https://doi.org/10.17221/479/2024-AGRICECON

Perception of resilience and its determinants with a focus on farm size: The case of agricultural enterprises in the Czech Republic

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Citation: Svobodová I., Šimpachová Pechrová M., Takáč M. (2025): Perception of resilience and its determinants with a focus on farm size: The case of agricultural enterprises in the Czech Republic. Agric. Econ. - Czech, 71: 458–474.

Abstract: The aim of the paper is to examine the resilience of Czech agricultural enterprises through the perceptions of farm managers and to assess the areas where these businesses perceive themselves as resilient and where they feel vulnerable. The analysis is based on data from a survey conducted by the Institute of Agricultural Economics and Information (IAEI) in June 2022, involving 521 Czech agricultural managers. The study focuses on six key areas: climate change and its impacts, agricultural inputs, labour force, market outlets, land prices and availability, and changes in the Common Agricultural Policy (CAP). Across all areas, managers reported that businesses were more frequently vulnerable than resilient, particularly in relation to agricultural inputs and climate change. The results also highlight differences in the perception of resilience across enterprises of varying sizes, with significant variation noted in how changes to the CAP were viewed. Contrary to the common belief that larger enterprises are more resilient, the survey found that Czech medium-sized and large enterprises (with 200 hectares or more of agricultural land) were more frequently perceived as vulnerable.

Keywords: determinants of resilience; farm; farmers' perception; resilience; vulnerability

The topic of business resilience typically gains prominence during times of unpredictable change (Meuwissen 2019; Buitenhuis et al. 2022; Hudecová and Rajčániová 2023), within chaotic business environments where companies must constantly overcome new challenges to remain competitive and survive (Do et al. 2022). Agricultural entrepreneurship has always been inherently considered high-risk (Jankelová et al. 2017), with farmers frequently facing a wide range of external challenges. These include production, market, institutional, personal, and financial pressures, often acting simultaneously and exerting varying degrees of influence on agricultural enterprises (Komarek et al. 2020).

Corporate resilience can generally be understood as the ability to withstand external influences – whether natural, economic, or social – to adapt to them and continue operating (Walker et al. 2006; Folke et al. 2010; Herman et al. 2011; Darnhofer 2014; Johnson et al. 2017; Slijper et al. 2022). This resilience may depend on internal factors within the enterprise, such as farm size, the focus of agricultural activities, workforce, financial health, and technological advancement, as well as external factors like government support, subsidy policies, input availability and costs, agricultural commodity markets, labour markets, purchasing power, business climate, and even global events such

Supported by the Ministry of Agriculture of the Czech Republic, internal research Project (No. 1272/2024) of the Institute of Agricultural Economics and Information.

https://doi.org/10.17221/479/2024-AGRICECON

as pandemics. Additionally, relationships between businesses or between businesses and the state – such as partnerships with the banking sector, trust between enterprises, access to information, and involvement in social networks – can significantly contribute to resilience (Faherty et al. 2021; Labeyrie et al. 2024).

The concept of resilience has gained prominence in the political agenda of the European Union (EU), becoming a guiding principle for the reform of the EU's Common Agricultural Policy post-2020. Since around 2015, this concept has been widely adopted in both academic and policy discussions concerning the EU's agricultural sector and its capacity to manage current and future shocks and stresses (Buitenhuis et al. 2020).

The resilience of agricultural enterprises can be studied both in terms of assessing resilience attributes as farm characteristics at a given time (e.g. Biggs et al. 2012; Cabell and Oelofse 2012; Kerner and Thomas 2014; Worstell and Green 2017; Meuwissen et al. 2019; Feindt et al. 2022), and in terms of the dynamics or process in which robustness, adaptability, and transformability are key factors (Darnhofer et al. 2010; Ashkenazy et al. 2018; Daugstad 2019). A comprehensive framework for assessing the resilience of European agricultural systems is offered by Meuwissen et al. (2019), who describe an approach based on evaluating both resilience attributes and capacities.

As practice and previous research have shown (Carpenter et al. 2001; Cumming et al. 2005; Alexander and Pescaroli 2019), the concept of resilience is rather ambiguous, unstable, abstract, multidimensional, and context-dependent, raising questions about how policymakers and farmers themselves understand and perceive resilience and vulnerability, and how these perceptions influence the design and implementation of policies aimed at strengthening resilience. It is important to note that while the English literature distinguishes between two concepts – 'resistance', which refers to the ability to withstand incoming challenges or risks, and 'resilience', which refers to the capacity to adapt to these changes – these terms tend to converge in the Czech context (the Czech term 'odolnost' does not differentiate between 'resistance' and 'resilience'). Additionally, the concept of resilience in Czech usage often overlaps with other commonly used terms such as viability (referring to a business's ability to thrive in the long term, see Hlavsa et al. (2017) for further details), stability (the capacity to maintain operations, performance, supply chain relationships etc.), and sustainability, which also implies the long-term functioning of an entity without adverse impacts on the environment and society. As a result, cross-country comparisons of perceived resilience may be complicated not only by contextual factors such as different time frames, farm structures, or geographic conditions, but also by differences in how the very concept of resilience is understood and interpreted across linguistic and cultural contexts.

Due to the inherent complexity of resilience and vulnerability concepts, researchers face significant challenges in measuring these phenomena, acknowledging that they are difficult to directly observe or quantify using a single indicator or by merely examining different attributes of a business (Meuwissen et al. 2019). A key issue is capturing the processes of adaptation and adjustment to emerging challenges, which would benefit from repeated surveys of the studied businesses (as attempted, for example, by Do et al. (2022), through a three-wave data collection to examine the dynamics of resilience and innovation over time among Vietnamese small- and medium-sized enterprises). Moreover, vulnerability tends to manifest most clearly during the occurrence of threats.

In light of these challenges, one effective approach to studying business resilience, particularly in social, economic, or environmental contexts, lies in the perception of resilience, which forms the basis of this paper. We examine the resilience in general as the ability to withstand external influences without targeting a specific risk similarly as in the study of Slijper et al. (2022).

Literature review. The aim of this paper is to examine the resilience of Czech agricultural enterprises based on the perceptions of farm managers collected in the IAEI Survey (2022), and to assess differences in their views regarding the resilience or vulnerability of their businesses across six preselected areas (broadly defined dimensions of resilience): climate change, workforce availability, rising material input costs, land availability and prices, market access, and changes in agricultural policy (CAP). Most existing studies tend to focus either on a single challenge and its consequences – such as climate change (Reidsma et al. 2008), the Covid-19 pandemic (Feindt et al. 2022), or disruptions in input supply chains (Pinsard and Accatino 2023) – or on specific farm types, such as French organic dairy farms (Perrin et al. 2020b). We assess how resilience is perceived across different farm types, focusing on their size and production orientation (i.e. predominance of arable land or grassland, presence of livestock production, organic farming).

