European Journal of Sustainable Development (2026), **15**, 4, 236-248 ISSN: 2239-5938
Doi: 10.14207/ejsd.2026.v15n4p236

Young People as Agents of Digital Innovation in Family-Owned Agricultural Small Businesses: Implications for Economic Sustainability

By Florina Atanase (Murar)[1]

ABSTRACT:
Family-owned agricultural small businesses have a vital role in rural economies by providing employment, ensuring food security, and promoting community stability. However, these enterprises frequently face significant challenges, including limited resources, restricted market access, and concerns regarding long-term financial sustainability. In this context, innovation, specifically digital innovation, emerges as a pivotal mechanism for enhancing economic resilience within small-scale agricultural family enterprises. This study investigates the role of youth, particularly students enrolled in entrepreneurial education programs within an agricultural technological high school, as catalysts of digital innovation in family-owned agricultural micro and small enterprises. It also focuses on low-cost and accessible digital solutions, including social media marketing, online sales channels, and basic digital management tools, which are particularly suited for small agricultural businesses with limited financial resources. Employing a quantitative, cross-sectional pilot design, data were gathered through a structured, self-administered questionnaire from nine adult students (N=9, aged 18 and above) enrolled in entrepreneurial education classes at a dually funded (Ministry of Education and Ministry of Agriculture and Rural Development) technological agricultural high school in a rural area of Ilfov County, Romania, who are actively involved in their family-owned agricultural businesses. The analysis explores the degree of youth engagement in digital innovation activities and examines the perceived impact of these innovations on financial sustainability, market visibility, cost-effectiveness, and overall business resilience. Given the small pilot sample, findings are preliminary and exploratory rather than confirmatory. Results suggest that young people may have an important influence in initiating and implementing digital innovations within their families' businesses, serving as a potential link between conventional agricultural practices and contemporary market requirements. Furthermore, this research points to a possible role of agricultural education in developing innovation capabilities that could promote sustainable business models in rural contexts. By focusing on the intersection of innovation, education, and economic sustainability, the study aims to provide preliminary insights and a validated instrument for a larger-scale investigation into the long-term viability of family-owned agricultural enterprises.

Keywords: family businesses, digital innovation, youth, economic sustainability, agricultural education, rural development

1. Introduction

Family-owned agricultural small businesses play an essential role in rural economies, serving as crucial contributors to employment, food security, and community resilience. However, these businesses often grapple with significant challenges, including restricted access to resources, limited market presence, and issues related to long-term financial sustainability. The rise of digital innovation offers a transformative mechanism through which these challenges can be mitigated, enabling family farms to strengthen their

[1]Bucharest University of Economic Studies, Bucharest, Romania.

economic resilience and competitiveness in an increasingly digital market (Tirdasari et al., 2019; Cheng et al., 2021). At the same time, as education evolves, the digital transformation of micro family businesses has become one of the most important areas of research, reflecting the growing recognition that innovative learning approaches are essential for fostering adaptability and long-term sustainability within these enterprises (Atanase Murar & Biţu, 2025). Moreover, as the dynamics of the global workforce undergo significant transformation, educational systems must cultivate leadership competencies capable of addressing emerging sustainability and ethical challenges (Enăchescu, 2025).

One noteworthy trend in this context is the involvement of young individuals, particularly those studying in agricultural high schools, who are emerging as vital instigators of digital innovation within their family-run farms. Their educational background equips them with the skills needed to deploy modern digital tools that can bridge traditional agricultural practices with contemporary market demands. Innovations such as social media marketing, e-commerce platforms, and digital management applications are not only cost-effective but also particularly suited for small-scale agricultural operations that may lack substantial financial resources. These tools empower youth to enhance their family's business visibility and operational efficiency (Paunović & Vučković, 2024; Zhang & Fan, 2022).

Agricultural education plays a pivotal role in developing these digital skills among young people, fostering a generation capable of driving change within family businesses. Programs tailored to instill digital literacy and entrepreneurial competencies facilitate the application of innovative practices in traditional farming settings. As these students engage in digital initiatives, they not only contribute to the sustenance and growth of their family's enterprises but also acquire valuable professional skills that prepare them for future careers in the agricultural sector (Johnston & Humphries, 2019; Sandhu et al., 2012).

