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AGROBIODIVERSITY AND RURAL RESILIENCE IN MOUNTAIN REGIONS: THE ROLE OF FARM CULTURE IN NORTHERN ALBANIA

АГРОБИОДИВЕРЗИТЕТ И РУРАЛНА ОТПОРНОСТ У ПЛАНИНСКИМ РЕГИОНИМА: УЛОГА ПОЉОПРИВРЕДНЕ КУЛТУРЕ У СЈЕВЕРНОЈ АЛБАНИЈИ

Summary: *The study examines the relationship between agrobiodiversity and rural resilience in mountain regions of Northern Albania within the broader Western Balkans context. Using longitudinal panel data from 82 households and 107 businesses across 11 villages during 2023–2025, the study applies econometric models to analyze ecological, cultural, and economic dimensions of rural development. The findings show that higher agrobiodiversity is associated with stronger economic performance, higher investment activity, and greater rural resilience. Farm culture and biodiversity communication partially mediate this relationship, while mountain rural heritage strengthens the resilience effects of agrobiodiversity. Tourism participation and higher resilience levels are also associated with lower migration intentions. The study contributes to the literature by integrating agrobiodiversity, cultural practices, and heritage within a single empirical framework. Overall, the findings support integrated rural development strategies linking biodiversity conservation, tourism diversification, and territorial sustainability in mountain economies.*
Keywords: *Agricultural diversification, Rural resilience, Agritourism, Cultural heritage, Sustainable development, Western Balkans.*
JEL classification: *Q01; Q18; R11; Z32; O13*

Резиме: *Ова студија анализира везу између агробиодиверзитета и руралне отпорности у планинским регионима Сјеверне Албаније, у ширем контексту Западног Балкана. Користећи лонгитудиналне панел-податке прикупљене од 82 домаћинства и 107 привредних субјеката у 11 села у периоду 2023–2025. године, студија примјењује економетријске моделе за анализу еколошких, културних и економских димензија руралног развоја. Резултати показују да је виши ниво агробиодиверзитета повезан са бољим економским перформансама, већим инвестицијама и израженијом руралном отпорношћу. Пољопривредна култура и комуникација биодиверзитета дјелимично посредују у овој вези, док планинско рурално насљеђе јача ефекте агробиодиверзитета на отпорност. Учешће у туризму и виши нивои отпорности такође су повезани са нижим намјерама за миграцију. Студија доприноси литератури интегрисањем агробиодиверзитета, културних пракси и насљеђа у јединствен емпиријски модел. У цјелини, резултати подржавају интегрисане стратегије руралног развоја повезане са очувањем биодиверзитета, диверзификацијом туризма и територијалном одрживошћу у планинским економијама.*
Кључне ријечи: *пољопривредна диверзификација; рурална отпорност; агротуризам; културно насљеђе; одрживи развој; Западни Балкан.*
JEL класификација: *Q01; Q18; R11; Z32; O13*

INTRODUCTION

Agrobiodiversity has become increasingly important for sustainable rural development, particularly in mountain regions exposed to climate change, demographic decline, and economic vulnerability. Diversified agricultural systems enhance ecosystem services, strengthen food-system resilience, and improve adaptive capacity under environmental and market pressures (Altieri 2002; Benton et al. 2023; Lin 2011; Pretty et al. 2018). European policy frameworks, including the Common Agricultural Policy and the Green Deal, increasingly emphasize biodiversity conservation and integrated rural sustainability strategies (European Commission 2023; OECD 2023).

These challenges are particularly evident in the Western Balkans, where fragmented agriculture, rural depopulation, weak infrastructure, and limited market integration continue to constrain development (Bogdanov and Zorica 2011; World Bank 2020). At the same time, the region retains substantial agrobiodiversity, traditional knowledge, and cultural heritage assets that provide opportunities for sustainable territorial development (FAO 2020). Recent research suggests that diversified farming systems contribute not only to ecological sustainability but also to economic resilience and rural adaptation (Altieri et al. 2015; Darnhofer et al. 2016; Wezel et al. 2014).

