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Original Article

Identification and Prioritization of the Dimensions of Local Governance and Social Capital and Their Implications for Rural Resilience to Natural Hazards (Case Study: Ahar Village)

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Abstract

Purpose- This study aims to identify and prioritize the key dimensions of local governance and social capital and to explain their implications for enhancing rural resilience to natural hazards in Ahar Village.

Design/methodology/approach- This applied research adopts a mixed-methods sequential exploratory design. In the qualitative phase, the dimensions of local governance, social capital, and rural resilience were identified through qualitative content analysis. In the quantitative phase, the extracted dimensions and indicators were validated and prioritized using the Delphi technique and statistical analysis. The statistical population consisted of experts in disaster management, geography and rural planning, local governance, social capital, and rural resilience, who were selected through purposive sampling. A total of 24 experts participated in three rounds of the Delphi process. Data were collected through semi-structured interviews and an open-ended questionnaire in the first round, followed by closed-ended questionnaires based on a five-point Likert scale in subsequent rounds. Data were analyzed using mean, standard deviation, and Kendall's coefficient of concordance.

Finding- The findings showed that the three main dimensions' local governance, social capital, and rural resilience ranked first to third, with mean scores of 4.42, 4.31, and 4.18, respectively. Within the local governance dimension, institutional capacity (4.58), preparedness and preventive planning (4.52), and coordination among local institutions (4.46) received the highest priorities. Within the social capital dimension, social trust (4.55), local participation (4.43), and social cohesion and cooperation (4.37) ranked highest. Regarding rural resilience, local community preparedness and adaptability (4.41), social and institutional capacity (4.32), and the ability to recover and maintain village activities after a disaster (4.25) received the highest priorities.

Practical Implications- The findings suggest that strengthening rural resilience requires an integrated approach to local governance and social capital. Policymakers and local authorities should prioritize strengthening institutional capacity, improving disaster preparedness and preventive planning, enhancing coordination among local institutions, and promoting social trust, local participation, social cohesion, and support networks. Developing these capacities simultaneously can improve communities' ability to prepare for, adapt to, respond to, and recover from natural hazards while maintaining essential village activities.

Originality/value- By combining qualitative content analysis with the Delphi technique and statistical prioritization, the study identifies the most influential institutional and social factors underlying rural resilience. The findings highlight the complementary role of institutional capacity and social capital and demonstrate that sustainable resilience-building requires simultaneous attention to governance structures, community participation, social trust, preparedness, and institutional coordination.

Keywords- Local Governance, Social Capital, Rural Resilience, Natural Hazards, Disaster Management, Ahar Village.

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1. Introduction

In recent decades, the increasing frequency and intensity of natural hazards, including floods, earthquakes, droughts, and landslides, have posed a wide range of challenges to rural settlements (Poudel & Shaw, 2024). The greater vulnerability of rural areas to such hazards is influenced not only by their natural and physical characteristics but also by factors such as limited resources, inadequate infrastructure, low institutional capacity, and restricted access to disaster management services and facilities (Marchetti et al., 2025). Accordingly, contemporary disaster management approaches increasingly emphasize reducing vulnerability and strengthening the capacity of local communities to prepare for, adapt to, cope with, and recover from hazardous events (Hart et al., 2025). Within this context, rural resilience has emerged as a key concept in hazard planning and management, focusing on the capacity of local communities to anticipate, withstand, cope with, adapt to, and recover from the consequences of natural hazards (Kang et al., 2026). However, resilience should not be regarded as a fixed or uniform set of capacities that operates similarly across all communities and hazard contexts. Rather, the relevance, effectiveness, and interaction of resilience capacities may vary according to the type and characteristics of hazards, the size and organizational structure of the affected community, and the broader institutional and policy environment in which communities operate.

In this regard, achieving rural resilience cannot be accomplished solely through technical and physical measures; rather, it requires adequate managerial, institutional, and social capacities. Local governance is among the factors that play a significant role in this regard, as local institutions are essential to hazard identification, preventive planning, resource organization, inter-agency coordination, information dissemination, and mobilization of community capacities (Khandokar et al., 2026). The greater the institutional and managerial capacity at the local level, the greater the potential for more effective crisis preparedness and response planning, stronger coordination among responsible organizations, and more rapid responses to community needs (Falsoleiman et al., 2025). However, the contribution of local governance to resilience may depend on the characteristics of the hazard and the scale of the community. For example, the institutional arrangements and coordination mechanisms required to address sudden-onset hazards such as earthquakes may differ from those required to manage slower-onset or recurrent hazards such as droughts. Likewise, the effectiveness of local institutions may vary between smaller communities with relatively dense social relationships and larger communities with more complex organizational structures and a wider range of institutional actors. Therefore, institutional capacity, preparedness and preventive planning, and coordination among local institutions can be regarded as fundamental components of local governance for enhancing the resilience of rural settlements, while their effectiveness should be understood within the specific hazard and community context.

Alongside local governance, social capital constitutes one of the most important endogenous capacities of rural communities for confronting natural hazards (Varshney et al., 2026). Through components such as social trust, participation, cohesion, cooperation, and communication and support networks, social capital facilitates interaction and collaboration among community members and local institutions (Prayoga et al., 2024). The presence of mutual trust and strong social relationships can facilitate the flow of information, increase public participation in disaster management programs, strengthen mutual support, and enhance the community's capacity for a coordinated response under crisis conditions (Qu et al., 2026). Thus, social capital should be understood not only as an independent social capacity but also as a factor that strengthens the effectiveness of local governance and facilitates the implementation of risk-reduction and resilience-enhancement programs (Boyana et al., 2026; Rodriguez et al., 2025). Nevertheless, the contribution of social capital to resilience is also context-dependent. The extent to which social networks, trust, and collective action can be translated into effective disaster responses may depend on the type of hazard, the size and social organization of the community, and the extent to which local social capacities are supported or constrained by formal institutions and external policies.

The importance of the interaction between local governance and social capital becomes more evident when natural hazards are examined at the

local scale. Under such circumstances, formal institutions alone are unable to manage all dimensions of a crisis, making it necessary to draw upon local capacities, indigenous knowledge, social networks, and residents' participation (Chen et al., 2026). Constructive interaction between local institutions and rural communities can foster participatory decision-making, enhance trust, improve coordination, and strengthen community preparedness (Schaffer & Bennett, 2026). Accordingly, rural resilience is the outcome of interactions among a range of institutional and social capacities and cannot be reduced solely to the availability of physical facilities or economic resources. Importantly, these interactions are not necessarily stable over time or across contexts. The relative contribution of different capacities may change depending on the characteristics of the hazard, the demographic and organizational scale of the community, and the external institutional and policy conditions. External policies can, for instance, strengthen local capacities by providing resources, institutional support, disaster-management services, and coordination mechanisms, while inappropriate or insufficient policies may constrain the ability of communities to convert existing social and institutional capacities into effective resilience outcomes. Thus, understanding rural resilience requires attention not only to the presence of particular capacities but also to the conditions under which these capacities interact and become effective.

The village of Ahar is also exposed to various natural hazards due to its geographical location, natural characteristics, and mountainous setting, making the strengthening of local capacities for hazard management particularly important. In such an environment, the level of community preparedness, the capacity of local institutions, the degree of social participation and trust, and the quality of coordination among local actors can play a decisive role in reducing the impacts of hazards and enhancing the village's capacity to recover following a disaster. At the same time, the effectiveness of these capacities should be considered in relation to the specific characteristics of the hazards affecting the community, the scale and structure of the local population, and the institutional and policy environment surrounding the village. Nevertheless, an accurate understanding of the dimensions of local governance and social capital, as well as the relative importance of their respective components in shaping rural resilience, requires a systematic investigation drawing on expert perspectives.

Despite the growing body of research on resilience to natural hazards, a substantial proportion of existing studies has focused on the physical, economic, or infrastructural dimensions of resilience (Chen et al., 2026; Poudel & Shaw, 2024; Jamini & Shabani Hosainabadi, 2025; Hajjarian, 2024; Riahi & Rostamian, 2022), while the simultaneous relationship between local governance capacities and social capital has received comparatively limited integrated attention. Moreover, many studies have examined the factors contributing to resilience without determining their relative priorities. Identifying the components of greater importance can, however, facilitate the targeted allocation of resources and the design of more effective disaster management programs. Accordingly, the present study adopts a mixed-methods approach, combining qualitative content analysis and the Delphi technique, to identify, validate, and prioritize the dimensions of local governance, social capital, and rural resilience, and to elucidate their implications for resilience to natural hazards in Ahar Village. Based on this rationale, the main research question is: What are the most important dimensions and components of local governance and social capital that influence the resilience of Ahar Village, and how can these components be ranked in terms of their relative importance and priority?

The remainder of this article is organized as follows. First, the theoretical foundations and relevant empirical literature on rural resilience, local governance, and social capital are reviewed. Second, the research methodology, including the qualitative content analysis and Delphi technique, is presented. Third, the findings are reported and discussed in relation to the existing literature. Finally, the conclusions, practical implications, and recommendations for enhancing rural resilience are presented.

2. Research Theoretical Literature

2.1. Social Capital Theory: Robert D. Putnam

Social capital theory is one of the important approaches for explaining the role of social relationships, trust, and cooperation in the functioning of communities. Among the various perspectives on social capital, Robert D. Putnam's approach provides an appropriate framework for

explaining the link between social and institutional capacities and their outcomes at the local community level, particularly because of its emphasis on horizontal relationships, civic engagement, mutual trust, and the capacity for collective action (Coleman, 2019). From Putnam's perspective, social capital refers to features of social organization, including networks, norms, and trust, that facilitate coordination and cooperation for mutual benefit (Putnam, 2018: 78). Thus, social capital is not merely a collection of individual relationships; rather, it constitutes a collective resource that enhances a community's capacity to cooperate and address shared problems.

Within Putnam's theory, social trust is one of the most fundamental elements of social capital. Trust enables individuals to engage in reciprocal relationships with greater confidence, reduces the costs of interaction, and increases their willingness to cooperate. Mutual trust also provides a foundation for the development of shared expectations and stable relationships among community members. Under such conditions, individuals perceive participation in collective activities as less costly and more reliable, thereby increasing the likelihood of cooperation (Putnam, 2017).

Another essential element of the theory is social networks. Networks provide the basis for communication, information exchange, resource sharing, and the formation of reciprocal relationships among individuals and groups. Putnam distinguishes between bonding and bridging networks. Bonding networks strengthen cohesion and mutual support among members of a particular group, whereas bridging networks facilitate connections across different groups and provide access to broader resources and opportunities (Putnam, 2018). From this perspective, the existence of diverse and effective networks can enhance a community's capacity to mobilize resources and achieve social coordination. However, the effectiveness of such networks is not necessarily uniform across communities or circumstances. The extent to which bonding and bridging networks contribute to collective action may depend on the size and social organization of the community, the nature of the hazard being addressed, and the community's connections with formal institutions and external sources of support.

Civic and social participation also occupies a central position in Putnam's conceptualization. Participation strengthens social ties, creates experiences of cooperation, and fosters the development of reciprocal norms. Continued involvement in collective affairs gradually enhances trust and the capacity for cooperation, thereby providing a foundation for the formation of enduring social relationships (Putnam, 2020). Accordingly, participation can be both an outcome of social capital and a mechanism through which social capital is reproduced and strengthened.

Norms of cooperation and reciprocity constitute other important components of the theory. In communities where individuals expect their cooperative behavior to be reciprocated by others, their willingness to participate and cooperate increases. Such reciprocal norms orient individual behavior toward collective goals and enhance the potential for collective action (Putnam, 2020).

According to Putnam's theory, the interaction among trust, social networks, participation, and norms of reciprocity generates the capacity for collective action (Putnam, 2020). This capacity refers to a community's ability to organize resources, coordinate among its members, foster cooperation, and achieve shared goals (Lin, 2018: 66). Within this framework, social capital can be regarded as a social capacity that strengthens relationships between the community and local institutions and enhances coordination and participation at the local level. Therefore, components such as social trust, local participation, social cohesion and cooperation, and support networks can be considered, within the theoretical framework of Putnam, as key manifestations of social capital and as resources that shape the collective capacity of a community.

Importantly, the relationship between social capital and collective action should not be understood as static or independent of context. Although trust, networks, participation, and reciprocal norms provide an important foundation for collective action, their contribution to resilience may vary according to the characteristics of the hazard, the size and organizational structure of the community, and the broader institutional and policy environment. Different hazards may require different forms of coordination, information exchange, and collective response, thereby altering the relative importance of particular social capacities. Similarly, the structure and effectiveness of social networks may differ between smaller and

larger communities, while external policies, institutional support, and access to formal disaster-management systems can either strengthen or constrain the ability of communities to translate social capital into effective collective action. Accordingly, within the present study, social capital is conceptualized not as a fixed capacity but as a context-dependent resource whose effectiveness emerges through its interaction with local governance, community characteristics, and the hazard environment.

2.2. Research Background

Recent research increasingly conceptualizes rural disaster resilience as a multidimensional and dynamic process rather than as a single outcome or a fixed set of capacities. Rural communities are exposed not only to the direct physical impacts of hazards but also to socioeconomic, spatial, institutional, and livelihood-related conditions that shape their ability to prepare for, respond to, and recover from disasters. Recent evidence from rural China, for example, shows that community resilience encompasses the capacity to anticipate and recognize potential damage, coordinate multiple actors, and mobilize local actions before, during, and after disasters (Li et al., 2024). Similarly, Su et al. (2024) demonstrated that rural community resilience changes over time following disasters and that the trajectory of resilience is influenced by both government intervention and community self-organization. These findings suggest that resilience should be understood as a process emerging from interactions among community capacities, institutional interventions, and changing hazard conditions rather than as a stable attribute of a community.

Importantly, the dynamic nature of resilience also implies that capacities themselves may need to evolve as hazard patterns and local conditions change. Adaptive capacity refers, in this context, to the ability of individuals, communities, and institutions to learn from experience, adjust existing practices, reorganize resources, and develop new responses as environmental and hazard conditions change. Flexibility is a closely related characteristic because it enables existing institutional, social, and organizational arrangements to be modified rather than applied rigidly across different situations. Thus, resilient communities require not only existing capacities for preparedness, response, and recovery, but also the ability to continuously revise and strengthen those capacities. The importance of such evolution is reflected in evidence that rural resilience may follow different trajectories after disasters depending on government intervention, community self-organization, and changing local conditions (Su et al., 2024). Similarly, the adaptive capacity and self-reliance observed in rural communities may depend on their ability to mobilize social networks, innovation, and cultural resources while responding to prolonged or changing pressures (Marchetti et al., 2025). Accordingly, rural resilience can be understood as an ongoing process of learning, adjustment, and capacity development rather than simply the maintenance of a predefined set of capabilities.

A first group of studies emphasizes the importance of the physical and spatial characteristics of rural settlements in shaping disaster vulnerability and response capacity. Falsoleiman et al. (2025), for example, found substantial differences among rural settlements in terms of their spatial distribution, proximity to faults and ephemeral streams, and accessibility to disaster-management centers and transportation infrastructure. Similarly, Jamini & Shabani Hosainabadi, (2025) identified substantial variation in flood susceptibility among rural settlements within the Hawraman cultural landscape, demonstrating that exposure and spatial characteristics can differ considerably even among settlements located within the same broader region. More recently, Xiong et al. (2026) provided field-based evidence from a high-altitude rural village showing that road geometry, intersections, sharp turns, route complexity, and wayfinding conditions can affect evacuation speed and route selection. Taken together, these studies indicate that the effectiveness of preparedness and response capacities cannot be separated from the physical and geographical characteristics of the community in which they operate. They also imply that preparedness and response arrangements need to remain sufficiently flexible to accommodate differences in hazard exposure, accessibility, and changing spatial conditions.

