agriculture

MDPI

Article

Challenges and Future Visions of the Hungarian Livestock Sector from a Rural Development Viewpoint

Jenő Zsolt Farkas [1,*], Irén Rita Kőszegi [2], Edit Hoyk [1,2] and Ádám Szalai [1]

[1] Great Plain Research Department, Centre for Economic and Regional Studies, 3 Rákóczi Str., H-6000 Kecskemét, Hungary
[2] Faculty of Horticulture and Rural Development, John von Neumann University, 10 Izsáki Str., H-6000 Kecskemét, Hungary
* Correspondence: farkas.jenozsolt@krtk.hu

Abstract: Livestock farming in developed countries faces adverse environmental impacts, including greenhouse gas emissions and pollution. Moreover, economic and social issues have emerged, such as farm concentration and the aging of farmers. Consequently, the decline of small farms and household animal husbandry substantially impacted rural communities, posing challenges for rural development. This study investigates these processes within the Hungarian livestock sector from the 1990s to recent years in the context of rural development, which is a rarely explored viewpoint in the literature. The research employed a statistical and policy document analysis, a literature review, and interviews (n = 66) conducted in Hungary's Southern Great Plain region. The results reveal a decline in the number of animals and small farms in rural settlements, accompanied by an intense farm concentration, negatively affecting income generation opportunities. The established large-scale industrial animal husbandry has adverse environmental effects without positive externalities. The interviews highlight the severe challenges that young farmers face in starting their businesses, including land, labor, and capital shortages, leading to a slow generational change in the farming society. These processes demonstrate the limited multifunctionality of animal husbandry in Hungary. Our findings differ from those advocating for large-scale industrial agriculture development because an overly one-sided development pathway could lead to unsustainability.

Keywords: livestock sector; rural development; household and small-scale farming; sustainability; Hungary

Citation: Farkas, J.Z.; Kőszegi, I.R.; Hoyk, E.; Szalai, Á. Challenges and Future Visions of the Hungarian Livestock Sector from a Rural Development Viewpoint. *Agriculture* **2023**, *13*, 1206. https://doi.org/10.3390/agriculture13061206

Academic Editor: Cornelia Flora

Received: 6 May 2023
Revised: 31 May 2023
Accepted: 5 June 2023
Published: 7 June 2023

1. Introduction

Between 1961 and 2021, global meat production increased from 69 million tons to 354 million tons, while raw milk output rose from 344 million tons to 918 million tons, according to the FAOSTAT data. This surge in production was accompanied by a significant expansion in the animal population, with the number of livestock units rising from 11.7 billion in 1961 to 23.5 billion in 2020. On one side, these processes resulted in a more considerable environmental burden, including the increase in greenhouse gas emissions and pollution from animal farms and the food industry [1,2]. On the other side, they initiated industrialization and intense farm concentration processes [3] with various potential negative impacts on rural communities [4].

As for the environmental impacts, according to the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report [5], the agriculture sector, encompassing livestock production, is responsible for approximately 22% of global greenhouse gas (GHG) emissions resulting from human activities. As estimated by the Food and Agriculture Organization of the United Nations (FAO), the livestock sector contributes about 14.5% of global GHG emissions, which is equivalent to the entire transportation sector [6]. Gerber and colleagues [6] report that enteric fermentation from ruminants accounts for 39% of

sector emissions, manure left on pastures accounts for 23%, manure management accounts for 10%, and feed production and processing account for 9%.

Carbon dioxide is another significant contributor to atmospheric pollution and is predominantly associated with the use of fossil fuels. Highly mechanized agricultural production systems also generate carbon dioxide, which typically account for approximately 5% of global emissions [7].

Gerber and colleagues [6] found that around 65% of human-caused nitrous oxide emissions can be attributed to livestock farming, which highlights its significant role in this type of pollution. This is mainly due to using nitrogen fertilizers for growing feed crops and handling and storing animal manure. In addition, nitrous oxide is a potent greenhouse gas, with a global warming potential of almost 300 times that of carbon dioxide [8].

Besides the environmental impacts, the livestock sector also requires significant resources. The global livestock sector accounts for 70% of all agricultural land use [3]. In addition, the sector plays a crucial role in deforestation in Latin America and the degradation of grasslands because of overgrazing in dry areas [3]. Water use in animal husbandry is also an essential environmental burden, both locally and globally [9,10]. For example, Mekonnen and Hoekstra [11] reported that, on average, 1 kg of beef production necessitates 15,400 L of water, while 1 kg of sheep production requires 10,400 L of water, from which feed production accounts for about 99%.

Recurring diseases and epidemics further compound the difficulties of animal husbandry. The intensification of animal production and the globalization of trade have facilitated the spread of animal diseases across borders and continents [12]. Climate change could exacerbate this trend by creating conditions that favor the transmission and establishment of new diseases in areas where they were previously absent or rare [13].

Because of the above processes, several studies pointed out the severe sustainability issues associated with animal husbandry [14–20]. Due to this reason, researchers recommend reducing the volume of animal husbandry and dairy and meat consumption [16,17]. In addition, many people recognize that reducing meat consumption can positively impact the fight against climate change. This trend is consistent with the research findings that advocate for reducing meat-centric diets and promoting consumption regulation [14,19,21].

The challenge of reducing the number of animals and outputs in the livestock sector cannot serve as a universal solution due to the dynamic growth of the world's population, which is projected to reach 9 billion by 2050 [22]. Additionally, it does not adequately address the issues impacting rural areas, including depopulation, aging, unemployment, and reduced living standards. These problems arise from industrialization and the concentration of farms, which increase the vulnerability of rural communities. Furthermore, this approach fails to address emerging concerns about food security, such as those arising from the COVID-19 pandemic or conflicts such as the war between Russia and Ukraine. These challenges underscore the significance of food sovereignty and security, locally produced food, and short supply chains [23,24].

According to D'Souza and Ikerd's review [25], while small farms may be less efficient than large-scale operations, they are more sustainable from environmental and social perspectives. Small farms are less susceptible to issues such as leadership succession, which frequently affect large-scale farms. Moreover, large farms are often owned by absentee landlords or agribusiness corporations who may not reinvest their profits back into the local economy to the same extent as small, family-owned farms. Small-scale livestock production is linked to the rural economy in various ways, from food production to tourism and social farming [26,27]. Small farms can better respond to changing consumer preferences, for example, in the case of organic and bio products [28]. They operate with greater transparency and can produce high-quality, delicious products that bypass the conventional supply chains maintained by large corporations [29]. Overall, these advantages are favorable for rural regions' environmental, economic, and social sustainability.

While previous studies have explored the farm concentration process in Hungarian agriculture and animal husbandry [30–32], they have not adequately addressed the associ-

ated rural development aspects. Moreover, the livestock sector continues to face persistent crises, which further justifies the analysis of the situation because other central and eastern European (CEE) post-socialist countries (such as Poland) were able to capitalize on the opportunities presented by the EU accession.

Furthermore, in the international literature, the discussion of rural development and its relationship to animal husbandry, including household and small-scale farming, is primarily focused on developing countries [33,34], with relatively few studies exploring this issue in developed countries [35] or the European Union [36].

This research aims to investigate the concentration and industrialization processes that occurred in Hungarian livestock farming over the last three decades and to reveal the significant environmental, economic, and social consequences. We also interviewed young livestock breeders to gain insights into their experiences and challenges in establishing and managing their businesses. This analysis will contribute to our understanding of how current processes in animal husbandry resulted in sustainability challenges and affected the development of Hungarian rural areas.

After this introduction, this article continues with a presentation of the general trends in Hungarian animal husbandry after 1990, followed by a presentation of the research background, and then a description of the data sources and methods used. Next, in the results section, we present our analysis in three subsections. After this, we present a discussion, based on our results and the literature, in which we attempt to outline alternative development pathways to animal husbandry in Hungarian rural areas. Finally, we draw our conclusions.

2. Hungarian Agriculture and Livestock Sector in Focus

In the EU's 27 member states (2020), the total agricultural industry output shows an increasing trend, which exceeded the value of EUR 536.6 billion in 2022. This represents an almost 72% increase compared to 2005 (EUR 312.7 billion). The value of output from crop production exceeds the value of livestock farming in the member states. The former was EUR 286.2 billion in 2022, while the latter was EUR 206.7 billion (Eurostat).

Among the post-socialist countries, Poland has the most significant livestock farming output, accounting for EUR 19,303 million in 2022. Romania followed but with a significantly lower contribution of EUR 5209 million. Hungary and the Czech Republic are in the middle of the pack, with EUR 4130 and 2519 million in 2022, respectively. This means Hungary has only a 2% share of European production in terms of value.

Hungarian livestock farming was considered a leading branch of agriculture in the 1980s, contributing approximately 55–60% to the total production value. However, while animal husbandry in the EU member states continued to develop, domestic livestock farming was turned down after the regime change [37] and is in continuous crisis except for cattle breeding.

Livestock farming contributed 41% to the gross output of agriculture in 2003, but after Hungary acceded to the EU, this ratio dropped to 34% (HCSO—Hungarian Central Statistical Office). After hitting its bottom in 2008, there was growth in the total agricultural production, but the difference between crop production and livestock farming is increasing in value (Figure 1a).

The significant decline in the number of farms demonstrates that the individual farmers could not, or due to the circumstances, did not want to maintain their farms that were established after the regime change, which were often otherwise forced enterprises. After the EU accession, this process gained a new impetus, and an intense concentration started. According to the data from the agricultural census (AC) conducted in 2000 and 2020, the number of farms declined from 968,000 to 234,000 (Figure 1b) (There is a methodological difference in determining the number of farms. Unfortunately, the Hungarian Central Statistical Office (HCSO) only recalculated the data of the 2010 comprehensive census, as well as the 2013 and 2016 economic structure surveys using the new economic threshold. According to the new methodology, the data for 2000 would probably be even 20–30%

lower, but this does not affect our conclusions about the trend. The recalculated values are also shown in Figure 1b for the years of 2010, 2013, and 2016).