Rural resilience increasingly depends on interactions between ecological, cultural, and economic systems. Farm culture, including traditional agricultural knowledge and local production practices, contributes to biodiversity preservation and adaptive capacity (Berkes et al. 2000; Gómez-Baggethun et al. 2013). Similarly, biodiversity communication through storytelling, local products, and tourism experiences can transform ecological resources into economic value (Kastenholz et al., 2012; Tew and Barbieri 2012). Agritourism and rural heritage are therefore becoming important mechanisms for diversification and resilience in mountain economies (Flanigan et al. 2014; Lane and Kastenholz 2015; Živković et al. 2025).

Despite growing literature, important gaps remain. Existing studies often examine agrobiodiversity, tourism, cultural heritage, and resilience separately, while empirical longitudinal evidence from mountain regions in the Western Balkans remains limited. In particular, few studies integrate ecological, socio-cultural, and economic dimensions within a unified analytical framework.

This study addresses these gaps by analyzing how agrobiodiversity influences rural resilience in Northern Albania within the broader context of the Western Balkans. Using longitudinal panel data from 82 households and 107 businesses across 11 mountain villages during 2023–2025, the study develops an integrated framework linking agrobiodiversity, farm culture, biodiversity communication, and mountain rural heritage. The research contributes theoretically by conceptualizing resilience as a multidimensional territorial system shaped by ecological and socio-cultural interactions, while empirically providing one of the first longitudinal econometric assessments of agrobiodiversity-resilience relationships in the region. More specifically, the study addresses the following research questions:

RQ1: How is agrobiodiversity associated with the economic and social strength of rural households and businesses in mountain regions?

RQ2: To what extent do farm cultural practices and biodiversity communication influence the relationship between agrobiodiversity and rural resilience?

RQ3: What role does mountain rural heritage play in moderating the relationship between agrobiodiversity and rural resilience?

RQ4: How do the findings from Northern Albania compare with patterns observed in the Western Balkans?

The findings provide evidence relevant to integrated rural development policies that link biodiversity conservation, tourism diversification, and cultural heritage within sustainable mountain development strategies.

1. LITERATURE REVIEW

Recent studies on sustainable rural development increasingly emphasize the role of multifunctional agricultural systems that combine ecological sustainability, economic diversification, and social adaptation. In this context, agrobiodiversity is viewed not only as an environmental resource but also as a strategic component of rural resilience (Altieri 2002; Lin 2011).

Diversified farming systems improve ecosystem stability, reduce vulnerability to shocks, and strengthen adaptive capacity through broader production structures and income diversification (Tscharntke et al. 2012; Pretty et al. 2018; Benton et al. 2023).

These dynamics are particularly relevant in mountain regions characterized by fragmented agriculture, limited infrastructure, and economic vulnerability (Bogdanov and Zorica 2011). Rural resilience increasingly depends on interactions between ecological assets and socio-economic adaptation mechanisms rather than agricultural production alone (Folke 2006; Darnhofer et al. 2016).

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Within this process, farm culture and traditional ecological knowledge play an important role in preserving biodiversity and sustaining local livelihoods through inherited cultivation practices and intergenerational knowledge transfer (Berkes et al. 2000; Gómez-Baggethun et al. 2013; Stone 2007).

Recent literature also highlights biodiversity communication as an important mechanism linking ecological resources with tourism-based value creation. Storytelling, local products, gastronomy, and visitor experiences enable rural households to transform biodiversity into economic opportunities (Kastenholz et al. 2012; Kastenholz et al. 2018). Agritourism, therefore, functions as both a diversification strategy and a mechanism that connects agriculture, tourism, and cultural identity (Barbieri and Mahoney 2009; Tew and Barbieri 2012). These relationships are especially important in mountain economies where tourism can partially offset agricultural limitations and demographic decline (Flanigan et al. 2014; Safarov et al. 2024; Kedla et al. 2025).

Rural heritage further strengthens these processes by increasing destination attractiveness and reinforcing territorial identity through traditional landscapes, architecture, and local customs (Lane 1994; MacDonald and Jolliffe 2003). Previous studies suggest that heritage assets can amplify the economic effects of biodiversity and tourism within integrated rural development systems (Lane and Kastenholz, 2015; Funduk et al. 2024; Živković et al. 2025).

These issues are particularly relevant in the Western Balkans, where rural regions continue to face depopulation, fragmented agriculture, and migration pressures (de Haas, 2010; King and Vullnetari 2003). Although the region retains significant agrobiodiversity and cultural heritage potential, empirical studies integrating ecological, cultural, and resilience dimensions remain limited. Existing research frequently examines these factors separately, while longitudinal evidence from the mountain regions of the Western Balkans remains scarce (Lazarevski et al., 2018; Sergeyeva et al., 2024; European Commission 2023; OECD 2024).

