

Article

Sustainability Performance of Family-Owned Farms in Slovakia: A Comparative Approach with RISE 3.0

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Abstract: RISE (Response Inducing Sustainability Evaluation) is an indicator-based method for assessing environmental, economic, and social sustainability at the farm level and has been applied to more than 6,000 farms worldwide. Its use in Central Europe, and particularly in Slovakia, remains limited. This study presents the first documented application of RISE 3.0 in Slovakia and provides an exploratory assessment of its suitability for comparing contrasting production systems, including regenerative agriculture. Using a qualitative case-study approach, RISE 3.0 was applied to two Slovak family farms with different production orientations: a regenerative crop farm and a livestock-based dairy farm. Data were collected through structured on-site and remote interviews and analyzed using the RISE software, with results visualized through sustainability polygons. The regenerative crop farm achieved high scores in Energy and Climate (90) and Biodiversity (71), reflecting the benefits of low-input and soil-conserving practices, but showed weaker performance in Water Use (65) and Economic Viability (60). The livestock farm performed strongly in Animal Welfare (97) and Working Conditions (80), while challenges were identified in Water Use (72) and Economic Viability (65). These results illustrate clear system-specific sustainability profiles rather than directly comparable overall performance. The findings confirm the value of RISE 3.0 as a farm-level advisory and diagnostic tool but also reveal methodological limitations in cross-system comparison, particularly when regenerative and livestock systems are assessed using a fixed indicator set. The study contributes novel empirical evidence from Slovakia and highlights the need for greater indicator flexibility to better capture emerging farming models while maintaining the tool's holistic framework.

Keywords: indicator-based assessment, farm-level analysis, regenerative agriculture, livestock systems, decision-support tools.

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1. Introduction

Agriculture has long been central to human development, ensuring food security and economic stability while shaping landscapes and societies (Alves et al., 2025; Castillo-Díaz et al., 2025). Yet, the intensification of farming since the Green Revolution, driven by mechanization, chemical inputs, and monocultures, has generated severe environmental costs, including soil erosion, biodiversity loss,

water contamination, and greenhouse gas emissions (Castillo-Díaz et al., 2025; Meng et al., 2025; Nica and Georgescu, 2025). Agriculture now contributes roughly 25% of global emissions, making it both highly vulnerable to and responsible for climate change (Biagetti et al., 2025; Byfuglien et al., 2025;). The pressure to feed a projected 9.7 billion people by 2050 heightens the challenge of reconciling productivity with ecological integrity (Artuzo et al., 2025; Bulfa et al., 2025; Dziumla et al., 2025; Kaewchutima et al., 2025). This has elevated sustainable agriculture as a global priority, emphasizing integrated approaches that combine environmental, economic, and social dimensions (Vasishta et al., 2025; Zarba et al., 2025).

A critical element in advancing sustainable agriculture is the ability to assess it systematically. Numerous tools have been developed for this purpose, including Sustainability Assessment of Food and Agriculture systems (SAFA), Indicateurs de Durabilité des Exploitations Agricoles (IDEA), and SOSTARE (a diagnostic model for technical, economic, and environmental sustainability), which vary in scope, methodology, and regional applicability (Schader et al., 2014; Paracchini et al., 2015; Kaewchutima et al., 2025; Zarba et al., 2025). However, many such tools embed normative assumptions, such as privileging organic farming, that may not align with farmers' own values, reducing their perceived relevance (de Olde et al., 2016). By contrast, the RISE (Response-Inducing Sustainability Evaluation) tool is widely recognized for its farm-level, indicator-based, and context-specific approach (Häni et al., 2003; Berbeć et al., 2018; Iakovidis et al., 2025). Its latest version, RISE 3.0, evaluates sustainability across ten themes and 46 indicators, translating abstract concepts into measurable outcomes, supporting decision-making, and fostering continuous improvement (Rööse et al., 2019; Coteur et al., 2020). The RISE 3.0 Manual (2016) reports that the tool has been applied to more than 6,000 farms in 63 countries, while Rööse et al. (2019) documented its application to over 3,300 farms in 57 countries, highlighting its global adaptability and credibility.

