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Abstract: Almost 90% of Slovakia's agricultural land is managed by holdings of 100 ha or more. The decline of small-scale farming stems from historical collectivisation, the persistence of large farms, and Slovakia's entry into the EU CAP in 2004. In addition to global factors behind this trend there are also specific national and local issues that remain less visible. Which factors play a key role in the decline of small-scale farming? What are the implications of this trend for the rural mountain landscape? This study analyses farmland at the local level, recent CAP developments, and farmer responses through in-depth questionnaires. Findings show that small-scale mountain farming area is reduced, grazing is often replaced by mowing, and parcels are absorbed by larger farms. CAP's administrative burdens and weak social capital are key barriers. Farmers managing up to 30 ha would benefit more from systematic support rather than small additional subsidies.

Keywords: farm size, mountain, CAP, socio-economic, Slovakia

Highlights

- Decrease of agricultural land in Slovakia is visible in mountains especially.
- CAP support area significantly fluctuates for small/medium farms.
- The number of all applicants for CAP support decreased radically after 2023.
- CAP's administrative burden and the ageing of the rural population are key factors.
- Small-scale mountain animal farming is uncertain due to social and economic reasons.

1. Introduction

Urbanisation, agricultural intensification and simultaneous abandonment of rural areas have been key global driving forces of European agricultural landscape change in the last decades (e.g., van Vliet et al. 2017; Kopecká et al. 2019; Subedi et al. 2022). The income support subsidy system introduced in the EU's Common Agricultural Policy (CAP), along with the increased globalization of agricultural commodity markets, has motivated farmers to enhance production efficiency and modify farm management practices, significantly impacting European landscapes (Van Zanten et al. 2014). These global processes impact biodiversity, social capital, and the sustainability of socio-ecological systems, which are particularly vulnerable in mountain areas (e.g., Klein et al. 2019). However, due to varying socio-ecological conditions and political settings, rural development in the least urbanised regions may result in various scenarios, for example, depopulation and farmland abandonment (Bezáková and Bezák 2022) or increased interest in farmland with subsequent economic conflicts between farmers (Milczarek-Andrzejewska et al. 2018).

Rural areas comprise about 46% of Slovakia, and a significant part of them is located in the mountains. For the purposes of the CAP payments, the category of areas with natural or other area-specific constraints (ANC) was introduced to compensate farmers with natural or other specific constraints on their farming (previously categorised as less favoured areas). In Slovakia, 1,053 municipalities were identified as belonging to the sub-category of mountain areas under the ANC scheme, based on the decree of the Ministry of Agriculture of the Slovak Republic no. 928/1/1999-100 of 16 April 1999. The farmland in these mountain areas accounted for about 27% of the total agricultural land registered in the Slovak LPIS (Land Parcel Identification System) in 2014. However, there has been a continual decrease in the agricultural area within mountain ANC, and by 2024 this area represented only 86% of the level recorded in 2014 (and 81% of the level recorded in 2005). This indicates that the decline of agricultural land in ANC mountain areas is more severe than the decrease observed for Slovakia's overall agricultural area, which fell to 93% of its 2014 level (and 89% of its 2005 level) by 2024.

Although there are several definitions of a small farm, the most common criterion is farmland area, the so-called utilised agricultural area (UAA) used in the European Union (EU) statistics, which was the most

suitable criterion for our research, particularly due to data availability. Based on the EU's farm structure survey in 2020 (Eurostat 2022), almost two-thirds of the EU's farms were less than 5 hectares (ha) in size in 2020, and this size is usually considered a small farm by Eurostat and many publications across Europe (e.g., Davidova et al. 2012; Guiomar et al. 2018). Despite small farms constituting the numerical majority of farms, they worked only ca. 6% of the total UAA in the EU Member states, while farms above 50 ha used more than two-thirds of the UAA (ca. 53% of UAA for farms of size above 100 ha).

The above-mentioned survey shows that approximately 89% of the UAA in Slovakia was managed by agricultural holdings of land size over 100 ha in 2020. This is the greatest percentage of farms of this size out of all EU countries, followed by Czechia (86%). In contrast, Slovak farms below 5 ha manage less than 1% of the UAA and farms from 5 to 30 ha less than 5%.

The exclusion of small farming from agricultural management has a historical context, as it was especially driven by collectivisation in the communist era, the persistence of large farms after the Slovak political and socio-economic changes of 1989, and joining the EU Common Agricultural Policy in 2004 (Bezák and Mitchley 2014; Izakovičová et al. 2022). Globalized agricultural market and the recent CAP conditions better fit large-size agricultural holdings, and the support to small farms has been insufficient, especially in the East European countries (Pe'er et al. 2017). The *Complementary Redistributive Income Support for Sustainability* (CRISS) was introduced to reflect economies of scale: the larger the farm, the lower the unit cost. This mechanism redistributes income support from larger to smaller or medium-sized farms within the CAP and has been compulsory since 2023. Despite differences between individual Member States, it appears that CRISS payments are not exclusively aimed at supporting the smallest farms (Laroche-Dupraz et al. 2024).

The contribution of small-scale farming to sustainable rural development is well known and evidenced in the literature. While economic globalization is the primary driver of the ecological footprint in European countries (Karimli et al., 2024), small farms are well-positioned to address biodiversity challenges and provide a variety of ecosystem services from multi-functional and extensive farming; they help to maintain social capital and additional income and thus reduce the risk of rural poverty (Alexandri et al. 2015; Babai et al. 2015; McDonagh et al. 2017; Špulerová et al., 2018). Nevertheless, there are common challenges that small farms face, e.g., lack of investments and the difficulty of competing with large agricultural holdings, insufficient equipment or weak technical infrastructure in remote areas (Fredriksson et al. 2017; Busch et al. 2022; Šumrada et al. 2024). In addition, extra effort and resources are needed to acquire the land for farming in Slovakia, as 74% of the farmland is rented (Eurostat 2022), which is less feasible for smaller farms.

As mentioned above, the number of small farms is declining, which impacts socio-ecological systems in mountain areas. In addition to global factors driving this trend – such as economies of scale and global market pressures – there are also site-specific issues that remain less visible. What national and local factors play a key role in the decline of small farms? What are the implications of this trend for the rural mountain landscape? What potential measures could help halt the decline of small-scale farming?