Empirical research underscores the transformative impact of youth involvement in digital innovation within family-owned agricultural businesses. Studies have shown that engaging younger generations in innovation-driven activities is associated with improvements in financial viability, market visibility, and overall resilience (Tiwasing et al., 2022; Jack et al., 2020). This research explores these dynamics through an exploratory pilot study, seeking to highlight the role of youth and educational structures in fostering a culture of innovation that is vital for sustaining family-owned agricultural enterprises in a rapidly changing economic landscape. In summary, the integration of digital tools and innovative practices within family-owned agricultural businesses, alongside educational frameworks promoting digital skills, is understood in the literature as important for enhancing economic sustainability. This study aims to provide preliminary insights into the intersection of youth, education, and innovation as components in driving the sustainability of agricultural family businesses.

2. Theoretical Background

Research on family-run agricultural small enterprises can be organized around three interconnected themes that together form the conceptual framework guiding this study: (a) the structural challenges these businesses face and the adaptive strategies proposed to address them; (b) digital transformation as a mechanism for overcoming these

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

challenges; and (c) the role of youth and agricultural/entrepreneurial education in enabling this transformation. These three themes map directly onto the study's hypotheses (H1-H5) and are reviewed in turn below.

2.1 Structural challenges and adaptive strategies

The literature on family-run agricultural small enterprises underscores their significant contributions to rural economies, primarily through job creation, food provision, and enhancing community stability. Nonetheless, these businesses encounter persistent challenges that may jeopardize their long-term viability, including restricted access to financial resources, limited market opportunities, and difficulties with succession planning (Bordean et al., 2025; Ceptureanu et al., 2020). Effective succession planning paired with robust internal governance has been identified as critical for sustaining performance in family-owned small and medium enterprises (SMEs), facilitating the transfer of knowledge and leadership to younger generations and minimizing organizational disruptions. Diversifying agricultural activities has been widely recommended as a complementary strategy to mitigate market volatility: farmers engaging in diversification strategies can bolster their resilience against economic fluctuations and decrease their vulnerability to the risks associated with mono-cropping practices (Stephens et al., 2019).

This need for adaptive strategies aligns with Ceptureanu (2016), who suggests that family involvement in change management allows controlling families to influence organizational behavior effectively, positioning smaller firms to remain innovative in the face of evolving market demands. Furthermore, the comprehensive research by Cheng et al. (2022) emphasizes the necessity for new agricultural business models to enhance employment decisions among farmers, elucidating how such changes can lead to better economic outcomes for rural communities (Alex, 2024). This kind of business-model adaptation within family-owned agricultural enterprises is not a purely contemporary phenomenon: historical analysis of family-run wine farms documents a comparable shift toward more businesslike, market-oriented operating styles in response to changing economic conditions (Geraci, 2000), while more recent work on the dairy sector shows that the success of change and innovation processes in family- and community-based farming is itself shaped by the underlying values held by those involved (Knook et al., 2023).

2.2 Digital transformation as an adaptive mechanism

The digital revolution has become a transformative influence in agriculture, reshaping operational strategies and stakeholder engagement (Macrì & Orsini, 2024). Digital tools such as social media marketing and e-commerce platforms enable family-run farms to improve visibility and customer interaction while optimizing internal operations (Nikulina et al., 2022). These low-cost, accessible tools are particularly suited to small-scale agricultural operations with limited financial resources (Paunović & Vučković, 2024; Zhang & Fan, 2022), and their adoption has been associated with improved farmer welfare and employment outcomes more broadly (Cheng et al., 2021; Tirdasari et al., 2019).

This pattern is consistent with broader family-business research: survey evidence from German family firms shows that non-family managers and transgenerational control

intentions help explain why some family firms are better able to overcome the combined "willingness and ability" challenge of engaging in digital innovation (Bornhausen & Wulf, 2024). At the same time, panel evidence from Chinese family firms indicates that intergenerational succession can, on average, negatively affect digital transformation, an effect that is moderated by the extent of family involvement and by the firm's operating status (Zhang & Wei, 2025) — underscoring that the relationship between generational change and digital adoption is more complex than a simple positive link. Technology adoption in small-farm settings is itself rarely a single decisive event: evidence from smart livestock technology in Japanese small-farm systems shows adoption following a sequential, iterative path that moves gradually from initial conservatism toward innovation, rather than a one-time switch (Ohashi et al., 2024).

