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RESILIENCE TO SHOCKS AND CRISIS BEHAVIOUR IN FEMALE-LED FARMS IN ROMANIA

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Abstract: This paper analyses the resilience and crisis behaviour of female-led family farms in Romania during the global crisis of 2019-2024. Utilizing administrative data from the Agency for Payments and Intervention in Agriculture (APIA), the research employs a quantitative longitudinal analysis of holdings between 10 and 100 ha in two contrasting regions: high-performing Timiș County and economically disadvantaged Vaslui County. The findings reveal divergent demographic trajectories: Timiș represents a mature, consolidating "industrialized continuity" model, while Vaslui exhibits "socio-economic fluidity" through a 50% increase in participation and a younger workforce. Results indicate that these female-led farms acted as critical socio-economic "shock absorbers" during the COVID-19 pandemic, the 2021 energy crisis, and the 2022 invasion of Ukraine. While the larger farms in Timiș maintained structural stability through eventual existing capital reserves, Vaslui's model demonstrated resilience through labour-intensive flexibility and youth absorption. The study concludes that differentiated support policies are essential to address regional-specific barriers to generational renewal and market volatility with particular focus on gender issues in agriculture.

Keywords: Woman-led farms, Crisis response, Generational shift

INTRODUCTION

The global agricultural landscape has been subjected to a series of unprecedented systemic shocks between 2019 and 2024 (FAO, 2021; Béné, 2020; Laborde et al., 2020). The convergence of the COVID-19 pandemic, the 2021 global energy crisis, and the geopolitical destabilization following the 2022 invasion of Ukraine has created a volatile environment for food security and rural stability (Siche, 2020; IEA, 2021; Berahab, 2022; FAO, 2022; Ben Hassen and El Bilali, 2022). Within this context, the resilience of agricultural systems is increasingly dependent on the adaptive capacity of specific demographic cohorts, notably women who manage family-sized holdings (Sachs et al., 2016; Meuwissen et al., 2019).

In Romania, the agricultural sector is characterized by a sharp dualism between large-scale industrial farms and small subsistence plots (Davidova and Thomson, 2014; Ciutacu et al.,

2015; Eurostat, 2020). This study focuses on the critical "middle tier": family-sized farms ranging from 10 to 100 ha (FAO, 2014; Lowder et al., 2016; Graeub et al., 2016). These holdings represent the backbone of rural socio-economic resilience, as they are large enough to be commercially viable and market-integrated, yet small enough to be managed through family labor and localized decision-making (Sutherland et al., 2012; Darnhofer et al., 2010; Lyson et al., 2008; Wegren et al., 2018).

Despite their importance, the specific crisis responses of female farm heads remain under-researched (Shortall, 2014; Bock, 2015; Petrics et al., 2021; Baylina and Salamaña, 2006). This paper aims to analyse how women managing these family-sized holdings have navigated the crisis of the early 2020s. By examining demographic shifts and land management trends, we seek to determine if female-led farms act as "shock absorbers" within the Romanian agricultural economy (Darnhofer, 2014; Urruty et al., 2016; Pelling and Dill, 2010). The empirical foundation of this research is derived from the administrative datasets of the Agency for Payments and Intervention in Agriculture (APIA), utilizing subsidy payment records to track real-time longitudinal changes in farm structure and participation (Romanian APIA, 2020; Hennessy and Rehman, 2008; Zimmermann and Heckelei, 2012).

MATERIAL AND METHODS

This research employs a quantitative, longitudinal analysis of administrative data provided by the Romanian Agency for Payments and Intervention in Agriculture (APIA) (Balmann, 1997; Weiss, 1999; Breustedt and Glauben, 2007). The methodology was designed to isolate the impact of recent global crises on a specific agricultural segment through a rigorous four-stage filtration process (Yin, 2014; Eisenhardt, 1989).

1. Regional Selection. To capture the heterogeneity of the Romanian agricultural landscape, two counties were selected based on their contrasting socio-economic performance: Timiș (TM), representative of the high-performing agricultural sector in Western Romania. It is characterized by high soil quality, advanced mechanization, and proximity to Western European markets. Vaslui (VS), representative of the most economically disadvantaged agricultural region in Eastern Romania. It serves as a proxy for regions facing high poverty indices, infrastructure challenges, and a higher reliance on traditional farming practices.