Our investigation primarily examines farming management and its impacts on the mountain landscape, in the context of the EU's Common Agricultural Policy and related socio-ecological changes in rural areas. As mentioned above, the CAP was identified as one of the key drivers in agricultural landscape change since the Slovak Republic became an EU Member State. The objective of our research was to identify the impact of recent CAP, particularly since 2014, and other socio-economic variables on farm structure and the sustainability of farm management, including its impact on the overall socio-ecological system in mountainous rural areas at the local level. We studied the similarities and differences among farm clusters in their management practices, continuity, and landscape impacts, which are relevant to challenges in future agricultural policy.

2. Methods

2.1 Study area

The study area is located in the northwest of the Slovak Republic and on the border with the Czech Republic (Fig 1). It lies in the Javorníky and Turzovská vrchovina mountains, both part of the outer West Carpathian mountain range. Therefore, the study area has a mountainous character, with an altitudinal range of 450–1072 m. As for land use, forests are dominant in the study area (63.4% based on statistical data for 2023; <https://datacube.statistics.sk>), followed by agricultural land (30.3%). The share of forest in the study region is considerably higher than the Slovak average (41.4%), as reflected in the rate of ongoing agricultural land abandonment, mainly due to forest expansion (see Results). Grassland covers 83.9% of the agricultural land (Fig 2). Many parts of the agricultural landscape have signs of historical forms, especially the “arable land – grassland strips and terraces” type, which is typical for traditional small-scale mosaic farming (Špulerová et al., 2011). Their mapping in 2011 found their share to be around 35% of agricultural land in our study area; however, many of them have been converted to grasslands or been gradually overgrown by shrubs and trees (Lieskovský et al., 2015; Barančok and Barančoková, 2016).

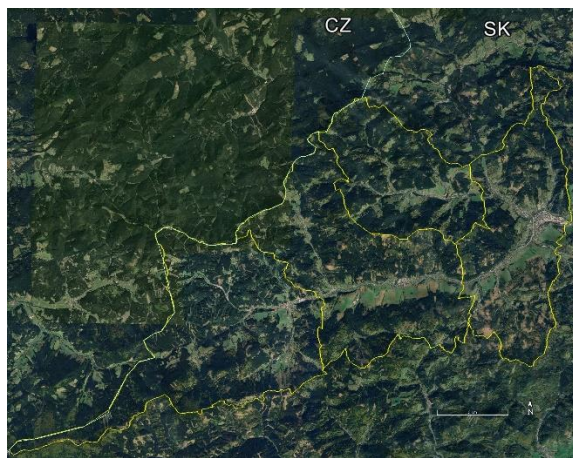


Fig 1. Location and demarcation of the study area municipalities. Source: own map

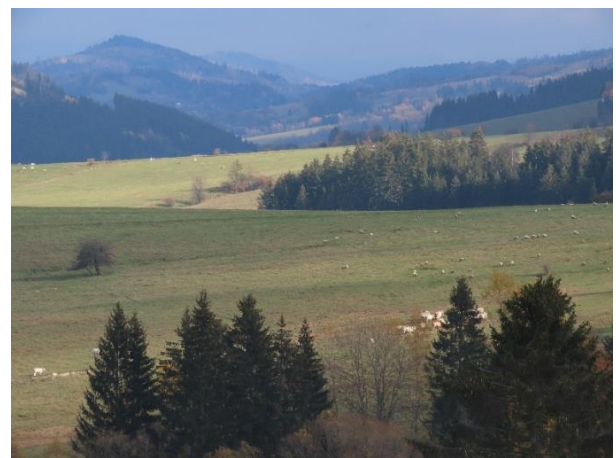


Fig 2. Large-scale grazing in the study area. Source: own photo

The study area comprises the administrative areas of 4 municipalities – Turzovka, Korňa, Vysoká nad Kysucou and Makov, with a total area of 150.2 km² and 13,227 permanent residents in 2023. The area has a typical form of dispersed settlement which complements a mosaic pattern of agricultural landscape. The population density for the whole study area is 88.1 inhabitants per square kilometre, which is below the Slovak average of 110.7 inhabitants per square kilometre. As regards the above-mentioned ANC scheme, all four municipalities fall under ANC's mountain area scheme – in particular, Makov is listed in category 1 (average altitude above 700 meters above sea level) and the rest in category 2 (above 600 meters).

This study area has been a part of several landscape-oriented research investigations (e.g., Bezák and Bezáková 2014; Barančok and Barančoková 2016; Mohr et al. 2023 and 2024). Its landscape character, as described above, is representative of mountain farming in Slovakia and includes a significant share of traditional small-scale forms. These factors were taken into account when selecting a study area for our research.

2.2 Analytical and empirical methods

We have implemented two methods to provide a complex overview of mountain farming in the study area and recent trends in Slovakia. In particular, both desk study analysis and feedback from local farmers captured several time horizons to better document processes in the agricultural landscape.

2.2.1 Agricultural policy and socio-economic data

As mentioned in the Introduction, the CAP is one of the key variables in our research. Although some data has been available since 2004, it provides only basic, inaccurate information on blocks registered in the LPIS (Land Parcel Identification System), making it difficult to compare with the latest information. We focused on the policy period from 2014 to 2024, with greater emphasis on 2018, when the first questionnaire survey was conducted (see below). Thus, our research aligns with the CAP 2014–2022 programming period, although, based on the interpretation of 2023–2024 data, we were able to uncover details of its transition to the CAP 2023–2027 period.

Information about agricultural land, its administration and management represents the most important data for our desk study. This included the number of farms, size of farms based on UAA (utilised agricultural area), the number, size, location and crop structure of agricultural parcels registered under LPIS and LPIS parcels applied by farmers for subsidies. Data were interpreted for 3 spatial scales: at the farm level, for the study area and some data were compared with average figures for the Slovak Republic. As explained in the previous paragraph, we mainly focused on collection of data since 2014 so as to look at the CAP 2014–2022 period and beyond.