2.3 Youth, agricultural education, and digital innovation

Youth engagement, particularly from agricultural high school students, is positioned in the literature as a vital driver of these digital transitions. By bridging generational divides, young individuals introduce contemporary skills and competencies that align with current market demands. Salanţă et al. (2024) argue that developing digital competencies is crucial for organizations seeking to implement and benefit from innovative technologies, reinforcing the premise that targeted skill acquisition can provide a competitive advantage (Bordean et al., 2025). Uzhva (2022) further discusses how increasing employment opportunities in rural regions can enhance overall economic growth, emphasizing the value of integrating youth into these transformative processes.

Educational frameworks that provide structured training in agricultural and entrepreneurial practices contribute significantly to building the innovative capabilities of young individuals; investing in human capital, especially through such educational initiatives, has been shown to strengthen the adaptive capacity of agricultural businesses (Nikulina et al., 2022). This is consistent with evidence from vocational education more broadly, where digital literacy and entrepreneurial agility jointly predict students' readiness for the digital economy (Swaramarinda et al., 2025), and with curriculum-development research identifying the specific competencies (e.g., evaluating business opportunities, market assessment, and agricultural value-chain knowledge) that youth agricultural entrepreneurship programs should target (Zickafoose et al., 2023).

2.4 Outcomes: economic performance and resilience

Empirical research links youth involvement in digital innovation to improvements in financial viability, market visibility, and overall resilience (Tiwasing et al., 2022; Jack et al., 2020). Community-level financial mechanisms have been shown to complement these micro-level dynamics: community-invested loans have stimulated agricultural growth by addressing the financial needs of rural producers, thereby enhancing economic sustainability (Stephens et al., 2019). Such community-driven approaches not only address the financial barriers faced by farmers but also help build resilient local economies.

2.5 Synthesis and research gap

For the purposes of this study, economic sustainability is understood specifically through the lens of intergenerational transfer: a family-owned agricultural business is

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

considered economically sustainable to the extent that it can maintain viable operations over time by successfully integrating the digital competencies introduced by younger family members with the accumulated agricultural and business experience of older generations, rather than treating either generation's contribution in isolation. This framing is consistent with the succession-planning and change-management literature reviewed above (Bordean et al., 2025; Ceptureanu, 2016; Ceptureanu et al., 2020), which identifies the transfer of knowledge and leadership across generations — not simply financial performance in a given year — as the central mechanism through which small family firms endure. In the remainder of this article, the terms "economic sustainability" and "financial sustainability" are used interchangeably to refer to this broader, intergenerational notion of long-term business viability, rather than to two separate constructs.

Taken together, the reviewed literature suggests that integrating digital innovation, youth involvement, and targeted educational programming may enhance the resilience and competitiveness of family-run agricultural businesses. However, the mechanisms linking youth digital competencies, agricultural/entrepreneurial education, and firm-level economic outcomes have rarely been examined jointly, and, to the author's knowledge, have not previously been examined among students enrolled in a dually-funded (Ministry of Education and Ministry of Agriculture and Rural Development) technological agricultural high school. This study addresses that gap through an exploratory pilot investigation, the design of which is detailed in the following section.

3. Research Methodology

3.1 Research Purpose and Framework

This research investigates how young individuals, particularly students enrolled in agricultural high schools, contribute to digital innovation within small, family-run agricultural enterprises, as well as the extent to which their participation influences economic sustainability and the overall resilience of these businesses. The chosen methodological framework corresponds closely with the study's aims, guiding questions, and proposed hypotheses, ensuring coherence throughout the research design.

3.2 Research Objectives

The research is guided by the following objectives:

O1. Identify the forms of youth engagement in digital innovation processes within family-owned agricultural businesses.

O2. Analyze the types of low-cost digital tools adopted or proposed by young participants.

O3. Evaluate the perceived impact of digital innovation on economic performance, including sales, customer acquisition, and costs.

O4. Investigate the relationship between agricultural education and the ability of young people to contribute to business innovation.