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Farm size is widely recognised as one of the key factors influencing farm resilience (Borychowski et al. 2020; Slijper et al. 2021). Larger farms are often perceived as economically more resilient due to better access to capital, modern technologies, and opportunities for income diversification. These factors can enhance their ability to withstand economic shocks or adapt to market fluctuations. However, this type of economic resilience does not necessarily translate into other dimensions of resilience, such as social or community resilience, where smaller farms may demonstrate comparative strengths. Moreover, the relationship between farm size and resilience may vary across different EU countries, depending on national policies, structural characteristics of the agricultural sector, and historical development patterns (Antón and Sauer 2021). Given the long-standing and strongly polarised ideological divide between the Czech agricultural community and the general public concerning the merits of small versus large farms (Svobodová et al. 2023), our study specifically investigates how resilience is perceived across farms of different sizes. We distinguish size based on both the total farmland area and the number of employees.

In terms of production orientation, mixed farms combining both crop and livestock production are generally considered more resilient, sustainable or flexible, as they are less vulnerable to commodity price fluctuations and environmental shocks and are often more self-sufficient in feed supply. This type of diversification has been highlighted as beneficial in the context of both climate-related risks and income stability (Lin 2011; Kharrazi et al. 2020).

In contrast to some authors (e.g. Borychowski et al. 2020; Spiegel et al. 2021; Prat-Benhamou et al. 2024), we exclude sociodemographic characteristics of the respondents, such as gender, age, level of education, or years of experience in agriculture, as well as farmers' personal resilience (e.g. optimism or ability to respond to challenges) from our analysis of perceived farm resilience. Nevertheless, it is acknowledged that these factors may play a role in shaping how resilience is perceived in particular contexts. For example, the respondent's gender may influence the perception of resilience in the context of climate change, with women generally considered more sensitive to its impacts (Bush and Clayton 2023). The level of education may affect not only how risks and uncertainties are perceived but also the ability to adapt to change. Age may also play a role in the evaluation of the CAP, as older generations tend to be more Eurosceptic, as demonstrated by the findings of a 2020 study on Czech public attitudes toward the CAP and farmers (Svobodová et al. 2023). Spiegel et al. (2021) suggest that farmers who perceived the resilience capacities above regional means were younger.

In addition to these more individual-level aspects, other studies have explored less tangible factors that contribute to resilience. For example, an extensive study by Feindt et al. (2022) confirmed that diversity, openness, adequate feedback mechanisms, system reserves, and modularity of agricultural holdings across the EU are relevant predictors of resilience. Likewise, Speigel et al. (2021) found that farmers who perceived their resilience to be above regional averages were characterised by lower risk aversion, a stronger focus on the provision of public goods, a higher number of implemented risk management strategies, greater involvement in networks, and a higher openness to innovation.

In line with Perrin et al. (2020a) we use farmers' perceptions, to assess the subjective resilience of farms to multiple disturbances. They developed an original method based on the postulation that stable or increasing well-being of farmers, which is visible through their satisfaction, would demonstrate subjective resilience of farms in a holistic way. The approach based on subjective assessment of the managers provides valuable insight to the decision-making processes on the farm.

Context. Since research into the perception of farm resilience is inherently shaped by the temporal and environmental context in which it is conducted, we briefly outline several key circumstances relevant to the Czech Republic in 2022. The events that unfolded during this year may have influenced how the resilience of agricultural enterprises was perceived. Although meteorological conditions in 2022 were relatively unremarkable (MoA 2023), other developments made the year exceptional. By early 2022, the Czech economy had already been strained by two years of the pandemic, with inflation accelerating markedly over several months. The final state of emergency, declared in response to the worsening Covid-19 situation, was lifted on December 25, 2021.

Labour market data indicate a gradual deceleration of economic activity, evidenced by a progressive decline in the job vacancy rate within the national economy since 2019 (CZSO 2024). The outbreak of the war in Ukraine in early 2022 had a significant impact (an emergency state was declared from March 4 to the end of June 2022 in response to the migration wave). Inflation surged, and job opportunities decreased at an accelerated pace. The first half of the

https://doi.org/10.17221/479/2024-AGRICECON

year was characterised by uncertainty regarding future developments, which was reflected in declining business and consumer confidence. By the time our survey among farmers was conducted, in mid-2022, both business and consumer confidence had reached record low levels, with a historically high number of respondents expecting a worsening of their financial situation in the near future (CZSO 2022). The society was in a crisis period that, according to ongoing findings, was in many respects more pronounced than most previous crises since 1989, with a significant drop in assessments of societal development (STEM 2023). In many areas of public life, including agriculture, there was a decline in public satisfaction between 2021 and 2022 and the proportion of residents who considered the overall direction of development in the Czech Republic to be incorrect increased significantly (CVVM 2023).

The year 2022 in the Czech Republic was characterised by record inflation, with the average annual inflation rate reaching 15.1% (CZSO 2023), and agricultural input prices increasing by 24% year-on-year (MoA 2023). For farmers, 2022 was also exceptional due to the planned changes to the CAP for the period 2023–2027. During 2022, the Strategic Plan was being finalised, which notably revised the conditions for redistributive payment (higher payment for the first hectares up to 150 ha). Due to the nature of the planned changes, this reform was expected to differentially impact agricultural enterprises based on their total farmed area, with a more significant financial impact on larger enterprises.

MATERIAL AND METHODS

The paper introduces an examination of the perception of resilience in Czech agricultural enterprises, utilising data obtained through a survey 'Resilience of Agricultural Enterprises in Crisis Periods' conducted between May and July 2022 by the Institute of Agricultural Economics and Information (IAEI Survey 2022). The research employed an online platform SURVIO for data collection, distributing survey links and accompanying letters through local Agrarian chamber (in Czech 'Agrární komora České republiky') and other agricultural bodies representing their members.

The total sample of agricultural enterprises' responses consisted of 521 entities from various regions of the Czech Republic and with diverse focuses, covering a wide range of sizes according to managed land area and legal forms of business (see Figure 1). In total, the enterprises in the survey managed just under 450 000 ha, representing approx. 13% of the cultivated agricultural land in the Czech Republic (more specifically, 14.3% of arable land, 11.2% of vineyards, orchards, and hop gardens, and 9.2% of permanent grassland in the country), and employed 13.5%