In order to assess the economic background of the selected farms we analysed the total amount of received subsidies per farm. Furthermore, basic data on social capital were employed to better understand socio-economic background and globalization trends in farm management and subsequent landscape changes. We have analysed change in the number of inhabitants and the ageing index, both for the study area and the country.

2.2.2 Farmer engagement

After initial screening of existing farms and individual farmers in the study area in 2018, we selected 14 farmers/farms for in-depth face-to-face semi-structured interviews. These farmers represent various farming groups, based on farmed area, management type, subsidy connections, socio-economic background, etc. (see details in Results). Selection of farmers was based on information obtained mainly from municipal offices, as the UAA database used by individual farmers was not publicly available at the time. The municipal office registers most farming groups and individuals within its cadastral area, whether or not they are connected to subsidies, and maintains a good overview of land-use activities. Consequently, they were able to identify large farms and small farmers, as well as their farming practices. This information was further verified during initial interviews with individual farmers, which, in turn, established the final composition of farms for our research.

The total farming area of the selected farms accounted for about 67% of the LPIS in the study region in 2018.

Finally, two rounds of interviews were held with farmers, the first in 2018/2019 and the second in 2023/2024, to request detailed feedback on their farming practices, social and economic background (see Tab 1), and perceptions of the CAP's support schemes (see Tab 2). Handwritten questionnaire forms, completed during the interviews, were transcribed into a consolidated Excel table. Both quantitative and qualitative information were used for the purpose of this paper (see figures under Results). Information from the interviews provided empirical data, which was combined with the previous analytical research data. The personal views and perceptions of farmers on local farming in the context of the recent agricultural policy were crucial for understanding trends in the agricultural mountain landscape over a 10- year time horizon.

3. Results

3.1 Farm clusters and social background

We distinguished 3 farm clusters based on size, as identified during the first questionnaire survey (2018–2019). The first group is small farmers (S group), with farm sizes up to 5 ha, meaning they manage an area

below 5 hectares. Another group we call medium-size farms (M group), with a farming area above 5 ha, up to 30 ha, with up to 20 ha registered for subsidies. The last cluster contains large farms with a managed area of at least 100 ha (L group). The number of respondent farmers is well balanced across the clusters, with 4, 6, and 4 for the S, M, and L clusters, respectively. Here we must highlight that there is no major difference between small and medium farms in our study area in regard to the type of management, which is mostly traditional in both categories, with a low number of managed parcels (up to 8 parcels) and a similar social background (see below). Furthermore, the mean farm size supported by the CAP is much smaller in the EU overall (17.4 ha) than in Slovakia (101 ha for CAP support; 80.7 ha for all registered farms). Due to these factors, in this paper, we also associate the M-cluster with small-scale mountain farming. In the study area, 82 farms were registered for subsidies in 2018 and, as regards our cluster definitions, there were 37 farms with less than 5 ha of UAA (managing 3.2% of the area), 35 farms from 5 to 30 ha (14.4%), 5 farms between 30 and 100 ha (9.3%) and 5 farms above 100 ha (73.1%). These figures align with the overall trend in Slovakia, where several farms manage most of the agricultural area.

Tab 1a. Details of respondent farms (2018): farm size, farm management. Source: own table

Farm (2018)	Farm size	Subsidised area	type of farm	grazing animals	which animals	grazing area	mowing area	fields in LPIS	average LPIS field size
Cluster S (below 5ha)									
S1	4	1.2	household	3	cattle	0	3.5	2	0.62
S2	0.3	0	household	13	goats	0.3	0.3	0	0
S3	1.5	0	household	1	cattle	0	1.5	0	0
S4	4	0	household	8	3 cattle, 5 goats	4	4	0	0
Cluster M (5 to 30ha)									
M1	17	10.3	household	59	22 cattle, 21 sheep, 16 horses	17	0	2	5.2
M2	30	3.3	household	11	4 cattle, 3 sheep, 4 goats	2	28	4	0.81
M3	9.8	9.8	household	3	3 cattle	2	8	8	1.23
M4	19.5	12.6	household	54	4 cattle, 30 sheep, 20 goats	20	10	1	12.56
M5	18.8	18.8	individual entrepreneur	0	N/A	0	19	15	1.25
M6	6.53	6.5	household	5	1 cattle, 4 sheep	1	5	7	0.93
Cluster L (over 100ha)									
L1	127.4	127.4	LLC (forestry)	0	N/A	0	127	89	1.58
L2	866.3	866.3	LLC (farming)	870	750 cattle, 120 sheep	450	416.3	116	8.15
L3	177.6	177.6	LLC (farming)	366	20 cattle, 346 sheep	32	150	57	3.12
L4	338.3	338.3	LLC (farming)	900	900 sheep	264	66	185	1.83

As seen from Table 1, except for one case, all farmers from the S and M clusters (9 farmers) are classified as owning household farms. Their farm is inherited and/or farming management is being carried out by multiple family members. However, the majority of respondent farmers are older, and despite occasional work support from other family members, there is often no successor to continue their farming. The attitude of respondent household farms towards farming is positive, they enjoy this job, and they regard, as key reasons for farming, the way of life in the countryside, the possibility of having their own products and to maintain continuity in family farming. Here, we must highlight that “enjoying farming” includes taking care of animals, as all of them engage in animal husbandry (see further under farm management). Economic gain is the main motivation for the individual entrepreneur M5. All L-farms are limited liability companies, although family connections can be found in some of them: farming was inherited in L2 and farming is performed by multiple family members in L3. Other L-farms also have other interests in their business portfolio (e.g., forestry). Their reason for farming is not primarily lifestyle-

related, but they are motivated, especially financially, to maintain the agricultural landscape and avoid its abandonment and overgrowth.