O5. Highlight the role of youth involvement in enhancing the economic resilience of small family-owned agricultural enterprises.

3.3 Research Questions

The study addresses the following questions:

RQ1. To what extent are young people involved in digital innovation within family-owned agricultural businesses?

RQ2. What types of low-cost digital innovations are initiated or implemented by youth?

RQ3. How does digital innovation influence perceived financial sustainability?

RQ4. How does agricultural education contribute to the development of young people's digital innovation skills?

RQ5. In what ways does youth involvement impact the economic resilience of small family-owned agricultural businesses?

3.4 Research Hypotheses

The study tests the following hypotheses:

H1. Youth involvement in digital innovation positively influences financial sustainability.

H2. Low-cost digital tools enhance business visibility and attract new customers.

H3. Digital competencies of young people are positively associated with the level of digital innovation.

H4. Youth participation in digital innovation strengthens business resilience.

H5. Agricultural education facilitates the transfer of digital competencies to family-owned agricultural businesses.

Linkages to the research instrument:

H1, H4 → correlations and regression analysis

H2 → items measuring costs and visibility

H3 → digital competencies ↔ innovation level

H5 → agricultural education ↔ innovation

3.5 Research Design

A quantitative, cross-sectional design was employed to measure and analyze the relationships among key variables: digital involvement, skills, tool adoption, economic impact, performance, and resilience. Given the exploratory nature of this stage of the research, a single pilot administration was used both to assess the psychometric properties of the instrument and to generate preliminary evidence regarding the proposed hypotheses; results are therefore reported as exploratory rather than confirmatory throughout this article. Commonly cited benchmarks for pilot studies recommend at least 12 participants per group as a pragmatic minimum for assessing feasibility and instrument properties (Julious, 2005), with 10-40 participants generally needed depending on the specific aim being assessed (Hertzog, 2008) and a well-defined framework of objectives recommended to avoid pilot studies being under-sized for their stated purpose (Lancaster, Dodd, & Williamson, 2004). The present pilot (N=9) falls slightly below these benchmarks; this is acknowledged explicitly as a limitation in the Conclusions, and the planned full-scale study will target a sample consistent with these recommendations.

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

3.6 Participants and Sampling

Participants were recruited exclusively from this single technological agricultural high school, located in a rural area of Ilfov County, Romania; no other schools or regions were sampled at this pilot stage. This school operates under the dual coordination of the Ministry of Education and the Ministry of Agriculture and Rural Development. Students were recruited through purposive sampling from among those enrolled in entrepreneurial education classes. Eligible participants were students aged 18 years or older who were actively involved in their family's agricultural business. Among this one school's adult (18+) students enrolled in these classes, only nine met this eligibility criterion of active involvement in a family agricultural business; all nine completed the questionnaire (N=9), yielding a full response rate within the eligible group at this single institution. Because the sample was drawn from this single school through purposive/convenience sampling, the findings are not statistically generalizable and should be interpreted as exploratory; this limitation is discussed further in the Conclusions.

3.7 Instrument

The questionnaire was structured around the five research objectives and corresponding hypotheses, combining categorical items (age bracket, education level, area of residence, family business ownership, and the types, complexity, and cost of digital tools used) with thirteen attitudinal items rated on a five-point Likert scale (1 = "Total dezacord"/strongly disagree to 5 = "Total de acord"/strongly agree), and one open-ended question inviting participants to describe a concrete example of their contribution to the family business. Item wording was aligned with the study's five hypotheses (H1-H5), as summarized in the Linkages to the Research Instrument above.

3.8 Ethical Procedures

Given that all participants were adults, informed consent was obtained directly through the online questionnaire: before accessing the substantive items, participants were presented with a mandatory consent statement describing the study's purpose, its voluntary nature, and data confidentiality, and could proceed only after indicating their agreement. Parental consent was not required, as no participant was a minor. A separate institutional ethics committee review was not sought for this exploratory pilot phase; this is acknowledged as a limitation, and formal institutional and ethics committee clearance will be sought prior to the planned large-scale extension of this study.