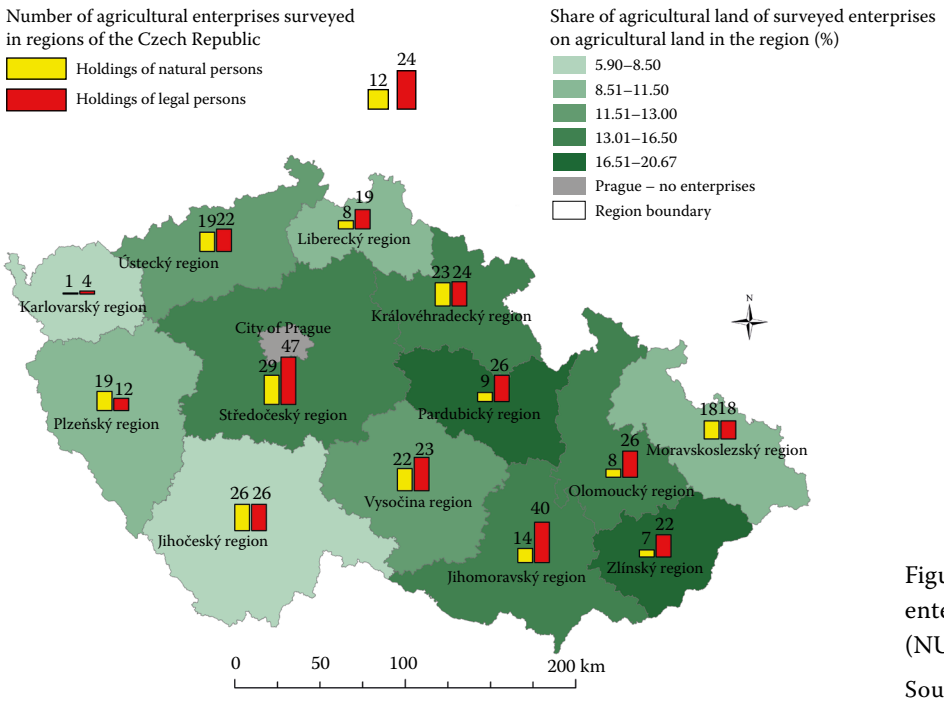

Figure 1. Number of agricultural enterprises surveyed in regions (NUTS 3) of the Czech Republic

Source: IAEI Survey 2022

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of workers (compared to data from the Report on the State of Agriculture in the Czech Republic for 2022). Of the respondents, 15.7% operated fully under the organic farming regime. A third of the enterprises were located, at least partially, in Areas with Natural Constraints (ANC) areas with natural disadvantages. The most common focus of livestock production was on cattle, dairy cows, and pigs (see Table 1).

The sample was predominantly composed of legal entities (61.0%) rather than individuals, although nationwide, there is a significant majority of individual enterprises (85.3%), which, however, manage only 29.8% of agricultural land (CZSO 2021). The average utilised agricultural area pear holding was also significantly higher at 974.5 ha compared to 121 ha (CZSO 2021). A total of 60 enterprises (11.5%) utilised no agricultural land at all, focusing solely on livestock production, while 22.1% of enterprises engaged exclusively in crop production. The majority of enterprises (66.4%) had mixed production.

Although the sample was not representative of the entire group of agricultural entities in the Czech Republic – medium and larger enterprises, mixed-production farms, and legal entities were more prominently represented among respondents – the diverse composition of respondents in terms of size, region, and production (see Figure 1 for livestock production) allows us to highlight the perception of selected issues among different types of farms.

The survey was designed to be relatively comprehensive, comprising 36 groups of questions (with over 100 variables), primarily closed-ended. The first group of determinants focused on business characteristics, specifically:

i) the legal form (natural person/legal entity) and size of the enterprise (based on agricultural land area and number of employees). The second category of determinants addressed production characteristics,

ii) whether the enterprise primarily managed arable land or permanent crops or permanent grasslands, whether it engaged in crop or livestock production, whether it practiced conventional or organic farming, and whether it operated in areas with natural constraints.

Information was also gathered on land use (arable land, permanent crops – vineyards, orchards, and hop fields, permanent grasslands), production focus (crop/livestock), and labour force. Statistical description of the determinants can be found in Table 2.

The data were initially described using descriptive statistical methods (statistical data classification, meas-

Table 1. Statistical description of main characteristics of agricultural enterprises in the IAEI survey (n = 521)

Characteristics	Option/statistics	Values
Region (%)	Středočeský	14.6
	Jihočeský	10.0
	Plzeňský	6.0
	Karlovarský	0.8
	Ústecký	7.9
	Liberecký	5.2
	Královéhradecký	9.0
	Pardubický	6.7
	Vysočina	10.6
	Jihomoravský	10.4
	Olomoucký	6.5
	Zlínský	5.6
	Moravskoslezský	6.9
Legal form (%)	natural person	39.0
	legal person	61.0
Number of employees	total	12 312
	minimum	1
	median	14
	average	28
	maximum	317
Agricultural land area (ha)	total	449 232.0
	minimum	0.5
	median	620.0
	average	974.5
	maximum	6 500.0
Vineyards, orchards, hop-gardens (ha)	total	4 315.8
	minimum	0.0
	median	0.0
	average	9.4
	maximum	610.0
Organic farming on arable land (%)	fully organic	15.7
	fully conventional	64.5
	both	4.6
	no arable land	3.6
	no crop production	11.5
Production (%)	no crop	11.5
	no livestock	22.1
	both	66.4
Arable land area (ha)	total	353 521.5
	minimum	0.0
	median	390.0
	average	766.9
	maximum	5700.0
Permanent grassland (ha)	total	90 201.5
	minimum	0.0
	median	62.0
	average	195.7
	maximum	1 750.0
ANC categories (%)	fully in ANC	23.8
	partly in ANC	34.4
	outside of ANC	30.3
	no crop production	11.5

ANC – Areas with Natural Constraints
Source: Own elaboration

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Table 2. Detailed statistical description of the determinants of vulnerability (n = 521)

Determinant	Option	Number of enterprises	Share of enterprises (%)
Legal form	physical person	203	39.0
	legal person	318	61.0
Size category (land)	without crop production (0 ha)	60	11.5
	0.1–49.9 ha	63	12.1
	50–199.9 ha	91	17.5
	200–499.9 ha	59	11.3
	500–999.9 ha	79	15.2
	1 000–1 999.9 ha	104	20.0
	2 000 and more ha	65	12.5
Size category (workers)	0 workers	82	15.7
	1–4 workers	130	25.0
	5–9 workers	56	10.7
	10–49 workers	175	33.6
	50 and more workers	78	15.0
Predominance of arable land	yes	332	63.7
	no	129	24.8
	not available (without crop production)	60	11.5
Predominance of permanent grasslands	yes	101	19.4
	no	360	69.1
	not available (without crop production)	60	11.5
Presence of crop production	yes	461	88.5
	no	60	11.5
Presence of livestock production	yes	406	77.9
	no	109	20.9
	no, but plan to start	6	1.2
Organic *vs.* conventional agriculture	exclusively organic	82	15.7
	exclusively conventional	336	64.5
	both	24	4.6
	without arable land	19	3.6
	not available (without crop production)	60	11.5
ANC area	out of ANC	158	30.3
	partly in ANC	179	34.4
	fully in ANC	124	23.8
	not available (without crop production)	60	11.5

ANC – Areas with Natural Constraints
Source: IAEI Survey 2022

ures of central tendency – arithmetic mean, median). This was followed by dependency analysis in contingency tables. The objective was to examine whether the absolute frequencies of occurrence for the response categories rather 'vulnerable', 'very vulnerable', 'rather resilient', and 'very resilient' were dependent on certain qualitative variables. Due to the low absolute frequency of responses in the categories 'very resilient' and 'rather resilient' regarding vulnerability to climate change, input areas, and production output, these two categories of resilience were combined into a single category – 'resilient' – for the purposes of further analysis.