Despite this global uptake, applications of holistic sustainability assessment tools remain rare in Central and Eastern Europe (CEE), particularly in Slovakia. In this region, small- and medium-sized family farms are the backbone of rural economies and critical to regional resilience, especially under the evolving framework of the Common Agricultural Policy (CAP) (Castillo-Díaz et al., 2025; Dziumla et al., 2025). Addressing this gap, the present study applies RISE 3.0 to two Slovak family farms with distinct production systems (regenerative crop farming and livestock husbandry). The aim is to identify sustainability strengths and weaknesses, assess the applicability of RISE in a new regional context, and reflect on the challenges of comparing different farm types. In doing so, the study contributes to the broader debate on refining sustainability assessment methodologies to ensure they remain robust, flexible, and relevant to diverse agricultural realities (Byfuglien et al., 2025; Karpe et al., 2025; Zarba et al., 2025).

Research questions:

How effectively does the RISE 3.0 tool assess the sustainability of small, family-owned farms in Slovakia?

Are there any limitations when using RISE 3.0 to compare sustainability between different types of farming systems (crop vs. livestock)?

Research assumption:

The RISE 3.0 tool can identify major sustainability strengths and weaknesses at the farm level.

Differences in production systems (crop vs. livestock) complicate direct comparisons of sustainability scores using RISE 3.0, due to varying relevance of certain indicators.

2. Materials and Methods

The aim of this paper is to assess the sustainability performance of two-family farms in Slovakia using the RISE 3.0 assessment tool and to explore its applicability for evaluating contrasting production systems. One farm focuses on regenerative crop production and the other on livestock farming. RISE 3.0 was selected for its comprehensive, standardized framework that evaluates environmental, economic, and social dimensions at the farm level, and for its demonstrated flexibility across diverse farming systems worldwide (RISE 3.0 Manual, 2016; Iakovidis et al., 2025).

The selection of two farms was deliberate and follows a case-study logic commonly applied in sustainability assessment research using RISE (Marchand et al., 2014; de Olde et al., 2016). Given the high data requirements and time intensity of RISE 3.0 assessments, an in-depth analysis of a limited number of exploitations allows for a detailed and context-sensitive evaluation of sustainability performance. The small sample size does not allow for statistical generalization of results beyond the studied farms; rather, the objective is analytical generalization, focusing on understanding how RISE 3.0 performs when applied to contrasting production systems. The chosen farms represent two highly relevant but structurally different agricultural models in Slovakia—regenerative crop farming and livestock-based dairy production—enabling exploration of system-specific strengths, weaknesses, and methodological constraints while ensuring analytical depth and data saturation (Berbeć et al., 2018; Iakovidis et al., 2025). This study adopts a case study design, focusing on an in-depth analysis of two Slovak family farms with contrasting production orientations.

The farms were selected through purposive sampling to represent two distinct agricultural models prevalent in Western Slovakia:

- **Plant Farm:** A regenerative crop production farm located in the Trnava region implementing practices such as crop rotation, minimal tillage, and organic fertilization. It focuses on large-scale production of cereals and oilseeds.
- **Livestock Farm:** A goat farming operation located in the Nitra region producing dairy products with a focus on circular economy principles and local market integration through direct sales.

The study was conducted in Western Slovakia, a region characterized by favorable climatic conditions for both crop and livestock production and by farm structures shaped by historical collectivization processes. The Plant Farm is in the Trnava region, while the Livestock Farm operates in the Nitra region.

To ensure ethical research practices, the identities of both farms are anonymized in compliance with confidentiality agreements. The selection procedure mirrors the approach of de Olde et al. (2016), where farmers were chosen based on their interest in sustainability and willingness to cooperate. In our study, the same principle applied: both farms volunteered to participate and were motivated to contribute to sustainability research.