A second body of research highlights the role of socioeconomic and livelihood conditions in shaping disaster vulnerability and preparedness. Liu et al. (2025), based on evidence from farming households in flood-prone areas of rural China, found significant relationships between different forms of livelihood risk and disaster preparedness. Their

findings showed that social, financial, and health-related risks can affect different dimensions of preparedness, indicating that households do not face disaster risk independently of their livelihood conditions. This relationship is further illustrated by Livne et al. (2026), whose study of rural Malawi demonstrated that agricultural land loss can simultaneously function as a symptom, cause, and consequence of disaster vulnerability. Their findings showed that repeated climate-related hazards can interact with existing socioeconomic inequalities and weaken traditional coping mechanisms, while ineffective policies concerning access to resources may reproduce vulnerability over time. These findings reinforce the importance of considering the socioeconomic and livelihood context when examining rural resilience. They further suggest that adaptive capacity depends partly on the ability of households and communities to adjust livelihood strategies and resource use as hazard pressures change over time.

A third group of studies focuses on institutional, managerial, and governance capacities. Evidence from Iran has emphasized the importance of planning, education and extension, laws and regulations, information dissemination, and infrastructure in rural crisis management (Hajjarian, 2024). Riahi and Rostamian (2022) likewise identified substantial differences in disaster-management awareness among rural women across different rural districts, demonstrating that preparedness capacity is not distributed uniformly across rural communities. More recently, Lee et al. (2025) showed that strengthening the capacity of organized citizen-response forces can reduce rural vulnerability and improve disaster-response capacity. Their findings also emphasized collaboration among policymakers, local leaders, and researchers, thereby illustrating the importance of coordination between community-level capacities and formal institutional actors. These findings collectively indicate that rural resilience depends not only on the internal capacities of communities but also on the institutional arrangements through which resources, information, coordination, and emergency support are provided.

From a dynamic perspective, however, effective local governance also requires the capacity to learn and adjust. Planning systems, coordination mechanisms, information flows, and resource-allocation arrangements may need to be revised when the frequency, intensity, timing, or spatial distribution of hazards changes. Governance capacity should therefore not be understood solely as the presence of formal institutions or predefined plans, but also as the ability of local institutions to review experience, incorporate new information, coordinate changing actors, and modify existing strategies. In this sense, institutional flexibility and learning can strengthen the adaptive capacity of rural communities by allowing formal governance arrangements to evolve alongside changing risk conditions.

At the same time, an important strand of the literature emphasizes the role of social relationships, self-organization, and community participation. Rural communities often rely on social networks, mutual assistance, trust, local knowledge, and collective action to cope with disasters, particularly where formal resources are limited. Marchetti et al. (2025) found that rural communities can demonstrate considerable self-reliance and adaptive capacity through strong social networks, innovation, and cultural resources. However, the study also showed that these locally generated capacities may become constrained when communities face prolonged crises, limited resources, or institutional responses that are poorly aligned with local needs. This finding is consistent with the broader argument that social capital can strengthen resilience but cannot necessarily compensate for structural and institutional deficiencies. Similarly, Su et al. (2024) showed that community self-organization becomes increasingly important during longer-term recovery, while government intervention can have a particularly strong influence during disaster relief and reconstruction. Thus, community-based capacities and formal governance should be viewed as complementary rather than mutually exclusive sources of resilience.

The dynamic character of social capital is also important for adaptive capacity. Social networks can provide channels through which communities exchange information, learn from previous disasters, identify emerging risks, and mobilize collective responses. However, networks may need to expand, reorganize, or establish new connections when hazards change or when existing coping arrangements become insufficient. Bridging relationships may be particularly important in such circumstances because they can connect local

groups with external institutions, knowledge, resources, and new forms of support. Accordingly, social capital contributes to resilience not only by facilitating immediate collective action but also by supporting learning, social adjustment, and the renewal of collective capacities over time.

The findings of the existing literature therefore point to an important conceptual relationship among physical exposure, livelihood conditions, local governance, social capital, and rural resilience. Spatial and environmental characteristics determine the nature and intensity of exposure; socioeconomic and livelihood conditions influence the resources available to households and communities; local governance provides institutional coordination, planning, information, and organizational capacity; and social capital facilitates trust, participation, mutual assistance, and collective action. Rural resilience emerges from the interaction of these dimensions rather than from any single component. Recent studies increasingly support this integrated perspective by demonstrating that resilience is shaped simultaneously by community self-organization, government intervention, local stakeholder action, spatial characteristics, and socioeconomic conditions (Su et al., 2024; Li et al., 2024; Lee et al., 2025; Marchetti et al., 2025; Livne et al., 2026).

Building on this integrated perspective, adaptive capacity can be understood as a cross-cutting property of these dimensions rather than as an isolated component. Local governance contributes to adaptive capacity when institutions can learn, coordinate, and revise plans and resource allocations; social capital contributes when networks, trust, and participation enable communities to exchange knowledge, reorganize cooperation, and mobilize resources under changing conditions; and rural resilience is strengthened when these capacities collectively allow communities to adjust while maintaining essential functions. In this sense, flexibility provides an important link between existing capacities and their future development. A community may possess substantial resources and strong institutions at a given point in time, yet resilience depends partly on whether these resources can be reconfigured when the nature of risk changes.

However, despite this growing body of research, the dimensions of rural resilience have often been examined separately. Some studies have primarily focused on spatial exposure and physical vulnerability (Falsoleiman et al., 2025; Jamini & Shabani Hosainabadi, 2025; Xiong et al., 2026), whereas others have emphasized livelihood risk and socioeconomic vulnerability (Liu et al., 2025; Livne et al., 2026). Another group has concentrated on institutional preparedness, crisis management, or formal disaster-response capacity (Hajjarian, 2024; Lee et al., 2025), while studies of community resilience have highlighted social networks, self-organization, participation, and local adaptive capacities (Su et al., 2024; Marchetti et al., 2025). Although these perspectives are complementary, relatively less attention has been given to how local governance and social capital can be conceptualized together as interconnected capacities within a rural resilience framework and, importantly, how these capacities can evolve as hazard conditions change.

This gap is particularly important because local governance and social capital represent two distinct but potentially complementary dimensions of community capacity. Local governance provides organizational structures, planning mechanisms, institutional coordination, information dissemination, and access to formal resources, whereas social capital supports trust, participation, social cohesion, mutual assistance, and collective action. Their interaction may determine how effectively rural communities can mobilize available resources and translate them into preparedness, adaptation, response, and recovery. Importantly, the relationship between these capacities should not be assumed to be uniform across all rural settings or stable over time. The type and characteristics of hazards, the size and organizational structure of communities, the socioeconomic conditions of households, and the institutional and policy environment may shape the ways in which governance and social capital are developed and mobilized. Moreover, as hazard patterns change, these capacities may need to be continuously adjusted through learning, institutional adaptation, social reorganization, and flexible resource mobilization.

Therefore, the existing literature suggests the need for an integrated framework that does not treat local governance, social capital, and rural resilience as isolated or fixed concepts, but instead examines their interconnected roles within a changing disaster context. The present study addresses this gap by using a three-round Delphi process to identify, refine, and prioritize the dimensions and indicators

that experts consider important for rural resilience to natural hazards. By bringing together managerial and institutional capacities with social capacities and resilience-related outcomes, the study seeks to provide a more integrated understanding of the capacity configuration underlying rural resilience. Although the Delphi process does not directly measure the longitudinal evolution of adaptive capacity, the resulting framework can be interpreted as a basis for understanding which capacities may need to be maintained, strengthened, or flexibly adjusted as hazard conditions and community needs change. In this way, the study moves beyond a fragmented treatment of individual risk, preparedness, vulnerability, or resilience indicators and develops a context-sensitive framework linking local management, social capital, adaptive capacity, and rural resilience at the community level (Table 1).

Table 1. Comparison of Previous Studies and Distinction from the Present Study

Study	Year	Main Focus / Findings	Distinction from the Present Study
Xiong et al., "Emergency Behavior Management of Rural Residents in Response to Disasters: A Field Study of High-Altitude Villages in Sichuan, China"	2026	Examined how environmental and physical characteristics of rural settlements, including route complexity, intersections, irregular routes, and wayfinding conditions, influence residents' movement speed, hesitation, and evacuation-route selection.	Focuses primarily on emergency behavior and the physical characteristics of evacuation routes. In contrast, the present study develops a broader capacity configuration for rural resilience, integrating institutional, managerial, social, and adaptive capacities through a structured expert-consensus process.
Livne et al., "Root Causes of Disaster Vulnerability: Loss of Subsistence Agricultural Land in Rural Malawi"	2026	Demonstrated how agricultural land loss and degradation interact with socioeconomic inequalities and climate-related hazards to reinforce cycles of rural vulnerability.	Examines land access, inequality, and livelihood-based vulnerability. The present study moves beyond a specific livelihood mechanism by systematically identifying and prioritizing institutional, social, and resilience-related capacities within a common rural resilience framework.
Liu et al., "Does livelihood risk matter in disaster preparedness? Insights from flood risk areas of rural China?"	2025	Investigated relationships between livelihood risks and disaster preparedness among farming households, showing that social, financial, and health-related risks are associated with different dimensions of preparedness.	Uses farming households and livelihood risk as the primary analytical focus. The present study adopts a community-level capacity perspective and uses Delphi to identify and prioritize interconnected institutional, social, adaptive, and resilience capacities rather than testing the effect of a specific livelihood-risk construct.
Marchetti et al., "The resilience paradox: Rural self-reliance and the limits of disaster recovery"	2025	Showed that social networks, innovation, and cultural resources can strengthen rural self-reliance and adaptive capacity, while prolonged crises and inadequate institutional support can constrain recovery.	Provides important evidence on social networks, self-reliance, and adaptive capacity, but does not systematically develop and prioritize a broader configuration of institutional and social capacities. The present study explicitly integrates these capacities and establishes their relative importance through three rounds of Delphi consensus.
Lee et al., "Evaluating the disaster response capacity of the Korean citizen corps in rural areas: A System Dynamics–GIS approach"	2025	Examined the capacity of organized citizen-response forces and showed that strengthening volunteer capacity and cooperation among policymakers, local leaders, and researchers can improve rural disaster response.	Focuses on a specific organized volunteer-response mechanism and its implications for disaster response. The present study addresses a wider configuration of capacities, including governance, coordination, trust, participation, social cohesion, adaptability, and recovery, and systematically prioritizes them rather than modeling one response mechanism.
Jamini & Shabani Hosainabadi, "Analysis of Flood Susceptibility in Rural Settlements	2025	Identified substantial variation in flood susceptibility among rural settlements and highlighted the importance of spatial and	Concentrates on hazard susceptibility and spatial exposure. The present study does not primarily assess hazard zoning or physical susceptibility; instead, it examines the

Study	Year	Main Focus / Findings	Distinction from the Present Study
within the Hawraman Cultural Landscape"		environmental characteristics in determining exposure.	capacities through which rural communities can prepare for, adapt to, respond to, and recover from hazards.
Falsoleiman et al., "Location and Vulnerability of Rural Settlements in Zirkouh County"	2025	Demonstrated that settlement distribution, proximity to hazard-prone areas, disaster-management centers, and transportation infrastructure contribute to differences in rural vulnerability.	Emphasizes spatial location and physical vulnerability. The present study addresses a different analytical question by identifying and prioritizing social, institutional, managerial, and adaptive capacities that can shape rural resilience across changing risk conditions.
Li et al.	2024	Showed that rural community resilience involves anticipating and recognizing potential damage, coordinating multiple actors, and mobilizing local action before, during, and after disasters.	Provides evidence for the multidimensional nature of community resilience, but does not develop a systematic expert-based prioritization of the interconnected capacity dimensions. The present study operationalizes this broader perspective through a multi-round Delphi process.
Su et al.	2024	Demonstrated that rural community resilience can follow different trajectories following disasters and that government intervention and community self-organization influence these trajectories.	Highlights the dynamic interaction between government intervention and community self-organization, but primarily examines resilience trajectories rather than systematically identifying and prioritizing the underlying capacity configuration. The present study provides an expert-informed framework of capacities that can support such future longitudinal investigation.
Hajjarian, "Analysis of Effective Components in Crisis Management in Rural Areas from the Perspective of Experts"	2024	Identified planning, education and extension, laws and regulations, information dissemination, and infrastructure as important components of rural crisis management.	Although it also uses an expert-oriented perspective, the focus is on crisis-management components rather than an integrated rural resilience framework. The present study extends the analytical scope by connecting institutional and managerial capacities with social capital, adaptive capacity, and resilience-related capacities, and by systematically refining and prioritizing indicators through a three-round Delphi process.
Riahi & Rostamian, "Assessing the Awareness of Rural Women about the Components of Natural Disaster Crisis Management (Case Study: Damghan City)"	2022	Assessed rural women's awareness of disaster-management components across the pre-disaster, response, and post-disaster stages and identified differences among rural districts.	Focuses on awareness among a specific population group rural women and across disaster-management stages. The present study takes a broader community-level perspective and seeks to identify and prioritize the interconnected institutional, social, adaptive, and resilience capacities underlying rural resilience.

The review of previous studies indicates that the existing literature has generated valuable knowledge about individual aspects of disaster vulnerability, preparedness, response capacity, institutional management, social networks, livelihood conditions, and rural resilience. However, the present review also shows that these dimensions have frequently been examined within separate analytical frameworks or with a focus on particular hazards, population groups, spatial conditions, or organizational capacities. The research gap addressed in the present study is therefore not the absence of studies on local governance, social capital, or rural resilience, but the limited systematic integration and prioritization of these related capacities within a common rural resilience framework.

This study addresses this gap through a three-round Delphi process involving experts with relevant academic, institutional, managerial, and professional experience. Rather than testing causal relationships among local governance, social capital, and rural resilience, the study identifies, refines, validates, and prioritizes the dimensions and indicators considered important by the expert panel. Its principal contribution therefore lies in developing a prioritized and context-sensitive configuration of capacities that integrates local governance, social capital, and resilience-related components.

This approach distinguishes the present study from previous research in three principal respects. First, it brings together managerial and institutional capacities, social capacities, and resilience-related capacities within a single analytical framework. Second, it focuses on the systematic identification and refinement of indicators rather than examining only a predefined set of variables or a single aspect of disaster vulnerability. Third, it uses a multi-round expert-consensus process to determine the relative importance and priority of the identified capacities. The resulting framework should consequently be interpreted as an exploratory and expert-informed representation of the capacities considered relevant to rural resilience, rather than as a statistically validated causal model.

Within this framework, the study identifies institutional capacity, preparedness and preventive planning, coordination among local institutions, social trust, local participation, social cohesion and cooperation, social support networks, preparedness and adaptability, social and institutional capacity, and recovery-related capacities as interconnected components of the broader capacity configuration associated with rural resilience. By organizing and prioritizing these capacities within the context of Ahar Village, the study provides a context-sensitive basis for understanding which managerial, institutional, and social capacities may warrant particular attention in efforts to strengthen rural resilience to natural hazards. Future field-based research can build on this framework to empirically examine the relationships among these capacities and their actual effects on resilience outcomes.

3. Research Methodology

3.1 Geographical Scope of the Research

Ahar Village is located in Rudbar-e Qasran Rural District, Rudbar-e Qasran District, Shemiranat County, Tehran Province, Iran. The village is situated at approximately 35°56′10″ N and 51°27′40″ E and lies within the mountainous landscape of the central Alborz range. According to the 2016 national census, Ahar had a population of 583 inhabitants. The village is located approximately 23 km northwest of Gholamduak (Golabdak) and occupies a strategically distinctive position at the intersection of two mountain valleys. One valley extends toward Dehtangeh and the Zargeh Pass, while the other extends toward the agricultural and orchard areas of Shokrab, the Shokrab waterfall and river system, Mount Tochal, and the boundary of Shemshak and Shahrestanak areas. This geomorphological setting has strongly influenced the spatial organization, accessibility, natural-resource base, and livelihood structure of the village.

