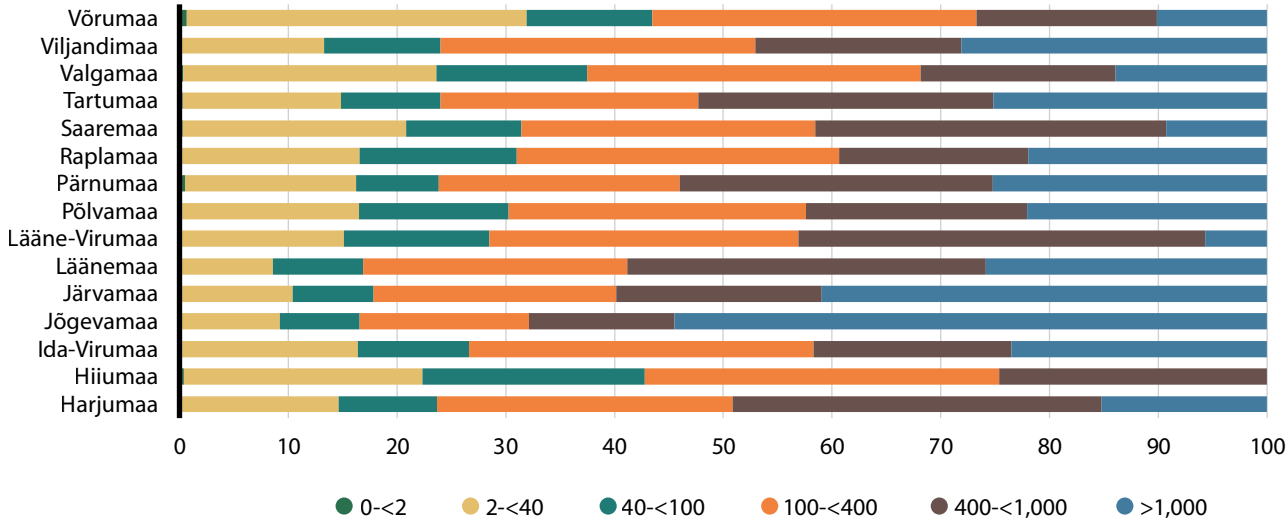

Figure 5: Share of utilised agricultural area in size groups in Estonian counties in 2011.
Source: Own composition based on ARIB data

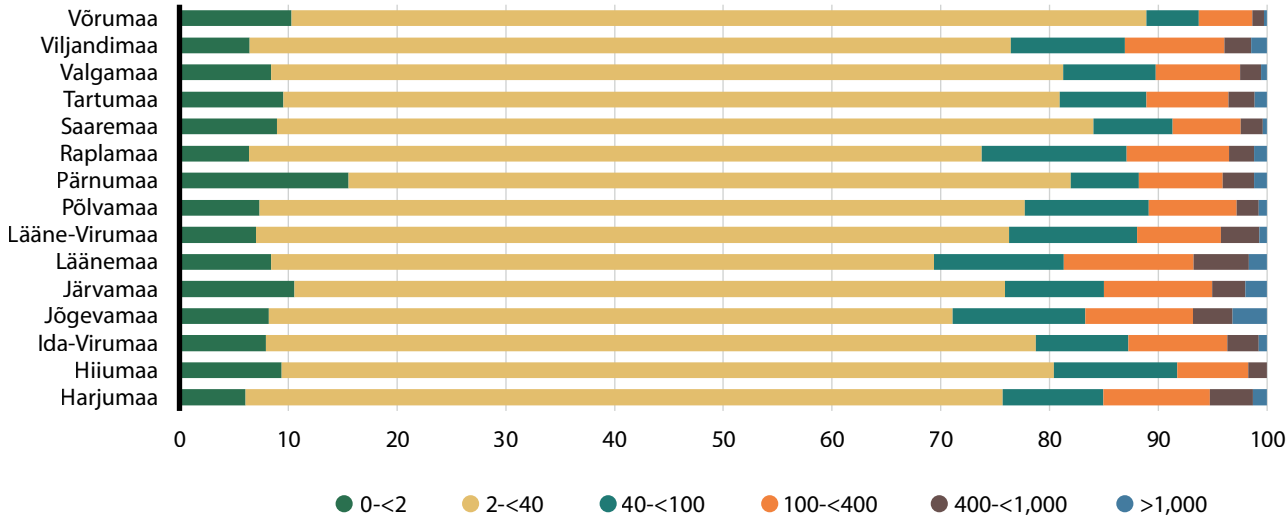

Figure 6: Share of agricultural holdings in size groups in Estonian counties in 2011.
Source: Own composition based on ARIB data