From a methodological perspective, RISE 3.0 follows a system-oriented, indicator-based approach to sustainability assessment at the farm level (Häni et al., 2003; Berbeć et al., 2018). RISE 3.0 was selected for its comprehensive, indicator-based approach to farm-level sustainability evaluation (Berbeć et al., 2018; Iakovidis, et al., 2022; Packer & Zanasi, 2023). According to Ruckli et al. (2022), farmers perceived RISE as the most relevant tool, as it is based on quantitative questions and applies a context-specific approach. According to the RISE 3.0 Manual (2016) and Rööse et al. (2019), the tool has been successfully applied to over 6,000 farms in more than 63 countries, demonstrating its flexibility and global adaptability across diverse agricultural contexts.

The tool assesses sustainability across ten thematic areas: energy and climate, biodiversity, soil use, water use, nutrient flows, plant protection, working conditions, quality of life, economic viability, and farm management. It evaluates sustainability across the three core pillars—environmental, economic, and social—quantifying a farm's contribution to sustainable development and its alignment with sustainability principles (Iakovidis et al., 2022). Beyond its evaluative function, RISE 3.0 serves as a knowledge-based tool for fostering sustainability improvements, grounded in principles of voluntary participation, confidentiality, and capacity building (Rööse et al., 2019). From a methodological perspective, RISE offers a system-oriented, easy-to-use, and holistic approach, making it valuable not only for sustainability assessment but also for advisory services, education, and strategic planning (Häni et al., 2003). Its goal is to promote the adoption and consolidation of sustainable agricultural practices by providing farmers with practical insights and clear guidance for improvement (Berbeć et al., 2018; Robling et al., 2023).

Importantly, this study represents the first application of RISE 3.0 in Slovakia. A large input of Slovak regional reference data was required to calibrate the system. As de Olde et al. (2016) noted in the Danish context, the high degree of contextualization of RISE may positively influence farmers'

perception of its relevance. We expect similar dynamics in Slovakia, where the contextualization process increases precision and enhances farmer engagement.

Data required for the assessment encompass four main types (Berbeć et al., 2018):

- Quantitative farm data: crop yields, livestock numbers, fertilizer and pesticide usage, energy consumption, labor inputs, financial data.
- Qualitative farm data: management practices, social and environmental considerations, farmer perspectives.
- Regional reference data: climatic conditions, regional productivity benchmarks.
- Global reference data: environmental impact coefficients, such as pesticide toxicity and energy density.

Data collection followed the protocol of de Olde et al. (2016), consisting of two stages:

- Structured Interviews - conducted with three respondents per farm (the farm owner and two other key staff members), each interview lasted approximately four hours per farm, questions were answered in real time, and responses were directly entered into the RISE 3.0 software.
- Follow-up Data Provision - for missing data (e.g., detailed records of energy consumption or finances), farmers supplied additional documents after the interviews.

These were verified for completeness and consistency, as recommended by de Olde et al. (2016).

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All collected data were processed by the RISE 3.0 software developed by the Bern University of Applied Sciences (HAFL). The software automatically compares farm-specific data against threshold values and reference datasets, generating normalized sustainability scores for each theme (Berbeć et al., 2018; Pacarada et al., 2024). Each theme is evaluated through multiple indicators, resulting in a score between 0 and 100, where higher values indicate better sustainability performance (Berbeć et al., 2018; Heredia-R et al., 2021). These scores are interpreted using the standard RISE classification:

- Problematic: 0–33 points
- Medium: 34–66 points
- Good: 67–100 points (Iakovidis et al., 2022).

The conversion of qualitative responses into numerical scores is handled within the software. Similar to the findings of de Olde et al. (2016), this process is not transparent to researchers, as the algorithms are embedded in the tool itself. Consequently, no additional coding or weighting is performed by the researcher. While this reduces transparency, farmers in previous studies nonetheless considered RISE more precise, relevant, and understandable than other assessment tools such as IDEA or PG, where embedded value judgments affected perceived credibility (de Olde et al., 2016).