The paper presents the results reflecting managers' perspectives on the resilience or vulnerability of their

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businesses in 2022 in these areas: climate change and its impacts (drought, disease occurrence etc.), input sector of agriculture (availability and prices of fertilisers, non-energy inputs, fuels etc.), labour force sector (shortage, insufficient qualifications etc.), agricultural product market (market opportunities, prices), land (availability, price, leasing), and the CAP framework post-2023 (direct payments etc.).

When interpreting the results, we must consider that while the test in contingency tables identifies which qualitative variables are dependent on each other, it does not indicate the direction of dependency. First, the actual (empirical/observed) absolute frequencies of the occurrence of different combinations of variables are determined and organised into a contingency table. These frequencies are then compared with the theoretical (calculated) absolute frequencies, i.e. the frequencies that the variables would exhibit if they were independent. The null hypothesis of the χ^2 goodness-of-fit test states that the variables are independent. The alternative hypothesis asserts that the variables are dependent.

The test statistic G is calculated as the sum of the squared deviations between the empirical (n_{ij}) and theoretical frequencies (n'_{ij}), divided by the theoretical frequency. The sum across all rows and columns gives the test statistic G, which approximately follows a χ^2 distribution. The tabulated value of the χ^2 distribution corresponds to a probability of $1 - \alpha$, and the degrees of freedom are calculated as the product of the number of rows minus one and the number of columns minus one.

$$G = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(n_{ij} - n'_{ij})^2}{n'_{ij}} \quad (1)$$

where: r (i = 1, ... r) – the number of rows; c (j = 1, ... c) – the number of columns.

If the test statistic exceeds the tabulated value, the result falls in the critical region, and we reject the null hypothesis in favour of the alternative hypothesis, concluding that the qualitative variables are dependent. The significance level α of 0.05 was used for the test.

If the qualitative variables are dependent, it is appropriate to measure the strength of their dependency using a contingency coefficient. Cramér's V coefficient was chosen, which ranges from 0 to 1 (and can thus be interpreted as a percentage from 0% to 100%). The closer the value is to 1 (100%), the stronger the dependency.

$$V = \sqrt{\frac{G}{n(m-1)}} \quad (2)$$

where: m – min (r, c), which is the smaller of the number of rows or columns; n – the number of observations a.

The strength of the dependency was interpreted as follows as the values of Cramér's V were generally low:

i) Below 0.2: very weak dependency,

ii) 0.2–0.4: weak dependency,

iii) Above 0.4: moderate dependency.

RESULTS AND DISCUSSION

The surveyed agricultural enterprises generally perceived themselves as more vulnerable than resilient across all assessed areas, as illustrated in Figure 2.

When assessing the observed frequencies of declared corporate resilience or, conversely, vulnerability, a large group consisted of 188 enterprises (36% of those surveyed), whose managers perceived their companies as vulnerable across all six assessed areas (indicating responses of 'rather vulnerable' or 'very vulnerable'). Among them, 31 companies (just under 6% of those surveyed) reported being very vulnerable in all these areas. In contrast, the group of resilient enterprises (rated as 'rather resilient' or 'very resilient' in all areas) comprised only 17 agricultural entities. Across the entire sample of 521 enterprises, not a single entity declared itself as very resilient in all the areas.

As for the assessment of individual areas, the majority of agricultural managers (84.6%) considered their enterprises vulnerable to fluctuations in the availability and cost of key inputs such as fertilisers, feed, energy, and fuels. This is not a surprising result, as rising input costs significantly impact farmers' profitability and competitiveness. According to the Summary Report 2022 (MoA 2023), the prices of fertilisers increased by 85%, feed by 18%, and plant protection products by up to 10% (depending on the product type) year-on-year (2022 compared to 2021). However, there was also an increase in the prices of agricultural commodities, which offset the impact of rising input costs.

A very similar high proportion of farm leaders (84.1%) expressed concerns about future threats posed by climate change and its impacts, such as atypical temperature and precipitation patterns, disease outbreaks, and other associated risks. This represents a substantial challenge for agricultural enterprises, which must develop and implement

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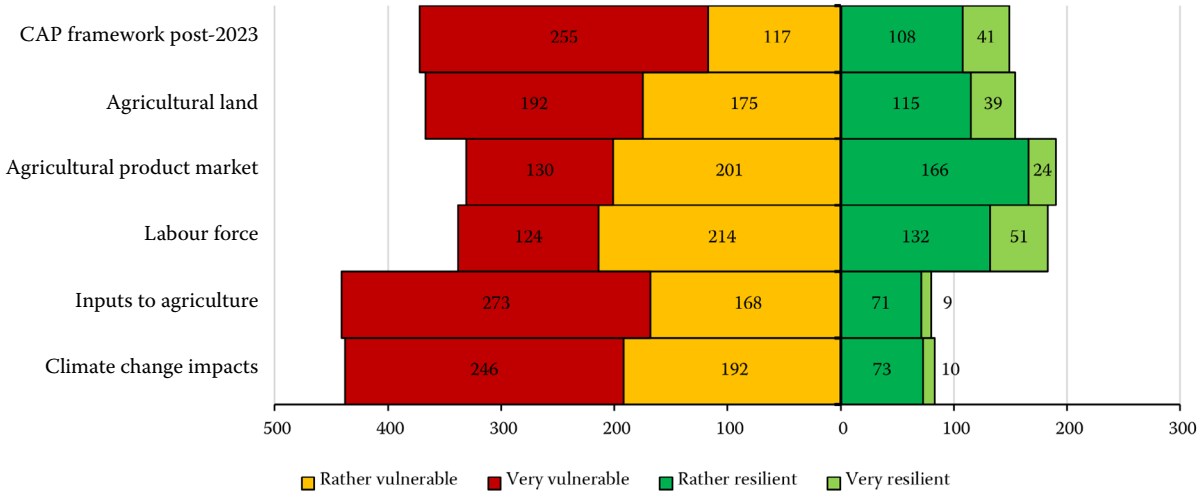

Figure 2. Perception of resilience and vulnerability of agricultural enterprises in different areas

CAP – common agricultural policy
Source: Survey: Resilience of Agricultural Enterprises in Crisis Periods, IAEI 2022

adaptive strategies to mitigate climate-related risks. Climate change is perceived as a frequent and pressing threat by Czech farmers, and it can be reasonably excluded that the responses were affected by any anomalous meteorological events in 2022, as previously noted. Czech agricultural leaders acknowledge the seriousness of climate change considerably more often than the Czech population at large, who – compared to the EU average – tend to perceive it as a major problem far less frequently (in 2023, 77% of EU citizens considered climate change a very serious issue, compared to only 48% of Czech respondents; Eurobarometer 2023).