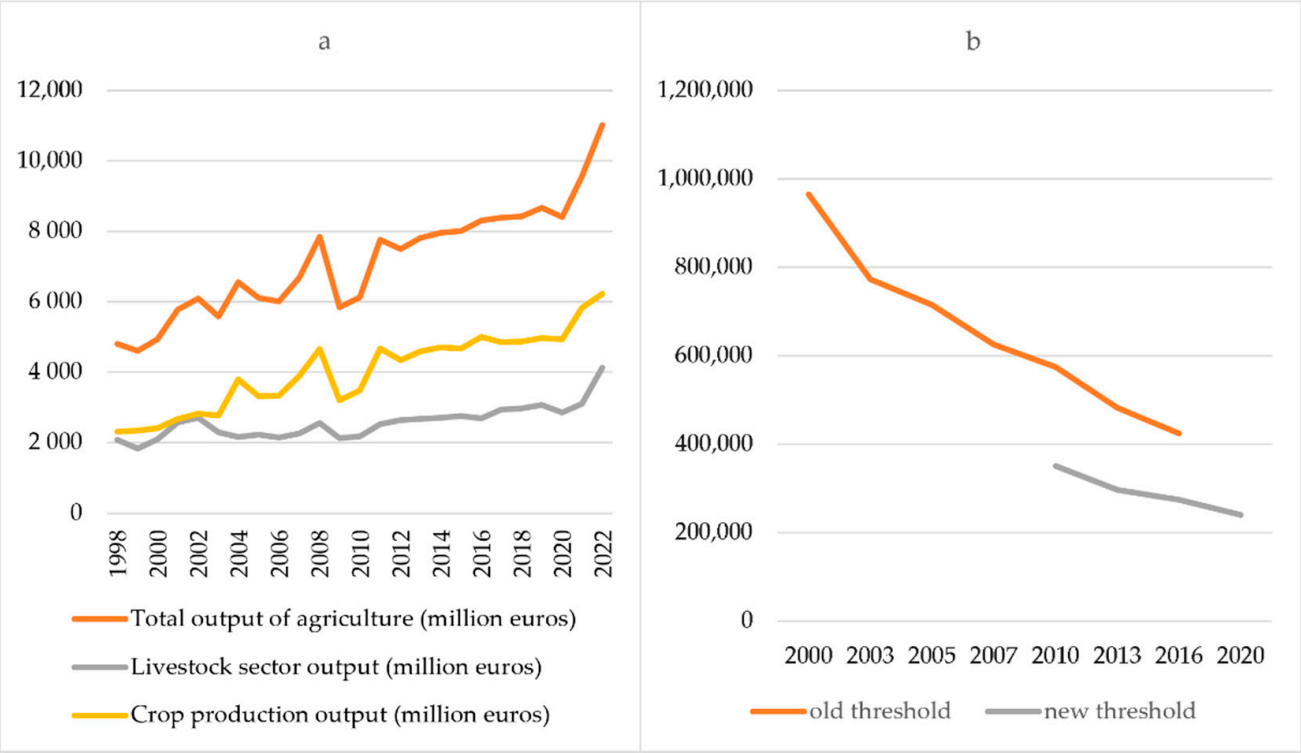

Figure 1. (**a**,**b**) Total output of the agricultural sector in Hungary and changes in the number of holdings. (Sources of data: (**a**) Eurostat, (**b**) Agricultural Censuses).

Based on the results of the agricultural census from 2000, 40% of the agricultural organizations engaged in crop production, 38% engaged in mixed production, and 22% exclusively focused on animal husbandry. The dominant trend in the 2000s was a marked decline in the share of mixed farms. Between 2010 and 2020, the proportion of livestock holdings decreased significantly, while the share of mixed holdings fell to only 9 % (Figure 2a). The loss of animal husbandry is shown by the fact that the proportion of farms that are engaged in animal husbandry continuously decreases. It is increasingly common for animal husbandry and crop production to be separated. A total of 51% of farms have agricultural land without animal populations, while 15% of farms with animal populations do not have any agricultural land at all (AC, 2020), so they are forced to procure all of their feed from other farms, which further worsens the prospects of livestock breeding.

The current animal population is only a fraction of what it used to be (Figure 2c), which has upset the balance between the crop and livestock sectors. Today, the cattle and pig populations have stabilized at around 60% (902 thousand heads) and 36% (2725 thousand heads), respectively, compared to their 1990s levels (Figure 2b). The sheep population is at 53% (887 thousand heads) (Figure 2b), and the poultry population is at 70% (32.1 million heads) of their populations in the 1990s (Figure 2c).

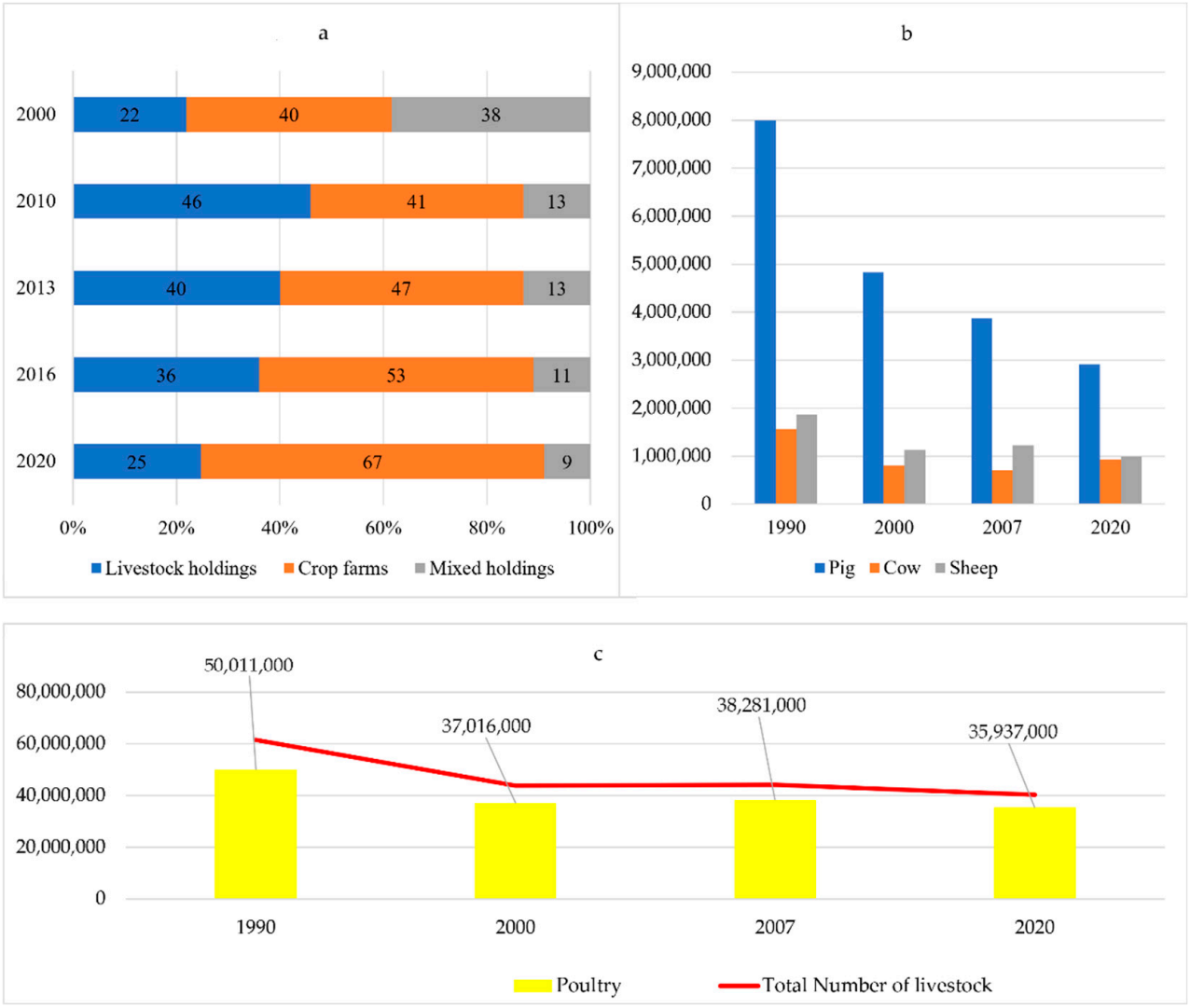

Figure 2. (**a**–**c**) Distribution of farms by their primary type of activity (%) and livestock population changes (head). (Source of data: Agricultural Censuses).

3. Research Background

Rural development is challenging to define because rural areas and communities face different challenges in developing and developed countries [38]. While in the former case, it primarily means modernizing agricultural production, ensuring food security, and overcoming rural poverty [39], the goals in the United States or the European Union are broader, including promoting prosperity and well-being to the local economies and communities [40,41]. Another problem is that the definition of rural itself is debatable [42]. Therefore, in the European Union, the member states can determine the target area of rural development programs according to their characteristics.

Industrialized agriculture caused significant environmental damage and the erosion of the prestige of agricultural production, while its role in rural employment and communities declined by the 1980s in Europe. Thus, it became necessary to change the agricultural production's environmental, economic, social, and policy model [43]. As a result, rural development with the new multifunctional agriculture model emerged in the Agenda 2000 framework and action program, which prepared the Common Agricultural Policy and Regional Policy reforms [44]. Based on the new multifunctional model, agriculture serves multiple social goals simultaneously [45]. Thus, besides producing goods (food and fiber), several non-good market commodities are also generated, some of which can be

classified as public services. Without claiming to be complete, these public services include protecting the rural environment, ensuring food safety and security, and maintaining production traditions and the rural cultural heritage [46].

Accordingly, in the past two decades, the reforms of the CAP increasingly emphasized the protection of the rural environment (greening) and addressed climate change, culminating in the significant milestone in 2021 when the CAP was subordinated to the sustainability objectives of the European Green Deal (EGD) [47].

The 2021 CAP reform emphasizes the importance of resilience in the agricultural sector, thus reinforcing the support for small and medium-sized farms. As a continuation of the greening efforts, more complex objectives were formulated, including the preservation and regeneration of ecosystem services, carbon sequestration in biomass and soil, reduction in GHG emissions through adaptation, and doubling the area under organic farming by the year 2027 compared to 2018. Social justice, inclusivity, and making rural areas more attractive to people are now essential considerations in rural development. Within this framework, the young farmer scheme continues to help the process of generational change and farm succession, which is a longstanding issue of European agriculture. The specific goal for the 2023–2027 period is to facilitate the initiation of businesses by 377,000 new young farmers with CAP support [41].

Our analysis scrutinizes the environmental (biodiversity, waste production, and GHG emission) and social factors (situation of small farms, young farmers, and generational change) related to the Hungarian livestock sector that appeared prominently in the CAP 2021 reform. Furthermore, we also considered these when formulating our policy implications and recommendations.

4. Materials and Methods

4.1. Materials

This research relied on multiple data sources, including the agricultural data of the Eurostat and the Hungarian Central Statistical Office (HCSO). The data from the Agricultural Census highlight the decline in household and small-scale animal husbandry during the 2000s. We also examined the producers and site registration database of the National Food Chain Safety Office to obtain additional information on farm concentration.