Tab 1b. Details of respondent farms (2018): selected socio-economic parameters. Source: own table

Farm (2018)	% of area under subsidy	Farmers age structure	continuity	full time farming	other income	economic vitality (own assessment)	sale of products
Cluster S (below 5ha)							
S1	30	55–59	family	Y	N (retired)	1	own
S2	0	60–64	family	Y	N (retired)	1	own
S3	0	50–54	family	N	Y	0	own
S4	0	35–39	family	N	Y	0	own
Cluster M (5 to 30ha)							
M1	61	30–34	family	Y	N	-2	N
M2	11	25–29	family	N	Y	-1	own
M3	100	55–59	family	N	Y	-1	own
M4	65	60–64	family	N	Y	-1	own
M5	100	30–34	subsidies driven	N	Y	1	N
M6	100	60–64	family	Y	N (retired)	0	own
Cluster L (over 100ha)							
L1	100	50–54	subsidies driven	N	Y	1	N
L2	100	25–29	family	Y	N	0	Y
L3	100	40–44	family	Y	N	0	Y
L4	100	45–49	subsidies driven	N	Y	0	Y

Notes: farmers we asked to evaluate the economic vitality of their farm within the scale from very negative (-2) to very positive (2); answers for sale of products mean: Y (they officially sell products), N (no sale), own (only for own consumption).

3.2 Farm management and landscape

Farm management correlates with the farm size and social background, as described above. The majority of S-M farmers use traditional practices on the area with up to 8 parcels; the exception is M5, who takes care of 15 parcels, which is mainly due to a different way of farming – mulching. Except for this farmer, all others from these groups have animals and grazing has been an inseparable part of their management for many years, complemented by mowing. Cattle are the most common animals and are owned by 8 of the 10 farmers in the S+M groups, usually 1–4 animals each. Two M farmers own more than 50 animals, including sheep and goats. Their grazing area is the largest of the two groups, reaching up to 20 hectares, and grazing dominates over mowing. In the remaining S and M farmers, mowing prevails, while M5 exclusively performs mulching. L-farms take care of more than 50 parcels (up to 185), while the average parcel size varies from 1.5 ha to 8 ha. Three out of four L-farms own animals, mostly tens or even hundreds of cattle and sheep. The share of the area devoted to grazing and mowing varies, with the majority for mowing (L3), grazing (L4), or both farming practices in balance (L2). The last large farm (L1) only mulches the entire 127 ha.

As widely evidenced in literature, traditional grazing management is an important farming practice on grasslands from an ecological point of view and very positively contributes to biodiversity enhancement in general (e.g., Pykälä 2000; van Klink et al 2014; Schneider and Hering 2024). This is fully exemplified by the S group farms, which are extensive, small-scale, and based on long-term family management and independent of state support.

Although grazing management is also practiced by most M and L farms, they are often forced to adapt to the requirements of agricultural subsidies. These subsidies have broadly defined ecological objectives and are tied to standardized administrative procedures, which frequently do not align well with site-specific conditions – for example, the strict removal of vegetation from undergrazed areas without considering the ecological benefits for particular habitats. If traditional farmers prefer to follow their own management practices – such as more extensive forms of farming (e.g., later or mosaic mowing, maintaining larger non-productive areas, or prioritizing grazing) – which are generally more beneficial for the landscape and biodiversity (see Introduction), especially in mountain areas, they often choose to opt out of CAP subsidy schemes (see Sustainability chapter below). Finally, the purely mulching activities carried out by two farmers are considered as the least effective for biodiversity in general, fulfilling mainly a landscaping function. The mulching fulfils the basic CAP obligation that the agricultural area be managed, or simply cleaned, and thus the payment per hectare can be requested. This is considered the easiest way for “land managers” without animal husbandry to receive the basic payment.

As regards the spatial distribution of farmed areas, this is relatively clearly differentiated in the study area (Fig 3). The farming areas of S and M farmers are close to their homes or farms. Most L-farms cover a large, concentrated area, managing most or all of the available agricultural parcels; e.g., L4 manages many smaller, dispersed parcels in the north part of the study area, while L3 farms on larger, compact parcels in the north-east part. In contrast, L2 uses parcels mainly located along the main road across the valley of the whole study area. These parcels are the largest due to better physical conditions and good accessibility.

When we analysed changes in the LPIS study area in 2014–2024, we observed a decrease in the area aimed for farming. Both small parcels in remote areas and larger ones in the valley have tended to be excluded from LPIS over the years, mainly due to general trends such as urbanisation (in the valley) and land abandonment (in remote sites). This trend applies to both small and large farms (Fig 4). Therefore, the geographical position of farming plots did not play a key role in maintaining agricultural land. This is also confirmed by the questionnaire survey and statistical data about the respondents’ farms, i.e., a radical decrease due to this reason was not confirmed.

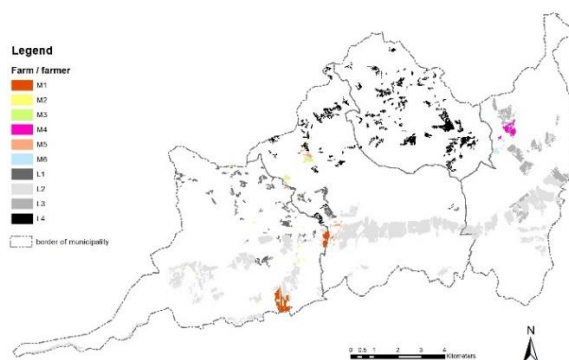


Fig 3. Registered LPIS areas of the respondent farms within the study area in 2019. Source: own map

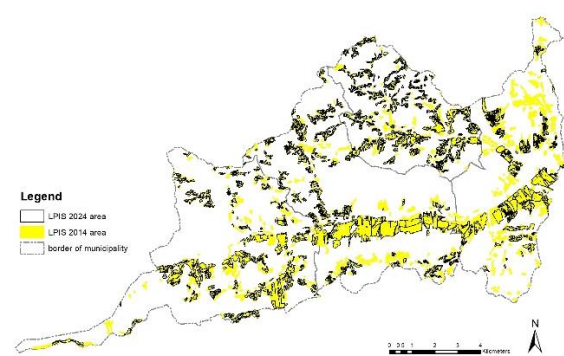


Fig 4. Changes in LPIS in the study area in the period 2014–2024. Source: own map

3.3 Economic vitality

There are significant differences in the economic situation of respondent farms, especially due to differences in size, social background, and attitudes to farming. Farmers from the S-group either have another job or have retired and thus farming is more of a hobby. A similar situation obtains for M farmers, although farming was the only full-time job for one farm. In contrast, full-time farming is the case for 50% of L farmers, which is higher than for the other groups, although still surprisingly low given the large size of the farms. This indicator confirms that sustaining a farm with an economic focus purely on agriculture is very demanding under recent CAP conditions, for any size group.