2. METHODOLOGY

This study employs a longitudinal panel design using primary data collected from the same rural households and businesses during 2023–2025 in the mountainous regions of Northern Albania. The panel structure enables the examination of temporal variations in rural resilience, agrobiodiversity, and tourism-related activities while controlling for unobserved heterogeneity across households.

2.1 Data Collection and Sample

Primary data were collected through structured surveys conducted across 11 mountain villages: Bogë, Çerem, Dedaj, Dragobi, Lekbibaj, Lepushë, Reç, Selcë, Theth, Valbonë, and Vermosh. The sample includes 82 households, 107 businesses, and 310 working-age individuals engaged in agricultural and tourism activities. Several households operated multiple economic activities, including agricultural and tourism-related businesses. To avoid duplication of observations and ensure consistency across survey waves, business-level information was aggregated to the household level. Consequently, all econometric models were estimated at the household level, with households serving as the panel units observed during the 2023–2025 study period. Data collection covered agricultural production, biodiversity-related activities, tourism participation, economic performance, migration intentions, and socio-demographic characteristics. A stratified sampling approach was applied. Villages were selected for their importance to agrobiodiversity and rural tourism, while households were randomly selected using fixed quotas for agricultural and tourism businesses. The sample represents approximately 8% of households in the CABRA project area and captures major mountain communities characterized by strong integration of agriculture and tourism. Although geographically concentrated, the dataset provides detailed longitudinal evidence from some of the most important agrobiodiversity regions in Northern Albania.

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2.2 Construction of Composite Indices

To operationalize multidimensional rural development concepts, five composite indices were developed using standardized z-scores to ensure comparability across variables measured on different scales. Standardization was performed according to the formula:

$$Z_{ij} = \frac{X_{ij} - \bar{X}_j}{SD(X_j)}$$

where X_{ij} represents the value of indicator $_j$ for observation $_i$, X_j is the sample mean, and $SD(X_j)$ is the standard deviation of indicator $_j$. Composite indices were calculated as the arithmetic mean of the standardized indicators comprising each construct. Equal weighting was applied because no strong theoretical or empirical justification existed for assigning differential weights. Higher index values indicate stronger performance in the corresponding dimension. Reliability tests confirmed acceptable internal consistency (Cronbach's $\alpha > 0.70$).

Agrobiodiversity Index (ABI): measures diversification across crops, livestock, food processing, and biodiversity-related activities.

Farm Culture Index (FCI): captures preservation and transmission of traditional agricultural knowledge and practices.

Biodiversity Communication Index (BCI): measures how biodiversity values are communicated through tourism experiences, local products, and storytelling.

Mountain Rural Heritage (MRH): reflects heritage-related assets, including accommodation, catering capacity, guiding services, and crafts.

Rural Resilience Index (RR): measures economic and adaptive capacity through income, sales, investments, and future investment intentions.

2.3 Econometric Modeling

All models are estimated at the household level with year fixed effects and household-clustered standard errors. Model diagnostics indicated no evidence of problematic multicollinearity (VIF = 1.00–1.69). Breusch–Pagan tests revealed significant heteroskedasticity (BP = 17.57–52.04, $p < 0.01$), justifying the use of household-clustered robust standard errors.

Direct Effects Model: The baseline model estimates the relationship between agrobiodiversity and rural resilience:

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 X_{it} + \gamma_t + \varepsilon_{it}$$

where X_{it} includes gender, education, business type, access to training, and additional income sources.

Mediation Analysis: The mediation framework evaluates whether farm culture and biodiversity communication mediate the relationship between agrobiodiversity and rural resilience. The mediation analysis followed the causal mediation framework proposed by Preacher and Hayes (2008). Indirect effects were estimated using bias-corrected bootstrapped confidence intervals based on 5,000 replications.

$$FCI_{it} = \alpha_0 + \alpha_1 ABI_{it} + \alpha_2 X_{it} + \gamma_t + \varepsilon_{it}$$

$$BCI_{it} = \delta_0 + \delta_1 ABI_{it} + \delta_2 X_{it} + \gamma_t + \varepsilon_{it}$$

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 FCI_{it} + \beta_3 BCI_{it} + \beta_4 X_{it} + \gamma_t + \varepsilon_{it}$$

Indirect effects were estimated using bootstrapped confidence intervals with 5,000 replications.