In analyzing the environmental impacts of livestock breeding, this research relied primarily on data from the National Environmental Information System (NEIS), which allows for the assessment of waste and pollutant emissions at different territorial levels. Regarding GHG emissions, we relied on the National Inventory Report data of the United Nations Framework Convention on Climate Change (UNFCCC). The bird population database of the Hungarian Society for Bird and Nature Conservation was used to introduce the loss of biodiversity, which is a standard method for this purpose [48]. We chose bird species whose habitat was reduced by intensive agriculture. In this process, industrialized livestock farming also appears as an important cause, requiring large-scale feed crop cultivation. In addition, the decline of traditional animal husbandry also plays a role in the disappearance of habitats and nesting sites. To illustrate the landscape degradation processes, we examined the spread of invasive species using the National GIS Database of Invasive Species, which was created and operated by the University of Szeged, Department of Geoinformatics.

In addition, the research analyzed policy documents aimed at the sector's development, such as the former New Hungary Rural Development Programme and the Darányi Ignác Plan, as well as reports from the Agricultural Committee of the Hungarian Parliament. This research also reviewed news from the National Chamber of Agriculture and agricultural portals and statements from agricultural politicians. Finally, a review of the literature was also conducted to identify positive environmental, economic, and social aspects of extensive livestock production and to gather good practices that can serve as an example and vision for Hungarian livestock production.

4.2. Methods

We used a mixed methods approach during the research, combining qualitative and quantitative research activities to gain deeper insights. Our analysis included a qualitative examination of sectorial policy documents and strategic plans at the national level to explore the main priorities and trends in the Hungarian livestock sector. We also conducted a content analysis of media reports, interviews, and other materials to widen the scope of our sources. Finally, we conducted a review of the literature on good practices in livestock breeding, especially concerning its role in rural development; these results are used in the discussion section.

We used quantitative analysis of agricultural and livestock sector data to highlight macro trends, the changes in production patterns, and their evolution in rural areas. Since we were primarily interested in rural areas, in the descriptive statistical analysis, we only analyzed the data of settlements with less than 10,000 people, since these are the ones that are considered rural in Hungarian rural development. For the environmental impact analysis of the livestock sector, we used descriptive statistical analysis of the NEIS and UNFCCC data.

To investigate the micro-level situation of agricultural producers who manage small farms, we interviewed young farmers in the Homokhátság region of Hungary, located in the Danube-Tisza Interfluve. The region was traditionally significant for livestock farming. The area encompasses over 100,000 hectares of grassland, accounting for 12% of its total area. The livestock population is also substantial, with 117,000 head of cattle, 223,000 head of pigs (10% controlled by a single company), and 4.5 million chickens. While there is already a noticeable concentration of farms, small farms are still present, with approximately 5600 young farmers. In addition, the region is environmentally sensitive and vulnerable to the negative impacts of climate change [49,50], so sustainable management of the area is critical.

The interviews were conducted in two phases between January 2017 and March 2018 and from December 2021 to January 2022. We interviewed 124 producers under the age of 40 who operated their farms independently (limited liability companies and other companies are not included in the sample). We considered it crucial to incorporate young farmers in the sample who started their agricultural activities through the young farmer scheme without any prior experience or background in the field. A total of 50% (62 farmers) of the respondents were engaged only in crop production, 46.8% were involved in animal husbandry and crop production, and 3.2% (4 farmers) were solely involved in livestock breeding. For this article, we only utilized the responses of the 66 farmers involved in animal husbandry. Due to the unavailability of a sampling frame during the research, we utilized snowball sampling to select respondents, whereby previously interviewed individuals recommended additional participants. Therefore, the sample is not representative. This methodology can be used for exploratory purposes [51], which was our primary goal.

The questions for semi-structured interviews were as follows:

- What motivated the young agricultural producer to start working in agriculture?
- What perceived or actual factors could influence or limit the opportunity to acquire land or expand the animal population for future farming? What difficulties do the young farmers face during farm management?
- Can the farm run by the young farmer provide employment opportunities for their immediate family or the local community?
- What reasons may be behind the decreasing popularity of agriculture among young people?

The interviews were conducted in person at the respondent's residence or farm, and usually lasted two hours, but in some cases, even three hours. After transcription, the pre-defined interview outline facilitated the responses' coding process. We used a mixed deductive and inductive coding approach, meaning there were initial codes for analysis, but during the processing, new codes were added, which is a standard solution in qualitative research [52]. The main topic codes—pre-defined—grouped many interrelated questions

including personal background (this included questions on demographic characteristics, education, and motivation), farm production characteristics, farm management experiences and problems, agri-environment practices and sustainability issues, and connection with the local community. Within these main topics, consistent answers and opinions were assigned a new subcode. Thus, the most common opinions or problems could be identified.

5. Results

5.1. The Disappearance of Animal Husbandry from the Hungarian Countryside

Starting from the 1960s, two-thirds of the gross production value of Hungarian agriculture was produced by cooperatives and state-owned farms, while the remaining one-third was provided by household farms and the independent farmers who remained. Even during this period, the latter group still owned 6% of the land [53]. Cooperative members were allowed to run household farms, which were regulated in size, alongside their collective work. In animal husbandry, aside from the cooperative mega-farms, household and small individual farms contributed to 45% of the output (in heads) in 1981 [54]. Their role was primarily decisive in the pig and chicken industries, providing around half of the production (Table 1).

Table 1. Livestock in households and small farms in 1981 (in 1000 heads).

Livestock	Total Livestock	Household Farms Related to Cooperatives	Part-Time and Small Farms	Total of Household and Small Farms	Share of Small Farms (%)
Pig	8296	2420	1771	4191	50.52
Cattle	1945	312	125	437	22.47
Chicken	63,452	14,913	14,846	29,759	46.90
Sheep	3140	242	209	451	14.36

Source: Agricultural Yearbook of 1981; source of data: HCSO, 1982.

In addition, the cooperatives assisted their members with feed and the organization and execution of sales [55]. The solution provided mutual benefits for both parties since it was easier to achieve the goals by including additional resources under the planned economy system, thereby satisfying the growing domestic meat consumption and the critical export in terms of income. On the members' side, this provided additional income, improving the rural living conditions and quality of life. This process is well represented by the construction of approximately 800 thousand so-called "Kádár blocks" (residential buildings based on a model plan) during this period.

After the regime change, animal husbandry fell into crisis, with the most significant causes being the loss of internal and external markets and the poorly executed privatization of the food industry. For the household animal husbandry farms, it was also unfavorable that the cooperatives weakened due to the changing regulatory environment and sales difficulties, causing the background of household farming to disappear in many settlements in the early 1990s. Another consequence of the weakened cooperative sector was the dismissal of agricultural labor, with nearly 500 thousand people losing their jobs between 1990 and 2001. In 1991, 45.4% of the working-age population was engaged in agricultural activities, which decreased to 32.7% by 2000 and 22.9% by 2003. Between 1990 and 2001, the number of inactive people increased from 640,000 to 3.3 million, while the number of unemployed people increased from 300,000 to 416,000. At that time, 44% of the inactive people and 48% of the unemployed people lived in settlements with less than 10,000 inhabitants. The numbers represent a transformative change that brought a deep social crisis to rural areas, in which agriculture and animal husbandry played a significant role. Between 1991 and 1996, the number of livestock kept by individual and small farmers in rural settlements decreased significantly (Table 2).

Table 2. Change of livestock population in rural settlements between 1991 and 1996 (in heads).

Livestock	1991	1996	Change (%)
Pig	3,350,684	2,308,897	−31.09
Cattle	392,263	332,326	−15.27
Chicken	27,089,391	25,558,010	−5.65
Sheep	702,159	648,831	−7.59

Source of data: Small and individual farmers census 1991 and 1996, HCSO.

In addition to the challenges above, other factors have contributed to the crisis in the sector. These include the deterioration in the quality of forage and grain production and inadequate management of grasslands [56].

Furthermore, due to the lack of regulation of the fodder and animal product markets, the profitability of animal husbandry was significantly reduced [57]. In the late 1990s, another influential factor was the emergence of multinational retail chains, which offered imported food, including meat, cheaply and easily accessible [58]. One of the reasons for this was the gradual adoption of animal welfare regulations in the process of accession to the European Union, which primarily caused difficulties for smaller individual farms [59]. The result was a further drastic decrease in both animal populations (Table 3) and the number of animal husbandry farms. Based on the data from the agricultural census conducted in 2000, there were more than 730,000 animal husbandry farms in operation, with 80% located in rural areas. However, this number decreased significantly to 250,000 farms by 2010 and 117,000 farms by 2020, representing only 15% of the 2000 value.

Table 3. Change of livestock population in rural settlements between 2000 and 2020 (in heads).

Livestock	2000	2010	2020	Change (%)
Pig	3,854,428	2,453,426	2,506,409	−34.97
Cattle	659,433	518,895	745,613	13.07
Chicken	33,116,311	27,307,460	25,917,932	−21.74
Sheep	1,019,526	963,919	796,905	−21.84

Source of data: Agricultural Census of 2000, 2010, and 2020, HCSO.

In the overall decline, cattle farming is the only exception, with a 32% increase (from 706,000 to 933,000 heads) between 2010 and 2020, which can mainly be attributed to subsidies. However, this positive trend may be at risk due to the global increase in animal feed prices, which rose by 30–50% in the past two years, further burdening livestock breeders [60]. Moreover, the upward trend in feed and commodity prices continued into 2022, casting doubt on the future of animal husbandry in several farms.

The decrease in the animal population and the number of farms was also accompanied by a concentration process in which an increasingly larger proportion of the animal population is concentrated among large-scale animal farmers. According to the 2020 agricultural census, producers with more than 100 animal units kept 1.47 million animals (77%) out of the 1.9 million animal units. At the same time, the number of farms with fewer than five animal units decreased from 227,000 (2010) to 93,000 (2020). Additionally, their animal population, expressed in animal units, decreased from 220,000 to 94,000.

An intense concentration was also developed in pig and poultry farming, which were previously the most important sectors in household and small-scale farms. As for pigs, 2.4 million (83%) out of the total population of 2.9 million were raised on farms with at least 1000 pigs. In parallel, the population of those who kept less than ten pigs decreased by 263,000 (−67%). The situation is similar for the chicken population; 22.33 million (72%) out of the 31 million chickens are in the hands of those who keep at least 50,000 chickens. In contrast, the population of those who keep less than 50 chickens decreased from 2.5 million to 1.11 million (−55.6%) over the last ten years. According to the data from the National Food Chain Safety Office in 2022, 35 farmers and companies in a single location hold 9.7% of the total capacity in the layer industry. A similar situation exists regarding the chicken hatchery capacity; three farms in a single settlement concentrate 10% of the capacity.