2. Demographic and Leadership Filtration. The dataset was strictly filtered to include only female heads of holdings. This allows for a gender-specific analysis of resilience and management styles. By isolating female leadership, the study circumvents general agricultural trends to focus on the demographic dynamics of women in a traditionally male-dominated sector.

3. Farm Size and Commercial Viability. The study focuses exclusively on family-sized farms, defined for this research as holdings between 10 and 100 ha. This range was selected to exclude small-scale subsistence plots (under 10 ha) that do not participate significantly in the market economy, and large-scale corporate or industrial holdings (over 100 ha) where management is often detached from family-level decision-making.

4. Subsidy Scheme and Indicator Selection. Data was extracted for the period 2019-2024 to encompass the pre-crisis baseline and the subsequent periods of instability. The analysis focuses on direct payments under the: SAPS (Single Area Payment Scheme): Utilized for the 2019-2022 period, and BISS (Basic Income Support for Sustainability): The equivalent scheme implemented under the New CAP starting in 2023.

The primary indicators analysed include the number of unique female participants (count), age distribution of the farm heads, and the area/head (average surface managed per individual). This allows for an assessment of both the "demographic health" of the sector and the physical scale of production managed by women during successive crises.

RESULTS AND DISCUSSION

Statistical processing was conducted to calculate mean and median age, standard deviation, and regional growth rate. Comparative analysis between Timiș and Vaslui was performed to identify if regional economic status correlates with the demographic resilience of female farmers when faced with external shocks.

Table 1. Summary and statistics of observation for the two counties

Year	Count	Mean Age	Median Age	Min Age	Max Age
Timis County					
2019	768	50.3	50	19	88
2020	785	50.8	51	18	89
2021	804	51.2	51	19	90
2022	803	51.6	52	19	91
2023	785	51.8	52	18	92
2024	792	51.2	51	18	93
Vaslui County					
Year	**Count**	**Mean Age**	**Median Age**	**Min Age**	**Max Age**
2019	322	43.7	42.5	19	86
2020	350	43.6	43	19	87
2021	373	43.6	44	19	84
2022	408	43.5	43.5	19	85
2023	447	43.9	44	19	87
2024	483	43.7	44	19	88

Source: Processing of APIA data for the period 2019-2024 (Romanian APIA, 2020)

Timiș (TM) consistently maintains an average age roughly 7-8 years older than Vaslui. The median age in Timiș (50-52) suggests a mature workforce, with a significant concentration of individuals in their 50s and 60s. Vaslui (VS) is notably "younger," with a mean age holding steady around 43.7 years. The median (42-44) indicates that half of the participants are under the age of 44, which is significantly younger than the Timiș cohort. The number of participants in Timiș has remained very stable, fluctuating between 768 and 804. This suggests a saturated or well-established agricultural participation base. Vaslui has seen a remarkable 50% increase in participation (from 322 in 2019 to 483 in 2024). Interestingly, despite this influx of new participants, the average age has remained almost identical, meaning new entries are distributed evenly across the age spectrum, rather than being dominated solely by the youth. Between 2019 and 2023, the mean age in Timiș crept up from 50.3 to 51.8. However, in 2024, there was a slight "rejuvenation" as the mean dropped

back to 51.2. The maximum age has also increased annually, reaching 93 years by 2024, showing that older farmers are remaining active longer. Vaslui shows a very "healthy" demographic balance. Even with rapid growth, the "Under 30" group increased from 56 to 86 individuals, and the "40-49" group remains the strongest pillar of the community. The "70+" age group has grown noticeably (from 81 in 2019 to over 100 in 2022-2023), reflecting an aging population in Timis. The "Under 30" group, conversely, saw a decline from 71 in 2019 to a low of 49 in 2023, though it recovered slightly to 53 in 2024. The "50-59" age group more than doubled (from 44 to 111), which is the most significant growth area in Vaslui County. Unlike Timiș, the "Under 30" group has grown steadily from 56 to 86, suggesting better success in attracting or retaining younger participants in the agricultural schemes. As pure demographic interpretation, Timiș represents an established, aging agricultural community that is currently experiencing a slow demographic shift toward older brackets. Vaslui, by contrast, is a rapidly expanding community with a much younger profile and a balanced growth that successfully incorporates both middle-aged and younger participants.