In Järvamaa and Jõgevamaa, large agricultural holdings greater than 1000 hectares represented the largest share of agricultural land in 2011, accounting for 41% and 54%, respectively. Meanwhile, agricultural land in smaller size groups below 400 hectares made up 39% of Järvamaa's and 32% of Jõgevamaa's land (see Figure 5). The notably high Gini coefficient in Lääne-Virumaa for that year can be attributed to the complete absence of producers in the size group of zero to two hectares, resulting in a 0% share of agricultural land use for this category. The size group greater than 1000 hectares made up 6% of Lääne-Virumaa's land. Conversely, agricultural land among the size group 400 to 1000 hectares made up 37% of Lääne-Virumaa's land.

In 2011, the majority of agricultural holdings in Lääne-Virumaa, Jõgevamaa, and Järvamaa were concentrated in the 2–<40 hectares size group, comprising approximately 69%, 63% and 65% of the total, respectively. Only a small percentage of holdings – 3% in Jõgevama, 1% in Lääne-Virumaa, and 2% in Järvamaa – fell into the size group of over 1000 hectares (see Figure 6). Notably, despite their small numbers, these larger holdings accounted for a significant share of agricultural land use, representing 41% of the total in Jõgevamaa and 54% in Järvamaa.

In 2011, in Hiiumaa, 71% of agricultural holdings belonged to the 2 to less than 40 hectares size group, while only 2% were in the 400 to less than 1000 hectares group. Consequently, 71% of agricultural holdings utilised 22% of the agricultural land in Hiiu County, whereas the 2% of larger holdings utilised 25% of the land.

By 2023, the overall Gini coefficient in Estonia had increased, reaching its peak of 0.5-0.55 in Järvamaa (see Figure 7). Following Järvamaa, the highest Gini coeffi-

cients were observed in Jõgevamaa, Tartumaa, and Lääne-Virumaa, ranging from 0.42 to 0.50.

In Järvamaa, holdings larger than 1000 hectares used the largest share of agricultural land usage at 56%, while those smaller than 100 hectares represented the smallest share, ranging from 0% to 5% in 2023 (Figure 8). In Jõgevamaa, the >1000 ha category used 45% of agricultural land, while holdings under 100 hectares made up between 0% and 6%. Similarly, in Tartumaa and Lääne-Virumaa, the >1000 hectares group used 38% of the total agricultural land. In Tartumaa, holdings smaller than 100 hectares utilised between 0% and 8% of the agricultural land, while in Lääne-Virumaa, this group accounted for 0% to 5%. In Hiiumaa, the 100–<400 hectare size group represented the largest share of agricultural land at 40% in 2023, and the holdings smaller than <1000 hectares used 9% of the agricultural land in the county.

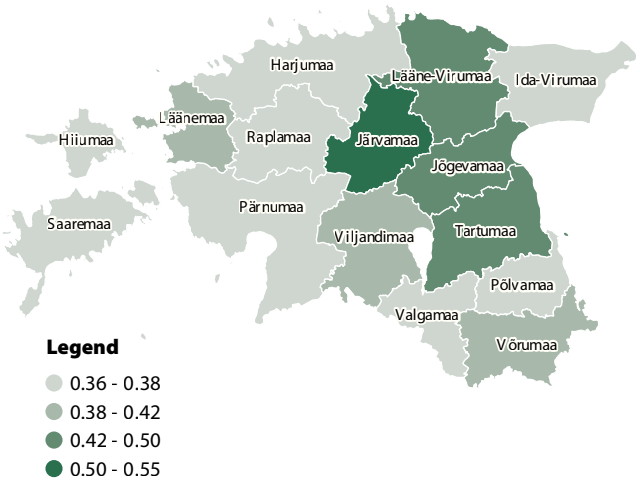

Figure 7: Gini coefficient in Estonian counties in 2023.