These processes can be summarized from the economic and social perspective of rural development as follows: animal breeding in household and small-scale farms significantly reduced in the past 30 years; thus, an activity that previously generated substantial income disappeared for rural communities. Meanwhile, according to the latest data from the Hungarian Central Statistical Office, 12.7% of the Hungarian population (1.29 million people) live in relative income poverty, and 5.5% live in households with very low labor intensity. In the NUTS2 (Nomenclature of Territorial Units for Statistics) regions of the Northern and Southern Great Plain, which have good agricultural conditions, 25% and 19% of the population are at risk of poverty or social exclusion, respectively. In settlements with less than 10,000 inhabitants, the average domestic income per capita is around 58% of that in the capital city (Budapest) as of 2021.

5.2. Environmental Impacts of Animal Husbandry and the Food Industry

According to the data from the National Environmental Information System (NEIS), 290,000 tons of waste were generated in the crop and animal farming sector, and 421,000 tons of waste were generated in the food industry (together, 711,000 tons) in 2020, which is 5.8% of the annual quantity for all economic sectors. Nearly 90% (260,000 tons) of waste is liquid manure, and an additional 9000 tons is from animal tissues. On the 2020 list of the 100 largest waste-producing companies recorded in the system, 4 companies were identified as belonging to the agri-business sector, of which 2 were interested in the livestock sector.

The above data on waste generation in the agriculture and food industry suggest that waste and pollutant emissions are a significant concern. Among the various pollutants, GHG emissions are particularly important. The National Inventory Report for 1985–2019 [61] shows that Hungarian agriculture contributed 11% to the country's total greenhouse gas emissions in 2019. Methane produced during enteric fermentation and methane and nitrous oxide emissions from manure management are the most significant contributors. A total of 75% of all methane emissions from agriculture came from beef cattle breeding, and another 13% came from the swine sector [61].

The most considerable quantity of animal-originated pollutant emissions was ammonia. According to the NEIS database (combined data for poultry, pig, and beef cattle facilities), the annual ammonia emissions decreased from 746 thousand kg/year to 304 thousand kg/year, which is consistent with the changes in the animal population from 2014. In contrast to methane emissions, where the cattle industry plays a leading role, ammonia emissions are primarily associated with pig farming, followed roughly equally by poultry and cattle farming. Ammonia, as a pollutant, contributes to soil acidification, eutrophication, and forest degradation through its toxic effects on plants, thus leading to decreased biodiversity [62].

In addition to ammonia, intensive livestock farming also emits other pollutants, primarily in the form of nitrogen oxides and CO_2, because of the use of nitrogen fertilizers and operating equipment and machinery. In 2019, 86% of Hungary's total N_2O emissions and 0.4% of their total CO_2 emissions came from agriculture [61].

In animal husbandry, extensive livestock farming substantially declined in the central European Countries [63], and due to this, the vegetation of these areas transformed. Invasive plant species are particularly noticeable, especially the spread of common milkweed (*Asclepias syriaca*), according to the National Spatial Information Database of Invasive Plant Species (http://www.geo.u-szeged.hu/invasive/ (accessed on 6 March 2023)). Forests and wooden shrubs eventually overtake abandoned pastures, but their species composition often includes invasive plants such as black locust (*Robinia pseudoacacia*), Russian olive (*Elaeagnus angustifolia*), or tree of heaven (*Ailanthus altissima*). Degraded pastures lead to decreased biodiversity and pose problems for environmental protection, resulting in increased allergic diseases, for example.

The Hungarian Ornithological and Nature Conservation Society's data show that the bird population in Hungary's agricultural areas experienced a decline of around 30% in the last 15 years. The grey partridge (*Perdix perdix*), which is strongly associated with

agricultural areas, stands out among the declining populations. Its population decreased by 91% by 2018, as well as the grasshopper warbler (*Locustella naevia*). In addition, the population of the European stonechat (*Saxicola rubicola*), the Eurasian skylark (*Alauda arvensis*), the common quail (*Cotunix cotunix*), and the barn swallow (*Hirundo Rustica*) also declined significantly, with declines ranging around 50% for each species between 1999 and 2021 (Figure 3).

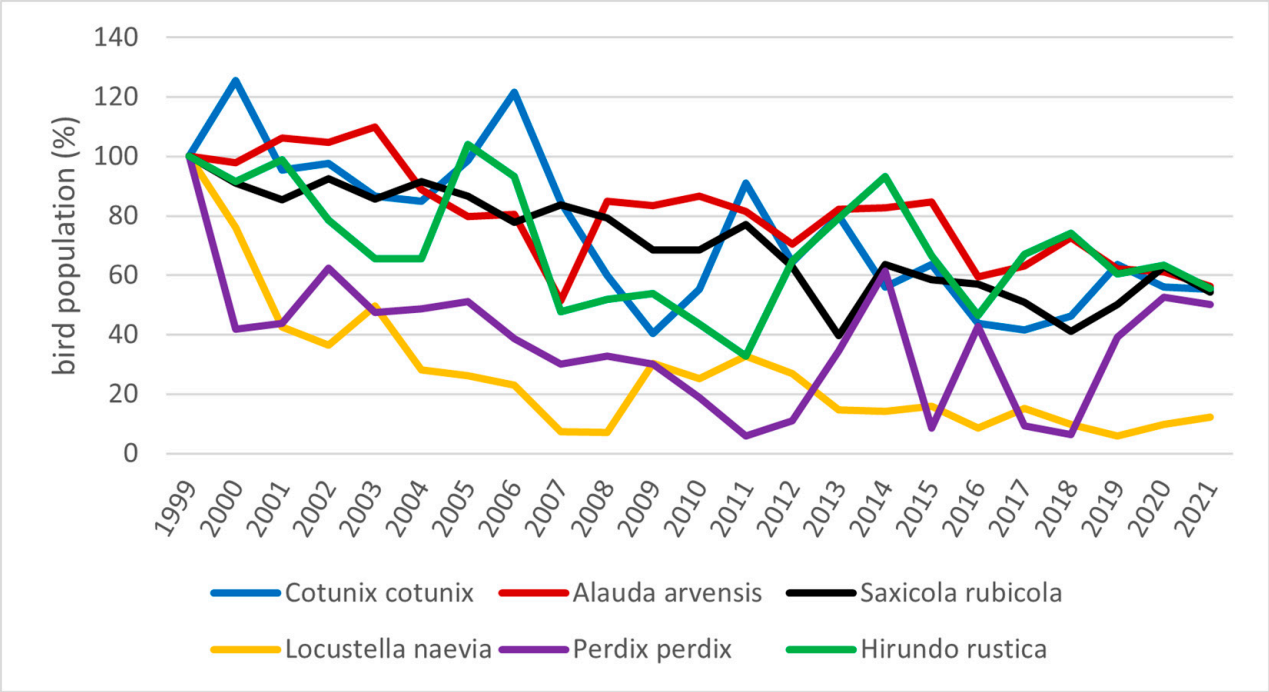

Figure 3. Changes in bird populations between 1999 and 2021, as a percentage of the 1999 level. (Source of data: https://www.mme.hu/magyarorszagmadarai/madaradatbazis (accessed on 2 March 2023)).

5.3. Business Start-Up and Running Problems of Young Farmers

The aging population that characterizes Europe and Hungary also results in an aging farming community. In the European Union, one-third of agricultural producers are over 65 years old, and over 50% have surpassed 55 years of age. In contrast, those under 35 years of age make up barely 6% of farmers. The percentage of farms in Hungary that were managed by individuals aged 65 years or older was 28% in 2010, which increased to 35% by 2020. In the last agricultural census of 2020, it was found that 70% of all farm managers were between 45 and 74 years of age, while only 9.9% were below the age of 40.

When examining the livestock sector, the 2020 agricultural census data show that those under 40 years old own only 13% of all livestock (11.84% of pigs, 14.79% of cattle, 13.73% of sheep, and 12.54% of poultry).

These European and Hungarian statistics show that generational change is not occurring satisfactorily, and the livestock sector is heavily affected. Although the EU and Hungary have addressed the issue of aging farmers for over 20 years through various policy measures, the existing data suggest that these efforts achieved little success. Therefore, we felt that it was essential to identify the problems and opinions of young farmers through semi-structured interviews.

According to our primary research, it was found that young farmers who were engaged in animal husbandry or mixed farming in the Homokhátság region identified the difficulty of purchasing arable land as a longstanding problem (n = 47). After lifting the land moratorium in 2014, the rising prices of arable land negatively affected young producers' access to the land (Hungary joined the European Union on 1 May 2004. The Act of Accession

allowed for a seven-year land moratorium, which meant that Hungary could maintain different rules for the acquisition of land by Hungarian and non-Hungarian persons. After the end of the seven years, the moratorium was extended for another three years at the initiative of the government. This means that the moratorium ended on 30 April 2014.). For arable land, the prices increased by 3.8 times between 2010 and 2021; for pastures, the prices increased by 3.3 times. The situation is similar for rental fees, with increases of 2.5 times for arable land and 2.45 times for pastures. As a result of the increased prices of arable land—which also applies to poor quality sandy soils—less capitalized farmers still cannot acquire arable land and expand the size of their farms. Another difficulty for less capitalized farmers is that there is no more arable land for sale in the area as more capitalized farmers have already bought it, so they cannot even rent or buy smaller areas. According to the data from the Hungarian Central Statistical Office, between 2017 and 2021, approximately 45 thousand hectares of arable land and 7–9 thousand hectares of pastures changed hands annually, which comprise approximately 1% of the country's total agricultural area.

Another longstanding problem is the aridification of the Homokhátság region, but it affects almost all agricultural land to a lesser extent in Hungary due to climate change. Because of the relatively frequent droughts, there is a considerable variability in crop yields, resulting in fluctuating feed and crop prices, negatively affecting all animal breeding farms (n = 66). In addition to feeding, the price of roughage also increased significantly, which is a cost-increasing factor for animal breeders who do not operate under extensive conditions. However, the feed price surge was somewhat compensated by the increase in the purchase price of live animals in all sectors in the past year.

Because of water scarcity in the Homokhátság region, the issue of environmental sustainability is particularly important for young farmers (n = 66). Nevertheless, due to the labor shortage, maintaining the farm takes precedence over this aspect. In cattle farming, the work processes can be well mechanized, so the demand for manual labor can be kept relatively low, for example, with milking robots. There is also support for purchasing these devices, but substantial water usage is necessary to keep them clean (500 L/day for a robot milking 75 cows).