We have analysed the amount of all CAP payments received in 2022, which is the last year of the CAP's programming period 2014–2022, and compared it with the farmed area of each respondent. A simplified calculation of the overall amount per 1 ha shows a predominance of large farms (with a few medium farms as well), especially those with a higher number of animals (Fig 5; e.g., L2, L4, M4). We must highlight that although farmers practising only mulching of grasslands have the lowest amount per 1 ha, their share is more than half that of several medium- and large-scale farms with animal husbandry. While keeping animals requires much more time and resources over the course of a year, mulching is usually a one-time action performed by subcontractors. This structure of the subsidy scheme creates favourable conditions for individuals or companies for whom farming is not a priority. This was confirmed through our analysis of individual CAP scheme payments. Direct payments (Pillar I) accounted for 100% or two-thirds of all payments for medium-sized farms and large farms practicing mulching. In contrast, they accounted for about half or less of total payments to other large farms that also participated in agri-environmental measures and/or organic farming (Pillar II). Regarding the ANC scheme (Pillar II), its share of total CAP payments was approximately one-third. However, it was not received by one large and one medium mulching farm (L1 and M5), as well as two other medium farms (M2 and M6). Conditions for ANC support include a minimum stocking density of 0.3 livestock units per hectare of permanent grassland and detailed documentation of grazing activities. While mulching farms were not interested in grazing or stabling animals, the other two medium farms were unable to meet all administrative requirements.

Respondents' own assessment of their economic vitality reflects their attitude to farming management (Tab 1). Family farming, with the possibility of producing their own food and without ambitions to expand or receive subsidies, is economically sufficient for small farmers. Most M farmers with similar attitudes and social backgrounds who receive subsidies perceive their economic situation as unfavourable. We can conclude that their increased effort due to inclusion in the subsidy system is not adequately reflected in the farm's improved economic vitality. Negative perceptions of economic vitality were not recorded for large farms, partly because of their economic efficiency under recent CAP conditions and partly because some of them generate off-farm income (e.g., forestry, tourism).

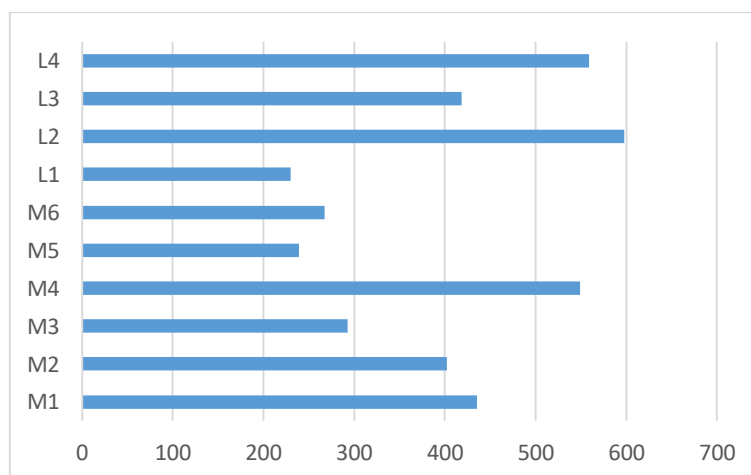


Fig 5. Amount of subsidies received by respondent medium and large farms in 2022 (in EUR per 1 ha). Source: own graph
Note: other respondent farmers did not receive subsidies in 2022

3.4 Sustainability of mountain farming management

Based on the above-mentioned facts, the second round of interviews and analysis of available data, we can summarise the current state of mountain farming in the study area in relation to global trends and agricultural policy. As already indicated, the overall number and the average size of farmed LPIS parcels slightly decreased in the whole study area in 2018–2024 (by up to 14%), mainly due to land abandonment and subsequent technical adjustments of the LPIS area and borders by the executive agency (e.g., exclusion of abandoned and/or non-productive parts in LPIS). Management of small, marginal mountain parcels is not efficient for the purpose of receiving CAP support and this was also confirmed by other

studies conducted in Slovakia (e.g., Lieskovský et al. 2015; Bezáková and Bezák 2022). However, other visible trends need to be highlighted here. In particular, the total area of farmed agricultural land registered in the LPIS across the entire study area decreased in 2024 to 77.5% of its 2018 extent (Fig 6). Thus, the decline in LPIS-registered land in the study area is more pronounced than the figures showing a similar trend across all Slovak ANC mountain areas (see Introduction). In addition to the main factors discussed above – land abandonment and urbanisation – there is a tendency for small and medium farmers to skip the CAP's support.

This negative trend has been especially evident since 2023. In the study area, a 35% drop in the number of farmers registered under the CAP was recorded in 2024 compared to 2022 (Fig 6). In terms of farm size categories, the number of large farms has remained stable, while a sharp decline in CAP applicants was observed among small farms (a decrease to 52%) and medium-sized farms (a decrease to 65%).

The aforementioned negative effect also affects small- and medium-sized farmers. While the graph shows a more or less stable trend in the subsidised area of large farms in 2014–2024 (Fig 7a), the area of the majority of small/medium farms under CAP support significantly fluctuates (Fig 7b). Even worse, 6 out of 7 respondent farmers who had received any subsidy since 2014 had withdrawn from the support program by 2024. The only farmer from the S-M groups who remained (M5) practices grassland management, mainly through mulching, without animal husbandry.