Results are visualized using sustainability polygons, which provide a graphical overview of each farm's performance across the ten thematic areas (RISE 3.0 Manual, 2016; Berbeć et al., 2018). This visual format facilitates accessible interpretation of strengths and weaknesses.

In summary, the methodological approach combined a qualitative–quantitative case study design with a standardized sustainability assessment using RISE 3.0. Farm-level data were collected through structured interviews and supplementary documentation, contextualized using regional and global reference values, and processed within the RISE software to generate normalized sustainability scores and polygon diagrams. This approach enabled a holistic evaluation of environmental, economic, and social dimensions at the farm level while acknowledging methodological limits related to cross-system comparability (Häni et al., 2003; de Olde et al., 2016; Berbeć et al., 2018). The results should be interpreted as illustrative rather than representative, providing insights into tool performance and methodological suitability rather than sector-wide sustainability levels. A SWOT analysis was conducted to synthesize the RISE 3.0 results into key strengths, weaknesses, opportunities, and threats for each farm, providing a structured framework

to interpret internal performance factors alongside external environmental and socio-economic influences (Alyamani et al., 2025; Ronda et al., 2025; Vasconcelos & Castilho, 2025).

3. Results (or Results and Discussion)

3.1. Plant Farm – Sustainability Assessment

The Plant Farm specializes in regenerative agriculture practices, including no-till soil management and continuous ground cover through crops or cover crops. The farm reports high infiltration rates (50–70 mm/h) and significant carbon sequestration capacities (30–45 tons CO₂ per hectare cumulatively), contributing to climate neutrality goals. Additionally, the farm avoids synthetic fertilizers, fungicides, and insecticides, which reduces material inputs and operational costs. A sustainability assessment was conducted on-site using RISE 3.0. However, since RISE 3.0 currently only distinguishes between conventional and organic farming systems, there was no option to specifically assess regenerative practices. Consequently, certain questions and indicators did not fully align with the farm’s management approach, and some data points could not be accurately captured or filled. The polygon diagram generated by the software illustrates performance across five key indicators: Water Use, Energy & Climate, Biodiversity, Quality of Life, and Economic Viability. The respective scores are summarized below.

3.2. Livestock Farm – Sustainability Assessment

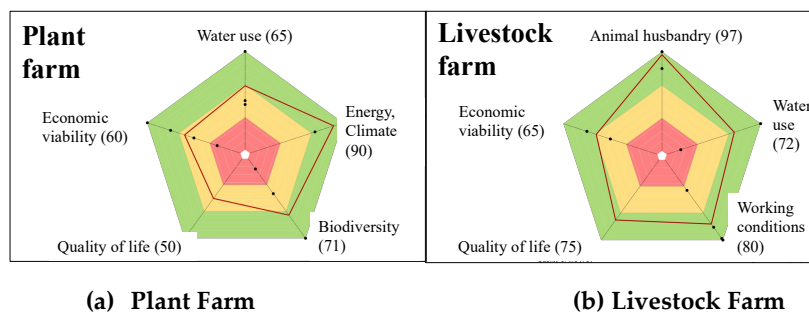
The Livestock Farm is a family-run business focused on goat farming and artisanal dairy production. Products are distributed through local markets and small retailers in the surrounding region. Data collection was carried out via two online sessions using MS Teams, with direct data input into RISE 3.0. The sustainability assessment polygon illustrates performance across five indicators tailored to livestock operations: Animal Welfare, Water Use, Working Conditions, Quality of Life, and Economic Viability. The results are as follows.