Source: Own composition based on ARIB data

In 2023, agricultural holdings exceeding 1000 hectares formed the largest share, representing 37% of all agricultural holdings in Järvamaa. In contrast, the smallest shares were found in the size groups of 0–<2 hectares and 40–<100 hectares, contrivuting only 1% and 9%, respectively (Figure 9). Similarly, in Jõgevamaa, the majority of agricultural holdings (30%) were also over 1000 hectares, with the smallest shares (1% and 9%) being attributed to the size groups of 0–<2 hectares and 40–<100 hectares.

In Tartumaa, the largest share (26%) of agricultural holdings was in the size group of less than 1000 hectares, while the smallest share (1% to 9%) was found in the size groups of 0 to less than 2 hectares and 40 to less than 100 hectares. Similarly

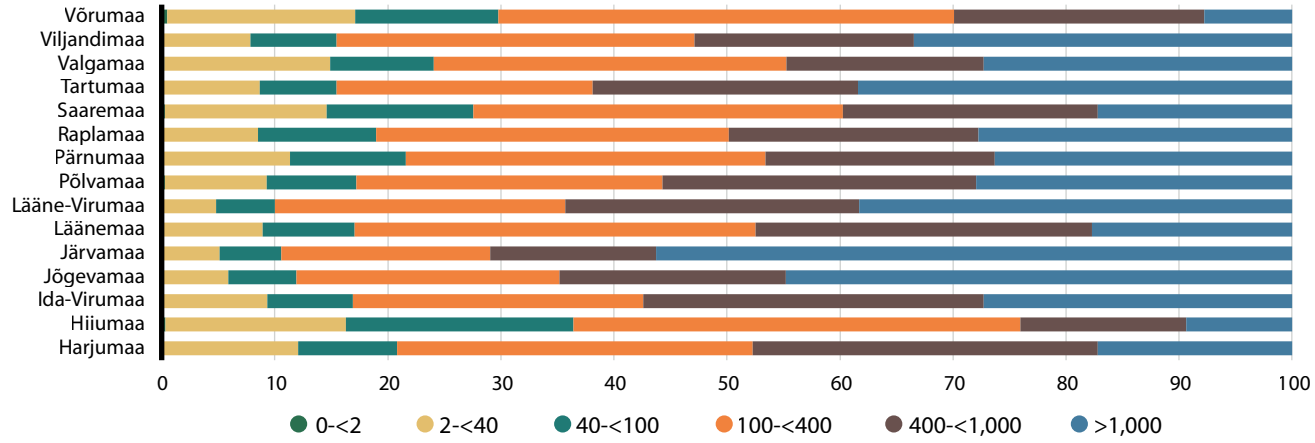

Figure 8. Share of utilised agricultural area in size groups in Estonian counties in 2023

Source: Own composition based on ARIB data

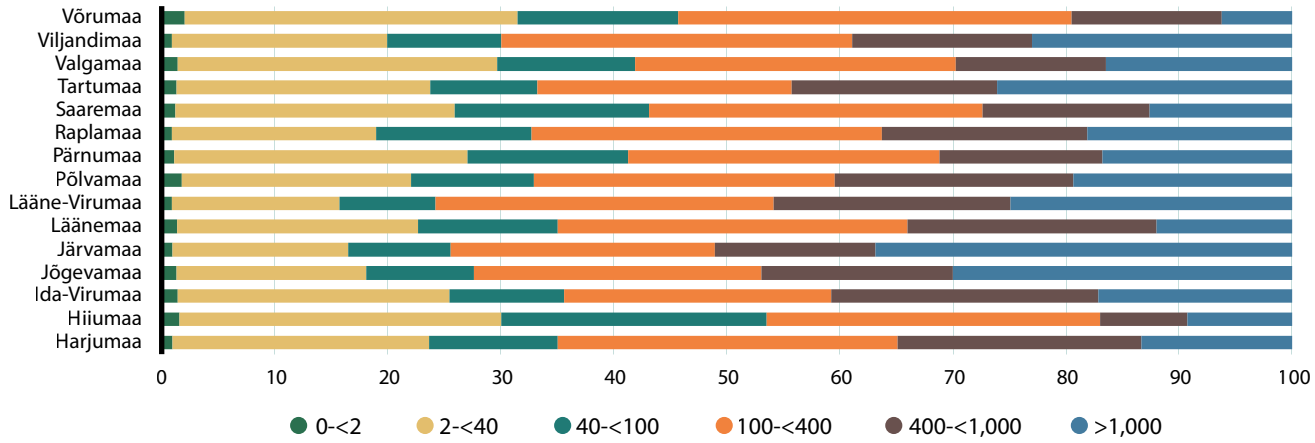

Figure 9: Share of agricultural holdings in size groups in Estonian counties in 2023.