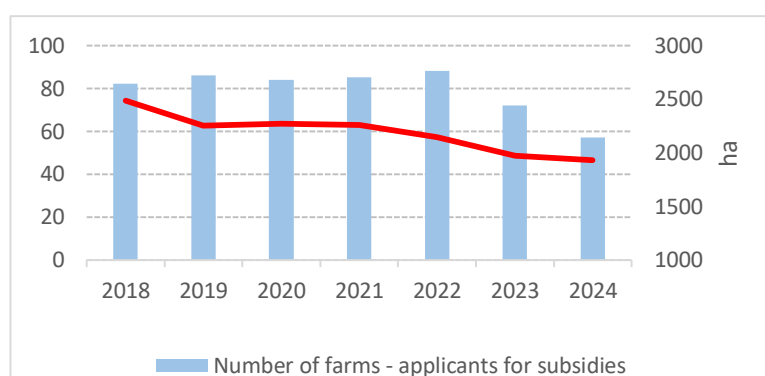


Fig 6. Number of applicants for subsidies and LPIS in the study area in 2018–2024. Source: own graph



Fig 7. Subsidised area of respondent farms in 2014–2024: a) large farms, b) small/medium farms. Source: own graph

So, what are the main factors that have influenced small/medium farmers since 2018? The key negative factor, mentioned by most respondents among medium farmers, is the administrative burden of the CAP (Tab 2). In particular, the required administrative procedures are very time-consuming, require technical skills, and require equipment (i.e., a PC with a good internet connection). In large farms, this work is usually performed by a trained person, either employed or sub-contracted. However, most small rural farmers do not have these skills and resources to fulfil administrative obligations or to pay an external

person, especially due to the low income they generate. Thus, most of them depend on advisory services from regional agencies under the Ministry of Agriculture, which are often difficult to access due to additional time and travel costs, as mentioned by S-M respondent farmers. To confirm this argument, we quote a response from two young farmers (M1 and M2) on the question of what the main impact is of withdrawing from the subsidy scheme: *“I have less stress and better sleep.”* The decision to opt out of the CAP will undoubtedly have economic consequences for young farmers, as subsidies were not negligible. However, they can still adapt their farming practices (see Table 2), relying on their own income and moving toward social and economic sustainability.

Tab 2. Small and medium farms: connection to CAP 2023–2027 subsidy, key changes in farming and reasons behind. Source: own table

Farm	CAP 2023–2027		Changes in farming since 2018	
	Applied?	Reasons	Key changes	Reasons
S1	N	administrative burden and old age	finished with farming, most of the land is rented to a large farm	too old, no successor
S2	N	not applied before	finished with farming, most of the land is rented to a large farm	too old, no successor
S3	N	not applied before	change from grazing to mowing, land rented to a large farm	too old, no successor
S4	N	land ownership (no interest from owners to sell or rent the land for a reasonable price)	less area for grazing and finally moved to CZ in 2023	land unavailable for farming (parcels repurposed for development of tourism, increased price)
M1	N	administrative burden (too much time and resources, not worth the small income from subsidies)	continuing with farming on smaller area, increased focus on agrotourism, especially horses	focus on agro-tourism, lack of horse-grazing subsidy
M2	N	administrative burden (too much time and resources not worth the small income from subsidies)	continuing with farming on smaller area, fewer animals, increased focus on sale of own farming products	forced to reduce farming due to limited time, resources and land ownership
M3	N	administrative burden and old age	continuing with farming on smaller area, moving away from animal husbandry and grazing	getting older, no successor, administratively demanding subsidies
M4	N	administrative problems (conflict between subsidy requests, disallowed claim for full payment) and old age	continuing with farming on smaller area, moving away from animal husbandry and grazing	getting older, no successor, territorial dispute with large farm over land rent for farming
M5	Y	financially favourable	no major changes	N/A
M6	N	administrative burden and old age	continuing with farming on a smaller area, moving away from animal husbandry and grazing	getting older, no successor, administratively demanding subsidies

Furthermore, when administrative requirements are combined with old age, the second key factor in withdrawal from the CAP recorded in our survey (Tab 2), there is a very strong compound motivation to cease farming (M3, M4, M6). Insufficient social capital becomes a real barrier to sustaining small-scale farming in the study area, considering negative trends in the number of inhabitants and ageing of the population (Fig 8 and 9). The number of inhabitants of the study area has been steadily decreasing over the last 25 years, in contrast to the general Slovak trend, and the ageing index confirms out-migration of the young generation over the last two decades.

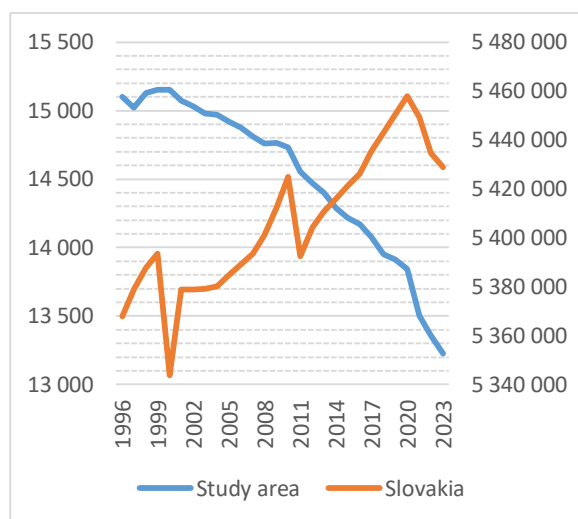


Fig 8. Trend in the number of inhabitants in the study area and in Slovakia since 1996. Source: own graph adapted from <https://datacube.statistics.sk>

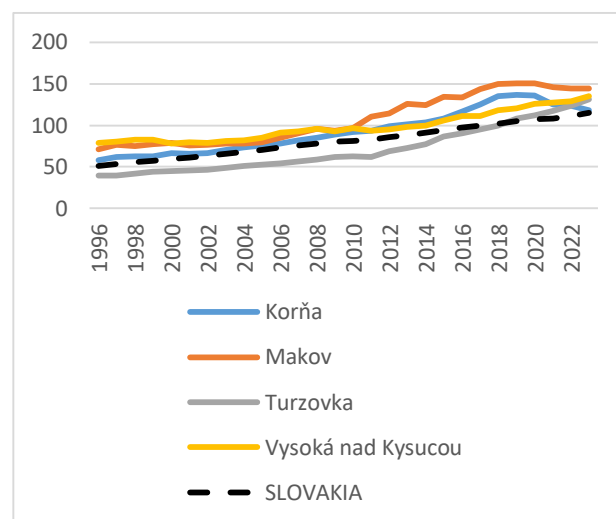


Fig 9. Trend of ageing of population in study area municipalities and in Slovakia since 1996. Source: own graph adapted from <https://datacube.statistics.sk>

We can conclude that the farming of most small and medium mountain farms in the study area is not socially or economically sustainable under current policy conditions. Farming on all respondents' small/medium farms with animal husbandry has decreased in both farmed area and number of animals. Furthermore, their farming is gradually being simplified; in particular, grazing has been partly replaced by mowing, and/or parcels have been taken over by large farms and holdings. These changes create a less diverse, more homogeneous landscape, with reduced ecosystem services for human well-being (see Introduction). This has been a continuous trend since the massive changes initiated in the Communist era in this region, e.g., transformation of agricultural mosaics to intensive grassland and expansion of forests into valleys (Mohr et al. 2024).