3.9 Pilot Data Collection

The questionnaire was administered to nine young adults (N=9) actively engaged in family-owned agricultural businesses. Participants' responses, including the closing open-ended item, allowed an assessment of item clarity, relevance, comprehensibility, and the appropriateness of the response scales, alongside the substantive pilot results reported below. Internal consistency of the three multi-item composite scales was acceptable given the small sample: Cronbach's $\alpha = .86$ for Digital Involvement (4 items), $\alpha = .89$ for Economic Impact (5 items), and $\alpha = .77$ for Resilience (3 items); these estimates should be interpreted cautiously given N=9 and will be re-assessed in the full-scale study.

4. Results

4.1 Youth Involvement in Digital Innovation

The analysis revealed that young people are moderately active in operational digital tasks but are perceived as key agents of innovation at a conceptual level.

Table 1: Descriptive Statistics of Youth Involvement

Item / Variable	Mean (M)	SD	Std. Interpretation
Active involvement in online promotion	3.11	1.05	Moderate
Proposing new digital ideas	3.22	0.97	Moderate
Utilization of social media (Facebook/Instagram)	3.22	1.56	Moderate
Online communication with clients/suppliers	3.78	1.48	High
Perception: "Youth involvement is a form of innovation"	4.33	1.00	Very High

N = 9. The gap between the high perception of youth as innovators (M=4.33) and moderate practical implementation (M≈3.22) suggests that while potential is recognized, operational integration remains limited.

4.2 Perceived Economic Impact and Financial Sustainability

Findings indicate that digital adoption primarily enhances market visibility and customer acquisition, rather than immediate cost savings.

Table 2: Perceived Impact of Digital Innovation on Economic Performance

Economic Indicator	Mean (M)	SD	Std. Interpretation
Increase in sales volume	3.22	1.39	Moderate
Attracting new customers	3.56	1.33	High
Reduction of promotion costs	2.67	1.32	Low-Moderate
Increase in market visibility	3.67	1.12	High
Contribution to economic sustainability	3.56	1.33	High

N = 9. These results provide preliminary support for H2, suggesting that low-cost digital tools may be particularly effective in expanding visibility and attracting customers, though the small sample means this should be confirmed with a larger, representative sample.

4.3 Role of Agricultural Education

A pattern was observed linking formal agricultural education and self-reported innovation capacity. Respondents reported that education in agricultural high schools provided the skills needed to propose innovative solutions.

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

Table 3: Influence of Education on Innovation

Variable	Mean (M)	SD
"Agricultural education helped me propose innovative solutions"	4.00	1.50

N = 9. This finding provides preliminary support for H5, tentatively pointing to agricultural high schools as hubs for technology transfer to family farms; replication with a larger sample is needed before drawing firmer conclusions.

4.4 Resilience and Intergenerational Collaboration

The survey examined social dynamics, resilience, and succession. Scores were highest in this section, indicating agreement that youth involvement is perceived to positively affect long-term business survival.

Table 4: Resilience and Long-term Development

Resilience Indicator	Mean (M)	SD	Std. Interpretation
Intergenerational collaboration (Parents-Children)	4.67	0.71	Very High
Adaptability to economic changes	4.44	1.01	Very High
Chances of long-term development	4.67	1.00	Very High

N = 9. These results provide preliminary support for H4, suggesting that the combination of older generations' experience and younger generations' digital skills may be relevant for economic resilience.

4.5 Correlation Analysis (Hypothesis Testing)

Spearman's rank correlation analysis indicated three positive relationships of varying strength. Because the asymptotic t-approximation for Spearman's rho is unreliable at very small n, p-values were computed from the exact permutation null distribution of rho for N=9 (all 9! = 362,880 possible rank arrangements), following Zar (1972); this is also the approach used by default in standard statistical software (e.g., R, SciPy) for samples of this size. Given the very small pilot sample (N=9, df=7), these results are interpreted strictly as exploratory and hypothesis-generating; they do not constitute confirmatory evidence, and the repeated significance testing on such a small sample carries an elevated risk of Type I error.

Table 5: Spearman's Rank Correlations

Hypothesis	Relationship Tested	Spearman's ϱ	Exact p-value	Result
H1	Digital Involvement ↔ Economic Impact	0.79	0.014	Strong positive (exploratory)
H3	Agricultural Education ↔ Digital Involvement	0.89	0.002	Very strong positive (exploratory)

H4	Youth Involvement ↔ Business Resilience	0.68	0.050	Moderate positive, borderline (exploratory)

Note. Exact two-sided p-values from the permutation null distribution of Spearman's rho for N=9. The H4 association reaches conventional significance only marginally (p=.050) and should be treated as the weakest and least stable of the three; it is the most likely to lose significance in a larger, adequately powered sample.