Source: Own composition based on ARIB data

in Lääne-Virumaa, the highest presentage (25%) of agricultural holdings belonged to the size group of less than 1000 ha, with the smallest shares (1% and 8%) attributed to the size groups of 0 to less 2 hectares and 40 to less than 100 hectares.

In 2023, 37% of agricultural holdings in Järvamaa used 56% of all agricultural land in the County. Meanwhile, 30% of agricultural holdings in Jõgevamaa used 45% of the agricultural land in Jõgeva County, and 26% of agricultural holdings in Tartumaa used 38% of the agricultural land in that County.

Discussion

The agricultural landscape in Europe is undergoing significant changes, primarily driven by a rapid decline in the number of agricultural holdings, and the expansion of large enterprises (Joosse and Grubbström, 2017). This concentration of land use and the growing rise in inequality have profoundly affected small agricultural households (Kay *et al.,* 2015) and rural life as a whole. Moreover, the COVID-19 pandemic and the Russia's aggression towards Ukraine have further highlighted the essential role of rural areas in enhancing Europe's resilience (EC, 2024).

Like many other European countries, Estonia is experiencing a rapid concentration of agricultural land. The number of agricultural households is declining, while the average area of land managed by each holding is expanding quickly. Larger agricultural holdings are increasingly acquiring a greater portion of the total agricultural land, resulting in a reduced share of farmland managed by smaller producers. As a consequence, smaller agricultural households in Estonia are gradually closing down, and younger generations face significant challenges in accessing land and entering the farming sector. This process of generational renewal is crucial for fostering innovation and modernisation in agriculture (Daniele, 2024). Maintaining these smaller agricultural households is vital for the sustainability of rural communities, as they provide employment opportunities for locals and help preserve the cultural landscape (Tomson, 2007). However, the concentration of land poses a significant threat to the vitality of rural life. Furthermore, the ageing farming population and limited access to land pose a risk to food security (Põldaru *et al.,* 2018).

Land concentration in Estonia has significant implications that extend beyond the realm of agricultural economics, impacting the social fabric, generational renewal, and balanced regional development. This phenomenon is shaped by a complex interplay of historical, economic, policy, and market dynamics.

Following the restoration of independence in 1991, Estonia implemented land reform aimed at returning property to pre-Soviet landholders. This process resulted in fragmented land ownership and a rise in small farms. However, many of these small farms ultimately proved economically unviable, leading to their consolidation into larger entities (Rasva and Jürgenson, 2020). Larger farms enjoy economies of scale, enhanced access to technology, and increased bargaining power, all of which contribute to the trend of concentration in Estonia's agricultural sector. Additionally, the relatively low land prices in Estonia have attracted both investors and corporate entities, further accelerating land acquisition (Rasva, 2023). The Common Agricultural Policy (CAP) subsidies, which are often proportionate to land area, tend to favour large landholders, facilitating their expansion in Estonia (Jürgenson and Rasva, 2020). Unlike some neighbouring countries, such as Latvia and Lithuania, Estonia imposes few restrictions on the amount of land that one entity can own (Rasva, 2023). In the absence of targeted policies to protect smallholders, market dynamics inherently favour consolidation.

Agricultural land in Estonia is increasingly being acquired by corporate entities (Rasva and Jürgenson, 2022), which possess the resources to manage extensive tracts of land more effectively. Non-local investors and absentee owners may prioritise profit over responsible land stewardship, leading to greater land concentration without reinvestment in rural communities. The migration of younger generations to urban areas has resulted in rural land becoming underutilised or available for purchase by larger corporations. Consequently, many older farmers find themselves without successors, prompting the sales or lease of their land to larger agricultural producers.