The appearance of animal diseases such as avian influenza, tuberculosis, African swine fever, and their indirect effects are becoming increasingly important. Although African swine fever did not decimate domestic herds in Hungary, it significantly impacted the price of pig meat, mainly due to reduced demand and slaughterhouse shutdowns in 2021. The low purchase price was unfavorable for the future of pig farming, and although it somewhat improved in 2022, many farms had to eliminate their herds due to the previous events. Furthermore, the appearance of avian influenza in the poultry sector and the subsequent culling of animals endangered the livelihoods of many families in recent times.

In the Homokhátság region, there is high unemployment, but young farmers also reported a labor shortage in both skilled and unskilled seasonal workers (n = 60). As a result, they had to turn to mechanization and robotization, the cost of which is still burdensome even for larger farms. Therefore, several farmers believe that the unsolved problem of labor shortage could result in further closures of farms in labor-intensive sectors such as animal husbandry. The farmers say that the labor shortage is becoming increasingly worrying in agriculture, so many have set comprehensive mechanization as their goal.

Finally, it is worth highlighting that two-thirds of the respondents took over the family farm because they have always worked in agriculture, so it was natural for them. Conversely, only a small fraction of the interviewees (2–3%) had no prior ties to agriculture and came entirely from outside of the industry.

6. Discussion

6.1. Evaluation of the Findings Related to the Literature

Our results show that Hungarian animal husbandry underwent a significant decline and an intense concentration over the past 30 years. As a result, the role of household and

small-family farms became marginal in production compared to large-scale operations. Furthermore, the farmers' generational change is slow, like in other European countries [64]. Thus, the current situation is characterized by a dearth of young farmers who are confronted with a multitude of challenges. These include limited access to land, capital, and labor, as well as the growing prevalence of animal diseases and significant rises in input costs. This led to an increasing abandonment of household and small farming activities in recent decades, which poorly affects rural communities, further strengthening the negative processes such as aging and outmigration in Hungary and other CEE countries, too [65,66].

At the same time, the grasslands' ecological condition is deteriorating, various invasive plant species are spreading rapidly, and biodiversity is significantly decreasing, as in other European countries [67,68]. Therefore, we state that existing large-scale animal husbandry is not multifunctional, and only its environmental burden is apparent, without positive environmental, economic, and social externalities. Despite the fact that European, and thus, Hungarian agriculture is based on the multifunctional agriculture model, this model backs subsidies with the farmers' role in providing non-market and public services such as preserving the rural environment and cultural heritage [43,69].

We believe new approaches and policy tools are necessary for the Hungarian agricultural policy, which alters the current competitiveness, efficiency, and digitalization-oriented strategies [70]. We do not dispute that this latter approach can improve the crop and animal production's environmental and economic sustainability [71,72]. However, they do not promote biodiversity or regenerate ecosystem services which are goals of the 2021 CAP reform; they only reduce environmental damage. Furthermore, Stevenson [73] also raises the possibility that using precision livestock farming (PLF) leads to unsustainable intensive animal husbandry practices and threatens food security in the long term. PLF also does not consider social and cultural aspects and cannot effectively promote the renewal of the farming community. It may even increase inequalities and eliminate traditional jobs [74]. Additionally, intensive livestock farming is difficult to adapt to changing consumer demands regarding quality and environmental protection expectations [20]. We believe that the necessary change has at least two defining elements, including (1) a diversified farming system (DFS) [75] and (2) the adaptation of civic agriculture [76,77] and the closely related new agro-social paradigm [78,79].

6.2. Policy Implications from Environmental Viewpoint

The DFS is essentially an alternative to modern industrial agriculture, a holistic system approach that "includes functional biodiversity in multiple spatial and/or temporal scales, through practices developed via traditional and/or agro-ecological scientific knowledge" [75]. Although the implementation of the DFS at the farm level may lead to increased costs in the short run, the long-term benefits in terms of enhanced biodiversity and ecosystem services (such as soil health, pollination, and water management) can potentially result in greater and more consistent yields and profits [80].

Among European and Hungarian conditions, animal husbandry's environmental/ecological benefits are mainly realized through grazing [81,82]. Grazing animals are essential in maintaining grassland vegetation and ecosystem services [83–86]. Of course, under- or overgrazing is not permissible, so the animal population must be determined based on the area's carrying capacity [87,88]. Nevertheless, grazing positively affects natural vegetation; many plants live in these areas that require (moderate) trampling. In addition, the diversity of the vegetation provides space for numerous pollinators and vertebrate populations. In the case of meadows and pastures, the number and population of bird species are much higher. Furthermore, the excrement and urine of grazing animals provide nutrients to the area, enhancing the vegetation's viability. Thus, extensive animal husbandry greatly helps to conserve and restore biodiversity [82]. Despite these favorable effects, traditional grazing shows a decreasing trend worldwide (except for tropical areas), including Europe [89].

Another option under the DFS umbrella is the adaptation of low-cost agro-innovations based on agro-ecological evidence, such as agrivoltaics or silvopasture. Several studies show that raising sheep in solar parks has numerous advantages [90,91], including dual use of land, easier social acceptance of solar parks, and a more favorable environment for animals, which overall provides greater efficiency than traditional breeding methods. In addition to the positive link between animal husbandry and photovoltaic systems, solar energy can reduce agriculture's carbon footprint. Furthermore, the method effectively achieves climate-neutral farming, especially in the case of organic farming [92]. Silvopasture is an agroforestry practice combining trees, forage, and livestock [93]. This complex management technique has several ecological and economic advantages based on numerous studies [93–95], but despite this, its use is not widespread in Europe, even though there are many suitable areas for it [96,97]. Hungary has a National Afforestation Program, which foresees the afforestation of nearly 700,000 hectares over 50 years. Thus, complex land management practices such as silvopasture may become increasingly important.

In addition to environmental considerations, extensive animal husbandry also positively affects the health and reproduction of animals [98]. Thanks to this, meat from animals raised in natural conditions—from poultry to pigs and cattle to sheep—is tastier and healthier than from animals raised under industrial conditions, which is becoming increasingly important to consumers [99]. Products produced in this way can be sold at higher prices, but this may require the development of appropriate trademarks. There were attempts made in this direction in Hungary, such as scattered farms and national park products. Another economic advantage may be the development of short food chains, which is an important goal for the EU (Farm To Fork Strategy).

Compared to concentrated industrial animal husbandry, small-scale farming offers an added benefit in that, in the event of animal diseases, there is no need to cull a substantial portion of the domestic animal population (as high as 10% in certain locations). Although in the unfortunate event of animal diseases, the lost production may be significant for the local or micro-regional businesses, it would have less of an impact on national food security.

6.3. Renewal of Farmer and Rural Communities through Adaptation of Civic Agriculture

From the side of rural communities, the decline of household and small family farms occurs because Hungarian agricultural and rural development policies cannot address their problems effectively. Furthermore, apart from a few shorter periods, there was no political will either, which is also shown by the case of the Social Land Program. Although this program was launched in Hungary in 1992 to revive household farming, its budgetary financing in the early 2000s was minimal compared to the agricultural subsidies (EUR 1–1.2 million vs. EUR 2.4 billion at the exchange rate that time). When Hungary joined the EU in 2004, the program could not be integrated into the rural development fund; ten years later, it eventually became part of the public employment program [100].

In the mid-2010s, a foundation tried to support socially disadvantaged households with state funding to start new household farms (supplying seeds, fodder, and animals for needy families), but the program was unsuccessful. Later, the press [101] criticized the program for its inadequate preparation and lack of education for the new farmers.

Our results also show that starting or maintaining a successful agricultural business after 1990 was challenging. As long as only 60% of the farms are taken over by the heirs, it is anticipated that there will be a decline in the total number of farms, leading to an aging farming population. Therefore, it is imperative to attract new entrants to counteract this process, which is the main element of the new agro-social paradigm [78,79,102]. Making farming attractive to young people requires changes in the food system's economic, social, and political structures by adopting new farming approaches, such as civic agriculture [77]. The two concepts mentioned above go beyond the agro-ecological approach and aim to address broader social and economic issues in rural areas. Furthermore, they strengthen the ties of agriculture to the rural communities and help to preserve the cultural heritage of production and rural life. These concepts go against the reigning Hungarian paradigm,

which favors an agricultural development-centered rural development [30] prioritizing efficiency and competitiveness [70].

The semi-structured interviews reveal that, in the Hungarian context, promoting the establishment of household and small family farms, and ensuring equal opportunities for them in areas such as land acquisition, renting, and access to development subsidies, are crucial goals and can be the base of a mitigation policy. Furthermore, achieving a socially just and sustainable food system in Hungary requires interventions from farming to consumption. Only this can ensure the country's long-term food security, similar to other central and eastern European countries [103].

6.4. Limitations of the Research

In this research, we summarized our findings as a descriptive case study for several reasons. First, a more in-depth statistical analysis would have required building a unified database, but the territorial data from the agricultural censuses and the farm data from other sources cannot be merged. Another problem was that the different sectoral datasets refer to different bases. Finally, in the case of long-term studies, such as ours, changes in the methods of statistical data collection also pose a challenge, which is evident in the evolution of the number of farms discussed in Section 2.

7. Conclusions

Our research results highlight that since the regime change, the Hungarian livestock sector has faced a permanent crisis accompanied by an intense concentration of animal husbandry. The causes of these are multifaceted, ranging from the privatization of the food industry to changes in the regulatory environment. Consequently, what was once an important sector in providing income for a wide range of people in rural areas now only benefits a decreasing number of large farms and corporations. As a result, the multifunctionality of animal husbandry is restricted in terms of its environmental and social impacts.

Our interviews with young farmers indicate that there are currently numerous obstacles to initiating an animal husbandry operation, such as land, labor, and capital shortages. Although the young farmers scheme is functioning, it is not sufficiently effective in overcoming these barriers, thus impeding the process of generational transition. Therefore, there is a need to implement mitigation policies that generally facilitate the establishment of agricultural enterprises by individuals from outside of the agricultural sector. One such solution could be the support of household farming, which requires fewer resources due to its smaller scale.

Furthermore, to put agriculture, including animal husbandry, on a new trajectory, new policy tools and approaches must be adopted in Hungarian policy making, such as DFS, civic agriculture, and the new agro-social paradigm. These changes are crucial for developing an environmentally and economically sustainable and socially just food system that ensures the country's food security.

A future research direction could be the systematical comparison of small traditional and large industrialized farms' environmental impacts and economic and social benefits. Of course, such an analysis is place dependent, but for the European conditions, it can clearly show the advantages and disadvantages of each development direction for policymakers and rural development specialists. Moreover, the results may help resolve the sometimes-strong opposition between supporters of new digital technologies and traditional production methods.