The physical environment of Ahar is characterized by mountainous slopes, narrow valleys, perennial or seasonal watercourses, agricultural lands, and extensive orchards. The presence of rivers and surface-water resources has contributed to the ecological productivity of the surrounding landscape and has historically supported agricultural and horticultural activities. The village is particularly known for its orchards, where cherries, sour cherries, pears, and apples are among the principal cultivated crops. Accordingly, horticulture constitutes an important component of the local livelihood system and contributes to the economic and spatial identity of the settlement. The combination of mountain topography, water resources, agricultural land, and orchard systems also makes the village environmentally distinctive within the rural settlements of the Rudbar-e Qasran region.

From a demographic perspective, Ahar represents a relatively small rural community. Census data indicate changes in its population over time, with 702 inhabitants recorded in the 2006 census and 583 inhabitants in 2016. These figures should be interpreted within the context of a mountainous rural settlement that is also exposed to seasonal fluctuations in population and activity. The relatively small permanent population is particularly relevant to the analysis of rural resilience because the scale of the community may influence the organization of social networks, access to local services, participation in collective

action, and the capacity of local institutions to mobilize resources during emergencies.

Ahar also possesses a distinctive cultural and historical identity. Local residents speak the Tajrishi dialect, which is associated with the Persian–Mazanderani linguistic continuum. Historical and archaeological remains in and around the village further indicate the long-standing settlement history of the area. Among the notable historical features is the Qalʿeh Dokhtar (Dokhtar Fortress/Fire Temple) complex, which is associated with the Sasanian period and subsequent historical periods. The Shokrab area also contains historical and religious sites, contributing to the cultural landscape and local identity of the settlement. These cultural characteristics are relevant to the present study because community identity, local attachment, and historically established social relations can constitute important contextual conditions for collective action and the mobilization of social capital in rural communities.

The environmental characteristics of Ahar are also important from a disaster-risk perspective. The village is embedded within a mountainous terrain and is intersected by river channels and valley systems. Consequently, its physical setting creates exposure to a range of natural-hazard processes, particularly hydro-meteorological and slope-related hazards. The presence of watercourses and settlement and agricultural activities within a confined mountainous environment makes the management of flood-related processes and river corridors an important local concern, while steep slopes and mountainous access routes can increase exposure to rockfall and other slope-related hazards. Evidence of such exposure is also reflected in documented rockfall incidents in the Ahar area, including a reported rockfall accident in the mountainous area of Ahar in 2023. These characteristics indicate that the village should not be viewed merely as a geographically bounded settlement, but as a rural socio-environmental system in which livelihoods, infrastructure, natural resources, and settlement patterns are closely interconnected with the surrounding hazard environment.

The village also has an identifiable local institutional structure. As a rural settlement within the administrative system of Rudbar-e Qasran, Ahar is governed at the local level through the village council and the rural municipality (Dehyari), which operate within the broader administrative and governmental structure of Shemiranat County and Rudbar-e Qasran District. Available local administrative information indicates that the village council and Dehyari are involved in addressing issues related to infrastructure maintenance, road and access management, public services, environmental concerns, and the regulation of development within the village. Recent local administrative inspections have, for example, addressed issues including unauthorized construction within the rural boundary, improvement of village access routes, and unsafe excavation in the settlement area. These observations demonstrate that local governance in Ahar operates within a complex environment involving infrastructure management, land-use regulation, environmental pressures, and disaster-related safety concerns.

At the same time, the institutional context of Ahar extends beyond the village-level council and Dehyari. Local governance and disaster management are embedded within the administrative hierarchy of Rudbar-e Qasran District and Shemiranat County, while emergency response and disaster-risk management also involve relevant governmental and emergency-management organizations. The interaction between village-level institutions and higher-level administrative and emergency structures is therefore an important contextual feature when considering the capacity of the community to prepare for, respond to, and recover from natural hazards. In this respect, local governance should be understood not simply as an internal village institution, but as part of a multilevel institutional system through which resources, information, coordination, and external support can be mobilized.

Taken together, the geographical, demographic, socioeconomic, environmental, cultural, and institutional characteristics of Ahar provide a specific context for examining rural resilience to natural hazards. The village combines a relatively small permanent population, a livelihood system strongly associated with horticulture and natural resources, a mountainous and river-influenced physical environment, a distinctive historical and cultural identity, and an institutional structure involving village-level governance within a broader administrative system. These characteristics make Ahar a relevant case for investigating how local

governance, social capital, and rural resilience may be conceptually related and prioritized by experts. Importantly, the present study does not interpret the characteristics described in this section as direct measurements of residents' perceptions or as evidence of causal relationships among local governance, social capital, and resilience. Rather, they provide the geographical, socioeconomic, environmental, and institutional context within which the three-round Delphi process was conducted and the identified dimensions and indicators were interpreted.

3.2. Methodology

The present study is applied in terms of its purpose and adopts a mixed-methods approach with a sequential exploratory design. The research process was conducted in two qualitative and quantitative phases. In the first phase, qualitative content analysis was used to identify and extract the dimensions of local governance, social capital, and the components of rural resilience to natural hazards. Data for this phase were collected through semi-structured interviews and an open-ended questionnaire administered to experts. In the second phase, the findings obtained from the qualitative analysis served as the basis for developing a closed-ended Delphi questionnaire. The identified dimensions and indicators were subsequently evaluated, validated, and prioritized by experts through three rounds of the Delphi process. In the Delphi questionnaire, the importance of the identified dimensions and indicators was assessed using a five-point Likert scale. Finally, the quantitative data were analyzed using the mean, standard deviation, and Kendall's coefficient of concordance to determine the relative importance and priority of the dimensions and indicators and the degree of agreement among the experts. Thus, the findings from the qualitative phase provided the basis for the quantitative phase, while the Delphi results were used for the final validation and prioritization of the dimensions of local governance, social capital, and rural resilience.

a. Study Population and Sampling Method- The study population for the Delphi process consisted of experts in disaster management, geography and rural planning, local governance, social capital, and rural settlement resilience. The expert panel included faculty members and researchers in relevant fields, specialists from executive agencies involved in disaster management and rural development, local managers, and professionals specializing in disaster management and rural resilience. Purposive sampling was employed to select experts based on their relevant academic knowledge and professional experience, research or executive experience related to rural communities and natural hazard management, familiarity with local governance, social capital, and rural resilience, and their ability to provide informed judgments and participate effectively throughout the Delphi process.

The institutional context of the case study was also considered in interpreting the Delphi findings. At the village level, Ahar is administered through its Village Islamic Council and Dehyari (rural municipality), which constitute the principal local governance structures responsible for representing local interests and supporting the management of village affairs, public services, infrastructure, development, and local administrative issues. The Village Islamic Council consists of six elected members, while the Dehyari operates as the executive administrative body at the village level within the broader administrative structure of Rudbar-e Qasran District and Shemiranat County. These local institutions were not treated as a separate survey population and were not assumed to represent the perceptions of village residents. Rather, their role was considered as part of the institutional and governance context within which local capacities for disaster preparedness, coordination, response, and recovery are organized. Selection for the Delphi panel was based on relevant expertise and professional experience rather than residence in the study village. This approach was adopted because the purpose of the Delphi process was to obtain informed expert judgments on the dimensions and indicators of rural resilience, rather than to survey the perceptions or experiences of village residents. Accordingly, the presence of the Village Islamic Council and Dehyari in the study context should not be interpreted as evidence that the study directly measured residents' perceptions or the actual performance of these institutions.

In total, 24 experts participated in all three Delphi rounds. Their continued participation across the successive rounds enabled the reassessment of initial judgments in light of group feedback and facilitated the convergence of expert opinions toward an appropriate level of consensus regarding the identified dimensions and indicators. The panel

therefore represented a range of academic, institutional, managerial, and professional perspectives relevant to local governance, social capital, disaster management, and rural resilience. The Delphi findings were subsequently interpreted in light of the geographical, socioeconomic, environmental, and institutional characteristics of Ahar described in Section 2.4 (Table 2).

Table 2. Demographic Characteristics of the Expert Panel

No.	Variable	Category	Frequency	Percentage
1	Gender	Male	18	75.0
		Female	6	25.0
2	Age	30–40 years	5	20.8
		40–50 years	9	37.5
		50–60 years	8	33.3
		Over 60 years	2	8.3
3	Educational attainment	Master's degree	8	33.3
		PhD	16	66.7
4	Professional experience	10–15 years	6	25.0
		16–20 years	9	38.9
		More than 21 years	9	37.5
5	Organizational affiliation	Universities and academic research centers	10	41.7
		Executive agencies related to disaster management and rural development	9	37.5
		Local managers and specialists in disaster management and resilience	5	20.8

b. Data Collection Instruments- Two main instruments were used for data collection: semi-structured interviews and a Delphi questionnaire. In the first phase, semi-structured interviews and an open-ended questionnaire were administered to experts to identify the dimensions of local governance, social capital, and the components of rural resilience to natural hazards. The questions focused on issues such as institutional and managerial capacities, preparedness and preventive planning, coordination among local institutions, social trust, local participation, social cohesion and cooperation, support networks, preparedness and adaptation of the local community, social and institutional capacity, and the capacity to recover and maintain village activities following a disaster.

Based on the findings of the qualitative phase, a closed-ended Delphi questionnaire was developed. In this questionnaire, experts assessed the importance of the identified dimensions and indicators using a five-point Likert scale ranging from “Very Low = 1” to “Very High = 5.” The Delphi process was conducted in three rounds. In the first round, the closed-ended questionnaire was distributed to the experts, who evaluated the importance of the identified dimensions and indicators. In the second round, the results of the previous round were provided to the experts, who reconsidered their assessments in light of the feedback received. In the third round, the results of the second round were presented, and the experts' final assessments of the importance and priority of the dimensions and indicators were obtained. At the end of the process, the level of agreement among the experts and the final priorities of the study dimensions and indicators were determined. Accordingly, the findings from the qualitative phase formed the basis for developing the quantitative instrument, and the data obtained from the three Delphi rounds were used for the final validation and prioritization of the findings.

c. Data Analysis- Data analysis was conducted in two qualitative and quantitative components in accordance with the sequential exploratory mixed-methods design. In the qualitative component, the transcripts of the semi-structured interviews were analyzed using qualitative content analysis following transcription and repeated review. First, initial concepts and codes were extracted from the data. The similar codes were then organized into related categories based on conceptual similarity. Finally, the resulting categories were classified into the principal dimensions of local governance, social capital, and rural resilience. Information obtained from the open-ended questionnaire was also incorporated into the process of identifying and

refining the initial dimensions and indicators. Following the review and refinement of the preliminary framework, the identified dimensions and indicators were prepared for inclusion in the Delphi phase.

In the quantitative component, the data obtained from the closed-ended Delphi questionnaires were analyzed using the mean and standard deviation. The importance and priority of the dimensions and indicators were determined based on their mean scores. In addition, Kendall's coefficient of concordance (W) was used to assess the degree of agreement and consistency among the experts' judgments. Kendall's coefficient of concordance measures the degree of agreement among the rankings provided by multiple experts and ranges from zero to one, with higher values indicating greater agreement among the experts. In the present study, a Kendall's W value greater than 0.70 was considered the criterion for achieving an acceptable level of consensus among the experts. The formula for calculating Kendall's coefficient of concordance is presented below:

$$W = \frac{12S}{m^2 (n^3 - n)}$$

where:

W = Kendall's coefficient of concordance;

S = sum of squared deviations of the rank sums;

m = number of experts;

n = number of indicators.

d. Validity and Reliability of the Qualitative and Quantitative Findings- To enhance the credibility and trustworthiness of the qualitative data, the processes of data collection and analysis were conducted systematically and sequentially. Following the transcription and repeated examination of the semi-structured interviews, initial concepts and codes were extracted, and similar codes were organized into related categories based on conceptual similarity. The preliminary coding and categorization of concepts were subsequently reviewed, and the information obtained from the qualitative content analysis and the open-ended questionnaire was used to develop the initial framework of the study dimensions and indicators. Accordingly, the framework derived from the qualitative phase was reviewed and refined before serving as the basis for designing the closed-ended Delphi questionnaire.

In the quantitative component, the identified dimensions and indicators were validated and prioritized using the Delphi technique over three rounds. In each round, the questionnaire was administered to the experts, who assessed the importance of the dimensions and indicators using a five-point Likert scale. The results of each round were used for review and reassessment in the subsequent round in order to examine the convergence of expert judgments regarding the study dimensions and indicators. For the analysis of the quantitative data, the mean and standard deviation were calculated to determine the importance and priority of the dimensions and indicators, while Kendall's coefficient of concordance was used to assess the degree of agreement and consistency among the experts' judgments. In the present study, a Kendall's W value greater than 0.70 was considered the criterion for achieving an acceptable level of consensus among the experts. On this basis, the continuation or termination of the Delphi process was determined.

4. Findings

4.1. Results of the First Delphi Round: Identification and Extraction of Indicators

In the first phase of the study, qualitative data were collected from 24 experts through semi-structured interviews and open-ended questionnaires to identify the dimensions and indicators associated with local governance, social capital, and rural resilience to natural hazards. The participating experts were selected purposively from among specialists and scholars in disaster management, geography and rural planning, local governance, social capital, and rural settlement resilience.

At this stage, the experts were asked to identify and describe the most important capacities, mechanisms, and components associated with local governance, social capital, and rural resilience to natural hazards. Following data collection, the interview transcripts and open-ended responses were read and reviewed several times, and initial concepts relevant to the research topic were extracted. Subsequently, the initial codes were organized into subcategories based on conceptual similarity, and the resulting categories were ultimately classified into the three principal dimensions of the study: local governance, social capital, and rural resilience.

The results of the qualitative content analysis indicated that local governance constitutes a

fundamental dimension of the capacity of rural settlements to confront natural hazards. This dimension emphasizes the managerial and institutional capacities available at the local level for prevention, preparedness, coordination, response, and post-disaster management. The identified components included institutional capacity; preparedness and preventive planning; coordination among local institutions; planning and organization of local resources; local decision-making and rapid response capacity; access to and management of resources during crises; training and enhancement of local managers' preparedness; local communication and information dissemination during crises; and the participation of local institutions in disaster management. Overall, nine indicators were extracted to operationalize the local governance dimension.

The second dimension was social capital. The qualitative findings indicated that social relationships, mutual trust, participation, cohesion, and the capacity for cooperation among residents and local institutions constitute important elements of a village's social capacity to confront natural hazards. Accordingly, social trust, local participation, social cohesion and cooperation, local support networks, social relationships and ties, sense of belonging and collective responsibility, information and experience exchange among residents, and mutual support during crises were identified as the principal indicators of this dimension. In total, eight indicators were extracted to assess social capital.

The third identified dimension was rural resilience, referring to the capacity of rural communities to prepare for, confront, adapt to, recover from, and maintain their functioning in the face of the consequences of natural hazards. According to the experts' perspectives, local community preparedness and adaptation, social and institutional capacity, the capacity to recover and maintain village activities following a disaster, the ability to cope with hazard impacts, flexibility and adaptation to new conditions, the capacity to reconstruct and restore local resources, and the continuity of essential village services and functions constituted the principal components of this dimension. Overall, seven indicators were extracted to operationalize rural resilience.

The third identified dimension was rural resilience, referring to the capacity of rural communities to prepare for, confront, adapt to, recover from, and maintain their functioning in the face of the consequences of natural hazards. According to the experts' perspectives, local community preparedness and adaptation, social and institutional capacity, the capacity to recover and maintain village activities following a disaster, the ability to cope with hazard impacts, flexibility and adaptation to new conditions, the capacity to reconstruct and restore local resources, and the continuity of essential village services and functions constituted the principal components of this dimension. Overall, seven indicators were extracted to operationalize rural resilience. These findings also suggest that the relevance and effectiveness of such capacities should be understood in relation to the conditions under which rural communities encounter and respond to natural hazards, rather than as uniformly applicable capacities across all contexts.