Over 70% of agricultural managers (71.4%) also viewed their enterprises as vulnerable to changes in the structure of CAP after 2023. Given that the CAP's rules significantly influence farmers' decisions and practices, policy changes necessitate adaptive responses from agricultural enterprises.

Additionally, over 70% of respondents (70.4%) reported feeling vulnerable in the land market due to factors such as limited availability of farmland and the need to rent or purchase land. While land availability is a primary concern for Czech farmers, discussions in other parts of the world often centre around soil quality rather than availability.

Enterprises were relatively less vulnerable in the area of labour (shortages or low skill levels) (64.9%) and in the agricultural product market (product sales, availability and pricing) (63.5%). Although labour-related vulnerabilities were reported less frequently than in other areas, the share of enterprises facing difficulties in securing necessary labour remains significant in the European context. The Czech Republic has long been characterised by the largest average farm size in the EU, reflected in a high share of employees (more often full-time) and a lower share of family labour. Although overall labour demand has been gradually declining due to technological advancements, demand for manual workers remains high. Persistent wage disparities – agricultural wages being about 80% of those in industry – further complicate labour recruitment (MoA 2023).

The individual areas of vulnerability (or resilience, respectively) showed statistically significant moderate correlations; that is, if an enterprise was vulnerable in one area, it was likely to be vulnerable in another, and the other way round, if it was resilient in one area, it tended to be resilient in another.

Determinants of resilience

We investigate the relationship between managerial responses and two key categories of resilience determinants (Table 2). The first category encompasses fundamental enterprise characteristics, specifically the business's legal structure (individual or legal entity) and its size, measured by agricultural land area and employee count. The second category focuses on production characteristics, including whether arable land or permanent grassland is predominant, the orientation of production (crop versus livestock), the farming system (conventional or organic),

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and the classification of the enterprises within areas with natural constraints.

***i*) Basic enterprise characteristics**

Legal form. The study examined whether perceived resilience depends on the legal form of the enterprise, which was confirmed across all analysed areas. In every case, a higher proportion of Czech legal entities reported vulnerability in these areas compared to natural persons. A particularly notable difference is evident in the area of CAP, where 87.7% of legal entities consider themselves very or rather vulnerable, compared to only 45.8% of natural persons. A significant difference is also observed in the area of workforce. Of the total 17 enterprises declaring resilience in all of the specified areas, 15 were individual (natural person) enterprises.

The reasons why legal entities perceive higher vulnerability are not directly explored in the literature, as farm-level analyses often focus on other explanatory factors. However, these differences can be inferred from structural characteristics distinguishing legal entities from individual (natural person) farms. In the Czech Republic legal entities tend to manage larger areas, rely more heavily on rented land, and show stronger dependence on CAP payments. They are subject to more complex administrative procedures and are thus more exposed to changes in agricultural policy. In addition, they generally employ more workers, which increases their sensitivity to labour market pressures. Compared to individual farms, their lower operational flexibility may limit their ability to promptly respond to shifts in policy or market conditions.

Farm size. The perception of resilience in Czech agricultural enterprises depended on the size of the enterprise based on the area of cultivated agricultural land in most of the analysed areas (see Figure 3). An exception was the area of sales, where medium-sized enterprises (200–2 000 ha) considered themselves the most vulnerable. This may stem from difficulties in directly marketing agricultural products exclusively to local markets, reliance on intermediaries, and lower bargaining power, as well as increased sensitivity to seasonal production fluctuations due to limited storage capacity. Czech enterprises managing more than 2 000 ha of land generally considered themselves the most vulnerable in most areas, with the exception of sales, as previously mentioned, and concerns about business succession or transfer, which were more common in smaller entities. Concerns about the new CAP rules may have had a significant impact on the threat perception in other areas for larger businesses, as the introduction of redistributive payments meant a significant drop in their overall income. Larger enterprises also tend to be larger employers, where concerns about labour shortages are more common. In cases of production issues, fears of layoffs and other financial impacts on the enterprise are natural. Another reason for these perceptions could be that larger enterprises often have more developed risk management strategies, with risks more precisely defined, leading to greater awareness and less likelihood of underestimating them. Among the entities surveyed that described themselves as resilient in all areas, none cultivated more than 1 000 ha of agricultural land.

Contrary to Spiegel et al. (2021), who found that larger farms tended to perceive above-average resilience capacities within their regions, findings from the Czech Republic suggest the opposite. Borychowski et al. (2020) observed a positive correlation between the utilised agricultural area and socio-economic sustainability in Moldova and Poland, but a negative one in Lithuania and Serbia. These inconsistencies suggest that additional structural and contextual factors also influence the relationship between farm size and perceived resilience.

When measuring business size by the number of employees, perceived business vulnerability in all addressed areas is also dependent on size (see Figure 4). The strongest dependence was observed in the case of vulnerability to changes in the CAP. Larger enterprises (with more than 50 employees) reported feeling very vulnerable significantly more often than smaller firms (employing 1 to 4 workers). A moderate dependence was also identified in the labour-related area, where, as expected, firms employing more workers perceived greater vulnerability in acquiring and managing their workforce. This is in line with the findings of Feindt et al. (2022) who indicated that family labour enhances general resilience to the degree that it comes with the necessary skills. In this context, family farms may perceive themselves as less vulnerable due to their ability to mobilise internal labour resources. While a family farm does not necessarily imply a small-scale operation in the Czech Republic, the underlying mechanism appears applicable to this setting.

***ii*) Production characteristics**

Predominance of arable land. The results confirmed that when arable land, involving intensive cultivation, predominated within the agricultural area