Author Contributions: Conceptualization, J.Z.F., E.H. and I.R.K.; methodology, J.Z.F. and I.R.K.; investigation, I.R.K., J.Z.F., E.H. and Á.S.; data curation, Á.S. and J.Z.F.; writing—original draft preparation, J.Z.F., Á.S., E.H. and I.R.K.; writing—review and editing, J.Z.F. and Á.S.; visualization, Á.S. and E.H; supervision, J.Z.F.; funding acquisition, J.Z.F. All authors have read and agreed to the published version of the manuscript.

Funding: This paper was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (BO/00353/21/10).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The statistical data presented in this study are openly available on the websites of the Hungarian Central Statistical Office (https://www.ksh.hu/?lang=en) (accessed on 17 March 2023) and Eurostat (https://ec.europa.eu/eurostat) (accessed on 14 December 2022). The Agricultural Census data can be downloaded from the following two sources: 1. HCSO's agricultural census website (https://www.ksh.hu/agrarcenzusok_gszo) (accessed on 14 December 2022), and 2. the National Regional Development and Spatial Planning Information System operated by the Lechner Knowledge Centre (https://www.oeny.hu/oeny/teir/#/) (accessed on 14 December 2022). The producers and site registration data of the National Food Chain Safety Office are also openly available (https://portal.nebih.gov.hu/keresheto-adatbazisok) (accessed on 17 March 2023). For environmental data queries, we used the National Environmental Information System (https://web.okir.hu/hu/) (accessed on 12 December 2022). Bird population data was accessed from the Bird Atlas of Hungary by the Hungarian Society for Bird and Nature Conservation (https://www.mme.hu/magyarorszagmadarai) (accessed on 8 December 2022). The data about invasive plant species were obtained from the National GIS Database of Invasive Plant Species by the University of Szeged, Department of Geoinformatics, Physical and Environmental Geography (http://www.geo.u-szeged.hu/invasive/index_en.html) (accessed on 9 December 2022). The analyzed strategic documents can be downloaded from the following websites: 1. Reports of the Agricultural Committee of the Hungarian Parliament (https://www.parlament.hu/web/mezogazdasagi-bizottsag/a-bizottsag-ulesei) (accessed on 17 January 2023); 2. Darányi Ignác Plan (https://2010-2014.kormany.hu/download/3/70/70000/DIT_kiadvany_210x148mm_LEAD_kifut_nelkul.pdf) (accessed on 12 December 2022); 3. Farm to Fork Strategy (https://food.ec.europa.eu/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf) (accessed on 5 January 2023); 4. Digital Food Industry Strategy (https://cdn.kormany.hu/uploads/document/8/84/84d/84ddc0b48dca12b97b1c911f11dbe96920b30a5c.pdf) (accessed on 11 February 2023). The National Chamber of Agriculture news is available on their website (https://nak.hu/nyitolap). Information about agricultural subsidies is available from the website of Hungary's Minister of Agriculture (https://drnagyistvan.hu/category/agrartamogatasok/) (accessed on 5 January 2023) and in the database of the Hungarian State Treasury (https://www.mvh.allamkincstar.gov.hu/tamogatasi-adatok) (accessed on 5 January 2023).

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

References

1. Herrero, M.; Thornton, P.K.; Mason-D'Croz, D.; Palmer, J.; Bogard, J.R.; Bodirsky, B.L.; Bogard, J.R.; Hall, A.; Lee, B.; Nyborg, K.; et al. Innovation can accelerate the transition towards a sustainable food system. *Nat. Food* **2020**, *1*, 266–272. [CrossRef]
2. Adegbeye, M.J.; Ravi Kanth Reddy, P.; Obaisi, A.I.; Elghandour, M.M.M.Y.; Oyebamiji, K.J.; Salem, A.Z.M.; Morakinyo-Fasipe, O.T.; Cipriano-Salazar, M.; Camacho-Díaz, L.M. Sustainable agriculture options for production, greenhouse gasses and pollution alleviation, and nutrient recycling in emerging and transitional nations—An overview. *J. Clean. Prod.* **2020**, *242*, 118319. [CrossRef]
3. Steinfeld, H.; Gerber, P.; Wassenaar, T.; Castel, V.; Rosales, M.; de Haan, C. Livestock's Long Shadow: Environmental Issues and Options. 2006. Available online: https://www.fao.org/3/a0701e/a0701e.pdf (accessed on 1 January 2023).
4. Welsh, R. Farm and market structure, industrial regulation and rural community welfare: Conceptual and methodological issues. *Agric. Hum. Values* **2009**, *26*, 21–28. [CrossRef]
5. IPCC Sixth Assessment Report, Synthesis Report: Summary for Policymakers. 2023. Available online: https://www.ipcc.ch/site/assets/uploads/2023/03/Doc4_Approved_AR6_SYR_SPM.pdf (accessed on 22 May 2023).
6. Gerber, P.J.; Steinfeld, H.; Henderson, B.; Mottet, A.; Opio, C.; Dijkman, J.; Falcucci, A.; Tempio, G. *Tackling Climate Change through Livestock—A Global Assessment of Emissions and Mitigation Opportunities*; Food and Agriculture Organization of the United Nations (FAO): Rome, Italy, 2013; Available online: https://www.fao.org/3/i3437e/i3437e.pdf (accessed on 2 January 2023).
7. Sauerbeck, D. CO_2 emissions and C sequestration by agriculture—Perspectives and limitations. *Nutr. Cycl. Agroecosyst.* **2001**, *60*, 253–266. [CrossRef]
8. Environmental Protection Agency (EPA). Overview of Greenhouse Gases. 2022. Available online: https://www.epa.gov/ghgemissions/overview-greenhouse-gases (accessed on 20 January 2023).

9. Legesse, G.; Ominski, K.H.; Beauchemin, K.A.; Pfister, S.; Martel, M.; McGeough, E.J.; Hoekstra, A.Y.; Kroebel, R.; Cordeiro, M.R.C.; McAllister, T.A. BOARD-INVITED REVIEW: Quantifying water use in ruminant production. *J. Anim. Sci.* **2017**, *95*, 2001–2018. [CrossRef] [PubMed]
10. FAO. Livestock and the Environment—Water Use. 2018. Available online: http://www.fao.org/ag/againfo/themes/en/Environment/Water_use.html (accessed on 20 January 2023).
11. Mekonnen, M.M.; Hoekstra, A.Y.A. global assessment of the water footprint of farm animal products. *Ecosystems* **2012**, *15*, 401–415. [CrossRef]
12. Jones, B.A.; Grace, D.; Kock, R.; Alonso, S.; Rushton, J.; Said, M.Y.; McKeever, D.; Mutua, F.; Young, J.; McDermott, J.; et al. Zoonosis emergence linked to agricultural intensification and environmental change. *Proc. Natl. Acad. Sci. USA* **2013**, *110*, 8399–8404. [CrossRef] [PubMed]
13. Jones, K.E.; Patel, N.G.; Levy, M.A.; Storeygard, A.; Gittleman, J.L.; Daszak, P. Global trends in emerging infectious diseases. *Nature* **2017**, *451*, 990–993. [CrossRef]
14. Guyomard, H.; Bouamra-Mechemache, Z.; Chatellier, V.; Delaby, L.; Détang-Dessendre, C.; Peyraud, J.-L.; Réquillart, V. Review: Why and how to regulate animal production and consumption: The case of the European Union. *Animal* **2021**, *15*, 100283. [CrossRef]
15. Dumont, B.; Ryschawy, J.; Duru, M.; Benoit, M.; Chatellier, V.; Delaby, L.; Donnars, C.; Dupraz, P.; Lemauviel-Lavenant, S.; Méda, B.; et al. Review: Associations among goods, impacts and ecosystem services provided by livestock farming. *Animal* **2019**, *13*, 1773–1784. [CrossRef]
16. Wirsenius, S.; Hedenus, F.; Mohlin, K. Greenhouse gas taxes on animal food products: Rationale, tax scheme and climate mitigation effects. *Clim. Chang.* **2011**, *108*, 159–184. [CrossRef]
17. Henderson, B.; Golub, A.; Pambudi, D.; Hertel, T.; Godde, C.; Herrero, M.; Cacho, O.; Gerber, P. The power and pain of market-based carbon policies: A global application to greenhouse gases from ruminant livestock production. *Mitig. Adapt. Strateg. Glob. Change* **2017**, *23*, 349–369. [CrossRef]
18. Scholtz, M.M.; Maiwashe, A.; Neser, F.W.C.; Theunissen, A.; Olivier, W.J.; Mokolobate, M.C.; Hendriks, J. Livestock breeding for sustainability to mitigate global warming, with the emphasis on developing countries. *S. Afr. J. Anim. Sci.* **2013**, *43*, 269–281. Available online: http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S0375-15892013000300005 (accessed on 4 February 2023). [CrossRef]
19. Van Arendonk, J.A.M. Opportunities for animal breeding to meet the challenges of the future. *Nauka Przyr. Technol.* **2011**, *5*, 30. Available online: http://www.npt.up-poznan.net/pub/art_5_30.pdf (accessed on 4 February 2023).
20. Hocquette, J.F.; Ellies-Oury, M.P.; Michel Lherm, M.; Pineau, C.; Deblitz, C.; Farmer, L. Current situation and future prospects for beef production in Europe—A review. *Asian Australas. J. Anim. Sci.* **2018**, *31*, 1017–1035. [CrossRef]
21. Appleby, P.N.; Thorogood, M.; Mann, J.I.; Key, T.J. The Oxford Vegetarian Study: An overview. *Am. J. Clin. Nutr.* **1999**, *70*, 525–531. [CrossRef]
22. Jouzi, Z.; Azadi, H.; Taheri, F.; Zarafshani, K.; Gebrehiwot, K.; Van Passel, S.; Lebailly, P. Organic Farming and Small-Scale Farmers: Main Opportunities and Challenges. *Ecol. Econ.* **2017**, *132*, 144–154. [CrossRef]
23. Weiler, A.M.; Hergesheimer, C.; Brisbois, B.; Wittman, H.; Yassi, A.; Spiegel, J.M. Food sovereignty, food security and health equity: A meta-narrative mapping exercise. *Health Policy Plan.* **2015**, *30*, 1078–1092. Available online: https://www.jstor.org/stable/48508737 (accessed on 18 April 2023). [CrossRef]
24. Jarzębowski, S.; Bourlakis, M.; Bezat-Jarzębowska, A. Short Food Supply Chains (SFSC) as Local and Sustainable Systems. *Sustainability* **2020**, *12*, 4715. [CrossRef]
25. D'Souza, G.E.; Ikerd, J.E. Small Farms and Sustainable Development: Is small more sustainable? *J. Agric. Appl. Econ.* **1996**, *28*, 73–83. [CrossRef]
26. Vial, C.; Bigot, G.; Morhain, B.; Martin-Rosset, W. Territories and grassland exploitation by horses in France. *Forages Grazing Horse Nutr.* **2012**, *132*, 467–480. [CrossRef]
27. Schuessler, J.; Siegmund-Schultze, M.; van Elsen, T.; Zárate, A.V. Impact of support centres for social farming on benefits from livestock in northern Europe. *Outlook Agric.* **2011**, *40*, 313–322. [CrossRef]
28. McCluskey, J.J. Changing Food Demand and Consumer Preferences. Federal Reserve Research Papers. 2015. Available online: https://www.kansascityfed.org/documents/7025/mccluskey-paper.pdf (accessed on 15 January 2023).
29. Arnalte-Mur, L.; Ortiz-Miranda, D.; Cerrada-Serra, P.; Martinez-Gómez, V.; Moreno-Pérez, O.; Barbu, R.; Bjorkhaug, H.; Czekaj, M.; Duckett, D.; Galli, F.; et al. The drivers of change for the contribution of small farms to regional food security in Europe. *Glob. Food Secur.* **2020**, *26*, 100395. [CrossRef]
30. Csatári, B.; Farkas, J.Z.; Lennert, J. Agrarian and rural development in Hungary after 1989. In *Three Decades of Transformation in the East-Central European Countryside*, 1st ed.; Banski, J., Ed.; Springer: Cham, Switzerland, 2019; pp. 21–54. [CrossRef]
31. Dunay, A.; Vinkler-Rajcsányi, K. Hungarian pig sector: Actual problems and prospects for the future development. *Acta Univ. Agric. Silvic. Mendel. Brun.* **2016**, *64*, 1879–1888. [CrossRef]
32. Vetőné Mózner, Z. Sustainability and consumption structure: Environmental impacts of food consumption clusters. A case study for Hungary. *Int. J. Consum. Stud.* **2014**, *38*, 529–539. [CrossRef]