INTERPRETING THE CRISIS

The COVID-19 Crisis - Agriculture as a "Safety Net" in 2020. During the pandemic, agriculture was one of the few sectors that remained operational. The data shows a slight uptick in participation in both counties (+17 in TM, +28 in VS). In a period of urban lockdowns and economic uncertainty, the "return to the village" phenomenon likely played a role. This pattern has been documented across Eastern Europe, where rural areas serve as economic buffers during urban crises. In Vaslui, the "Under 30" group grew from 56 to 67. This suggests that younger individuals, perhaps facing layoffs in urban services or construction, returned to family farms. In Timiș, the growth was more concentrated in the 50-69 brackets, suggesting that the pandemic reinforced the activity of existing landholders rather than attracting new ones.

The Energy Crisis - Capital Intensity vs. Demographic Resilience in 2021. The spike in energy and fertilizer prices in 2021 put immense pressure on profit margins, particularly for mechanized commercial farms. Global fertilizer prices increased by over 80% in 2021, with natural gas prices tripling in European markets. Timiș, which features larger, more capital-intensive farms, saw its mean age rise to 51.2. This "aging" during a cost crisis often indicates financial barrier entry. Younger farmers with less liquidity or higher debt-to-equity ratios may have scaled back, while older, debt-free farmers with established capital reserves could better absorb the shock. The relationship between age, financial capacity, and crisis resilience has been well-documented in agricultural economics literature. Vaslui remained demographically stable. The prevalence of smaller-scale, less energy-intensive farming models in the east likely acted as a buffer against global energy price fluctuations, allowing the younger demographic profile to persist despite the crisis.

The War in Ukraine - Geopolitical Risk and "Border Resilience" in 2022. The invasion of Ukraine triggered a dual crisis: a massive disruption in grain markets and a localized risk perception due to Romania's proximity to the conflict. Ukraine and Russia together accounted for nearly 30% of global wheat exports prior to the war. Despite being a border county (near Moldova/Ukraine), Vaslui saw its largest jump in participation (+35 records) and its "Under 30" group reached a new high (81). Scientifically, this suggests "Resilience

through Diversification". In times of extreme geopolitical risk, small-to-medium scale farming becomes a vital survival strategy and a source of food security, encouraging more individuals to engage with the land. Timiș saw virtually zero growth in participation (804 to 803) and continued aging (Mean 51.6). For the large-scale grain producers of the West, the 2022 market volatility (price spikes followed by the "Ukrainian grain corridor" price drops) created a "Wait and See" environment. This high-risk commercial environment discouraged new, younger entrants from starting capital-heavy operations.

Post-Shock Consolidation and "Generational Handover" during 2023-2024. The 2024 data show a rare drop in mean age for Timiș. After three consecutive years of crises (2020-2022), the 2023-2024 period likely represents a "forced" generational turnover. The cumulative stress of the COVID, Energy, and War shocks may have accelerated the retirement of the oldest cohort in Timiș (the 70+ group dropped from 103 to 93). Research on farmer retirement patterns indicates that multiple consecutive shocks can trigger premature exit from agriculture. By 2024, the two counties emerged with different "immunities." Vaslui's younger, growing base suggests a system that thrives on labour-intensive resilience, while Timiș's older base suggests a system that survives through capital-intensive consolidation but struggles with generational continuity.

Table 2. Crisis Timeline and Regional Impact

Crisis	Primary Impact	Regional Winner	Demographic Result
COVID (2020)	Labor supply shift	Vaslui	Absorption of returning youth.
Energy (2021)	Operational cost spike	Vaslui	Smallholders less vulnerable to input prices.
War (2022)	Market & Risk Volatility	Timiș (Stability)	Large-scale farms survived but "aged in place."
Recovery (2024)	Generational Turnover	Timiș	Older farmers exiting after a decade of crises.

Source: Own assessment

LAND USE INTENSITY ANALYSIS

Timiș represents an established, aging agricultural community that is currently experiencing a slow demographic shift toward older brackets. Vaslui, by contrast, is a rapidly expanding community with a much younger profile and a balanced growth that successfully incorporates both middle-aged and younger participants. The analysis of land use intensity (measured by the average area/head per participant) across age groups provides a deep look into how different generations manage resources during economic and geopolitical instability. In Timiș, the data reveals a structured hierarchy in farm size that remained remarkably rigid despite the 2019-2024 shocks. The Peak Professionalism (40-49 Group). This age group consistently controls the largest average areas (approx. 29-30 units). Scientifically, this represents the "professional peak" where individuals have accumulated enough capital and creditworthiness to operate at a higher scale. The agricultural life-cycle theory suggests this age represents optimal farm productivity and expansion capacity. Notably, this group's area remained stable throughout the Energy Crisis (2021) and the War (2022), indicating high structural resilience. The Under-30 "Inheritance" Pulse. The youngest group (Under 30) manages surprisingly large areas (averaging 25-28 units), often larger than their elders in the 60-70+ brackets. This suggests that young entrants in Timiș are likely taking over established, large-family estates rather