Accordingly, the first phase of the study resulted in the identification of three principal dimensions and 24 indicators: nine indicators for local governance, eight for social capital, and seven for rural resilience. These indicators formed the basis for designing the closed-ended questionnaire for the second Delphi round, in which their importance was assessed from the experts' perspectives (Table 3).

Table 3. Dimensions and Indicators Identified in the First Phase of the Study

Dimension	Indicators	Number
Local governance	Institutional capacity; preparedness and preventive planning; coordination among local institutions; planning and organization of local resources; local decision-making and rapid response capacity; access to and management of resources during crises; training and enhancement of local managers' preparedness; local communication and information dissemination during crises; participation of local institutions in disaster management	9
Social capital	Social trust; local participation; social cohesion and cooperation; local support networks; social relationships and ties; sense of belonging and collective responsibility; information and experience exchange among residents; mutual support during crises	8
Rural resilience	Local community preparedness and adaptation; social and institutional capacity; capacity to recover and maintain village activities following a disaster; ability to cope with hazard impacts; flexibility and adaptation to new conditions; capacity to reconstruct and restore local resources; continuity of essential village services and functions	7

Overall, the findings of the first phase indicate that, from the experts' perspective, rural resilience to natural hazards is a multidimensional phenomenon conceptually associated with a range of managerial, institutional, social, and functional capacities. Accordingly, local governance, social capital, and rural resilience were identified as the preliminary framework of the study. It should be emphasized that the findings at this stage represent solely the qualitative analysis of experts' perspectives and do not indicate the relative importance, priority, or causal relationships among the dimensions and indicators. The extracted indicators were subsequently evaluated in terms of importance, convergence, and priority during the subsequent Delphi rounds.

4.2. Results of the Second Delphi Round: Assessing the Importance and Screening the Indicators

In the second Delphi round, based on the findings obtained from the qualitative content analysis in the first phase, a closed-ended questionnaire comprising 24 indicators across the three dimensions of local governance, social capital, and rural resilience was developed and administered to the 24 members of the expert panel. The experts assessed the importance of each indicator using a five-point Likert scale ranging from "Very Low" to "Very High."

The purpose of this round was to assess the importance of the extracted indicators, examine the dispersion of expert judgments, and screen the indicators according to predetermined criteria. Accordingly, the mean, standard deviation, and coefficient of variation (CV) were calculated for each indicator. In addition, the internal consistency reliability of the questionnaire was assessed using Cronbach's alpha. The Cronbach's alpha coefficient for the entire questionnaire was 0.89. The corresponding values for the local governance, social capital, and rural resilience dimensions were 0.88, 0.86, and 0.84, respectively. These values indicate satisfactory internal consistency among the items and an acceptable level of measurement reliability.

According to the predetermined criteria, indicators with a mean importance score below 3.50 or a coefficient of variation above 0.30 were to be excluded from the subsequent Delphi process. The results showed that the mean scores of all 24 indicators exceeded the threshold of 3.50, while the coefficient of variation for all indicators was below 0.30. Therefore, none of the indicators was excluded at this stage.

At the level of the principal dimensions, local governance ranked first with a mean score of 4.42, followed by social capital with a mean of 4.31 and rural resilience with a mean of 4.18. Thus, all three dimensions were assessed by the experts as highly important.

Within the local governance dimension, institutional capacity received the highest mean score (4.58) with a standard deviation of 0.42. It was followed by preparedness and preventive planning (mean = 4.52; SD = 0.46) and coordination among local institutions (mean = 4.46; SD = 0.49). These findings indicate that, among managerial capacities, adequate institutional capacity, preventive planning, and coordination among local institutions were perceived as particularly important.

Within the social capital dimension, social trust ranked first, with a mean score of 4.55 and a standard deviation of 0.45. Local participation (mean = 4.43; SD = 0.52) and social cohesion and cooperation (mean = 4.37; SD = 0.55) ranked second and third, respectively. This finding indicates that, from the experts' perspective, trust, participation, and social cooperation constitute the most important social capacities associated with rural communities' ability to confront natural hazards.

Within the rural resilience dimension, local community preparedness and adaptation received the highest importance rating, with a mean score of 4.41 and a standard deviation of 0.53. Social and institutional capacity (mean = 4.32; SD = 0.57) and the capacity to recover and maintain village activities following a disaster (mean = 4.25; SD = 0.61) ranked second and third, respectively (Table 4).

Table 4. Results of the Assessment of Indicator Importance in the Second Delphi Round

Rank	Dimension / Indicator	Mean	Standard Deviation	Coefficient of Variation
	Local governance	4.42	0.49	0.11
1	Institutional capacity	4.58	0.42	0.09
2	Preparedness and preventive planning	4.52	0.46	0.10
3	Coordination among local institutions	4.46	0.49	0.11

Rank	Dimension / Indicator	Mean	Standard Deviation	Coefficient of Variation
4	Planning and organization of local resources	4.39	0.56	0.13
5	Local decision-making and rapid response capacity	4.34	0.59	0.14
6	Access to and management of resources during crises	4.29	0.63	0.15
7	Training and enhancement of local managers' preparedness	4.24	0.65	0.15
8	Local communication and information dissemination during crises	4.20	0.69	0.16
9	Participation of local institutions in disaster management	4.16	0.72	0.17
	Social capital	4.31	0.56	0.15
10	Social trust	4.55	0.45	0.10
11	Local participation	4.43	0.52	0.12
12	Social cohesion and cooperation	4.37	0.55	0.13
13	Local support networks	4.30	0.60	0.14
14	Social relationships and ties	4.26	0.62	0.15
15	Sense of belonging and collective responsibility	4.21	0.66	0.16
16	Information and experience exchange among residents	4.17	0.69	0.17
17	Mutual support during crises	4.14	0.71	0.17
	Rural resilience	4.18	0.61	0.15
18	Local community preparedness and adaptation	4.41	0.53	0.12
19	Social and institutional capacity	4.32	0.57	0.13
20	Capacity to recover and maintain village activities following a disaster	4.25	0.61	0.14
21	Ability to cope with hazard impacts	4.19	0.65	0.16
22	Flexibility and adaptation to new conditions	4.15	0.67	0.16
23	Capacity to reconstruct and restore local resources	4.09	0.72	0.18
24	Continuity of essential village services and functions	4.05	0.78	0.19

As shown in Table 4, all indicators have mean scores above 3.50 and coefficients of variation below 0.30. The lowest coefficient of variation was observed for institutional capacity (0.09), while the highest was recorded for continuity of essential village services and functions (0.19). Therefore, dispersion in the experts' assessments of indicator importance was limited, and all indicators met the acceptance criteria for the second Delphi round. Within the local governance dimension, the three highest-ranked indicators were institutional capacity, preparedness and preventive planning, and coordination among local institutions. Within the social capital dimension, social trust, local participation, and social cohesion and cooperation received the highest mean scores. Within the rural resilience dimension, local community preparedness and adaptation, social and institutional capacity, and the capacity to recover and maintain village activities following a disaster ranked highest (Table 5).

Table 5. Results of Indicator Screening at the End of the Second Delphi Round

Indicator Screening Status	Number
Number of indicators extracted in the first phase	24
Indicators with mean scores above 3.50	24
Indicators with coefficient of variation below 0.30	24
Indicators excluded	0
Indicators advanced to the third Delphi round	24

As shown in Table 5, all 24 indicators identified in the first phase met the acceptance criteria of the second Delphi round. Consequently, no indicators were excluded, and the initial structure of the study was carried forward unchanged to the third Delphi round. Thus, nine local governance indicators, eight social capital indicators, and seven rural resilience

indicators were retained for final evaluation in the third round.

4.3. Results of the Third Delphi Round: Achieving Expert Consensus

In the third Delphi round, the results of the second round, including the mean scores and ranking of the indicators, were provided to the panel members. This enabled the experts to review the group feedback and, if necessary, reconsider their evaluations. The primary objective of this round was to assess the degree of convergence among the experts' views and to achieve final consensus regarding the importance and priority of the research indicators. Since all 24 indicators had met the acceptance criteria in the second round, none of the indicators was eliminated in the third round. To assess the degree of agreement among the experts, Kendall's coefficient of concordance was employed. This coefficient ranges from zero to one, with higher values indicating greater agreement among the evaluators' rankings. In the present study, a value greater than 0.70 was considered an acceptable level of agreement. The results showed that Kendall's coefficient of concordance at the end of the third round was 0.81, indicating a high level of agreement among the experts regarding the ranking of the research indicators (Table 6).

Table 6. Results of Kendall's Coefficient of Concordance Test

Statistical Indicator	Value
Number of experts (N)	24
Number of final indicators (K)	24
Kendall's coefficient of concordance (W)	0.81
Chi-square (χ^2)	447.12
Degrees of freedom (df)	23
Significance level (Sig.)	0.000

The chi-square statistic was 447.12, with 23 degrees of freedom. The significance level of the test was reported as 0.000, which is lower than the 0.05 significance threshold. Therefore, the null hypothesis of no statistically significant agreement among the experts' rankings is rejected, indicating that the observed level of agreement is statistically significant. Furthermore, the value of W = 0.81 exceeds the predetermined acceptable agreement level of 0.70. Accordingly, the panel of 24 experts achieved a high level of consensus in ranking the research indicators. This finding confirms the stability of the framework developed through the qualitative and quantitative stages of the study. Consequently, all 24 indicators were retained in the final research framework, and the Delphi process was concluded without eliminating any indicator.

4.*4. Comparison of Indicator Rankings across the Second and Third Delphi Rounds*

To examine the stability of the results and the extent of changes in the experts' priorities following the provision of statistical feedback, the rankings of the indicators with the highest mean importance scores were compared between the second and third Delphi rounds. As shown in Table 7, the overall structure of priorities remained relatively stable across the two rounds, and the statistical feedback did not result in substantial changes in the ordering of the main indicators. Institutional capacity and social trust remained in the highest positions, while preparedness and preventive planning, inter-institutional coordination, and local participation also remained among the highest-priority indicators (Table 7).

Table 7. Comparison of the Rankings of the Ten Most Important Indicators across the Second and Third Delphi Rounds

No.	Indicator	Rank in Round 2	Rank in Round 3	Change in Rank
1	Institutional capacity	1	1	0
2	Social trust	2	2	0
3	Preparedness and preventive planning	3	3	0
4	Local participation	5	4	+1
5	Coordination among local institutions	4	5	−1
6	Preparedness and adaptability of the local community	7	6	+1

No.	Indicator	Rank in Round 2	Rank in Round 3	Change in Rank
7	Social cohesion and cooperation	6	7	−1
8	Social and institutional capacity	8	8	0
9	Capacity for recovery and continuity of village activities after a disaster	9	9	0
10	Support networks	10	10	0

Note: Of the 24 final indicators, only the ten indicators with the highest mean importance scores in the second Delphi round are reported in this table.

As shown in Table 7, most of the major indicators either maintained their rankings or shifted by only one position. The greatest stability was observed for institutional capacity, social trust, and preparedness and preventive planning, which remained in the first through third positions in both rounds. In the third round, coordination among local institutions moved up from fifth to fourth place, while local participation moved from fourth to fifth place. In addition, preparedness and adaptability of the local community improved by one position, whereas social cohesion and cooperation declined by one position. The remaining indicators among the top ten retained their original positions.

Overall, these limited changes indicate that the provision of statistical feedback did not lead to a substantial reconsideration of the experts' priority structure. Therefore, the results of the second round demonstrated an appropriate level of stability, while the third round primarily contributed to confirming and consolidating expert consensus.

4.5. Analysis of the Importance of the Main Dimensions

Following the stabilization of the indicators through the Delphi process, the relative importance of the three main dimensions of the study local governance, social capital, and rural resilience was compared. The mean importance of each dimension was calculated based on the mean scores of the indicators belonging to that dimension.

The first-place ranking of local governance indicates that, within the study framework and from the experts' perspective, institutional and managerial capacity was considered the most important foundation for effective responses to natural hazards. The second-place ranking of social capital highlights the importance of trust, participation, and social cooperation. Finally, the third-place ranking of rural resilience reflects the importance of community-level outcomes and functional capacities in terms of preparedness, adaptation, and post-disaster recovery. These rankings should not, however, be interpreted as indicating that the relative contribution of these capacities is fixed across all hazard and community contexts. Rather, their practical importance may vary according to the characteristics of the hazard, the organizational and social structure of the community, and the institutional and policy environment in which local capacities are mobilized (Table 8).

Table 8. Mean Importance of the Main Dimensions of the Study

Main Dimension	Number of Indicators	Mean Importance (out of 5)	Final Rank	Most Important Components
Local governance	9	4.42	1	Institutional capacity; preparedness and preventive planning; coordination among local institutions
Social capital	8	4.31	2	Social trust; local participation; social cohesion and cooperation
Rural resilience	7	4.18	3	Preparedness and adaptability of the local community; social and institutional capacity; capacity for recovery and continuity of activities
Total	24	—	—	—

Note: The mean importance of each dimension was calculated based on the mean scores of the indicators associated with that dimension in the third Delphi round.

The results presented in Table 8 show that the differences among the mean scores of the three dimensions are relatively limited, and all three dimensions obtained mean scores above 4.

Accordingly, all three dimensions were considered highly important by the experts, and none can be excluded from the conceptual framework of the study.

The first-place ranking of local governance indicates that the experts considered institutional and managerial capacity to be the most important foundation for effective responses to natural hazards within the study framework. The second-place ranking of social capital highlights the importance of trust, participation, and social cooperation. Finally, the third-place ranking of rural resilience reflects the importance of community-level outcomes and functional capacities in terms of preparedness, adaptation, and post-disaster recovery.

Given the exploratory nature of the study and the use of the Delphi technique, this ranking represents the perceived importance and priority of the indicators from the experts' perspective and, by itself, does not constitute evidence of causal relationships among local governance, social capital, and rural resilience.

4.6. Stability of the Indicator Structure across the Delphi Rounds

One of the important findings of the study is the stability of the number of indicators throughout the three Delphi rounds. As the results demonstrate, none of the 24 indicators identified during the qualitative stage was eliminated in the second round, and all indicators were retained in the third round as well.

In this regard, the complete stability in the number of indicators across the three rounds suggests that the initial framework derived from the qualitative stage possessed an appropriate level of adequacy from the experts' perspective. No indicator was eliminated because of low importance or excessive dispersion in the experts' views. This finding, together with the Kendall's coefficient of concordance of 0.81, indicates that the conceptual structure and indicators identified in the first stage were successfully validated through the quantitative Delphi process.

Accordingly, the final research framework consisted of three dimensions' local governance, social capital, and rural resilience and a total of 24 indicators (Table 9).

Table 9. Distribution of the Research Indicators across the Delphi Rounds

Dimension	Round 1	Round 2 (After Elimination)	Round 3 (Final)
Local governance	9	9	9
Social capital	8	8	8
Rural resilience	7	7	7
Total	24	24	24

4.7. Final Ranking of the Research Indicators and Components

The results presented in Table 10 show that institutional capacity and social trust received the highest importance among the final indicators, followed by indicators related to preparedness and preventive planning, institutional coordination, and local participation. The presence of indicators from all three dimensions among the highest-ranked positions indicates that, from the experts' perspective, rural resilience does not result from attention to a single component; rather, it requires a combination of managerial, social, and resilience-related capacities.

The results presented in Table 4-8 show that all three dimensions of the study are represented among the indicators with the highest importance. The three indicators of institutional capacity, social trust, and preparedness and preventive planning occupy the highest positions. Therefore, from the experts' perspective, a framework for strengthening rural resilience is not limited to a single category of factors but encompasses a combination of managerial, social, and functional capacities.