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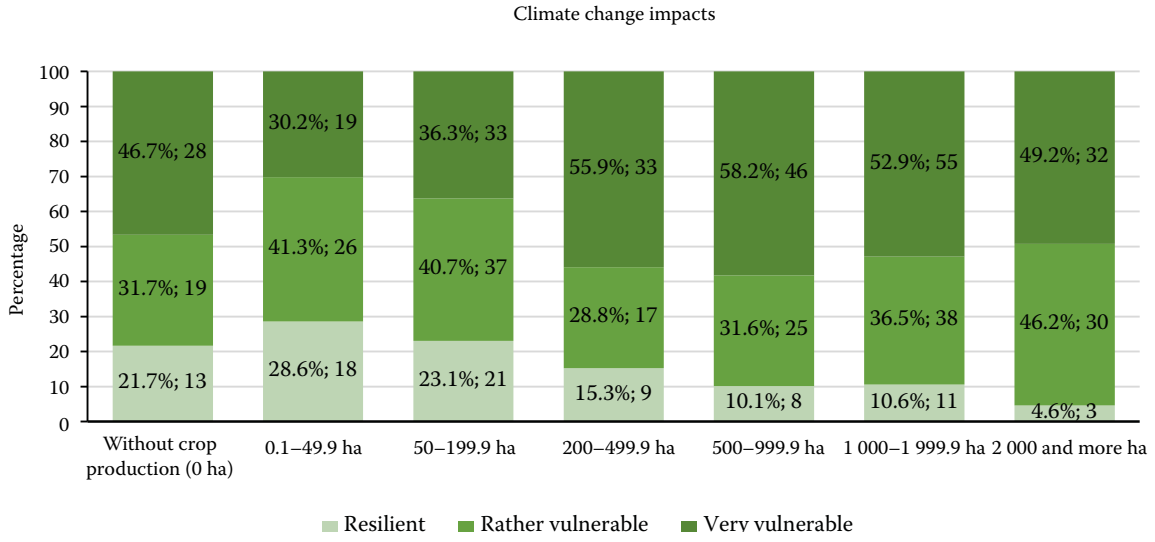