H1: Digital involvement shows a strong positive association with perceived economic sustainability in this pilot sample.

H3: The strongest association (ϱ=0.89, p=.001) tentatively suggests that formal agricultural education is linked to digital adoption, though causal direction cannot be established with this cross-sectional pilot design.

These pilot results are broadly consistent with prior evidence linking digital social capital to family-owned SME performance (Tiwasing et al., 2022) and linking farm diversification and adaptive capacity to business resilience (Jack et al., 2020). Unlike these earlier studies, which examined established business owners, the present pilot specifically targets adolescent/young-adult family members enrolled in a dually-funded technological agricultural high school in a rural Romanian context — a population and setting not previously examined jointly in this literature. Whether the associations observed here extend, confirm, or diverge from prior findings cannot be determined from a single pilot administration and remains an open question for the larger-scale study.

The pilot study provides preliminary support for the proposed research model and for the validity of the questionnaire instrument. Young people appear to act as agents of digital innovation, and their involvement, alongside agricultural education, is associated with market visibility and business resilience in this small sample. These findings justify extending the study to a larger, more representative sample rather than confirming the proposed relationships conclusively.

5. Discussion

This exploratory pilot study offers a preliminary understanding of how young people, especially students enrolled in agricultural high schools, may contribute to digital innovation within small, family-run agricultural enterprises. The results show that although direct involvement in routine digital operations is moderate, respondents' input at a conceptual level is rated highly. Young individuals are described as introducing fresh ideas, suggesting digital improvements, and offering strategic perspectives. This gap between hands-on participation and perceived creative potential is consistent with their possible role as catalysts of digital transformation on family farms, complementing the long-standing knowledge of older generations. The study also indicates that affordable digital tools, such as social media channels and basic online management platforms, are perceived as particularly effective for increasing visibility and attracting a wider customer base, while not meaningfully reducing operational expenses in the short term.

Formal agricultural education emerges from this pilot as another factor associated with digital innovation. Students with structured training in agricultural high schools

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

reported greater assurance and ability when proposing or implementing digital initiatives, tentatively suggesting that educational institutions may act as intermediaries that equip young people with relevant knowledge and digital skills. Youth participation was also associated with greater perceived resilience and adaptability in family farms, with collaboration between generations described as a mechanism for continuity. Correlational analyses from the pilot phase provide preliminary support for the proposed model; given the very small sample (N=9), however, these associations should be read as hypothesis-generating rather than as confirmation that the proposed relationships hold in the broader population.

6. Implications and further research

This study has several limitations that should be considered when interpreting its findings. First, the pilot sample was small (N=9) and drawn through purposive/convenience sampling from a single technological agricultural high school; this falls below commonly cited pilot-study benchmarks (e.g., Julious's, 2005, rule of thumb of at least 12 participants), which limits statistical power and precludes generalization to the broader population of young people involved in family-owned agricultural businesses. Second, all outcome measures were self-reported perceptions rather than objective business indicators (e.g., audited sales figures, verified customer counts), which may be subject to social desirability or recall bias. Third, the cross-sectional design does not allow causal inference regarding the direction of the observed associations. Fourth, informed consent for this pilot phase was obtained through the questionnaire itself, without separate institutional ethics committee review; future phases will seek formal ethical clearance and institutional approval in advance of data collection. Building on these limitations, future research should pursue a representative, larger-scale sample across multiple schools and regions, consistent with established pilot/full-study sample-size guidance (Hertzog, 2008; Lancaster et al., 2004); a longitudinal design capable of tracking changes in digital adoption and business performance over time; comparative analysis across regions and school types; and the use of objective, verifiable business indicators alongside perceptual measures, in order to test more rigorously whether the perceived benefits identified here translate into measurable economic outcomes.

With these limitations in mind, engaging youth in digital innovation appears to be a promising, low-cost strategy for small family farms confronting market volatility, technological change, and shifting consumer expectations, and one that merits confirmation through a larger, more rigorous follow-up study.