33. Ricalde, R.S.; Hau, C.E.; Casso, R.B.; Yañez, I.A.; Góngora, R.C.; Franco, L.S.; Correa, J.S. Socio-economic and technical characteristics of backyard animal husbandry in two rural communities of Yucatan, Mexico. *JARTS* **2004**, *105*, 165–173. Available online: https://www.jarts.info/index.php/jarts/article/view/59/53 (accessed on 2 January 2023).
34. Bryan, E.; Ringler, C.; Okoba, B.; Koo, J.; Herrero, M.; Silvestri, S. Can agriculture support climate change adaptation, greenhouse gas mitigation and rural livelihoods? Insights from Kenya. *Clim. Chang.* **2013**, *118*, 151–165. [CrossRef]
35. Pires, A.F.; Peterson, A.; Baron, J.N.; Adams, R.; Martínez-López, B.; Moore, D. Small-scale and backyard livestock owners needs assessment in the western United States. *PLoS ONE* **2019**, *14*, e0212372. [CrossRef]
36. Bigot, G.; Perret, E.; Vial, C.; Dornier, X. Role of the Horse Industry in the Regional Development in France. 2014. Available online: https://hal.science/hal-01195379/ (accessed on 11 February 2023).
37. Udovecz, G. A hazai állattenyésztés helyzete és fejlődési esélyei. *Gazdálkodás* **2004**, *48*, 1–12. [CrossRef]
38. Pawlak, K. Food security situation of selected highly developed countries against developing countries. *J. Agribus. Rural Dev.* **2016**, *40*, 385–398. [CrossRef]
39. McCalla, A.F.; Ayres, W.S. (Eds.) *Rural Development: From Vision to Action*; World Bank Publications: Washington, DC, USA, 1997; Volume 12. Available online: https://documents1.worldbank.org/curated/en/445541468326432599/pdf/multi-page.pdf (accessed on 22 May 2023).
40. United States Department of Agriculture. Rural Development—Summary of Programs. 2023. Available online: https://www.rd.usda.gov/files/RD_ProgramMatrix.pdf (accessed on 22 May 2023).
41. European Commission. Common Agricultural Policy from 2023–2027. 28 Strategic Plans at a Glance. 2022. Available online: https://agriculture.ec.europa.eu/system/files/2022-12/csp-at-a-glance-eu-countries_en.pdf (accessed on 22 May 2023).
42. Pratt, A.C. Discourses of rurality: Loose talk or social struggle? *J. Rural. Stud.* **1996**, *12*, 69–78. [CrossRef]
43. Van der Ploeg, J.D.; Roep, D. Multifunctionality and rural development: The actual situation in Europe. In *Multifunctional Agriculture: A New Paradigm for European Agriculture and Rural Development*; Ashgate: Hampshire, UK, 2003; Volume 3, pp. 37–54. Available online: https://www.researchgate.net/publication/258375349_Multifunctionality_and_rural_development_the_actual_situation_in_Europe (accessed on 22 December 2022).
44. European Commission. Europe's AGENDA 2000—Strengthening and Widening the European Union. 1999. Available online: http://aei.pitt.edu/15088/1/MOVE-EUROPESAGENDA2000-1999_1.pdf (accessed on 22 May 2023).
45. OECD. Multifunctionality: Towards an Analytical Framework. 2001. Available online: https://www.oecd-ilibrary.org/docserver/9789264192171-sum-en.pdf?expires=1684928009&id=id&accname=guest&checksum=CEBD79F5D-208146115A44EFCC83A2C50 (accessed on 22 May 2023).
46. Arovuori, K.; Kola, J. Policies and measures for multifunctional agriculture: Experts' insight. *Int. Food Agribus. Manag. Rev.* **2005**, *8*, 21–51.
47. European Network for Rural Development. ENRD Thematic Group: The European Green Deal and Rural Areas—Scoping Paper. 2019. Available online: https://ec.europa.eu/enrd/sites/default/files/egd_scoping_paper-v03.pdf (accessed on 22 May 2023).
48. Gregory, R.D.; Noble, D.; Field, R.; Marchant, J.; Raven, M.; Gibbons, D.W. Using birds as indicators of biodiversity. *Ornis Hung.* **2003**, *12–13*, 11–24. Available online: http://ornis.hu/articles/OrnisHungarica_vol12-13_p11-25.pdf (accessed on 22 December 2022).
49. Fehér, Z.Z.; Rakonczai, J. Analysing the sensitivity of Hungarian landscapes based on climate change induced shallow groundwater fluctuation. *Hung. Geogr. Bull.* **2019**, *68*, 355–372. [CrossRef]
50. Biró, M.; Révész, A.; Molnár, Z.; Horváth, F. Regional habitat pattern of the Danube-Tisza Interfluve in Hungary I. *Acta Bot. Hung.* **2007**, *49*, 267–303. [CrossRef]
51. Babbie, E. *The Basics of Social Research*; Cengage Learning: Belmont, CA, USA, 2008; p. 560.
52. Adeoye-Olatunde, O.A.; Olenik, N.L. Research and scholarly methods: Semi-structured interviews. *J. Am. Coll. Clin. Pharm.* **2021**, *4*, 1358–1367. [CrossRef]
53. Csáki, C.; Lerman, Z. Agricultural Transition Revisited: Issues of Land Reform and Farm Restructuring in East Central Europe and the Former USSR. *Q. J. Int. Agric.* **1996**, *35*, 211–240.
54. HCSO. *Agricultural Yearbook of 1981*; Hungarian Central Statistical Office: Budapest, Hungary, 1982.
55. de Haan, C.; Van Veen, T.S.; Brooks, K. *The Livestock Sector in Eastern Europe: Constraints and Opportunities*; World Bank—Discussion Papers; World Bank: Washington, DC, USA, 1992; Available online: https://EconPapers.repec.org/RePEc:fth:wobadi:173 (accessed on 3 February 2023).
56. Farkas, J.Z.; Kovács, A.D. Nature conservation versus agriculture in the light of socio-economic changes over the last half-century—Case study from a Hungarian national park. *Land Use Policy* **2021**, *101*, 105131. [CrossRef]
57. Sántha, A. Az Állattenyésztésünk Helyzete, Perspektívái és EU-Konform Fejlesztésének Koncepciója. Available online: http://mek-oszk.uz.ua/09800/09809/pdf/zold_belepo_11.pdf (accessed on 23 May 2023).
58. Czagány, L. Az élelmiszer-önrendelkezés koncepciója és magyarországi realitásai. *Jelenkori Társadalmi és Gazdasági Folyamatok* **2009**, *4*, 23–28. [CrossRef]
59. Vajda, L.; Baksa, A. Major changes in Hungarian agricultural economy as a result of EU-membership. *Gazdalk. Sci. J. Agric. Econ.* **2008**, *52*, 2–17. [CrossRef]