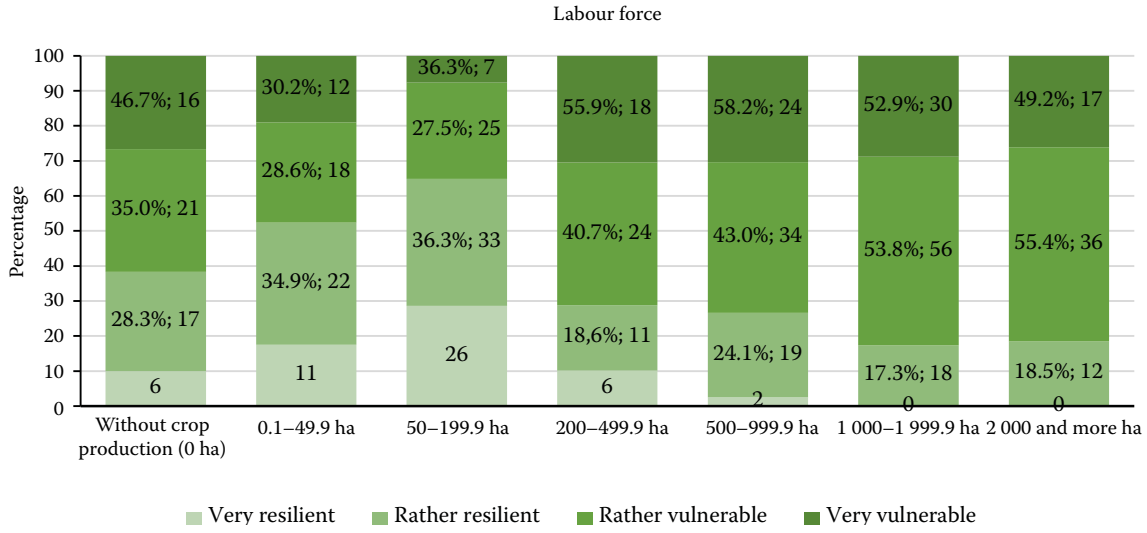

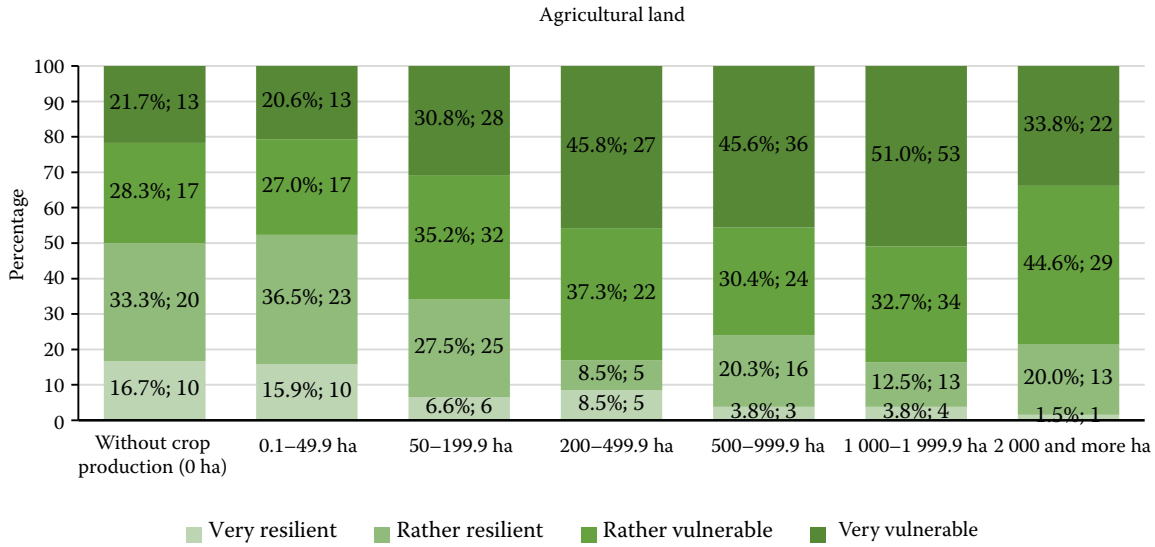

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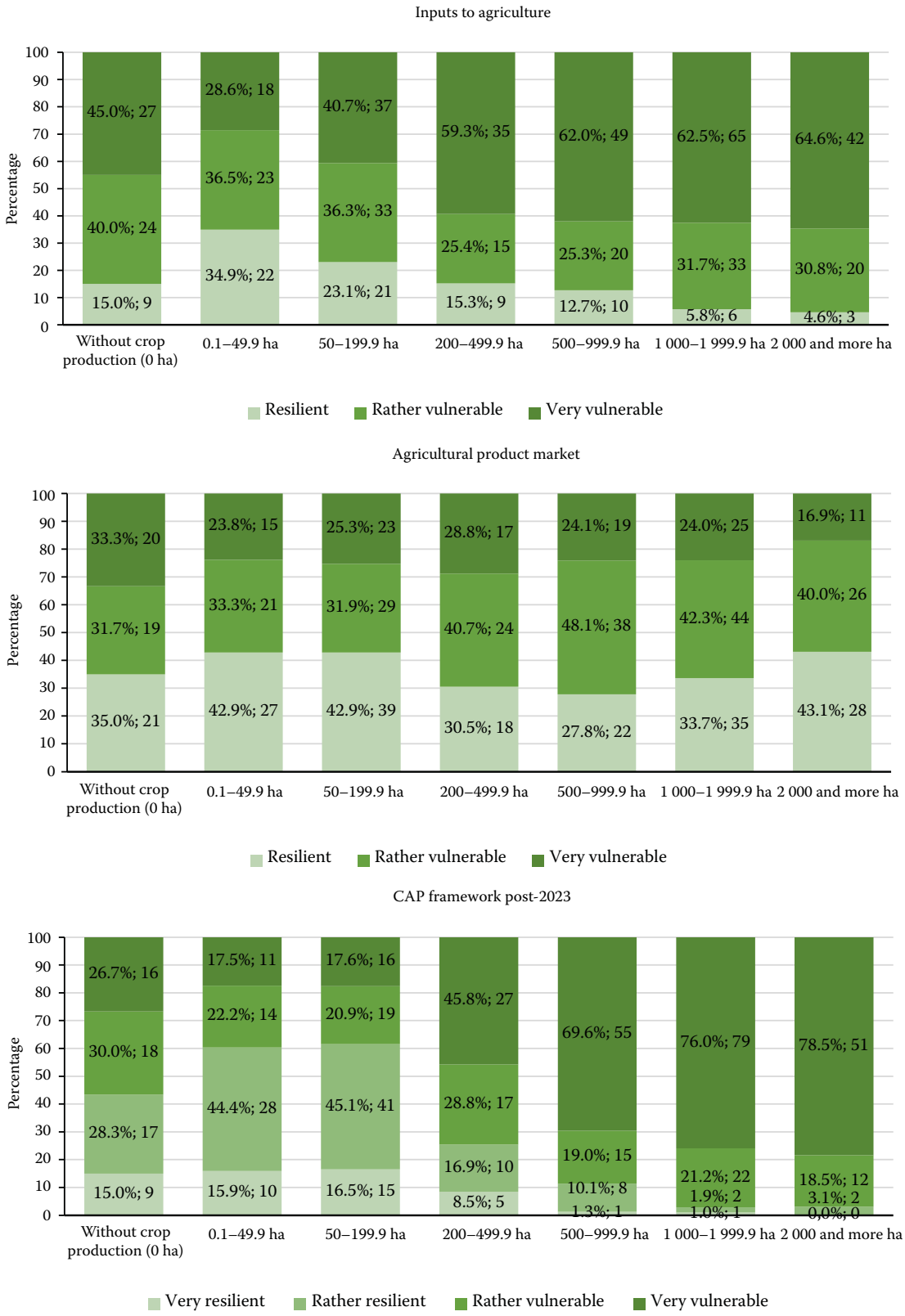

Figure 3. Relationship between the size category (based on agricultural land area) and the resilience of agricultural enterprises.

CAP – common agricultural policy
Source: Own elaboration

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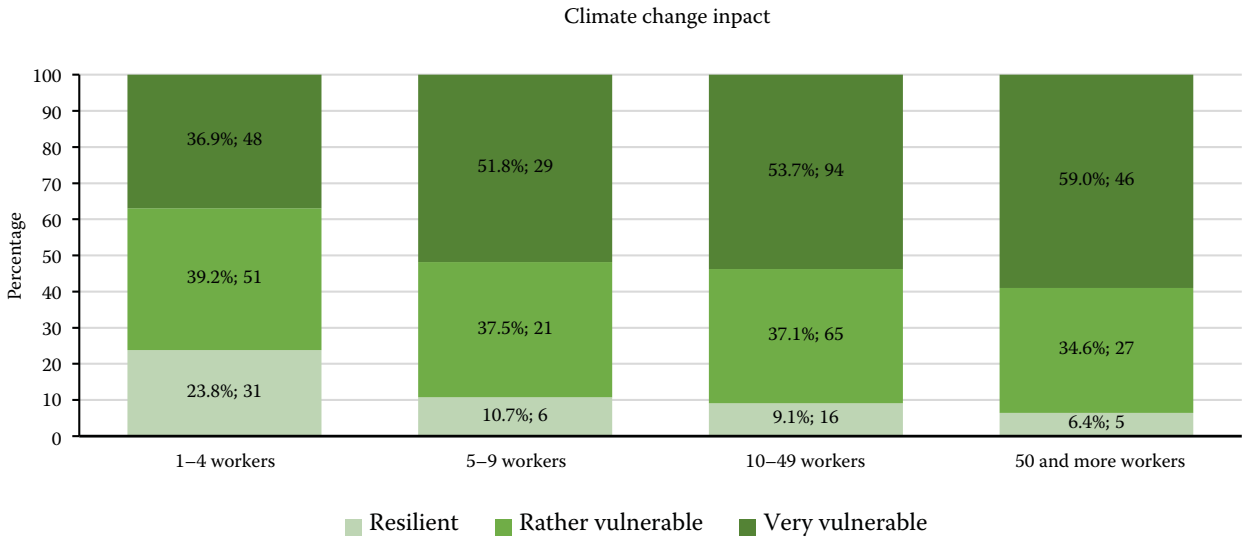

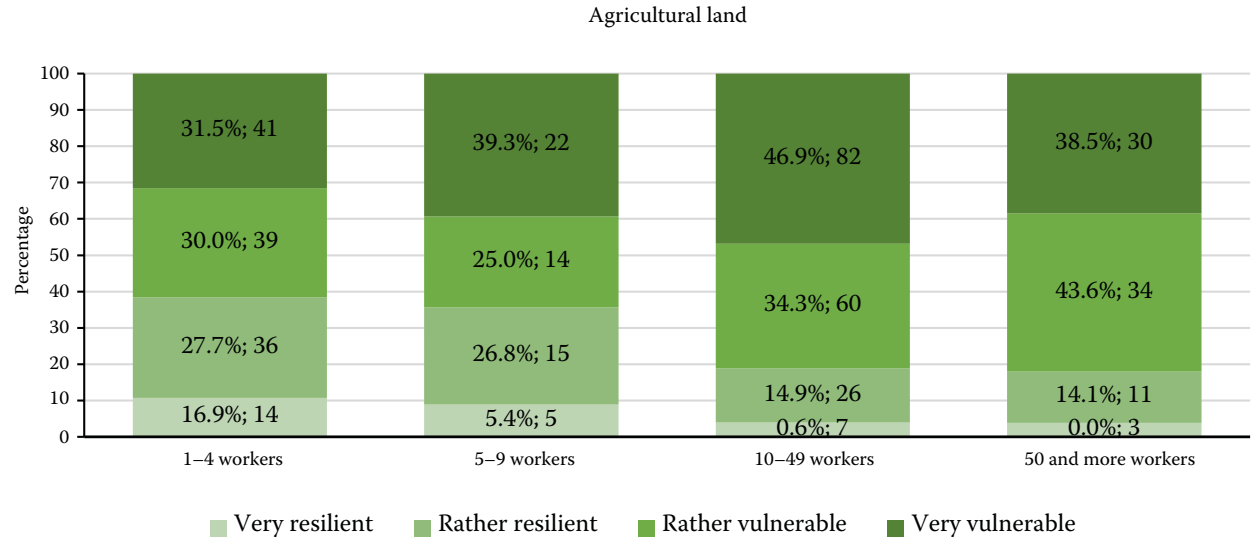

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Figure 4. Relationship between the size category (based on agricultural land area) and the resilience of agricultural enterprises.