Furthermore, the simultaneous presence of local governance and social capital indicators among the highest-ranked positions demonstrates the importance of both institutional and social capacities. At the same time, the indicators associated with rural resilience show that these capacities can be manifested at the functional level of the community through preparedness, adaptability, and the capacity to recover and maintain continuity of activities. The relative contribution of these capacities, however, should not be regarded as uniform across all settings. Their

effectiveness may depend on the type and characteristics of the hazard, the size and organizational structure of the community, and the extent to which external institutions and policies provide resources, coordination, and support. These contextual conditions provide an important basis for interpreting the priorities identified through the Delphi process.

However, since these findings are based on expert assessments within the framework of the Delphi technique, the reported ranking should be interpreted as an indication of the perceived importance and priority of the indicators, rather than as empirical evidence establishing causal relationships among local governance, social capital, and rural resilience. Similarly, the present Delphi results do not directly test the moderating effects of hazard type, community size, or external policy conditions; rather, these factors are incorporated into the conceptual interpretation of how the identified capacities may operate across contexts (Table 10).

Table 10. Final Ranking of the Indicators with the Highest Importance

No.	Key Indicator	Mean Importance (out of 5)	Final Rank	Main Dimension
1	Institutional capacity	4.58	1	Local governance
2	Social trust	4.55	2	Social capital
3	Preparedness and preventive planning	4.52	3	Local governance
4	Coordination among local institutions	4.46	4	Local governance
5	Local participation	4.43	5	Social capital
6	Preparedness and adaptability of the local community	4.41	6	Rural resilience
7	Social cohesion and cooperation	4.37	7	Social capital
8	Social and institutional capacity	4.32	8	Rural resilience
9	Capacity for recovery and continuity of village activities after a disaster	4.25	9	Rural resilience
10	Social support networks	4.22	10	Social capital

The results presented in Table 10 show that institutional capacity and social trust received the highest importance among the final indicators, followed by indicators related to preparedness and preventive planning, institutional coordination, and local participation. The presence of indicators from all three dimensions among the highest-ranked positions indicates that, from the experts' perspective, rural resilience does not result from attention to a single component; rather, it requires a combination of managerial, social, and resilience-related capacities.

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However, since these findings are based on expert assessments within the framework of the Delphi technique, the reported ranking should be interpreted as an indication of the perceived importance and priority of the indicators, rather than as empirical evidence establishing causal relationships among local governance, social capital, and rural resilience (Figure 1).

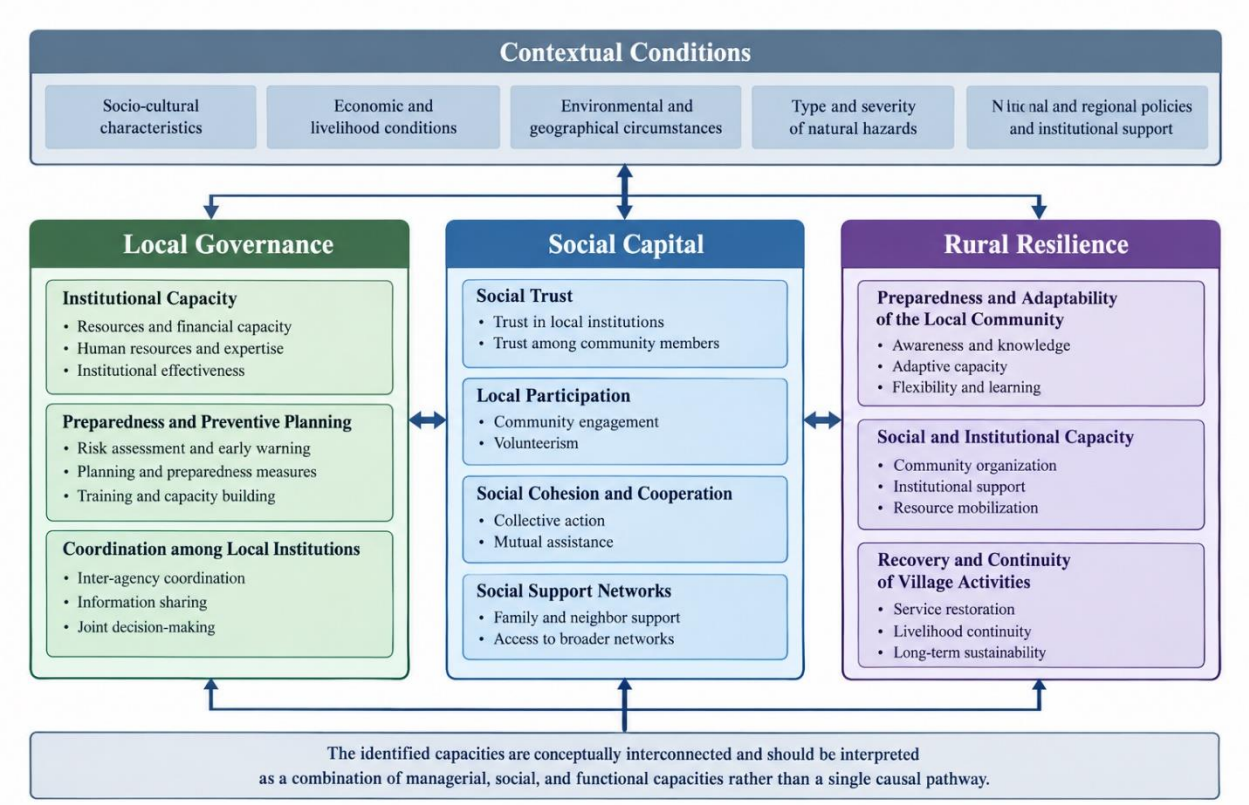


Figure 1. Conceptual Framework Developed from the Delphi Findings: Local Governance, Social Capital, and Rural Resilience in the Context of Natural Hazards

The conceptual framework presented in Figure 1 summarizes the dimensions and indicators identified, refined, and prioritized through the three-round Delphi process. It provides an interpretive representation of the conceptual relationships among local governance, social capital, and rural resilience within the context of the study. The framework is based on expert assessments and the supporting literature and is intended to illustrate the perceived importance and conceptual interconnectedness of the identified dimensions rather than empirically validated causal relationships.

Within this framework, local governance, represented by institutional capacity, preparedness and preventive planning, and coordination among local institutions, received the highest overall priority among the main dimensions according to the experts' assessments. These indicators therefore represent the managerial and institutional capacities considered particularly important by the participating experts for addressing natural hazards and strengthening the conditions associated with rural resilience. This prioritization should be interpreted as reflecting expert judgment regarding relative importance and should not be regarded as empirical evidence of a direct causal effect of local governance on rural resilience.

Alongside local governance, social capital, represented by social trust, local participation, social cohesion and cooperation, and social support networks, was identified as an important set of social capacities. According to the expert assessments and the theoretical literature, these capacities are conceptually relevant to collective action, information exchange, resource mobilization, cooperation, and mutual support under crisis conditions. Within the conceptual framework, social capital is therefore interpreted as being conceptually interconnected with the capacities associated with rural resilience, particularly preparedness, adaptability, and recovery. However, the nature, direction, and magnitude of these relationships were not empirically tested in the present study.

The rural resilience dimension includes capacities related to local community preparedness and adaptability, social and institutional capacity, and

the capacity for recovery and continuity of village activities following a disaster. The framework presents these components as important resilience-related capacities identified through expert consensus. Their placement within the framework should not be interpreted as indicating that they are statistically determined by, or are direct outcomes of, local governance and social capital. Rather, the framework provides a conceptual organization of the capacities that experts considered important within the broader context of rural resilience.

In addition, contextual conditions, including socio-cultural characteristics, economic and livelihood conditions, environmental and geographical circumstances, the type and severity of natural hazards, and national and regional policies and institutional support, may influence how the identified capacities are developed, mobilized, and maintained. These contextual conditions are not modeled as statistically tested moderating variables. Instead, they provide the contextual basis for interpreting how the identified capacities may operate differently across rural communities and hazard settings.

The framework should also be understood as context-dependent and dynamic rather than as a fixed configuration of universally applicable relationships. The relative importance and practical functioning of institutional and social capacities may change as hazard conditions, community needs, available resources, and institutional arrangements evolve. Similarly, preparedness, coordination, cooperation, and recovery capacities may require continuous learning, revision, and adaptation over time. The present Delphi study does not empirically examine these longitudinal processes; however, the framework provides an analytical basis for identifying capacities that may require continuous strengthening and adaptation.

Accordingly, the conceptual framework suggests that, from the perspective of the participating experts, strengthening rural resilience may require coordinated attention to managerial and institutional capacities, social capacities, and the contextual conditions within which these capacities operate. It should be emphasized, however, that the framework reflects expert consensus regarding the relative importance and conceptual interconnectedness of the identified dimensions and does not constitute a statistically validated structural model. The direction, strength, and causal nature of the relationships illustrated in Figure 1 were not tested through statistical techniques such as structural equation modeling, regression analysis, or path analysis. Therefore, the relationships illustrated in Figure 1 should not be interpreted as definitive causal relationships but rather as an exploratory and context-sensitive conceptual representation that can provide a basis for future empirical testing.

5-Discussion and Conclusion

The increasing occurrence of natural hazards and the growing vulnerability of rural settlements have highlighted the importance of managerial, institutional, and social capacities in disaster management and in supporting rural communities in preparing for, responding to, adapting to, and recovering from hazardous events. In this context, local governance and social capital represent important dimensions that may contribute to the organization and mobilization of community capacities. Although previous studies have examined risk, preparedness, vulnerability, response, and resilience from different perspectives, relatively less attention has been given to the systematic identification and prioritization of local governance, social capital, and resilience-related capacities within an integrated rural context. Therefore, the present study employed a mixed-methods approach and a three-round Delphi process to identify, refine, validate, and prioritize the dimensions and indicators that experts considered important for rural resilience to natural hazards in the context of Ahar Village.

The results of the three-round Delphi process indicated that, from the perspective of the expert panel, rural resilience to natural hazards can be conceptualized through three interconnected dimensions: local governance, social capital, and rural resilience. A total of 24 indicators were identified and retained across these dimensions, comprising 9 indicators related to local governance, 8 related to social capital, and 7 related to rural resilience. The Kendall's coefficient of concordance of 0.81, with a statistically significant level of agreement, indicated a high degree of convergence among the experts regarding the importance and priority of the identified indicators. Accordingly, the framework developed through the Delphi process provides a coherent representation of the capacities that the participating experts considered particularly relevant within the scope of the present study.

Based on the expert assessments, local governance, with a mean importance score of 4.42, was ranked as the highest-priority dimension within the framework developed in this study. Institutional capacity, preparedness and preventive planning, and coordination among local institutions received particularly high rankings among the indicators associated with this dimension. These results suggest that, from the experts' perspective, institutional arrangements, advance planning, and coordination mechanisms represent particularly important components for organizing local capacities in the context of natural hazards. Accordingly, the findings highlight the importance of considering disaster management not only in relation to post-disaster response but also in relation to preparedness, planning, institutional coordination, communication, information dissemination, resource organization, and the participation of relevant local institutions. However, these findings should be interpreted as reflecting the perceived importance assigned to these capacities by the expert panel rather than as empirical evidence demonstrating their causal effects on rural resilience.

Social capital was ranked as the second-priority dimension, with a mean importance score of 4.31. Social trust, local participation, and social cohesion and cooperation were identified as the highest-priority indicators within this dimension. From a conceptual perspective, trust among residents and between the local community and local institutions may facilitate cooperation, information exchange, participation in preventive activities, and the acceptance of collective decisions. Similarly, participation, cohesion, and cooperation may support the mobilization of local resources, mutual assistance, and collective responses to the needs of vulnerable groups. Within the framework developed in the present study, social capital is therefore interpreted as an important social capacity that may complement institutional and managerial arrangements. At the same time, these capacities should not be understood as fixed or static resources. Their practical relevance may depend on the ability of social relationships and community networks to learn from previous experiences, exchange information, reorganize patterns of cooperation, and mobilize different forms of support as hazard conditions and community needs change.

Rural resilience was ranked as the third-priority dimension, with a mean importance score of 4.18. Despite its third-place ranking, the relatively high mean score indicates that the experts assigned considerable importance to resilience-related capacities. Within this dimension, preparedness and adaptability of the local community, social and institutional capacity, and the capacity for recovery and continuity of village activities after a disaster received the highest priorities. These findings suggest that, within the expert-derived framework, rural resilience should not be understood solely in terms of post-disaster reconstruction. Rather, it encompasses preparedness before hazardous events, adaptation to changing conditions, the availability and mobilization of social and institutional capacities, and the ability to maintain or restore essential village activities following a disaster.

The emphasis placed on local community preparedness and adaptability also suggests that resilience-related capacities should be interpreted as dynamic rather than static. Maintaining resilience may involve learning from previous hazardous events, revising preparedness and response arrangements, reorganizing available resources, and adapting institutional and social arrangements to changing conditions. Nevertheless, the present study did not empirically measure these processes over time. Therefore, the dynamic interpretation of resilience presented here should be understood as a conceptual interpretation of the capacities identified through the Delphi process rather than as a longitudinal empirical finding.

The final Delphi ranking showed that institutional capacity, social trust, and preparedness and preventive planning received the highest priorities among the identified indicators. These were followed by coordination among local institutions, local participation, preparedness and adaptability of the local community, social cohesion and cooperation, social and institutional capacity, and the capacity for recovery and continuity of village activities after a disaster. The presence of indicators associated with all three dimensions among the highest-ranked positions suggests that, according to the expert panel, the consideration of rural resilience involves a combination of institutional, managerial, social, and functional capacities. Importantly, these rankings represent the perceived importance and priority of the indicators according to the participating experts and should not be interpreted

as evidence of the relative causal effects of these indicators on rural resilience.

The findings of the present study can be conceptually compared with previous domestic and international research. In domestic studies, the emphasis placed by Hajjarian (2024), Riahi and Rostamian (2022), Falsoleiman et al. (2025), and Jamini & Shabani Hosainabadi, (2025) on planning, education, information dissemination, preparedness, spatial conditions, and disaster-management capacities is broadly consistent with several of the capacities identified and prioritized in the present study. Similarly, international studies, including those of Li et al. (2024), Marchetti et al. (2025), Liu et al. (2025), and Xiong et al. (2026) have drawn attention to local cooperation, social networks, self-reliance, household preparedness, environmental conditions, livelihood vulnerability, and access to resources. The present study likewise identified local participation, institutional coordination, social trust, social cohesion and cooperation, support networks, and social and institutional capacity as important elements within the expert-derived framework. However, unlike studies designed to empirically examine relationships among observed variables, the present research focused primarily on identifying and prioritizing relevant dimensions and indicators through expert consensus.

The principal contribution of the present study lies in the development of an integrated, context-sensitive framework based on the systematic identification and prioritization of capacities through a mixed-methods approach and a three-round Delphi process. The identification of 24 indicators across the three dimensions provides an organized representation of the institutional, managerial, social, and resilience-related capacities considered important by the participating experts within the context of the study. From a theoretical perspective, the study brings local governance, social capital, and rural resilience-related capacities together within a single conceptual framework. Institutional capacity, preparedness and preventive planning, and coordination among local institutions were identified as prominent components of local governance. Social trust, local participation, social cohesion and cooperation, and support networks represented important components of social capital. Preparedness and adaptability of the local community, social and institutional capacity, and the capacity for recovery and continuity of village activities represented the principal resilience-related capacities identified by the expert panel.

These dimensions should not, however, be interpreted as forming a statistically validated causal model. The Delphi process used in this study was designed to obtain, refine, and prioritize informed expert judgments rather than to test causal relationships among variables. Consequently, the conceptual connections among local governance, social capital, and rural resilience presented in the study reflect their conceptual interconnectedness and the priorities identified through expert consensus. They do not constitute empirical evidence demonstrating that one dimension directly causes, predicts, mediates, or determines another.