Korhals Altes (2023) has pointed out that in situations of land concentration, landowning farmers may be tempted to stop farming and lease their land to the highest bidder. This trend hinders the entry of new farmers and contributes to a significant outflow of people and resources from rural communities. Thus, addressing land use concentration is essential for broader rural development initiatives. The concentration of agricultural land among a selected few individuals carries considerable political, economic, and social implications (Ayaz and Mughal, 2023). Data derived from population censuses and land registers indicate that regions with greater land inequality often experience higher rates of emigration (Boberg-Fazlić *et al.,* 2024). In Estonia, for instance, Statistics Estonia reported the highest emigration rates in 2023 from Ida-Virumaa (-685), Jõgevamaa (-243), and Võrumaa (-236). It supports the notion that areas characterised by greater land inequality may experience increased emigration. Conversely, the emigration rates in Järvamaa (-12) and Lääne-Virumaa (-65) were lower than in many other counties.

One way to assess land inequality is by calculating the Gini coefficient based on agricultural land use area and the number of users within a specific size group. Over the past 12 years, Estonia's Gini coefficient has shown an upward trend; however, it still falls within the higher end of a reasonable range. If this trend continues, the coefficient may soon reach a level that suggests significant inequality.

Over the years analysed, more than half of Estonia's agricultural land is managed by holdings exceeding 400 hectares, and this trend continues to grow. In 2023, 4% of these holdings utilised 54% of the total agricultural land area in Estonia. While larger holdings, particularly those surpassing 1000 hectares, have increased their share of agricultural land, their overall proportion among all holdings has remained unchanged. In 2023, these larger holdings formed 1% of all

holdings, yet utilised 31% of total agricultural land area. In contrast, 74% of all holdings used only 9% of Estonia's total agricultural land area. This data indicates that larger agricultural holdings possess a greater capacity for expansion and tend to expand more than their smaller counterparts, especially when considering the diversity of farm sizes (Korthals Altes, 2023; Zagata and Sutherland, 2015).

Holdings within smaller size groups have experienced a significant decrease in their share of agricultural land, accompanied by a reduction in their numbers. The most significant decrease has been observed in the size group of 2–<40 hectares. While large agricultural households are increasingly gaining a greater share of agricultural land, new entrants, farming successors, and smaller holdings continue to encounter significant challenges regarding land access (Zagata and Sutherland, 2015). When land becomes available, new entrants often find themselves competing with established households for agricultural land in pursuit of economies of scale (Zagata and Sutherland, 2015). This escalating land inequality contributes to an increase in rural poverty and food insecurity (IPES-Food, 2024). In Estonia, the regions exhibiting the most unequal distribution of agricultural land are Järvamaa and Jõgevamaa.

In 2011, a significant disparity was evident in the distribution of agricultural land use among different size groups in Järvamaa and Jõgevamaa. Approximately half of the agricultural land in these counties was utilised by holdings exceeding 1000 hectares, which comprised 63 to 65 per cent of all holdings. In contrast, the highest proportion of agricultural land used by smaller holdings was found in Hiiumaa, Võrumaa, and Valgamaa, where these counties also had the largest share of small holdings.

In 2023, there was a significant increase in the Gini coefficient, indicating a high level of inequality in the distribution of agricultural land in Järvamaa. Large holdings in the county utilised a substantial portion of the agricultural land, with the largest size group making up 56% of the total area. Meanwhile, in Jõgevamaa, there was a slight decrease in the share of agricultural land used by holdings exceeding 1000 hectares; however, this share remained comparatively high relative to other counties. Given the limited availability of local land, accessing agricultural land in both Järvamaa and Jõgevamaa may present challenges for new entrants and smaller agricultural holdings.

Recent years have seen a growing interest in agriculture among individuals and entities not previously involved in farming, as noted by Carolan (2018). Nonetheless, new entrants and younger individuals encounter significant challenges when moving to rural areas to pursue careers in agriculture. It is particularly evident in Estonia, as highlighted by Mändmets and Kärk (2022). The difficulties in acquiring agricultural land, coupled with a lack of investment opportunities, pose substantial obstacles to establishing a farming venture in the country. Raising the necessary capital and achieving profitability can be nearly impossible without prior access to agricultural land and equipment.