Table 1. Plant and Livestock Farm - Sustainability Assessment

Plant Farm Assessment			Livestock Farm Assessment		
	Name of indicator	Score		Name of indicator	Score
1	Water use	65	1	Animal husbandry	97
1.1	Water management	46	1.1	Herd management	83
1.2	Water supply	50	1.2	Livestock productivity	100
1.3	Water use intensity	100	1.3	Opportunity for species-appropriate behaviour	100
2	Energy & Climate	90	1.4	Living conditions	100
2.1	Energy management	70	1.5	Animal health	100
2.2	Energy intensity of agricultural production	99	2	Water use	72
2.3	Greenhouse gas balance	100	2.1	Water management	15
3	Biodiversity	71	2.2	Water supply	100
3.1	Biodiversity management	100	2.3	Water use intensity	100
3.2	Ecological infrastructures	13	3	Working conditions	80
3.3	Distribution of ecological infrastructures	100	3.1	Personnel management	100

3.4	Intensity of agricultural production	100	3.2	Working hours	84
3.5	Diversity of agricultural production	44	3.3	Safety at work	98
4	Quality of life	50	3.4	Wage and income level	38
5	Economic viability	60	4	Quality of life	75
5.1	Liquidity	25	5	Economic viability	65
5.2	Profitability	50	5.1	Liquidity	75
5.3	Stability	75	5.2	Profitability	75
5.4	Indebtedness	50	5.3	Stability	75
5.5	Livelihood security	100	5.4	Indebtedness	50
			5.5	Livelihood security	50

Figure 1. Plant and Livestock Farm - Sustainability Assessment Polygon Diagram



The sustainability assessment results obtained using RISE 3.0 (Table I; Fig. 1) should be interpreted in relation to comparable studies conducted in Central and Eastern Europe, where climatic, edaphic, and socio-economic conditions are broadly similar. In Slovakia and neighboring countries (e.g., Poland, Czech Republic, Hungary), agriculture is characterized by relatively low soil fertility, higher soil acidity, increasing climate variability, and a historically shaped farm structure dominated by larger land blocks following collectivization in the second half of the 20th century (Hološková et al., 2025).

In this context, the high scores of the Plant Farm in Energy & Climate (90) and Biodiversity (71) (Table I; Fig. 1) are consistent with findings from Polish organic and low-input farms assessed with earlier versions of RISE. In the study of Berbeć et al. (2018) organic farms achieved higher median scores than conventional farms for biodiversity (67 vs. 56) and greenhouse gas balance (100 vs. 80), reflecting lower livestock density and diversified crop rotations. These similarities suggest that RISE captures comparable environmental mechanisms across different regional contexts. Studies from the Lublin province showed that organic farms typically perform better in biodiversity, greenhouse gas balance, and production intensity than conventional farms, largely due to reduced external inputs, diversified crop rotations, and higher soil organic matter (Pacini et al., 2003; de Olde et al., 2016). Similarly, the regenerative practices applied on the Plant Farm as no-till management, permanent soil cover, and avoidance of synthetic inputs are aligned with mechanisms identified in regional studies as key drivers of improved soil carbon content, water infiltration, and ecosystem services.

However, the moderate performance in Water Use (65) and low score in Economic Viability (60) observed for the Plant Farm (Table I) reflect challenges also reported in Central European organic and regenerative systems. In Berbeć et al. (2018), organic farms frequently achieved only medium scores for economic viability, reflecting structural income constraints rather than shortcomings in

farm management. Similarly, regional studies in Slovakia note that low-input systems face economic pressures due to yield gaps, market volatility, and limited price premiums (Palšová et al., 2014). These constraints are amplified by regional socio-economic factors, including underdeveloped organic markets and limited advisory support, particularly in Slovakia where regenerative agriculture currently covers less than 0.4 % of arable land (Pre pôdu, 2022).

The Livestock Farm's strong performance in Animal Husbandry (97) and Working Conditions (80) (Table I; Fig. 1) is consistent with findings from RISE-based assessments in Poland and Denmark, where family-run livestock farms often score highly on animal welfare and social indicators due to close farmer-animal interactions and lower stocking densities (Berbeć et al., 2018; de Olde et al., 2016). The Livestock Farm's strong performance in Animal Husbandry and Working Conditions is consistent with Berbeć et al. (2018), who found that both organic and conventional farms achieved high scores for animal husbandry indicators, including living conditions and animal health (89–97), despite differences in farm type and productivity. This supports the validity of RISE 3.0 for capturing social and animal welfare performance in small-scale family farms. At the same time, the weaker performance in Water Use (72) and moderate Economic Viability (65) mirrors regional trends identified in Polish and Slovak farms, where water management inefficiencies and income instability remain persistent issues despite relatively low production intensity.