Furthermore, the identified priorities should not be assumed to apply uniformly across all rural communities or hazard contexts. The practical relevance of particular capacities may vary according to the characteristics and severity of natural hazards, geographical and environmental conditions, community size and organizational structure, socioeconomic and livelihood conditions, and the broader institutional and policy environment. The effectiveness of local governance and social capital may also depend on the capacity of communities and institutions to learn from experience, revise plans and coordination mechanisms, reorganize resources, exchange information, and adapt collective arrangements as risks and community needs evolve. In this sense, flexibility, learning, and adaptation can be regarded as important cross-cutting characteristics for interpreting the capacities identified in the present framework. It should also be emphasized that the present study does not directly measure the actual performance of local institutions, the perceptions and experiences of all village residents, or the longitudinal evolution of community capacities. Nor does it employ statistical methods such as structural equation modeling, regression analysis, or path analysis to test causal relationships among local governance, social capital, and rural resilience. Therefore, the framework should be regarded as an expert-based, conceptual, and interpretive framework rather than as a statistically validated causal model.

Future research can build upon the findings of the present study by collecting field-based data from rural residents, members of local councils, Dehyari

officials, and other relevant local stakeholders. Such research could examine the extent to which the capacities identified through the Delphi process are present and operational within rural communities. In addition, longitudinal studies could investigate how these capacities change in response to repeated hazards and changing environmental and socioeconomic conditions. The proposed conceptual connections could also be empirically examined using appropriate quantitative approaches, including structural equation modeling, regression analysis, or path analysis, where suitable data and research designs are available. Overall, the framework developed in this study provides a basis for understanding rural resilience as a context-dependent, multidimensional, and evolving process. Its primary value lies in identifying and prioritizing a set of institutional, managerial, social, and resilience-related capacities through expert consensus. Accordingly, the findings should be used as a basis for conceptual interpretation, context-sensitive planning, and future empirical investigation rather than as definitive evidence of universal or causal relationships among local governance, social capital, and rural resilience.

Recommendations

1. Strengthening institutional capacity and the managerial capabilities of local institutions: Given that "institutional capacity" achieved the highest rank among the indicators examined in the study, strengthening the operational capacity of the village administration, the Village Islamic Council, and other local institutions should be prioritized. Training local managers, clearly defining responsibilities, providing adequate resources, and enhancing decision-making capacity under crisis conditions can contribute to more effective disaster management. Furthermore, establishing a clear structure for organizing resources and preventive actions can improve the effectiveness of disaster management at the village level.
2. Developing a comprehensive disaster preparedness and prevention plan: Given the high ranking of "preparedness and preventive planning," a comprehensive plan should be developed for hazard identification, the identification of vulnerable areas, evacuation routes, safe locations, information dissemination procedures, and emergency response mechanisms. This plan should be prepared with the participation of local institutions and residents and should be periodically reviewed and practiced so that preparedness can be translated from the planning level into practical action. Simultaneous consideration of different hazard scenarios and the needs of vulnerable groups is also essential.
3. Strengthening social trust and local community participation: Given that "social trust" was the second-highest-ranked indicator, establishing transparent and continuous communication between local institutions and residents should be prioritized. Involving residents in hazard identification, preventive planning, decision-making, and the implementation of disaster management measures can enhance mutual trust and a sense of collective responsibility. Utilizing the capacities of trusted community members, local groups, and volunteers can also strengthen meaningful community participation in the disaster management process.
4. Establishing a coordination mechanism among local institutions: Given the high ranking of "coordination among local institutions," a specific mechanism for cooperation among the village administration, Village Islamic Council, service-providing agencies, emergency response organizations, and other relevant institutions is essential. Clearly defining the responsibilities of each institution, establishing clear channels for information exchange, and holding coordination meetings before disasters occur can help prevent duplication of efforts and delays in response. Such coordination should be structured in a way that maintains communication between the local community and formal institutions throughout all stages of disaster management.
5. Strengthening social cohesion and local support networks: Given the importance of "social cohesion and cooperation," "local participation," and "support networks" in the findings, the existing capacities embedded in neighborhood relations, kinship networks, and social groups should be organized for disaster management. Identifying households and individuals in need of support and establishing mutual-aid networks can enhance the community's capacity to cope with disasters. In addition to the response phase, these networks can play an effective role in supporting affected individuals, restoring village activities, and maintaining social life after a disaster.

Research Limitations

Despite the contributions of the present study, several limitations should be acknowledged. The

findings were derived from the perspectives of 24 experts using the Delphi method and therefore represent the perceived importance and priority of the indicators from the experts' viewpoints. Consequently, generalizing these findings to other villages or regions requires further investigation. Moreover, given the exploratory nature of the study, the relationships among local management, social capital, and rural resilience have not been established as definitive causal relationships. Future studies are therefore recommended to employ quantitative methods, resident surveys, structural equation modeling, or other empirical approaches to examine the relationships between managerial and social capacities and the components of resilience. Comparative studies across different villages exposed to different types of hazards could also contribute to the validation, refinement, and generalizability of the proposed framework.

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Author Contributions

The authors contributed equally to the development and preparation of this research.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the authorship or publication of this article.

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Original Article

شناسایی و اولویت‌بندی ابعاد حکمروایی محلی و سرمایه اجتماعی و دلالت‌های آن‌ها برای تاب‌آوری روستایی در برابر مخاطرات طبیعی (مطالعه موردی: روستای آهار)

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چکیده مبسوط

۱. مقدمه

افزایش وقوع و شدت مخاطرات طبیعی، سکونتگاه‌های روستایی را با چالش‌های متعدد مواجه کرده است. آسیب‌پذیری این سکونتگاه‌ها علاوه بر ویژگی‌های محیطی و کالبدی، به محدودیت منابع، ظرفیت نهادی، کیفیت برنامه‌ریزی و میزان مشارکت اجتماعی وابسته است. ازاین‌رو، تاب‌آوری روستایی مستلزم تقویت ظرفیت‌های آمادگی، سازگاری، مقابله و بازیابی در کنار توجه به زیرساخت‌های فیزیکی است. حکمروایی محلی از طریق برنامه‌ریزی پیشگیرانه، سازمان‌دهی منابع و هماهنگی نهادی و سرمایه اجتماعی از طریق اعتماد، مشارکت و همکاری، در این زمینه اهمیت دارند. با وجود مطالعات متعدد درباره آسیب‌پذیری و مدیریت مخاطرات، ادغام نظام‌مند این ابعاد و تعیین اولویت مؤلفه‌های آن‌ها کمتر مورد توجه قرار گرفته است. پژوهش حاضر با هدف شناسایی و اولویت‌بندی ابعاد و مؤلفه‌های حکمروایی محلی، سرمایه اجتماعی و تاب‌آوری روستایی در برابر مخاطرات طبیعی، در روستای آهار انجام شده است.

۲. مبانی نظری تحقیق

مبانی نظری پژوهش بر ارتباط مفهومی میان حکمروایی محلی، سرمایه اجتماعی و تاب‌آوری روستایی استوار است. بر اساس نظریه سرمایه اجتماعی پاتنام، اعتماد، شبکه‌های اجتماعی، مشارکت مدنی و هنجارهای همکاری، زمینه‌ساز هماهنگی و اقدام جمعی هستند و می‌توانند تبادل اطلاعات، بسیج منابع و حمایت متقابل را تسهیل کنند. حکمروایی محلی نیز از طریق ظرفیت نهادی و مدیریتی، آمادگی و برنامه‌ریزی پیشگیرانه، هماهنگی سازمانی و مدیریت منابع، زمینه سازمان‌دهی اقدامات مقابله با مخاطرات را فراهم می‌کند. تاب‌آوری روستایی به توانایی جامعه برای آمادگی، مقابله، سازگاری، بازیابی و تداوم فعالیت‌های ضروری اشاره دارد. در این چارچوب، ویژگی‌های اجتماعی و فرهنگی، شرایط اقتصادی و معیشتی، محیط جغرافیایی، نوع و شدت مخاطرات و حمایت‌های نهادی، از شرایط زمینه‌ای مؤثر بر عملکرد این ظرفیت‌ها محسوب می‌شوند.

۳. روش تحقیق

پژوهش حاضر از نظر هدف، کاربردی و از نظر رویکرد، دارای روش آمیخته اکتشافی متوالی است که در دو مرحله کیفی و کمی اجرا شده است. محدوده مکانی پژوهش، روستای آهار در دهستان رودبار قصران، شهرستان شمیرانات، استان تهران است؛ روستایی کوهستانی با جمعیت ۵۸۳ نفر بر اساس سرشماری سال ۱۳۹۵ که شرایط جغرافیایی و محیطی آن، بررسی ظرفیت‌های مرتبط با مدیریت مخاطرات طبیعی را اهمیت می‌بخشد. در مرحله کیفی، داده‌ها از طریق مصاحبه‌های نیمه‌ساختاریافته و پرسش‌نامه‌های باز از خبرگان گردآوری و با استفاده از تحلیل محتوای کیفی بررسی شدند. سپس، مفاهیم و کدهای استخراج‌شده در قالب سه بُعد اصلی و مؤلفه‌های متناظر سازمان‌دهی شدند. در مرحله کمی، تکنیک دلفی در سه دور به کار گرفته شد. جامعه مشارکت‌کنندگان را خبرگان حوزه‌های مدیریت بحران، جغرافیا و برنامه‌ریزی روستایی، حکمروایی محلی، سرمایه اجتماعی و تاب‌آوری سکونتگاه‌های روستایی تشکیل دادند که با روش نمونه‌گیری هدفمند انتخاب شدند. در مجموع، ۲۴ خبره در هر سه دور دلفی مشارکت کردند. اهمیت مؤلفه‌ها با استفاده از مقیاس پنج‌درجه‌ای لیکرت ارزیابی شد و میانگین، انحراف معیار و ضریب توافق کندال برای تحلیل داده‌ها و تعیین اولویت‌ها و میزان توافق خبرگان به کار رفت. همچنین، در دور دوم، پایایی درونی پرسش‌نامه با استفاده از آلفای کرونباخ بررسی شد.

۴. یافته‌های تحقیق

تحلیل محتوای کیفی به شناسایی ۲۴ مؤلفه در سه بُعد شامل حکمروایی محلی با ۹ مؤلفه، سرمایه اجتماعی با ۸ مؤلفه و تاب‌آوری

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روستایی با ۷ مؤلفه انجامید. در دور دوم دلفی، همه مؤلفه‌ها میانگین اهمیت بیشتر از ۳٫۵۰ و ضریب تغییرات کمتر از ۰٫۳۰ داشتند؛ بنابراین، هیچ مؤلفه‌ای حذف نشد. آلفای کرونباخ کل پرسش‌نامه ۰٫۸۹ بود. در رتبه‌بندی ابعاد اصلی، حکمروایی محلی با میانگین ۴٫۴۲، سرمایه اجتماعی با ۴٫۳۱ و تاب‌آوری روستایی با ۴٫۱۸ به‌ترتیب در جایگاه‌های اول تا سوم قرار گرفتند. در بُعد حکمروایی محلی، ظرفیت نهادی (۴٫۵۸)، آمادگی و برنامه‌ریزی پیشگیرانه (۴٫۵۲) و هماهنگی میان نهادهای محلی (۴٫۴۶) بالاترین اولویت را داشتند. در بُعد سرمایه اجتماعی، اعتماد اجتماعی (۴٫۵۵)، مشارکت محلی (۴٫۴۳) و انسجام و همکاری اجتماعی (۴٫۳۷) رتبه‌های نخست را کسب کردند. در بُعد تاب‌آوری روستایی نیز آمادگی و سازگاری جامعه محلی (۴٫۴۱)، ظرفیت اجتماعی و نهادی (۴٫۳۲) و توانایی بازیابی و تداوم فعالیت‌های روستا پس از بحران (۴٫۲۵) در اولویت بودند. در رتبه‌بندی نهایی، ظرفیت نهادی، اعتماد اجتماعی و آمادگی و برنامه‌ریزی پیشگیرانه سه مؤلفه نخست بودند. ضریب توافق کندال در دور سوم ۰٫۸۱ به دست آمد که نشان‌دهنده توافق بالای خبرگان در رتبه‌بندی مؤلفه‌هاست.

۵. بحث و نتیجه‌گیری

نتایج نشان می‌دهد که از دیدگاه خبرگان، تقویت تاب‌آوری روستایی مستلزم توجه هم‌زمان به ظرفیت‌های نهادی و مدیریتی، توانمندی‌های اجتماعی و قابلیت‌های آمادگی، سازگاری و بازیابی است. اولویت بالاتر حکمروایی محلی بر اهمیت ظرفیت نهادی، برنامه‌ریزی پیشگیرانه و هماهنگی سازمانی تأکید دارد؛ درحالی‌که جایگاه سرمایه اجتماعی، نقش اعتماد، مشارکت، انسجام و همکاری را در اقدامات جمعی برجسته می‌کند. این یافته‌ها از نظر مفهومی با مطالعات پیشین درباره اهمیت آمادگی، برنامه‌ریزی، هماهنگی نهادی و شبکه‌های اجتماعی در مدیریت مخاطرات همسو هستند. سهم اصلی پژوهش، ادغام و اولویت‌بندی این ظرفیت‌ها در چارچوبی مشترک و متناسب با زمینه روستای آهار است. بر این اساس، تقویت توان مدیریتی نهادهای محلی، تدوین و بازنگری برنامه‌های پیشگیری و آمادگی، ایجاد سازوکارهای هماهنگی میان نهادهای مسئول، افزایش مشارکت ساکنان و توسعه شبکه‌های حمایت متقابل پیشنهاد می‌شود. بااین‌حال، رتبه‌بندی‌ها بیانگر اهمیت ادراک‌شده مؤلفه‌ها از دیدگاه خبرگان هستند و روابط علّی میان ابعاد را اثبات نمی‌کنند. همچنین، نتایج مستقیماً بیانگر دیدگاه همه ساکنان یا عملکرد واقعی نهادهای محلی نیستند. بنابراین، انجام مطالعات میدانی با مشارکت ساکنان و مدیران محلی، پژوهش‌های تطبیقی و بررسی‌های طولی برای آزمون تجربی روابط مفهومی و ارزیابی قابلیت تعمیم چارچوب پیشنهادی ضروری است.

واژگان کلیدی: حکمروایی محلی، سرمایه اجتماعی، تاب‌آوری روستایی، مخاطرات طبیعی، مدیریت بحران، روستای آهار.

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Original Article

Exploring the Mechanisms of Rural Cooperatives' Roles in the Commercialization of Home-Based Products and the Development of Market-Oriented Businesses among Rural Women (Case Study: Sarab Kalan Village)

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Abstract

Purpose- Although previous studies have examined rural women's entrepreneurship, rural development, and the general functions of cooperatives, less attention has been paid to the specific mechanisms through which cooperatives can transform dispersed home-based production into sustainable, market-oriented economic activities. This study addresses this gap by developing an integrated framework that links product value enhancement, supply chain organization, market identity, sales-network development, and women's capacity for business growth.

Design/methodology/approach- An applied mixed-methods design with a sequential exploratory strategy was employed. First, qualitative data were collected through semi-structured interviews and open-ended questionnaires and analyzed using qualitative content analysis. The identified components were then validated and refined through three rounds of the Delphi technique involving 24 experts in rural cooperatives, women's entrepreneurship, rural development, business management, and marketing. Subsequently, a quantitative questionnaire based on a five-point Likert scale was used to assess and prioritize the identified mechanisms. Descriptive statistics, including means and standard deviations, and Kendall's coefficient of concordance were used to analyze the quantitative data.