The above-mentioned trends documented for the study area correspond to national CAP agricultural data. In particular, the share of UAA in Slovakia managed by farms larger than 30 hectares and registered under the CAP continues to increase – by 1% between 2018 and 2025, reaching 95.7%. The average farm size rose from 105 hectares in 2018 to 130 hectares in 2025. The most substantial change is recorded in the proportion of farms under 30 hectares between 2018 and 2025 (Fig 10), with a significant decrease in farms smaller than 5 ha and a moderate decrease in those between 5 and 30 ha. A similar declining trend in small farms is also observed in ANC mountain areas.

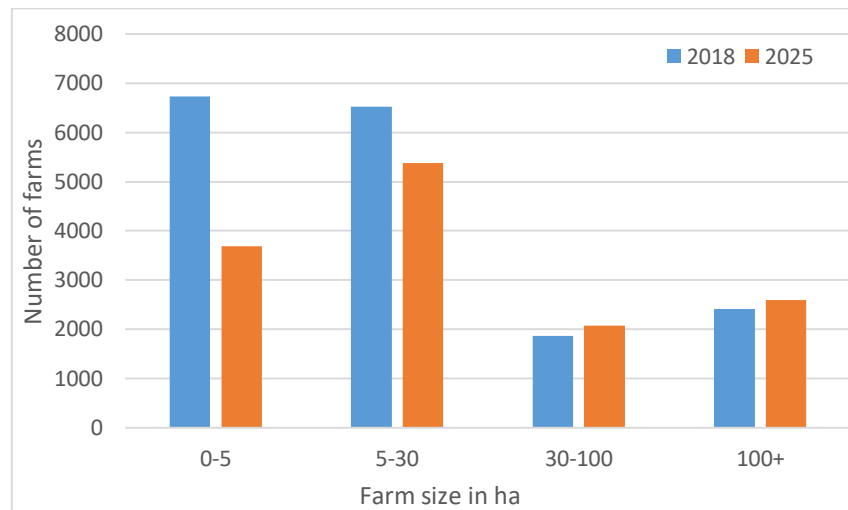


Fig 10. Change in the number of farms by farm-size clusters (2018–2025). Source: own graph

4. Discussion

Our research provides deep insight into mountain farming in Slovakia, using a small mountain region in the northwest as an example. While information at larger spatial scales, including national-level data, provides overall trends and quantitative figures, our investigation complements these findings with qualitative insights that offer significant context for underlying factors. Most of our results confirm national trends and align with issues discussed in publications from other rural regions. Therefore, despite the lower number of interviewed farmers, the qualitative information presented here can still contribute to the improved design of rural policy in Slovakia.

Respondent old farmers usually do not have successors in the family, which reinforces the gloomy prospects for rural identity found in similar studies in Slovakia (e.g., Bezák and Dobrovodská 2018) and in Europe (e.g., Zagata and Sutherland 2015; Mohr et al. 2023; Mattas et al. 2024). Due to this, and to insufficient CAP support and complicated land ownership, where the land must often be rented from many land owners (e.g., Dudzińska et al. 2018; Pipišková et al. 2022), maintaining farming jobs becomes inefficient and unsustainable. Although small-scale farmers put in extra effort to sustain their favourite side job or “pension hobby”, the operation of the farm and consumption of farming products are usually a strictly family affair. As a result of the driving forces discussed above, family farming is finally reduced to its own parcels in close proximity to housing, and this is one of the crucial factors in preventing land abandonment, especially in mountains (Pazúr et al. 2020; Heider et al 2021). Going beyond “closed family farming” would require accepting risk management and/or additional resources, which seems achievable only by younger farmers (i.e., M1, M2). The factors described above, such as location of the farm, the land available for farming, the age of the farmer and positive attitude towards risk, were also found in other Eastern European EU member states to be fundamental to household engagement in the market (Fredriksson et al. 2017; Šumrada et al. 2024). Based on qualitative analysis, these authors concluded that many problems of small-scale semi-subsistence farmers in these countries come from social disparities, i.e., between rural and urban income or in comparison to the western EU countries, which leads to the out-migration of young people and further limits the commercialisation of small-scale farmers. The globalized agricultural economy, urbanization, labour market restructuring, and changing lifestyles are general factors contributing to the weakening of social capital in rural areas (Alston 2004; Thissen et al. 2010; Kummitha et al. 2020). Moreover, globalization disrupts the historical connections between social and ecological subsystems in traditional farming landscapes (Fischer et al. 2012).

Our research found very positive personal attitudes of small-scale farmers to extensive animal farming, which significantly contributes to the maintenance of traditional local landscapes and enhances biodiversity (Agnoletti and Rotherham 2015; Špulerová et al. 2017). At the same time, we acknowledge the environmental benefits of large farms, especially those with animal husbandry. Detailed scientific comparison of the environmental impacts of small and large animal farms was out of this paper’s scope;

however, we tend to agree that the share of farms with multifunctional benefits from farming is higher in small/medium farms (see also Introduction). The key indicators here are the farmer's attitude and rural lifestyle, which stem from daily outdoor practices, unlike those of large farm managers. Small farmers tend to have higher motivation and commitment to the environment and local community, and these factors have also been recognised by many other studies (e.g., Slámová and Belčáková 2019; Ebel 2020; Busch et al. 2022), and this can play an important role in sustainable rural development (Szumelda 2013). Therefore, it is unfortunate that farming communities are losing these "enthusiastic small landscape managers." Although farm size is expected to increase due to large economies of scale, values that are specifically linked with small-scale farms must be supported by the agricultural policy (Guiomar et al. 2018; Whitaker 2024). In addition to a better design of the rural policy, bottom-up initiatives could also lead to improved small farm economy, for example, grouping farmers into short food supply chains (Floriš et al. 2022), increasing co-operation among farmers, and supporting local land consolidation projects (Looga et al. 2023; Mgomezulu et al. 2024). According to Karimli et al. (2024), social globalization is more strongly associated with the ecological footprint in Europe than economic globalization. Recommended actions include enhancing digital connectivity, fostering cross-cultural dialogue, establishing educational partnerships with institutions, promoting policies that support tolerance and inclusivity, and encouraging community-level initiatives.