than starting small, fragmented plots. Intergenerational farm transfer patterns in Europe typically favor direct succession over new entry. The Senior Efficiency Gap. Farmers over 60 show the smallest average areas (18-20 units). As farmers age, they appear to downsize or transfer the most labour-intensive or capital-heavy land to younger generations, retaining only smaller, manageable plots.

Vaslui presents a much more "equitable" and dynamic distribution of land, where the scale of farming is less strictly tied to age. The 2021 Senior Surge (70+). Interestingly, during the 2021 Energy Crisis, the average area for the 70+ group in Vaslui spiked from 23.5 to 28.9 units. This suggests a "defensive consolidation" where older landowners might have consolidated family holdings under their names for subsidy eligibility or survival during the price shocks. Strategic behavior in response to CAP subsidies has been documented in multiple European contexts. Youth Flexibility (Under 30). Unlike Timiș, the young farmers in Vaslui saw their average area decrease during the War years (2022-2023), dropping from 28.6 to 25.0. This indicates that while more young people entered the sector (as seen in the previous count analysis), they entered at a smaller scale, likely engaging in subsistence or small-scale market gardening as a response to local economic pressure. Consistency in the 50-59 Group: This cohort saw a steady increase in average area every single year (from 21.1 to 24.4). This group represents the "new backbone" of Vaslui's agricultural growth, slowly expanding their footprint year-over-year regardless of external crises.

The overall compilation of findings is summarised in Table 3 bellow indicating the main features and positions facing the crisis times and the demographic structure as structural issue of Romanian agriculture.

Table 3. Comparative Agricultural Models

	Timiș (TM) Observation
Crisis Response	Stability through Size: Large farms (40-49) held their ground, acting as "fortresses" against market volatility.
Generational Transfer	Top-Down: Young farmers enter at a large scale, likely through direct succession of high-value estates.
Senior Role	Retirement-Phase: Oldest group holds the least land, suggesting a clean break or active downsizing.
	Vaslui (VS) Observation
Crisis Response	Adaptability through Number: Growth was driven by an increasing number of participants at a medium scale.
Generational Transfer	Bottom-Up: Youth entry is more fragmented and sensitive to geopolitical risk (War/Energy costs).
Senior Role	Resource Guardians: Oldest group holds significant land, possibly acting as "family proxies" for subsidies during crises.

Source: Own interpretation of observations and findings

CONCLUSION

The Timiș model is one of Industrialized Continuity. The crises did not change who holds the most land; the middle-aged professional tier remains dominant. This pattern reflects broader trends in European agricultural consolidation and capital-intensive farming. The high entry scale for youth suggests that without an existing family estate, entry into Timiș's agricultural sector is nearly impossible for new participants. Land access barriers for new

farmers might become a critical policy concern across the European Union. The Vaslui model is one of Socio-Economic Fluidity. The convergence of mean areas across all age groups (mostly staying between 22 and 28 units) suggests a more "democratic" access to land. This model resembles the "peasant agriculture" paradigm described in rural sociology literature, where flexibility and family labour compensate for limited capital. However, the sensitivity of the youth group to the 2022 war-induced market shocks suggests that while entry is easier in the East, sustaining large-scale operations for young farmers is significantly more volatile than in the West. The divergent trajectories of Timiș and Vaslui highlight the need for differentiated agricultural support policies. Western regions may require targeted programs for young farmer entry and succession planning, while Eastern regions would benefit from market stabilization mechanisms and infrastructure investment to support the growing cohort of small and medium-scale female farmers. Further investigation is needed to understand the long-term sustainability of these divergent models, particularly in the context of climate change adaptation, technological innovation, and evolving CAP reforms.

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DATA AVAILABILITY STATEMENT

The data used in this study were obtained from the Romanian Agency for Payments and Intervention in Agriculture (APIA) administrative records for the period 2019-2024. Data are available from APIA for researchers who meet the criteria for access to confidential agricultural subsidy data, subject to institutional data sharing agreements and compliance with Romanian data protection regulations.

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