Findings- The findings identified five major mechanisms through which rural cooperatives can support the commercialization of rural women's home-based products: (1) product value enhancement and re-creation, (2) supply chain organization, (3) development of market identity and credibility, (4) strategic and smart linkage to sales networks, and (5) empowerment for business growth and scalability. The Delphi process reached a high level of agreement among experts, with Kendall's coefficient of concordance equal to 0.81. The quantitative assessment further supported the importance of the identified mechanisms, with an overall mean of 4.43 (SD = 0.66) across the 24 indicators.

Practical implications- The findings suggest that cooperatives should provide integrated support throughout the product value chain rather than focusing solely on production. Such support should include product innovation and quality improvement, branding and packaging, access to physical and digital marketing and sales channels, sustainable market connections, business networking, and targeted training in managerial, marketing, and commercial capabilities.

Originality/value: The study contributes to the literature by moving beyond a general assessment of the functions of rural cooperatives and identifying specific mechanisms through which they can facilitate the commercialization of home-based products. By combining qualitative content analysis, Delphi validation, and quantitative prioritization, the study provides a context-specific and integrated framework for understanding the intermediary role of rural cooperatives in connecting rural women's home-based production with market-oriented business development.

Keywords- Rural Cooperatives, Women's Entrepreneurship, Commercialization of Home-Based Products, Market-Oriented Businesses, Value Chain, Rural Development.

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1. Introduction

In recent decades, economic, technological, and market-oriented developments have transformed women's economic participation and entrepreneurship into key components of inclusive and sustainable development (Ekpodile-Domingo et al., 2026). Rural women, drawing on indigenous knowledge, productive skills, and local experiences, participate in the production of agricultural products, handicrafts, food products, and other home-based goods (Cao et al., 2026). However, productive capacity alone does not guarantee an effective presence in the market, as women's entrepreneurship generates greater developmental outcomes when it contributes to increased income, economic independence, and social capital (Mikolic et al., 2026). A significant proportion of rural women's activities nevertheless remains small-scale, fragmented, and informal and, due to weaknesses in value creation, commercialization, and market access, fails to develop into market-oriented businesses (Liu et al., 2026). Therefore, a fundamental challenge is the transition from "home-based production" to an effective and sustainable presence in the market.

In this transition, collective institutions and rural cooperatives can organize individual capacities and connect local producers to markets (Malki et al., 2024). Through the aggregation of production, reduction of supply fragmentation, coordination of resources, knowledge transfer, facilitation of specialized services, and development of communication networks, cooperatives can strengthen the commercialization potential of rural products (Jiang et al., 2025). However, the developmental role of cooperatives becomes more significant when they move beyond supporting production and establish effective linkages among products, value creation, and markets. Quality enhancement and alignment with customer needs, production standardization, packaging, branding, development of sales channels, and connection to physical and digital markets are important mechanisms for transforming home-based products into marketable and competitive goods (Imanuella et al., 2024).

From a process perspective, commercialization results from the interaction among productive capacity, organizational capabilities, and market requirements and, beyond production, requires value creation, identification of market demand, development of commercial identity, organization of supply chains, and access to sales networks (Garg et al., 2026). Accordingly, cooperatives can act as "Market Development Intermediaries" by promoting collective organization, reducing transaction costs, building trust, and expanding business relationships, thereby narrowing the gap between small-scale producers and markets (Xiang & Hu, 2025). Furthermore, the development of market-oriented businesses requires business management, customer understanding, pricing, marketing, and the effective use of modern sales tools (Lasrado et al., 2026). Thus, commercialization should be understood as an integrated process in which economic, organizational, market-related, and empowerment mechanisms are interdependent.

In Iran, despite programs supporting women's entrepreneurship and economic empowerment, many products produced by rural women are still offered on a small scale and outside formal market chains. Limited access to markets, weak distribution networks, the absence of appropriate branding and packaging, unstable sales, insufficient market information, and limited specialized services reduce the economic potential of home-based production (Shahabi et al., 2025; Keikha & Jafarian, 2025). Under such circumstances, cooperatives can strengthen links between producers and market actors by aggregating fragmented capacities and expanding economic cooperation (Soltani et al., 2025). However, their effectiveness depends on their ability to move beyond traditional forms of support toward value addition, market development, and the facilitation of sustainable sales networks (Golestani et al., 2026).

Ilam Province, with its agricultural capacities, handicrafts, local products, rural tourism, and indigenous knowledge, provides a suitable context for the development of rural women's home-based products. Nevertheless, fragmented production, the limited scale of activities, weak access to broader markets, and inadequate marketing infrastructure may hinder the realization of these capacities (Jaberi & Savari, 2026; Noorabadi et al., 2023). Although previous studies have addressed rural women's entrepreneurship, rural development, and the general functions of cooperatives, an important research gap remains regarding how cooperatives can specifically facilitate the transition from dispersed home-based production to sustainable,

market-oriented businesses. Existing research has more often examined these issues separately, focusing either on women's entrepreneurial participation, the developmental functions of cooperatives, or general barriers to market access, rather than explaining the mechanisms through which cooperatives can integrate production, value creation, supply-chain organization, market identity, sales-network development, and women's capacity for business growth within a coherent commercialization process (Zare et al., 2025; Golshani & Shiri, 2025).

This gap is particularly important in contexts such as rural Iran, where the persistence of fragmented production and weak market linkages limits the conversion of women's productive capacities into sustainable economic activities. Moreover, product value reconfiguration, supply-chain organization, identity-building and market credibility, connection to sales networks, and empowerment for growth and scalability have received comparatively limited attention as interconnected dimensions of cooperative-mediated commercialization (Rahimi, 2026; Mohammadian et al., 2025; Boleyde et al., 2024). Consequently, there is a need for an integrated framework that not only identifies the relevant mechanisms but also explains how rural cooperatives can function as intermediaries between women's home-based production and market-oriented business development.

Against this background, the present study addresses this research gap by identifying and integrating the specific mechanisms through which rural cooperatives can facilitate the commercialization of home-based products and the development of market-oriented businesses among rural women in Sarab Kalan Village, Ilam Province. Rather than examining the general role of cooperatives, the study focuses specifically on the mechanisms linking product value enhancement, supply-chain organization, market identity and credibility, sales-network development, and women's empowerment for business growth and scalability. Accordingly, the study seeks to answer the following question: Through what mechanisms can rural cooperatives contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women in Sarab Kalan Village?

2. Research Theoretical Literature

2.1. Value Chain Theory

Value chain theory is an important framework for analyzing how value is created, transferred, and realized in the production and supply of goods and services. In its classical form, the theory was introduced by Michael Eugene Porter, who conceptualized a firm as a set of interconnected activities that contribute to customer value and competitive advantage. In Porter's model, these activities are divided into primary activities, including inbound logistics, operations, outbound logistics, marketing and sales, and after-sales service, and support activities, including procurement, technology development, human resource management, and firm infrastructure (Porter, 2021). These activities are interconnected, and effective coordination among them can affect value creation, cost, efficiency, and differentiation.

A central concept in value chain theory is "value," defined as the amount that customers are willing to pay for a good or service. From this perspective, competitive advantage can be achieved through lower costs or differentiation. Value chain analysis therefore focuses on identifying activities, examining their relationships, and recognizing opportunities for value creation and cost reduction. An important aspect of this approach is the concept of "linkages," which refers to relationships among activities within an organization and between the organization and other actors, such as suppliers and distributors. Effective management of these linkages can improve coordination and efficiency (Porter, 2021).

Subsequent developments extended value chain analysis beyond the firm level to examine relationships among producers, suppliers, processors, distributors, retailers, and other economic actors. In this broader perspective, value creation results from interactions among actors across production and market chains, while concepts such as governance, upgrading, standards, coordination, and value distribution have become important dimensions of value chain analysis (Gereffi, 2018; Kamran, 2020). Accordingly, value chain theory provides a basis for understanding how interconnected activities and relationships among actors contribute to value creation, market performance, and efficiency (Walters & Rainbird, 2020).

In the present study, value chain theory provides a basis for explaining how rural cooperatives can contribute to the creation and enhancement of value in women's home-based products. Activities such as quality improvement, standardization,

packaging, branding, distribution, and marketing are considered interconnected components of the value-creation process. Thus, the theory helps explain how cooperatives can coordinate different stages of production and market access and facilitate the transition from fragmented home-based production to market-oriented businesses.

2.2. Social Network Theory and Business Networks

Social network theory is based on the assumption that the behavior and actions of individuals and organizations cannot be explained solely by their independent characteristics. Rather, relationships, linkages, and communication structures among actors are also fundamentally important. This approach has its roots in classical sociology and has developed through the works of Georg Simmel, Jacob L. Moreno, and, subsequently, Mark Granovetter, Ronald S. Burt, and other theorists (Borgatti et al., 2021). Georg Simmel was among the first scholars to consider relationships among individuals as an independent subject of social analysis. From his perspective, society is formed through patterns of interaction among individuals, and forms of relationships, such as dyads and triads, influence social structure and action (Simmel, 2019). Jacob L. Moreno also provided a foundation for the systematic study of social network structures through the development of sociometry and the analysis of relationships among group members (Moreno, 2018). In his well-known article on "The Strength of Weak Ties," Mark Granovetter highlighted the role of connections among relatively distant individuals and groups in the dissemination of information, access to opportunities, and network expansion. According to Granovetter, weak ties can connect individuals to different clusters and social groups, thereby increasing the flow of information and opportunities within a network. Another important concept in Granovetter's work is "social embeddedness," which emphasizes the influence of social relationships on economic actions (Granovetter, 2020).

By introducing the concept of "structural holes," Ronald S. Burt focused on the position of actors located between disconnected segments of a network. From this perspective, gaps between network groups create opportunities for intermediary actors. "Structural constraint," "brokerage," and "social capital arising from network position" are among the important concepts in this approach. An actor positioned between less connected parts of a network can benefit from access to diverse sources of information and communication opportunities (Burt, 2017).

Within the network approach, concepts such as nodes, ties, density, centrality, distance, network structure, clusters, cohesion, strong and weak ties, structural holes, and brokerage positions are important. "Centrality" indicates the position and accessibility of an actor within the network structure. Its various forms, including degree, closeness, and betweenness centrality, are used to analyze the position of actors. "Density" refers to the proportion of existing ties relative to the possible ties within a network (Hakansson et al., 2021). In economic and organizational contexts, this theory has been extended to the concept of "business networks." From this perspective, firms and organizations are embedded in a set of relationships with suppliers, customers, competitors, public institutions, and other actors. Network relationships can facilitate the flow of information, knowledge, resources, trust, and opportunities (Nohria & Eccles, 2018). Therefore, an actor's performance depends, to some extent, on the structure and quality of relationships, its position within the network, and its capacity to access and utilize available resources. Trust, norms of reciprocity, and commitment are also important elements in some network approaches, as they strengthen the continuity of relationships, cooperation, and resource exchange within networks (Scott, 2020).

In this study, value chain theory provides a basis for explaining how rural cooperatives can intervene in the process of creating, enhancing, and realizing the value of women's home-based products. Within this framework, activities such as quality improvement, standardization, packaging, branding, distribution, and marketing can be analyzed as interconnected links in the value chain. In contrast, social network theory and business network theory explain the capacity of cooperatives to establish and strengthen linkages among women producers, markets, customers, supporting institutions, and other economic actors. Integrating these theoretical perspectives makes it possible to analyze the role of cooperatives from two complementary dimensions: intervention in the value-creation process and network building to facilitate access to resources and markets. Accordingly, the integrated framework of this study considers the transition of

women's home-based products from fragmented production to market-oriented businesses as the result of interaction between value chain mechanisms and network mechanisms within the context of rural cooperatives.

2.3. Research Background

-Grangeiro et al. (2026), in a study entitled "Informal Women's Entrepreneurship in the Global South: Evidence from Brazil," found that external support and incentives are among the most important motivations for women to start businesses, while economic necessity is the main driver of their entrepreneurial activities. Therefore, the role of economic motivations was found to be greater than that of social motivations.

-Rajeev et al. (2026), in a study entitled "Agency, Technology, and Women's Entrepreneurship: A Policy Evaluation," found that the implementation of the Common Service Centers policy within the framework of the "Digital India" program strengthened women's capabilities and agency and created entrepreneurial opportunities for disadvantaged groups. Furthermore, over time, women demonstrated greater improvements in entrepreneurial capabilities and returns to scale than men. These findings highlight the role of technology and supportive policies in empowering women and promoting their effective participation in business.

-Lopez-Toro et al. (2026), in a study entitled "Entrepreneurial Success in Conflict Zones: Women, Indigenous People and Informal Entrepreneurship in Colombia," found that indigenous status and formal business registration were among the most important determinants of entrepreneurial success. In particular, indigenous status had the greatest effect on business performance. In addition, gender and the level of participation in production and marketing affected entrepreneurial success. The negative effect of being female became positive at higher levels of sales.

-Nannetti & Operti (2026), in a study entitled "Equalizing Networking Opportunities: How Women Can Leverage Incubators in Entrepreneurship," found that participation in incubators and accelerators has a greater impact on women-owned businesses and contributes to reducing the innovation gap between women and men. Women strategically use these centers to strengthen individual resources, establish relationships with key stakeholders, and gain access to role models and mentors. In contrast, men tend to use them in a more purposeful and transactional manner to acquire technical and business knowledge.

-Tabatabaeeamid & Shahraki (2026), in a study entitled "Qualitative Analysis of Barriers to the Development of Rural Women's Digital Businesses in Golestan Province," identified five major barriers: "lack of supportive policies," "lack of technical and vocational training," "traditional attitudes toward women's roles," "absence of an appropriate financial model," and "shortage of digital equipment." Each of these barriers had a frequency exceeding 70% and was identified as an important constraint on the development of digital businesses among rural women.

-Dolatabadi et al. (2025), in a study entitled "Identifying Drivers of Empowerment for Women Entrepreneurs Against Institutional Threats Using Meta-Synthesis Method," concluded that establishing effective relationships and creating strong social networks can contribute to the empowerment of women entrepreneurs.

-Alaeddinivandi & Soleymanipour (2025), in a study entitled "Factors Affecting the Economic Empowerment of Rural Women with an Emphasis on the Production and Processing of Medicinal Plants (Case Study: Chaharmahal and Bakhtiari Province)," found that, among the five factors examined, government support, economic attitudes, and rural women's skills accounted for the largest share of the variance in women's economic empowerment. In contrast, factors such as local support and infrastructure development did not have a significant effect on women's economic empowerment.

-Golshani & Shiri (2025), in a study entitled "Strategic Analysis of Entrepreneurship Development in Rural Women's Microcredit Funds (Case Study: Badrah County)," identified several strategies for entrepreneurship development in rural women's microcredit funds in Badreh County. These included encouraging and motivating fund members to establish family-based and collaborative businesses in agricultural products and handicrafts; designing and implementing training courses to enhance members' technical and specialized competencies and enable them to exploit agricultural and handicraft opportunities; and introducing and promoting successful female role models and entrepreneurs in cooperative and participatory businesses at the national, provincial,

and local levels to help change societal attitudes toward women.

A review of the research background indicates that previous studies have examined various factors, including institutional and government support, education and skills training, technology, networking, individual capabilities, social attitudes, and market access, in relation to the development of rural women's entrepreneurship. However, most of these studies have examined the factors affecting women's entrepreneurship and economic empowerment separately and have paid less attention to the mechanisms linking home-based production to its transformation into sustainable, market-oriented businesses. Furthermore, the role of rural cooperatives as intermediary institutions for market development and their contribution to establishing this linkage have received limited integrated attention.

Accordingly, the novelty of the present study lies in providing a process-oriented and mechanism-based perspective on the role of rural cooperatives in the transition from home-based and fragmented production to market-oriented businesses among rural women. The study explains this role through five complementary mechanisms: product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability.