Throughout Estonian history, various periods have been characterised by the dominance of large agricultural holdings in the sector (Rasva and Jürgenson, 2020; Reiljan and Kulu, 2002). During its early years of political independence, Estonia was predominantly a rural country (Unwin, 1997). The collective farming era during the Soviet occupation resulted in significant out-migration from rural areas and a shift towards urbanisation (Grubbström and Sooväli-Sepping, 2012). Most investments during this time were focused on the new urban centres and their surrounding villages, lacking in essential services (Raagmaa *et al.,* 2002). Consequently, many villages lost their status as local hubs (Raagmaa *et al.,* 2009), and the rural lifestyle that existed prior to 1940 never fully regained its footing.

The most recent and ongoing land reform has facilitated the resurgence of small holdings in Estonia. The Estonian population shares a profound emotional connection to their land, and small agricultural households are often regarded as an ideal way of life. This model of household was predominant in Estonia's rural areas during the relatively short period of 1919 to 1940, with most agricultural households being small, averaging around twelve hectares. However, in southern and central Estonia, there were also large, well-mechanised cattle-breeding farms, often exceeding 50 hectares (Holt-Jensen and Raagmaa, 2010). Remarkably, both small and large agricultural households coexisted successfully during this time.

Three decades after regaining its independence, Estonia is experiencing a trend of land concentration and growing land inequality. Since joining the European Union in 2004, Estonia has engaged in the CAP support systems, which predominantly benefit the largest agricultural holdings (Holt-Jensen and Raagmaa, 2010; Raggi *et al.,* 2013). Consequently, small agricultural households are facing significant challenges in maintaining their viability as a result of CAP. It has been suggested that these small agricultural households can adapt by either specialising in their operations or exploring alternative rural business ventures (Tomson, 2007).

Addressing the issue of agricultural land concentration and the resulting inequality is crucial. In Estonia, land concentration has significant repercussions that extend beyond agricultural economics; it impacts rural communities, young farmers, and regional development. As land becomes concentrated in fewer hands, small farms and family-run operations are disappearing, leading to depopulation and the erosion of rural traditions and community life (Rasva and Jürgenson, 2022). Absentee or corporate landowners often do not reinvest locally, which weakens rural economies and infrastructure. Smallholders play a vital role in preserving Estonia's rural identity, language, and customs (Rasva and Jürgenson, 2022), and their decline poses a significant threat to cultural continuity.

High land prices and competition from large entities pose significant challenges for young or new farmers looking to acquire land. Moreover, CAP subsidies often favour larger landholders, which leaves emerging farmers with fewer resources to innovate and expand (Rasva and Jürgenson, 2022). Without targeted support, the ageing farming population risks not being succeeded, putting the future of agriculture in Estonia in jeopardy.

The concentration of agriculture in a few regions leads to uneven economic activity across the country, leaving some

areas stagnant or in decline. Many large landholders operate across multiple counties, diminishing the impact of local decision-making and planning (Rasva and Jürgenson, 2020). Furthermore, the intensive land use by these large entities can contribute to soil degradation and biodiversity loss, thereby undermining sustainable regional development goals.

Transitioning to a more equitable agricultural system presents challenges, yet it is indeed achievable. All agricultural holdings should have fair access to agricultural land use and ownership, regardless of size. To address land inequality, a comprehensive set of measures must be implemented. These measures should encompass redistributive programs, regulatory reforms, taxation policies, and accountability initiatives. Furthermore, they should extend beyond land issues to include the entire agri-food sector, from inputs to retail (IPES-Food, 2024).

Land inequality continues to be a substantial barrier to achieving inclusive rural development in Estonia. The increasing concentration of agricultural land undermines the vitality of smallholder farming and poses long-term risks to social cohesion, environmental sustainability, and food security. To address land inequality domestically, Estonia should consider implementing a tiered land value tax designed to discourage excessive land accumulation and generate revenue for grants and support programs aimed at small agricultural producers. In addition to tax reform, it is vital to expand access to agricultural land for new entrants. This can be achieved by establishing a national land bank tasked with redistributing unused and state-owned land, while also offering low-interest loans, start-up grants, and long-term leases to young and emerging farmers.