CAP – common agricultural policy
Source: Own elaboration

https://doi.org/10.17221/479/2024-AGRICECON

managed by a business, these businesses more frequently perceived vulnerability to weather conditions and climate change. A statistically significant dependence was found between the predominance of arable land and business vulnerability not only in the area of climate change but also in relation to agricultural inputs, the agricultural land market, and agricultural policy. The areas of agricultural inputs, land market, and planned changes in the CAP posed greater risks to businesses with a predominance of arable land.

Predominance of permanent grassland. In cases where permanent grasslands dominate the cultivated land structure, reflecting an extensive crop production focus, it was assumed that such agricultural enterprises would view themselves as more resilient in certain areas. Land under permanent grasslands is generally less costly, with lower labour demands. Expenditures on fertilisers, pesticides, and other agrochemicals are typically reduced for permanent grasslands, as are machinery operating and maintenance costs. For pasture-based enterprises, these grasslands can also serve as a livestock feed source, potentially reducing reliance on external feed supplies. This assumption was confirmed, particularly in perceptions of resilience to climate change, agricultural input supply (concerns regarding availability, accessibility, and costs), and anticipated agricultural policy changes post-2023. A very low relation was found with perceived vulnerability in the labour force, where enterprises using extensive management practices also reported higher resilience. No correlation was identified between resilience perception in agricultural enterprises with a predominance of permanent grassland management and perceived vulnerability in agricultural product market, and somewhat surprisingly, no correlation was found in land market vulnerability either. Even within the land market, most businesses primarily managing permanent grasslands reported feeling vulnerable.

Presence of crop production. The perception of resilience or vulnerability of enterprises, in most areas of resilience, does not depend on the presence of crop production. A very weak dependence was observed in the area of agricultural land (availability, price) and the anticipated changes to the CAP after 2023.

Presence of livestock production. For enterprises engaged in livestock farming, we expected lower perceived resilience in specific areas, particularly with regard to input costs for feed and energy, as well as labour availability – despite the recent adoption of precision technologies that have begun to mitigate labour shortages in animal husbandry. However, the perception of vulnerability across the monitored areas does not appear to be significantly influenced by the presence or absence of livestock production. In terms of production type, our findings are consistent with those of Pinsard and Accatino (2023), who found that the most specialised French farming systems – such as vineyards, intensive monogastric production, and field crops – were the least robust in the short term (4–7 years) when facing a decline in input supply, due to their strong reliance on external inputs.

Organic versus conventional agriculture. A relationship between the predominant farming system (conventional or organic) and perceived resilience was observed across nearly all resilience dimensions – with the notable exception of product market resilience. As anticipated, perceptions of resilience to forthcoming changes in CAP varied between farming systems, although not necessarily in the way non-farmers might expect. A higher proportion of enterprises engaged in organic farming reported greater perceived resilience to the proposed CAP reforms. Although the relationship between farming system and perceived resilience to CAP changes was relatively weak, it was statistically significant.

In the Czech context, this finding may be partly explained by the fact that organic farms are more frequently located in less favourable areas and tend to manage permanent grasslands. These systems are typically characterised by lower input intensity and receive stronger environmental support under the CAP. This supports the idea that organic systems are more resilient in structural and policy-related terms. These findings are consistent with Perrin et al. (2020b), who found that extensive practices contribute to greater resilience in organic dairy farms.

Areas with natural constraints. The fact that a business operated in ANC areas influenced the perception of corporate resilience only in relation to climate change. There was a very weak, but statistically significant dependence found. Interestingly, enterprises located in ANC areas perceived themselves as more resilient compared to those operating exclusively or partially outside such areas. Farms in areas with natural constraints often apply more extensive farming practices that are less vulnerable to climatic extremes such as drought, and the impacts of climate change may manifest less severely in these regions – partly due to higher altitudes, which can mitigate the effects of heat and water stress – making such farms less immediately exposed to climate-related risks. In other do-

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mains, no significant dependence was found, indicating that farming in ANC areas is not a predominant factor affecting the overall perception of corporate resilience.

CONCLUSION

This research draws on farmers' perceptions to illustrate the subjective resilience of Czech agricultural enterprises across multiple domains. As noted by Spiegel et al. (2021) and Rosman et al. (2024), a key advantage of perceived resilience lies in its potential for cross-contextual comparison, as it is not strictly tied to local structural or environmental conditions. However, even from the farmers' perspective, assessing resilience across distinct domains can be challenging. Risks affecting one area may shape how vulnerabilities are perceived in others – a dynamic that was particularly evident during the turbulent year 2022, marked by substantial shifts in economic and external conditions. The study aimed to identify where Czech agricultural enterprises perceive themselves as resilient or vulnerable and to highlight farm-level factors influencing these perceptions within specific resilience areas.

Structural features such as legal form and farm size emerged as key determinants of vulnerability in Czech context. Legal entities, including cooperatives and joint-stock companies, reported consistently higher perceived vulnerability across all resilience areas –most notably in relation to the CAP post-23 and workforce availability. Likewise, large-scale farms managing over 2 000 hectares or employing a greater number of workers were more likely to perceive themselves as vulnerable, which may reflect their increased exposure to labour shortages, redistributive elements of the CAP post-2023, and the challenges inherent in managing complex operations. Conversely, individual (natural person) farms reported higher levels of perceived resilience. Czech organic farms also demonstrated enhanced perceived resilience, particularly in relation to anticipated CAP changes, which may be attributed to their stronger alignment with policy instruments and more adaptive management strategies. Enterprises predominantly managing permanent grasslands, often situated in less favourable areas, reported higher resilience to climate change and input-related pressures – likely due to their extensive production practices and reduced dependence on external inputs. However, even grassland-based farms expressed concern about vulnerabilities in the land market. Interestingly, in the context of Czech agriculture, the presence of livestock production was not found to significantly influence perceived resilience in any of the assessed dimensions.

Research on the subjectively perceived resilience of Czech agricultural enterprises revealed widespread feelings of vulnerability across multiple domains. Notably, it identified a group of Czech farms – primarily legal entities, medium-sized and large farms, conventionally managed operations – that reported heightened vulnerability specifically in relation to the CAP. This finding is particularly significant, as it concerns a substantial segment of Czech agricultural producers. These farms perceive agricultural policy, which is intended to reduce their vulnerability, as a source of uncertainty or exposure instead. We argue that a deeper understanding of farmers' attitudes, together with farm-level determinants of perceived resilience, is crucial for enhancing farms' capacity to cope with multiple concurrent risks, and for informing the design of more targeted and effective advisory and educational support.

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Received: December 17, 2024
Accepted: May 21, 2025