60. National Chamber of Agriculture (NAK). A Rise in Meat and Dairy Prices Seen as Unavoidable by Industry Players. 2021. Available online: https://www.nak.hu/kamara/kamarai-hirek/orszagos-hirek/103156-elkerulhetetlennek-latjak-a-hus-es-tejtermekek-aranak-emelkedeset-az-agazat-szereploi (accessed on 24 February 2023).
61. UNFCCC. National Inventory Report for 1985–2019. Hungary. 2022. Available online: https://unfccc.int/ghg-inventories-annex-i-parties/2022 (accessed on 3 February 2023).
62. Guthrie, S.; Giles, S.; Dunkerley, F.; Tabaqchali, F.; Harshfield, A.; Ioppolo, B.; Manville, C. *The Impact of Ammonia Emissions from Agriculture on Biodiversity. An Evidence Synthesis*; RAND Corporation: Santa Monica, CA, USA; Cambridge, UK, 2018; Available online: https://royalsociety.org/-/media/policy/projects/evidence-synthesis/Ammonia/Ammonia-report.pdf (accessed on 2 January 2023).
63. Rozstalny, A.; Kuipers, A. Livestock farming in Central and Eastern Europe and Central Asia. In *Cattle Husbandry in Eastern Europe and China*; Kuipers, A., Rozstalny, A., Keane, G., Eds.; EAAP Scientific Series; Wageningen Academic Publishers: Noordwijk, The Netherlands, 2014; pp. 13–36. [CrossRef]
64. Sroka, W.; Dudek, M.; Wojewodzic, T.; Król, K. Generational changes in agriculture: The influence of farm characteristics and socio-economic factors. *Agriculture* **2019**, *9*, 264. [CrossRef]
65. Ritter, K. Special features and problems of rural society in Hungary. *Stud. Mundi–Econ.* **2018**, *5*, 98–112.
66. Bell, S.; Montarzino, A.; Aspinall, P.; Penēze, Z.; Nikodemus, O.E. Rural society, social inclusion and landscape change in Central and Eastern Europe: A case study of Latvia. *Sociol. Rural.* **2009**, *49*, 295–326. [CrossRef]
67. Szilassi, P.; Kitka, D. Spreading of Invasive Species in Greenways: A GIS-based Case Study in Hungary. In Proceedings of the Fábos Conference on Landscape and Greenway Planning, Budapest, Hungary, 1 July 2016; Volume 5, pp. 1–6. Available online: https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1117&context=fabos (accessed on 4 February 2023).
68. Cremene, C.; Groza, G.; Rakosy, L.; Schileyko, A.A.; Baur, A.; Erhardt, A.; Baur, B. Alterations of steppe-like grasslands in Eastern Europe: A threat to regional biodiversity hotspots. *Conserv. Biol.* **2005**, *19*, 1606–1618. Available online: https://www.jstor.org/stable/3591129 (accessed on 15 January 2023). [CrossRef]
69. Czimbalmos, R.; Kovács, G.; Fehér, A. Multifunctionality and farm concentration in Hungary. *Res. J. Agric. Sci.* **2013**, *45*, 52–60. Available online: https://rjas.ro/download/paper_version.paper_file.beefd41dd3b61195.313537372e706466.pdf (accessed on 20 April 2023).
70. Hoyk, E.; Szalai, Á.; Palkovics, A.; Farkas, J.Z. Policy Gaps Related to Sustainability in Hungarian Agribusiness Development. *Agronomy* **2022**, *12*, 2084. [CrossRef]
71. Lovarelli, D.; Bacenetti, J.; Guarino, M. A review on dairy cattle farming: Is precision livestock farming the compromise for an environmental, economic and social sustainable production? *J. Clean. Prod.* **2020**, *262*, 121409. [CrossRef]
72. Tullo, E.; Finzi, A.; Guarino, M. Environmental impact of livestock farming and Precision Livestock Farming as a mitigation strategy. *Sci. Total Environ.* **2019**, *650*, 2751–2760. [CrossRef]
73. Stevenson, P. Precision Livestock Farming: Could It Drive the Livestock Sector in the Wrong Direction. 2017. Available online: https://www.ciwf.org.uk/media/7431928/plf-could-it-drive-the-livestock-sector-in-the-wrong-direction.pdf (accessed on 12 April 2023).
74. Sparrow, R.; Howard, M. Robots in agriculture: Prospects, impacts, ethics, and policy. *Precis. Agric.* **2020**, *22*, 818–833. [CrossRef]
75. Kremen, C.; Iles, A.; Bacon, C. Diversified farming systems: An agroecological, systems-based alternative to modern industrial agriculture. *Ecol. Soc.* **2012**, *17*, 44. [CrossRef]
76. Obach, B.K.; Tobin, K. Civic agriculture and community engagement. *Agric. Hum. Values* **2014**, *31*, 307–322. [CrossRef]
77. Lyson, T.A.; Guptill, A. Commodity agriculture, civic agriculture and the future of US farming. *Rural Sociol.* **2004**, *69*, 370–385. [CrossRef]
78. Monllor, N. Farm Entry: Comparative Analysis of Young Farmers, Their Pathways Attitudes and Practices in Ontario (Canada) and Catalunya (Spain) Final Report. Available online: https://www.accesstoland.eu/IMG/pdf/monllor_farm_entry_report_2012.pdf (accessed on 13 March 2023).
79. Van der Ploeg, J.D. *The New Peasantries: Struggles for Autonomy and Sustainability in an Era of Empire and Globalization*; Routledge: London, UK, 2009; p. 356.
80. Rosa-Schleich, J.; Loos, J.; Mußhoff, O.; Tscharntke, T. Ecological-economic trade-offs of diversified farming systems—A review. *Ecol. Econ.* **2019**, *160*, 251–263. [CrossRef]
81. Isselstein, J.; Jeangros, B.; Pavlu, V. Agronomic aspects of biodiversity targeted management of temperate grasslands in Europe–a review. *Agron. Res.* **2005**, *3*, 139–151. Available online: https://agronomy.emu.ee/vol032/p3202.pdf (accessed on 11 April 2023).
82. Pykälä, J. Mitigating human effects on European biodiversity through traditional animal husbandry. *Conserv. Biol.* **2000**, *14*, 705–712. [CrossRef]
83. Weltz, M.A.; Jolley, L.; Nearing, M.; Stone, J.; Goodrich, D.; Spaeth, K.; Arnold, J.; Bubenheim, D.; Mariano Hernandez, D.; Wei, H. Assessing the benefits of grazing land conservation practices. *J. Soil Water Conserv.* **2008**, *63*, 214–217. [CrossRef]
84. Tälle, M.; Deák, P.; Poschlod, O.; Valkó, O.; Westerberg, L.; Milberg, P. Grazing vs. mowing: A meta-analysis of biodiversity benefits for grassland management. *Agric. Ecosyst. Environ.* **2016**, *222*, 200–212. [CrossRef]
85. Wilkinson, J.M.; Lee, M.R.F.; Rivero, M.J.; Chamberlain, A.T. Some challenges and opportunities for grazing dairy cows on temperate pastures. *Grass Forage Sci.* **2020**, *75*, 1–17. [CrossRef]

86. Sanderson, M.A.; Soder, K.J.; Muller, L.D.; Klement, K.D.; Skinner, R.H.; Goslee, S.C. Forage Mixture Productivity and Botanical Composition in Pastures Grazed by Dairy Cattle. *Agron. J.* **2005**, *97*, 1465–1471. [CrossRef]
87. Vasques, C.F.; Souza, A.; Morais, E.G.; Benevenute, A.N.; da Silva, C.M.; Homem, G.C.; Casagrande, D.; Silva, M.B. Improved management increases carrying capacity of Brazilian pastures. *Agric. Ecosyst. Environ.* **2019**, *282*, 30–39. [CrossRef]
88. McKeon, G.M.; Stone, G.S.; Syktus, J.I.; Carter, J.O.; Flood, N.R.; Ahrens, D.G.; Bruget, D.N.; Chilcott, C.R.; Cobon, D.H.; Cowley, R.A.; et al. Climate change impacts on northern Australian rangeland livestock carrying capacity: A review of issues. *Rangel. J.* **2009**, *31*, 1–29. [CrossRef]
89. Pulido, M.; Barrena-González, J.; Badgery, W.; Rodrigo-Comino, J.; Cerdà, A. Sustainable grazing. *Curr. Opin. Environ. Sci. Health* **2018**, *5*, 42–46. [CrossRef]
90. Handler, R.; Pearce, J.M. Greener sheep: Life cycle analysis of integrated sheep agrivoltaic systems. *Clean. Energy Syst.* **2022**, *3*, 100036. [CrossRef]
91. Pascaris, A.S.; Schelly, C.; Burnham, L.; Pearce, J.M. Integrating solar energy with agriculture: Industry perspectives on the market, community, and socio-political dimensions of agrivoltaics. *Energy Res. Soc. Sci.* **2021**, *75*, 102023. [CrossRef]
92. Weselek, A.; Bauerle, A.; Hartung, J.; Zikeli, S.; Lewandowski, I.; Högy, P. Agrivoltaic system impacts on microclimate and yield of different crops within an organic crop rotation in a temperate climate. *Agron. Sustain. Dev.* **2021**, *41*, 59. [CrossRef]
93. Jose, S.; Dollinger, J. Silvopasture: A sustainable livestock production system. *Agrofor. Syst.* **2019**, *93*, 1–9. [CrossRef]
94. Shrestha, R.K.; Alavalapati, J.R.; Kalmbacher, R.S. Exploring the potential for silvopasture adoption in south-central Florida: An application of SWOT–AHP method. *Agric. Syst.* **2004**, *81*, 185–199. [CrossRef]
95. Smith, M.M.; Bentrup, G.; Kellerman, T.; MacFarland, K.; Straight, R.; Ameyaw, L.; Stein, S. Silvopasture in the USA: A systematic review of natural resource professional and producer-reported benefits, challenges, and management activities. *Agric. Ecosyst. Environ.* **2022**, *326*, 107818. [CrossRef]
96. Mosquera-Losada, M.R.; Santiago-Freijanes, J.J.; Rois-Díaz, M.; Moreno, G.; den Herder, M.; Aldrey-Vázquez, J.A.; Ferreiro-Domínguez, N.; Pantera, A.; Pisanelli, A.; Rigueiro-Rodríguez, A. Agroforestry in Europe: A land management policy tool to combat climate change. *Land Use Policy* **2018**, *78*, 603–613. [CrossRef]
97. Rodríguez-Rigueiro, F.J.; Santiago-Freijanes, J.J.; Mosquera-Losada, M.R.; Castro, M.; Silva-Losada, P.; Pisanelli, A.; Pantera, A.; Rigueiro-Rodríguez, A.; Ferreiro-Dominguez, N. Silvopasture policy promotion in European Mediterranean areas. *PLoS ONE* **2021**, *16*, e0245846. [CrossRef]
98. Béri, B. Tartástechnológia. A Gazdasági Állatok Legeltetése. Az Agrármérnöki MSc Szak Tananyagfejlesztése, TÁMOP-4.1.2-08/1/A-2009-0010. 2011. Available online: https://dtk.tankonyvtar.hu/xmlui/bitstream/handle/123456789/8561/08_Tartastechnologia.pdf?sequence=8&isAllowed=y (accessed on 29 November 2022).
99. Liu, J.; Ellies-Oury, M.-P.; Stoyanchev, T.; Hocquette, J.F. Consumer Perception of beef quality and how to control, improve and predict it? Focus on eating quality. *Foods* **2022**, *11*, 1732. [CrossRef]
100. Csoba, J. A kertkultúra és a háztartásgazdaság szerepe a vidéki szegények társadalmi integrációjában—25 éves a Szociális Földprogram. *Tér és Társdalom* **2017**, *31*, 85–102. [CrossRef]
101. origo.hu. "Most Nézzem Őket? Megettük"—Mi Lett a Szétosztott Adományállatokkal? 2011. Available online: https://www.origo.hu/itthon/20110927-riport-porcsalman-a-minden-gyerek-lakjon-jol-akciorol.html (accessed on 22 December 2022).
102. Zagata, L.; Sutherland, L.A. Deconstructing the 'young farmer problem in Europe': Towards a research agenda. *J. Rural Stud.* **2015**, *38*, 39–51. [CrossRef]
103. Toma, I.; Redman, M.; Czekaj, M.; Tyran, E.; Grivins, M.; Sumane, S. Small-scale farming and food security–policy perspectives from Central and Eastern Europe. *Glob. Food Secur.* **2021**, *29*, 100504. [CrossRef]