Inappropriate CAP setup and farmers' old age are the key obstacles identified by our study to the ongoing viability of small-scale mountain animal farming. This result is fully in line with the finding of Muñoz-Ulecia et al. (2023), i.e., the capacity of pasture-based farms to improve sustainability is constrained by the functioning of the socio-economic system at large, including the CAP payments. Widespread discussion regarding balancing economic profitability and socio-ecological benefits largely relates to farm size (Ebel 2020) and the CAP has been often criticised for overlooking environmental and social demands (e.g., Pe'er et al. 2019; Altamore et al. 2024). In general, there is little or no evidence that job satisfaction or the economic situation of farms with a multifunctional role is improving compared to productivist pathways (Helfenstein et al. 2024). The factors leading to farming sustainability must be better recognised and acknowledged by the public and by concerned authorities, in order to streamline social and economic incentives for multifunctional farming. For example, policy measures could support communities in obtaining certification for existing organic practices, developing markets for local products, or establishing an ecotourism industry (Fischer et al. 2012). Many studies confirmed that CAP support, especially direct payments, is not an effective tool to reduce the existing social and economic disparity among farms (Espinosa et al. 2020; Ciliberti et al. 2022), while gains and losses for small and large farms may not be always clear (Volkov et al. 2019; Biagini et al. 2020). At the same time, the ecological part of sustainability, e.g., biodiversity enhancement, also requires increased CAP attention (Jeanneret et al. 2021; Pe'er et al. 2022), particularly with a focus on delivering public goods, support of marginal land and phasing out payments to highly productive land (O'Rourke and Kramm 2012; Brady et al. 2017; Cusworth and Dodsworth 2021).

When turning our attention to the CAP Strategic Plan 2023–2027 for Slovakia, we must highlight that the importance of small farms in rural development and the provision of local goods and services was acknowledged, in contrast to the CAP 2014–2022. Improving the economic situation of small farms and their access to education and advisory services is a key objective of this Strategic Plan.

In Slovakia, CRIS payment support is higher for the first 100 hectares (an additional €80/ha) and for the area between 100 and 150 hectares (an additional €40/ha). Although this measure was predicted to bring environmental benefits to the agricultural landscape (Lieskovský et al. 2023), our research shows that the implementation of post-2023 measures has so far been insufficient and has not halted the decline of small and medium-sized mountain farms within the CAP scheme. The economic situation of the surveyed small and medium-sized farmers has not significantly improved, nor has the administrative burden been reduced. Our survey indicates that mountain farms up to 30 hectares would benefit more from systematic support – such as effective field consultancy services, removal of barriers to local product markets, or support for local agro-tourism – rather than small additional annual payments. Weak connection of social and economic dimension and livelihood of local community with small-scale farming

activities supported by the CAP was also observed in other rural regions in Slovakia (Bezáková and Bezák, 2022; Palkovič 2025) and in Europe (Waldén and Limborg, 2018; Rouet-Leduc et al. 2024).

In fact, insufficient improvement of the Agricultural Knowledge and Innovation System (AKIS) in Slovakia has already been recognised by the EC in their observation letter on the Strategic Plan proposal: *“Innovation support requires the right understanding and sufficient engagement. A back-office with specialist advisors in close connection with research and the CAP Network, which can support all field advisors, is missing.”* However, detrimental administrative burdens for small farms are not just country-specific: moves to further improve the AKIS have been recorded in other EU regions too (Balezantis et al. 2020; Lécole 2021; Toma et al. 2021; Whitaker 2024).

5. Conclusion

Using analytical and empirical methods, we identified key socioeconomic factors shaping mountain farm management across different farm sizes in Slovakia. Three size categories – below 5 ha, 5–30 ha, and above 100 ha – face similar social, economic, and environmental challenges, though their sustainability differs. Surveys with small and medium farmers show that their farming is largely family-based, motivated by continuity, a rural lifestyle, and self-provisioning. Large farms share some traditional elements but are driven mainly by economic goals. Notably, full-time farming is uncommon even among large farms.

Analysis of CAP payments indicates that support schemes favour large farms and farms without livestock. Although medium-sized farms make greater efforts to meet CAP requirements, this does not translate into stronger economic performance. Many small farmers chose to avoid subsidies altogether.

Agricultural land in Slovakia – especially in mountain areas – continues to decline, reflecting broader shifts in farm practices and global market pressures. Urbanisation, land abandonment, and fluctuating CAP participation reinforce this trend. CAP applicants nationwide have decreased, with a 35% drop in the study area between 2022 and 2024. In the study area, CAP-supported areas varied widely among small and medium farms but remained stable among large farms. By 2024, all small and medium livestock farms that had previously received support had left the subsidy system.

Two factors drive withdrawal from CAP: the high administrative burden and the ageing population in remote areas, both of which reduce the likelihood of farm succession. As a result, the future of small and medium mountain livestock farms in Slovakia is uncertain. Our findings show that small-farm activities are being simplified, grazing is being replaced by mowing, land is being consolidated, and larger holdings are increasingly taking over abandoned parcels. These changes threaten landscape heterogeneity and the provision of ecosystem services, as smaller farms traditionally maintain more diverse, extensive land use.

To counter these trends, policy should mitigate socio-economic impacts of globalisation and adopt site-specific measures reflecting local socio-ecological conditions. Priorities include stronger support for young and small farmers, targeted payments for marginal land and public good provision, development of short supply chains, greater cooperation and local initiatives, improved digital connectivity, and, above all, effective advisory services and farmer education.

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