3.3. SWOT analysis

To further respond to the practical advisory aim of sustainability assessment, the RISE 3.0 results (Table I; Fig. 1) were synthesized into a tailored SWOT analysis that integrates environmental, economic, and social dimensions.

3.3.1. Strengths

The strengths of both farms are primarily linked to innovation capacity and the provision of ecosystem services. The Plant Farm demonstrates strong climate mitigation potential through carbon sequestration, reduced input use, and biodiversity enhancement, which are widely recognized as key outcomes of regenerative and organic-oriented practices (Fedele et al., 2014; de Olde et al., 2016). These outcomes align with the objectives of the European Green Deal and the Common Agricultural Policy (CAP), which explicitly promote climate-smart agriculture and ecosystem service provision at the farm level (European Commission, 2021; Ortyl et al., 2024). The Livestock Farm's high performance in animal welfare and working conditions represents a significant social strength, consistent with findings that family-based livestock systems often achieve higher scores in social and animal-related sustainability indicators (de Olde et al., 2016). This is particularly relevant in the Central European context, where quality-of-life indicators in agriculture are frequently assessed as moderate or low (Palšová et al., 2014; Iakovidis, 2023).

3.3.2. Weaknesses

The main weaknesses identified through the RISE assessment are linked to climate dependence, workload intensity, and economic uncertainty. Both farms show vulnerabilities in water management, reflecting increasing exposure to drought and climate variability in Slovakia and neighboring countries (European Commission, 2021). Economic viability emerges as a structural weakness, especially for the regenerative crop system, supporting regional evidence that environmentally beneficial farming practices are not always sufficiently compensated through market mechanisms or existing subsidy schemes (Pacini et al., 2003; Palšová et al., 2014). Similar challenges related to income stability and labor demands have been reported in RISE-based assessments of organic and low-input farms in Central and Eastern Europe (de Olde et al., 2016; Berbeć et al., 2018).

3.3.3. Opportunities

Opportunities for both farms arise primarily from evolving policy and market frameworks. CAP 2023–2027 instruments, agri-environment-climate measures and emerging carbon farming initiatives provide opportunities for income diversification, particularly for farms delivering measurable environmental benefits (European Commission, 2023; Ortyl et al., 2024). In addition, the growing societal demand for biodiversity protection, low-input food production, and locally

embedded food systems strengthens the market position of farms adopting regenerative and sustainable practices (Bredemeier et al., 2022; European Commission, 2021).

3.3.4. Threats

Key threats include policy uncertainty, volatile input and output markets, and the absence of a dedicated legal and institutional framework for regenerative agriculture in Slovakia (Pre pôdu, 2022). Without targeted advisory services, adequate market support, and regionally adapted sustainability assessment tools, innovative farms risk remaining economically vulnerable despite strong environmental performance (de Olde et al., 2016; Iakovidis, 2023). These risks are amplified in post-socialist agricultural systems, where structural legacies and uneven access to knowledge and advisory networks continue to shape farm-level decision-making (Hološková et al., 2025).

The comparative interpretation of results confirms that RISE 3.0 is effective in identifying farm-level strengths and weaknesses, but its capacity for cross-system comparison remains limited. This limitation is particularly evident in regions like Slovakia, where crop and livestock systems coexist under similar climatic conditions but are embedded in distinct socio-economic and production contexts. Empirical applications of RISE demonstrate that the tool performs most robustly when applied to farms with comparable production structures and consistent thematic coverage, enabling meaningful benchmarking within rather than across production systems (de Olde et al., 2016; Rööse et al., 2019). Comparative reviews of sustainability assessment tools further emphasize that differences in tool design, indicator relevance, and system specificity constrain cross-system comparability, even within the same region (Marchand et al., 2014). The findings therefore support the development of modular or system-specific indicator sets, allowing RISE to better capture emerging practices such as regenerative agriculture while preserving comparability within farm categories. Such adaptation would enhance the tool's advisory value and its alignment with regional sustainability challenges, including soil degradation, biodiversity loss, and farmer income instability. The results confirm that RISE 3.0 is effective in identifying farm-level sustainability strengths and weaknesses, but its capacity for comparison across fundamentally different production systems remains limited. Although the tool provides a structured and holistic framework for sustainability assessment (Häni et al., 2003), the use of a fixed set of indicators constrains comparability when crop and livestock systems are assessed side by side.