Moderation Analysis: The moderating role of mountain rural heritage was estimated through an interaction model:

$$RR_{it} = \beta_0 + \beta_1 ABI_{it} + \beta_2 MRH_{it} + \beta_3 (ABI \times MRH)_{it} + \beta_4 X_{it} + \gamma_t + \varepsilon_{it}$$

A positive interaction coefficient indicates that heritage assets strengthen the relationship between agrobiodiversity and rural resilience.

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Migration Model: Migration intentions were estimated using Firth's penalized logistic regression due to the low incidence of emigration intentions:

$$\log\left(\frac{P(MI_{it}=1)}{1-P(MI_{it}=1)}\right)=\beta_0+\beta_1 RR_{it}+\beta_2 ABI_{it}+\beta_3 X_{it}+\gamma_t+\varepsilon_{it}$$

where MI_{it} indicates whether household members considered permanent migration abroad.

2.4 Western Balkans Comparative Framework

To contextualize the findings regionally, the analysis incorporates comparative benchmarks from Albania, Serbia, Bosnia and Herzegovina, Montenegro, and North Macedonia.

Table 1. Western Balkans Comparative Literature Framework

Country	Main Focus	Key Contribution
Albania	Agrotourism and agrobiodiversity	Agriculture–tourism integration and biodiversity preservation
Serbia	Rural tourism and heritage	Heritage contributes to tourism income and diversification
Bosnia and Herzegovina	Rural sustainability	Depopulation and weak institutional support
Montenegro	Agrotourism development	Tourism diversification strengthens rural economies
North Macedonia	Rural tourism	Tourism supports economic diversification

Source: Author's research

These countries share similar characteristics, including fragmented agriculture, rural depopulation, and increasing reliance on rural tourism.

3. RESULTS AND DISCUSSION

The empirical analysis is based on longitudinal panel data from 82 households, 107 businesses, and 310 working-age individuals surveyed between 2023 and 2025 across 11 mountain villages in Northern Albania. The rural economy remains dualistic, dominated by agriculture (62%) and tourism (37%), while tourism businesses increased by 29% during the study period.

Table 2. Descriptive Statistics of Key Variables

Variable	Mean	SD	Min	Max
Agrobiodiversity Index (ABI)	0.000	1.000	-1.571	0.634
Income (Lek)	498,974	217,732	113,019	1,171,112
Investment (Lek)	150,566	81,296	10,419	408,960
Tourism	0.437	0.497	0.000	1.000
Agriculture	0.712	0.453	0.000	1.000
Education	10.54	2.70	6.000	15.000
Household size	4.86	1.44	3.000	7.000
Migration intention	0.079	0.270	0.000	1.000

Source: Authors' calculations based on primary survey data (2023–2025).

Agrobiodiversity-related activities, including medicinal plants, honey production, and chestnut collection, remain widespread among households. Tourism-oriented households demonstrate substantially stronger economic performance than agriculture-only households. Average tourism income reached 632,000 Lek compared with 235,000 Lek in agriculture, while overall investments increased considerably during the observed period. Migration intentions remain relatively low (7%), although economic vulnerability continues to be the primary driver of migration.

3.1 Agrobiodiversity and Rural Resilience

Households with higher Agrobiodiversity Index (ABI) values report significantly stronger economic performance. High-ABI households achieve higher sales, income, and investment levels, suggesting that diversified agricultural systems improve economic resilience through broader production structures and value-added activities.

Table 3. Economic Performance by Agrobiodiversity Level

Indicator	Low ABI	High ABI	Difference	Significance
Average sales (000 Lek)	412	698	+286	$p < 0.01$
Average net income (000 Lek)	278	468	+190	$p < 0.01$
Total investments (000 Lek)	98	244	+146	$p < 0.05$
Future investment plans (%)	68%	88%	+20%	$p < 0.05$

Source: Authors' own calculations.

The direct-effects model confirms a significant positive relationship between agrobiodiversity and rural resilience:

$$RR = 0.42 + 0.38ABI + 0.15Education + 0.09Training + \varepsilon$$

The ABI coefficient ($\beta=0.38$, $p<0.001$) indicates that greater agricultural diversification is associated with stronger resilience outcomes.