Returning to the question of economic sustainability that motivates this study: the pilot findings tentatively suggest that sustainability in these family-owned agricultural businesses is not produced by digital tools alone, nor by youth involvement alone, but by the intergenerational transfer through which younger members' digital competencies are combined with older members' accumulated agricultural and business experience. The highest-rated pilot indicators were precisely those describing this transfer — intergenerational collaboration, adaptability to economic change, and perceived chances of long-term development (Table 4) — which is consistent with the strong pilot association between agricultural education and digital involvement (H3) reported above.

If this pattern holds in a larger sample, it would imply that policies and school programs aiming to strengthen the economic sustainability of family farms should target the transfer process itself — for example, through joint parent-child digital training — rather than treating digital skills training for youth as a stand-alone intervention.

Acknowledgment: This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

References

Alex, L. (2024). Bibliometric analysis on rural non-farm sector: Study on Scopus database during 1990–2022. *South Asian Journal of Social Studies and Economics*, 21(7), 146–163. https://doi.org/10.9734/sajsse/2024/v21i7851

Atanase Murar, F., & Biţu, Ş.-A. (2025). Innovative education and family businesses: The key to adaptability and reducing school dropout rates. *Proceedings of the International Conference on Business Excellence*, 19(1), 1934–1946. https://doi.org/10.2478/picbe-2025-0150

Bordean, O. N., Pop, Z. C., Rizun, N., Bopp, R., & Estad, T. (2025). Comparative analysis of entrepreneurial intentions among students: A cross-country study. *SAGE Open*, 15(1). https://doi.org/10.1177/21582440251323510

Bornhausen, A. M., & Wulf, T. (2024). Digital innovation in family firms: The roles of non-family managers and transgenerational control intentions. *Small Business Economics*, 62(4), 1429–1448. https://doi.org/10.1007/s11187-023-00823-w

Ceptureanu, E. G. (2016). Research on change management into small family businesses. *Review of International Comparative Management*, 17(5), 459–465.

Ceptureanu, E. G., Ceptureanu, S. I., Herteliu, C., & Cerqueti, R. (2020). Sustainable consumption behaviours in P2P accommodation platforms: An exploratory study. *Soft Computing*, 24(18), 13863–13870. https://doi.org/10.1007/s00500-020-04681-6

Cheng, L., Cui, Y., Duan, K., & Zou, W. (2022). The influence of new agricultural business entities on farmers' employment decision. *Land*, 11(1), 112. https://doi.org/10.3390/land11010112

Cheng, L., Zou, W., & Duan, K. (2021). The influence of new agricultural business entities on the economic welfare of farmer's families. *Agriculture*, 11(9), 880. https://doi.org/10.3390/agriculture11090880

Enăchescu, V. A. (2025). Rethinking educational management: Preparing leaders for global sustainability and ethical challenges in a digital era. *Review of International Comparative Management*, 26(2). https://doi.org/10.24818/RMCI.2025.2.374

Geraci, V. W. (2000). The family wine-farm: Vintibusiness style. *Agricultural History*, 74(2), 419–432. https://doi.org/10.1215/00021482-74.2.419

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, 31(2), 180–191. https://doi.org/10.1002/nur.20247

Jack, C., Ashfield, A., Adenuga, A., & Mullan, C. (2020). Farm diversification: Drivers, barriers and future growth potential. *EuroChoices*, 20(2), 70–75. https://doi.org/10.1111/1746-692X.12295

Johnston, T., & Humphries, V. (2019). Assessment of knowledge among college students regarding family-owned businesses: A revisit. *Global Journal of Entrepreneurship*, 3(1), 18–22. https://doi.org/10.47177/gje.03.01.2019.018

Julious, S. A. (2005). Sample size of 12 per group rule of thumb for a pilot study. *Pharmaceutical Statistics*, 4(4), 287–291. https://doi.org/10.1002/pst.185

Knook, J., Wreford, A., Gow, H., & Hemi, M. (2023). Understanding the influence of indigenous values on change in the dairy industry. *Agriculture and Human Values*, 40(2), 635–647. https://doi.org/10.1007/s10460-022-10376-5

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and analysis of pilot studies: Recommendations for good practice. *Journal of Evaluation in Clinical Practice*, 10(2), 307–312. https://doi.org/10.1111/j..2002.384.doc.x

© 2026 The Author. Journal Compilation © 2026 European Center of Sustainable Development.