Establishing prior rights for newcomers and small farms to rent or purchase agricultural land would significantly contribute to a future that is inclusive, resilient, and rooted in the local community (Rasva and Jürgenson, 2022). This policy has the potential to serve as a cornerstone for rural revitalisation, emphasising not only land access but also the involvement of various stakeholders in shaping the agricultural future of Estonia.

Furthermore, implementing an upper limit on the amount of agricultural land that individuals or entities may own in Estonia could lay the foundation for a more equitable and sustainable rural future (Rasva and Jürgenson, 2022). While this regulation would require careful legal design and stakeholder engagement, it represents a powerful mechanism to counteract land concentration. Although land ownership regulation falls within national jurisdiction, it must align with EU principles. Several EU member states have successfully defined such ownership limits on grounds of public interest, rural development, and environmental protection.

There is a pressing need to establish a clear structure of enterprises in Estonia to ascertain the extent of land ownership or rental by each enterprise (Rasva and Jürgenson, 2022). Estonia's e-governance infrastructure already lays a solid foundation for this initiative. The country could mandate the disclosure of beneficial ownership and related entities within the Land Register, link land use data with enterprise registries through digital platforms, and create public dashboards showing land ownership and rental patterns by enterprises.

In the absence of a transparent structure, it becomes challenging to track how much land is controlled by interconnected companies or associated individuals. Ownership and rental information may be obscured by subsidiaries or shell entities, making policy enforcement – such as land ownership limits or sustainability requirements – virtually impossible. Establishing a clear structure of enterprises is a strategic approach to safeguard rural equity, promote environmental sustainability, and ensure market fairness. It would empower regulators, researchers, and citizens alike to understand who controls Estonia's land and how it is managed.

EU strategic plans must also include measurable land equity targets, requiring Member States to define specific objectives and initiatives for inclusive land governance. This approach should be supported by dedicated funding for land tenure reform and participatory planning. The CAP needs to integrate stronger redistributive mechanisms that support small and medium-sized agricultural producers, as it plays a significant role in shaping land distribution patterns in Estonia. Historically, CAP has favoured larger farms due to its area-based structure, which allocates support in proportion to the land owned or cultivated. It has led to the concentration of agricultural land, reinforcing existing inequalities and making it increasingly difficult for small agricultural producers and new entrants to compete.

Estonia's CAP Strategic Plan for 2023–2027 recognises these challenges and includes measures aimed at redistributing a portion of direct payments toward smaller and medium-sized farms ("Estonia – CAP Strategic Plan," n.d.). However, additional reforms could further enhance equity, such as implementing stricter caps on subsidies for large landholders, providing stronger support for young and beginning farmers, and incorporating land inequality indicators into CAP performance monitoring. These adjustments would align CAP implementation more closely with the EU's broader objectives of inclusive rural development and sustainable land governance.

Conclusion

The mechanisation, specialisation, and scale expansion within Estonia's agricultural sector have significantly contributed to land concentration and agricultural inequality. Findings from this study indicate a growing disparity in land use, with just 1% of agricultural holdings accounting for 31% of the total agricultural land area in 2023. New generations now face challenges in accessing land and entering the agricultural sector, while small agricultural holdings have reached a critical tipping point.

Since regaining independence, Estonia's agricultural landscape has undergone considerable transformation, having experienced decades of foreign annexation. Over the years, the country has transitioned through various phases of agricultural production, including manors predominantly owned by Baltic Germans, state farms during the Soviet era, and the current focus on scale expansion. The interwar period marked the most prosperous time for small farms and rural communities in Estonia. Unfortunately, village life has not

fully restored to its pre-1940 state, despite reforms implemented after regaining independence in 1991. These reforms have fallen short in adequately supporting vital rural life and sustainable small-scale agricultural practices, overlooking family and small-scale farming traditions.

It is essential to monitor changes in agricultural land use in Estonia, as a troubling trend has emerged where even landowning farmers are choosing to cease farming and instead lease their land to the highest bidder. This concentration process poses significant challenges, reducing the influx of new entrants into agriculture and contributing to a one-way flow of people and resources out of rural areas. Furthermore, studies have highlighted the growing concentration of land ownership in Estonia. Addressing these issues will necessitate substantial changes to the political, economic, and legal frameworks to reverse the trends of land concentration and inequality.

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