3.2 Mediation Effects: Farm Culture and Biodiversity Communication

The mediation analysis demonstrates that Farm Culture (FCI) and Biodiversity Communication (BCI) partially mediate the relationship between agrobiodiversity and rural resilience. Agrobiodiversity positively influences both the transmission of cultural knowledge and biodiversity communication practices, thereby strengthening resilience outcomes.

Table 4. Mediation Analysis Results

Path	Coefficient	p-value
ABI → FCI	0.42	<0.001
ABI → BCI	0.51	<0.001
FCI → RR	0.29	<0.01
BCI → RR	0.34	<0.01
ABI → RR	0.38	<0.001
ABI → FCI → RR	0.12	<0.01
ABI → BCI → RR	0.17	<0.01

Source: Authors' own calculations.

The inclusion of FCI and BCI reduces the direct ABI effect, indicating partial mediation. The findings suggest that agrobiodiversity generates value not only through diversification itself but also through cultural practices and visitor-oriented communication about biodiversity.

4.3 Moderation Effects: Mountain Rural Heritage

Mountain Rural Heritage (MRH) significantly moderates the relationship between agrobiodiversity and resilience. The interaction term between ABI and MRH remains positive and statistically significant.

Table 5. Moderation Analysis Results

Variable	Coefficient	p-value
ABI	0.28	<0.01
MRH	0.31	<0.001
ABI × MRH	0.24	<0.001
Education	0.12	<0.05

Source: Authors' own calculations.

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Households with stronger heritage assets, including traditional accommodations and tourism infrastructure, obtain substantially greater resilience benefits from agrobiodiversity activities.

3.4 Migration Intentions and Rural Resilience

The logistic regression results indicate that rural resilience and tourism engagement are associated with lower migration intentions.

Table 6. Logistic Regression Results for Migration Intentions

Variable	Odds Ratio	p-value
Rural Resilience (RR)	0.42	<0.01
Agrobiodiversity (ABI)	0.73	n.s.
Income (log)	0.58	<0.05
Tourism engagement	0.48	<0.05

Source: Authors' own calculations.

Higher resilience significantly reduces intentions to migrate, while tourism participation is associated with lower out-migration pressures. Although agrobiodiversity does not have a direct, significant effect on migration intentions, its indirect effect through rural resilience remains important. Overall, the findings support the argument that integrated agrobiodiversity–tourism systems contribute to stronger territorial resilience in mountain regions.

3.5 Comparative Analysis with the Western Balkans

Comparative analysis indicates that Northern Albania shares several structural characteristics with other rural economies in the Western Balkans, including fragmented agriculture, rural depopulation, and increasing dependence on tourism as a driver of diversification. However, the findings also reveal stronger agriculture–tourism integration and higher biodiversity communication compared with regional benchmarks.

Table 7. Comparative Indicators: Northern Albania vs Western Balkans Benchmarks

Indicator	Northern Albania (2023–2025)	Western Balkans Benchmark	Source
Average household size	5.4 persons	3.8–4.5 persons	World Bank (2020)
Businesses per household	1.31	0.8–1.2	Bogdanov and Rodić (2011)
Tourism business share	37%	15–25%	Živković et al. (2025)
Average agricultural income	€2,150	€1,800–€2,500	FAO (2020)
Average tourism income	€5,750	€4,500–€7,000	Živković et al. (2025)
Investment rate	46%	30–40%	—
Permanent emigration	1%	2–5%	King and Vullnetari (2003)
Considering emigration	7%	10–20%	—
Biodiversity communication	35%	15–25%	Baraku and Hasaj (2023)

Source: Authors' compilation based on World Bank (2020), FAO (2020), Bogdanov and Rodić (2011), Živković et al. (2025), and primary survey data.

The results suggest that Northern Albania exhibits relatively stronger biodiversity communication and tourism integration than many other comparable regions in the Western Balkans. Approximately 37% of tourism businesses source agricultural products locally, indicating stronger territorial linkages between agriculture and tourism activities. Migration intentions also remain below regional averages.

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At the same time, persistent financing constraints, weak infrastructure, and limited access to credit continue to restrict broader rural investment and diversification. The comparative evidence suggests that Northern Albania shares several structural characteristics with other Western Balkan rural regions, including fragmented agriculture, demographic pressures, and increasing dependence on tourism diversification.