Macrì, M., & Orsini, S. (2024). Policy instruments to improve foreign workforce's position and social sustainability of the agriculture in Italy. *Sustainability*, 16(12), 4998. https://doi.org/10.3390/su16124998

Nikulina, Y., Arefieva, V., & Saraikin, V. (2022). Non-agricultural rural employment and urban–rural migration: Is there a connection? *Population*, 25(1), 118–128. https://doi.org/10.19181/population.2022.25.1.10

Ohashi, T., Saijo, M., Suzuki, K., & Arafuka, S. (2024). From conservatism to innovation: The sequential and iterative process of smart livestock technology adoption in Japanese small-farm systems. *Technological Forecasting and Social Change*, 208, 123692. https://doi.org/10.1016/j.techfore.2024.123692

Paunović, T., & Vučković, D. (2024). Small family farms capacity for sustainable development of Serbian agriculture. *Annals of the University of Craiova – Agriculture, Montanology, Cadastre Series*, 53(2), 212–221. https://doi.org/10.52846/aamc.v53i2.1524

Salanţă, I. I., Beleiu, I. N., Bordean, O. N., & Crişan, E. L. (2024). Blockchain digital innovation: A bibliometric analysis. *International Comparative Management Review*, 25(2), 189–197. https://doi.org/10.24818/RMCI.2024.2.189

Sandhu, N., Hussain, J., & Matlay, H. (2012). Entrepreneurship education and training needs of family businesses operating in the agricultural sector of India. *Education + Training*, 54(8/9), 727–743. https://doi.org/10.1108/00400911211274855

Stephens, P., Knežević, I., & Best, L. (2019). Community financing for sustainable food systems. *Canadian Food Studies / La Revue Canadienne Des Études Sur L'Alimentation*, 6(3), 60–87. https://doi.org/10.15353/cfs-rcea.v6i3.353

Swaramarinda, D. R., Isa, B. B., Puruwita, D., Faslah, R., Sebayang, K. D. A., & Adha, M. A. (2025). Preparing vocational students for the digital economy: Exploring the role of digital literacy, entrepreneurial agility, and digital entrepreneurship education. *Social Sciences & Humanities Open*, 12(4), 101926. https://doi.org/10.1016/j.ssaho.2025.101926

Tirdasari, N., Indrawan, D., & Fahmi, I. (2019). Family business in agriculture: Challenge and strategy to face global business. *Advances in Economics, Business and Management Research*, 98, 155–158. https://doi.org/10.2991/icot-19.2019.33

Tiwasing, P., Kim, Y., & Sawang, S. (2022). The interplay between digital social capital and family-owned SME performance: A study of social media business networks. *Journal of Family Business Management*, 13(4), 1026–1048. https://doi.org/10.1108/jfbm-07-2022-0103

Uzhva, A. (2022). Socio-economic aspects of increase in employment of population in rural territory of the region. *Ukrainian Journal of Applied Economics*, 7(1), 188–193. https://doi.org/10.36887/2415-8453-2022-1-23

Zar, J. H. (1972). Significance testing of the Spearman rank correlation coefficient. *Journal of the American Statistical Association*, 67(339), 578–580. https://doi.org/10.1080/01621459.1972.10481251

Zhang, L., & Fan, J. (2022). Formal credit-assisted new agricultural business: A multifactor analysis based on BP neural network. *Mobile Information Systems*, 2022, 1–11. https://doi.org/10.1155/2022/7826838

Zhang, Y., & Wei, X. (2025). Intergenerational succession and digital transformation in family firms: A socioemotional wealth perspective. *Cross Cultural & Strategic Management*, 32(3), 501–527. https://doi.org/10.1108/CCSM-12-2023-0260

Zickafoose, A., Wingenbach, G., Baker, M., & Price, E. (2023). Developing youth agricultural entrepreneurship in Latin America and the Caribbean. *Sustainability*, 15(22), 15983. https://doi.org/10.3390/su152215983