This limitation is evident in the differing thematic coverage of the two case studies. Biodiversity-related indicators, such as ecological infrastructure, were central to the assessment of the regenerative crop farm but not applicable to the livestock farm, while animal welfare was a key dimension for the livestock system but absent from the crop farm assessment. As a result, the sustainability polygons reflect system-specific performance rather than directly comparable sustainability profiles. These findings support previous observations that RISE is best suited for within-system assessments rather than cross-sectoral benchmarking (de Olde et al., 2016; Rööse et al., 2019).

Additional challenges emerged in the evaluation of regenerative agriculture. Because RISE 3.0 does not explicitly distinguish regenerative systems, several indicators—developed primarily for conventional or organic farming—were difficult to interpret or only partially applicable. This highlights the need for sustainability assessment frameworks to evolve alongside emerging agricultural models that do not fully align with existing typologies.

From a methodological perspective, these results point toward the potential value of more flexible or modular indicator structures within RISE, allowing the tool to retain its holistic orientation while improving relevance for diverse farm systems. Such adaptability is consistent with findings that emphasize the importance of translating sustainability assessments into actionable, farm-specific recommendations (Priya et al., 2025). However, the effective uptake of assessment tools also depends on broader structural conditions, including access to knowledge, advisory support, and farmer motivation, as shown by Iakovidis (2023).

In the Slovak context, the integration of RISE 3.0 into advisory services or CAP-related sustainability measures could support family farms in identifying critical improvement areas. The incorporation of regional reference data already enhances the tool's relevance and farmer acceptance (de Olde et al., 2016). Nevertheless, without further methodological refinement, particularly regarding cross-system

comparability, there is a risk that sustainability assessments may reinforce rather than bridge differences between crop and livestock sectors.

Overall, the study confirms both research assumptions: RISE 3.0 successfully identifies farm-level sustainability strengths and weaknesses, while differences in production systems complicate direct comparison of sustainability scores due to the varying relevance of indicators across farm types.

5. Conclusions

The aim of this paper was to assess the sustainability performance of two-family farms in Slovakia using the RISE 3.0 assessment tool and to explore its applicability for evaluating contrasting production systems. The results confirm that RISE 3.0 effectively identifies farm-level sustainability strengths and weaknesses across environmental, economic, and social dimensions, supporting its role as a structured advisory tool for guiding farm-level improvements.

However, the very limited sample size precludes statistical generalization of the findings. The results should therefore be interpreted as exploratory and analytical, illustrating how RISE 3.0 performs across contrasting production systems rather than representing broader sectoral trends. Within this scope, the assessment revealed methodological limitations in using RISE 3.0 for direct cross-system comparison, as differences in thematic coverage and indicator relevance constrain comparability between crop- and livestock-based farms.

More broadly, the study highlights the trade-off between standardized sustainability assessment and the need to reflect system-specific and emerging agricultural practices. Greater flexibility, such as modular indicator structures, could enhance the capacity of RISE 3.0 to accommodate diverse farming models while maintaining its holistic framework. For policy and practice, RISE 3.0 shows potential as a support tool for advisory services and CAP-related sustainability measures, particularly when combined with regional reference data. Future research should build on these exploratory findings by applying RISE 3.0 to larger and more diverse farm samples and by combining quantitative assessments with qualitative insights to strengthen both comparability and practical relevance.

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Data availability statement: The data presented in this study are openly available.

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