The stronger integration of agriculture, tourism, and biodiversity-related activities observed in the study area indicates a comparatively advanced stage of rural diversification. The findings position Northern Albania as a transitional mountain economy in which agrobiodiversity, tourism, and heritage increasingly serve as interconnected mechanisms for rural development.

3.6 Discussion

The findings provide strong empirical evidence that agrobiodiversity is positively associated with rural resilience in mountain regions. Households with higher levels of agricultural diversification report stronger economic performance, higher investment activity, and greater adaptive capacity. These results are consistent with previous studies emphasizing diversification as a key mechanism that supports resilience under environmental and economic pressures (Lin 2011; Darnhofer et al. 2016; Wezel et al. 2014).

The mediation analysis further demonstrates that farm culture and biodiversity communication function as important socio-cultural mechanisms linking agrobiodiversity with resilience outcomes.

Traditional knowledge systems, local production practices, and biodiversity storytelling appear particularly relevant for value creation and territorial differentiation, supporting earlier findings on the importance of cultural capital and experiential rural tourism (Berkes et al. 2000; Tew and Barbieri 2012).

The moderating role of mountain rural heritage highlights the importance of broader territorial systems in shaping rural development outcomes. The resilience effects of agrobiodiversity become significantly stronger in areas with developed heritage assets and tourism infrastructure. This supports previous research arguing that interactions between natural and cultural capital are central to sustainable rural development (Lane and Kastenholz 2015; Živković et al. 2025).

Migration-related findings also reinforce the economic significance of rural diversification. Higher resilience levels and tourism participation are associated with lower migration intentions, consistent with studies identifying economic vulnerability as a key driver of rural out-migration (de Haas 2010). These findings suggest that integrated agriculture–tourism systems may contribute to demographic stability in mountain economies.

Overall, the results indicate that agrobiodiversity contributes to rural resilience through interconnected ecological, cultural, and tourism-related mechanisms rather than through agricultural production alone. This perspective is particularly relevant for the Western Balkans, where fragmented agriculture, demographic decline, and uneven market integration continue to constrain rural development.

The findings therefore support integrated rural development approaches combining biodiversity conservation, tourism diversification, and cultural heritage preservation within broader territorial resilience strategies.

Although the panel design and robustness checks strengthen the analysis, the findings should be interpreted as longitudinal associations rather than definitive causal relationships. Nevertheless, the study provides important empirical evidence from Northern Albania and contributes to a broader understanding of resilience dynamics in transition economies in mountainous regions.

CONCLUSIONS

This study examined the relationship between agrobiodiversity and rural resilience in the mountain regions of Northern Albania within the broader Western Balkans context. The findings demonstrate that agrobiodiversity is positively associated with economic performance, adaptive capacity, and tourism-related diversification. Households with more diversified agricultural systems

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report higher sales, income, and investment levels, indicating that agrobiodiversity serves as an important resource for territorial development.

The analysis further shows that the effects of agrobiodiversity extend beyond agricultural production alone. Farm culture and biodiversity communication partially mediate the relationship between agrobiodiversity and resilience, while mountain rural heritage strengthens these effects through tourism and heritage-related infrastructure. In addition, higher rural resilience and tourism participation are associated with lower migration intentions, suggesting that integrated agriculture–tourism systems may contribute to demographic stability in mountain areas.

From a theoretical perspective, the study contributes to the literature by integrating ecological, cultural, and heritage-related dimensions within a single analytical framework. The findings support a multidimensional understanding of rural resilience in which agrobiodiversity, tourism, and territorial heritage operate as interconnected development mechanisms.

From a policy perspective, the results support integrated rural development strategies aligned with the European Union Green Agenda and the objectives of the Common Agricultural Policy. Policies promoting biodiversity conservation, rural tourism, local value chains, and heritage preservation may strengthen resilience outcomes in mountain economies. Investments in rural infrastructure, biodiversity communication, food processing, and accessible financing mechanisms appear particularly important for increasing the economic value of agrobiodiversity-based activities.

Although the findings are based on longitudinal panel data, the results should be interpreted as robust associations rather than definitive causal effects. Future research could expand the geographical scope to include additional Western Balkan countries and incorporate longer longitudinal periods to better capture resilience dynamics over time.

The study suggests that agrobiodiversity is not only an ecological asset but also a strategic mechanism that supports sustainable rural transformation, economic resilience, and territorial sustainability in mountain regions.

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