3. Research Methodology

3.1 Geographical Scope of the Research

Sarab Kalan is a rural settlement located in Zangvan Rural District of Karezan District, Sirvan County, Ilam Province, western Iran. The village is situated at approximately 33°34′24″ N and 46°43′04″ E. Administratively, it falls within Zangvan Rural District and Karezan District of Sirvan County. According to the 2016 General Population and Housing Census, Sarab Kalan had a population of 739 people living in 197 households. These characteristics identify Sarab Kalan as a relatively small rural community and provide an appropriate geographical and demographic context for examining the commercialization of home-based products and the development of market-oriented economic activities among rural women.

Sarab Kalan also has notable historical and cultural significance. The village is associated with the remains of the historical city of Sirvan, which is reported to date back more than 1,600 years. The archaeological site includes remnants of fortified structures, towers and walls, underground spaces, and one- and two-story buildings constructed primarily of stone and lime. The historical settlement is reported to have developed around a permanent water spring and to have covered an area of approximately 100 hectares. This historical and cultural context distinguishes Sarab Kalan from many ordinary rural settlements in the region and constitutes an important contextual characteristic of the study area.

Given its rural setting, population size, and historical-cultural context, Sarab Kalan provides the geographical setting for the present case study. The study examines the mechanisms through which rural cooperatives can facilitate the commercialization of women's home-based products and support the development of market-oriented businesses. The characteristics of the study area are therefore considered as contextual information for interpreting the study findings, while the empirical assessment of the identified mechanisms is based on the qualitative and Delphi stages described in the research methodology.

3.2. Methodology

The present study is applied in terms of purpose and employs an exploratory sequential mixed-methods design in terms of approach. The selection of this design is consistent with the nature of the research problem, which involves exploring the mechanisms through which rural cooperatives contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women. Accordingly, the study began with a qualitative phase. After identifying and extracting the components and mechanisms associated with the phenomenon under investigation, the qualitative findings served as the basis for designing and implementing the quantitative phase. Thus, the mechanisms through which rural cooperatives can transform rural women's home-based products from fragmented and market-limited production into marketable products and market-oriented businesses were first identified. These components were then refined, assessed, and prioritized in terms of importance using the Delphi technique.

In the qualitative phase, data were collected through semi-structured interviews and open-ended questionnaires administered to experts with knowledge and experience in the fields of cooperatives, women's entrepreneurship, rural

development, business management, and marketing. The collected data were analyzed using qualitative content analysis. Following transcription and repeated review of the data, meaning units relevant to the research problem were identified, and initial codes were extracted. Similar codes were then organized into subcategories based on conceptual proximity and, through constant comparison, classified into main categories and mechanisms. At this stage, efforts were made to identify the various dimensions of the role of rural cooperatives in value creation, production and supply organization, market identity-building and credibility creation, connection to sales networks, and women's empowerment for business growth and scalability. The findings of this phase formed the basis for developing the closed-ended Delphi questionnaire.

In the quantitative phase, the Delphi process was conducted in three rounds. In the first round, data obtained from the interviews and open-ended questionnaires were analyzed, and an initial set of components and mechanisms related to the role of rural cooperatives was extracted and categorized. In the second round, the identified components were presented to the experts in a closed-ended questionnaire using a five-point Likert scale. The experts assessed the importance of each component in the commercialization of home-based products and the development of market-oriented businesses among rural women. In the third round, the results of the previous round were provided to the experts as feedback, and they were asked to reassess the importance and priority of the components. The purpose of this stage was to increase the convergence of opinions, refine the components, and achieve final agreement regarding the main mechanisms. Quantitative data were analyzed using the mean, standard deviation, and Kendall's coefficient of concordance. The mean was used as the basis for assessing the importance and ranking of the components, whereas Kendall's coefficient of concordance was used to assess the degree of agreement among the experts regarding the priority of the mechanisms.

The study population consisted of experts with knowledge and experience in the fields of cooperatives, women's entrepreneurship, rural development, business management, and marketing. Participants were selected in consideration of the multidimensional nature of the research problem. The commercialization of home-based products and the development of market-oriented businesses among rural women are not limited to increasing production or providing financial resources. Rather, they require simultaneous attention to production and quality, value creation and supply chain organization, market and marketing, branding, sales networks, empowerment, and institutional support.

Purposive sampling was employed. The criteria for selecting experts included relevant expertise and experience, familiarity with the research topic, and willingness to participate in all Delphi stages. The experts were selected from among faculty members and researchers in relevant fields, specialists in executive agencies involved in rural development, cooperatives, women's affairs, and business support, experts in business management and marketing, and managers and practitioners of rural and women's cooperatives.

In total, 24 experts participated in the study, and the same individuals participated throughout all Delphi stages. Of these participants, 18 were men and 6 were women. Regarding age, the highest frequency was observed in the 40–50-year age group. Furthermore, 16 participants held doctoral degrees, while 8 held master's degrees. Regarding professional experience, all participants had at least 10 years of relevant experience, and the largest proportion were employed at universities and academic and research centers (Table 1).

Given the mixed-methods approach of the study, data were collected in two qualitative and quantitative phases. In the qualitative phase, semi-structured interviews and open-ended questionnaires were used. The questions focused on identifying the mechanisms and approaches through which rural cooperatives can contribute to the commercialization of rural women's home-based products and the development of market-oriented businesses. In designing the instrument, issues such as quality improvement and alignment of products with market demand, production aggregation and standardization, product development and innovation, packaging and branding, supply chain organization, the creation and expansion of in-person and digital sales channels, the development of communication networks, and the strengthening of women's managerial and business capacities were taken into consideration. However, the questions were designed in an open-ended format to allow for the identification of new and unforeseen mechanisms.

Table 1. Demographic Characteristics of the Research Experts

No.	Variable	Category	Frequency	Percentage
1	Gender	Male	18	75
		Female	6	25
2	Age	30–40 years	5	20/8
		40–50 years	9	37/5
		50–60 years	8	33/3
		Over 60 years	2	8/3
3	Education	Master's degree	8	33/3
		Doctoral degree	16	66/7
4	Professional experience	10–15 years	6	25
		16–20 years	9	37/5
		More than 21 years	9	37/5
5	Organizational/professional affiliation	Universities and academic and research centers	10	41/7
		Executive agencies related to rural development, women's affairs, cooperatives, and business support	9	37/5
		Rural and women's cooperatives, rural businesses, and specialists and experts in entrepreneurship, business management, and marketing	5	20/8

Following the analysis of the qualitative data, the extracted components were formulated as items for the Delphi questionnaire. The experts assessed the importance of each item using a five-point Likert scale. In the final round, feedback from the previous round was provided to the experts to enable them to reconsider their judgments, refine their perspectives, and reach greater consensus. Ultimately, qualitative content analysis identified five main mechanisms through which rural cooperatives contribute to commercialization: product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability. These mechanisms formed the basis for assessment, importance evaluation, and prioritization during the Delphi stages.

In the qualitative section, data analysis was conducted through a process of coding and categorizing concepts. Initially, the data were read thoroughly and repeatedly, and meaning units related to the role of rural cooperatives in the commercialization of home-based products and the development of market-oriented businesses among rural women were identified. Subsequently, initial codes were extracted, and similar codes were grouped into subcategories. Finally, through constant comparison of the categories, the main mechanisms through which rural cooperatives contribute to commercialization were identified.

In the quantitative section, the mean and standard deviation were calculated for each component. The mean of the experts' responses served as the basis for assessing the relative importance and ranking of the identified components and mechanisms. Furthermore, Kendall's coefficient of concordance was used to examine the degree of agreement among the experts regarding the priorities. This coefficient indicates the degree of convergence among the rankings provided by the evaluators on a scale ranging from zero to one, with higher values indicating greater agreement. In the present study, Kendall's coefficient of concordance in the final round was 0.81, indicating a high level of agreement among the experts. Therefore, the Delphi process was terminated after the third round.

To enhance the validity of the findings obtained during the qualitative phase, the criteria proposed by Lincoln and Guba, including credibility, transferability, dependability, and confirmability, were employed. Credibility was ensured through the systematic review and coding of the data, continuous examination of codes and categories, and assessment of the conceptual coherence of the extracted mechanisms. To ensure transferability, the characteristics of the expert population, selection criteria, sampling method, and stages of data collection and analysis were described

transparently. This approach allowed judgments to be made regarding the applicability of the findings in similar contexts. Dependability was addressed through the systematic implementation and documentation of the stages of data collection, coding, and analysis. Furthermore, to ensure confirmability, efforts were made to ensure that the results were directly grounded in the data and perspectives of the experts. The researchers also sought to avoid imposing their assumptions on the identification and interpretation of the mechanisms through which rural cooperatives contribute to commercialization.

In the quantitative section, the validity of the components was supported through the implementation of three Delphi rounds, obtaining feedback from the experts, reconsidering their judgments, and examining the degree of convergence among their perspectives. Following qualitative content analysis and refinement during the Delphi stages, the final components were classified into five main mechanisms: product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability. Accordingly, the structure of the quantitative instrument and the assessment of its reliability were developed based on these five mechanisms.

In addition, Cronbach's alpha coefficient was used to examine the reliability and internal consistency of the questionnaire items. The results showed that the alpha coefficients for the five main mechanisms were within acceptable and desirable ranges. Cronbach's alpha coefficient was 0.91 for the mechanism of product value re-creation, 0.89 for supply chain organization, 0.88 for market identity-building and credibility creation, 0.87 for strategic connection to sales networks, and 0.86 for empowerment for growth and scalability. Furthermore, Cronbach's alpha coefficient for the overall questionnaire was 0.90, indicating appropriate internal consistency and desirable reliability of the research instrument. Accordingly, the research instrument demonstrated the necessary capability to assess and prioritize the mechanisms through which rural cooperatives contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women (Table 2).

Table 2. Reliability of the Mechanisms Through Which Rural Cooperatives Play a Role Based on Cronbach's Alpha Coefficient

Dimension	Number of Indicators	Cronbach's Alpha
Product value reconfiguration	6	0/91
Supply chain organization	5	0/89
Market identity-building and credibility creation	4	0/88
Smart connection to sales networks	5	0/87
Empowerment for growth and scalability	4	0/86
Overall questionnaire	24	0/90

4- Findings

4-1. Results of the Qualitative Stage; Identification and Extraction of the Mechanisms of Rural Cooperatives' Role-Playing

In the first stage, with the aim of identifying and formulating the mechanisms through which rural cooperatives can contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women, qualitative data were collected through semi-structured interviews and open-ended questionnaires from experts in the fields of cooperatives, women's entrepreneurship, rural development, and marketing. The focus of this stage was on how women's home-based production could transition from dispersed production to products with the potential for market supply, sales, and continuity. Following transcription, the data were analyzed using conventional qualitative content analysis. First, meaning units related to the research objective were identified and initially coded. Subsequently, conceptually similar codes were compared and organized into subcategories. Thereafter, through continuous comparison of codes, categories, and themes, common patterns were identified and the main mechanisms were formulated. The analysis of qualitative data showed that the role of rural cooperatives in transitioning women's home-based products from dispersed production to market-oriented businesses is multidimensional and is not limited to input provision or distribution. Based on the themes extracted from experts'

perspectives, this role was explained through five mechanisms: "product value re-creation," "supply chain organization," "market identity-building and credibility creation," "strategic connection to sales networks," and "empowerment for growth and scalability." These mechanisms form a chain of complementary actions extending from enhancing product value to market access and business growth. The first mechanism, product value re-creation, refers to actions that increase the commercial potential of products. These include quality enhancement, alignment of product characteristics with market needs and demand, innovation, improvement of design and packaging, and enhancement of attractiveness and marketability. The second mechanism, supply chain organization, is based on the aggregation and coordination of dispersed production, process standardization, supply coordination, and improvement of the flow of materials and products. These actions strengthen supply capacity and support a more sustainable market presence.

The third mechanism, market identity-building and credibility creation, concerns establishing a professional and distinctive identity for products, brand development, identity-oriented packaging design, and enhancement of the product image. These actions aim to increase customer trust and market credibility. The fourth mechanism, strategic connection to sales networks, emphasizes establishing and expanding linkages between women's products and market opportunities. It encompasses in-person and digital sales channels, connections with markets and sales intermediaries, and the development of communication and business networks. The fifth mechanism, empowerment for growth and scalability, focuses on strengthening women's knowledge, skills, and managerial and commercial capacities. These include planning, decision-making, and marketing skills that can support the continuity and expansion of their economic activities.

The overall findings of this stage indicate that, if a rural cooperative actively performs a role in these five areas, it can transform from a service-oriented institution into an intermediary institution for market development. In this role, it establishes linkages among women's productive capacities, value chain requirements, support resources, and market opportunities. From this perspective, commercialization results from the coordination of interventions related to the product, supply, market identity, customer access, and business capabilities. Accordingly, the five identified mechanisms were used as the initial analytical framework. They formed the basis for developing the items of the closed-ended questionnaire and entering the refinement and validation process across three Delphi rounds. At this stage, the final importance and priority of the mechanisms were not determined. Instead, the conceptual structure derived from the qualitative data was formulated. Accordingly, Table 3 presents the main mechanisms and the themes associated with each (Table 3).

Table 3- Main mechanisms of rural cooperatives' role in the commercialization of home-based products and development of market-oriented businesses among rural women in the qualitative stage

Row	Main Dimension of Barriers	Overall Theme
1	Product Value Re-creation	A set of actions aimed at increasing product value and commercial potential, including quality enhancement, alignment of the product with market needs and demand, innovation and design improvement, packaging, and increasing the product's marketability and attractiveness to customers.
2	Supply Chain Organization	A set of actions related to aggregating and coordinating women's dispersed production, standardizing processes, coordinating supply, reducing production dispersion, and improving the flow of materials and products within the supply chain, with the aim of increasing supply capacity and ensuring regular market presence.
3	Market Identity-Building and Credibility Creation	A set of actions to establish a professional and distinctive identity for women's products, develop the brand, design identity-oriented packaging, enhance the product image, and increase its trustworthiness and credibility among customers and in the market.
4	Smart Connection to Sales Networks	A set of actions to establish and expand women's and their products' access to markets, including the development of in-person and digital

Row	Main Dimension of Barriers	Overall Theme
		sales channels, establishing connections with markets and sales intermediaries, and expanding communication and business networks.
5	Empowerment for Growth and Scalability	A set of actions related to strengthening women's knowledge, skills, and managerial and commercial capacities, including decision-making, planning, marketing, and business development, with the aim of sustaining economic activity and providing the necessary capacity for its growth and expansion.

4-2. Results of the Second Delphi Stage; Assessment of the Importance of the Mechanisms of Rural Cooperatives' Role-Playing

Following the identification of the findings from the qualitative content analysis, the extracted themes and indicators were used as the basis for developing the closed-ended Delphi questionnaire. Accordingly, the five mechanisms of "product value re-creation," "supply chain organization," "market identity-building and credibility creation," "strategic connection to sales networks," and "empowerment for growth and scalability" were operationalized through 24 indicators and presented to the experts. Responses were collected using a five-point Likert scale, and the mean and standard deviation were calculated for each indicator. According to the results of Table 4, the means of the indicators ranged from 4.29 to 4.60. Consequently, all indicators derived from the qualitative stage were considered highly important. The highest mean was assigned to "creating and expanding in-person and digital sales channels," with a value of 4.60. This was followed by "enhancing quality and aligning the product with market needs and demand," with 4.58, and "aggregating and coordinating women's production for regular market supply," with 4.56. The lowest mean was related to "diversifying and improving product characteristics in accordance with the market," with a value of 4.29. As this stage focused on assessing importance, its results were used as feedback for the experts in the third stage. The degree of agreement and final prioritization were determined in the subsequent stage.

In the first mechanism, namely product value re-creation, the primary focus was on increasing the commercial potential of home-based products by modifying characteristics directly related to market acceptance. The mean of this mechanism was 4.41, and all six of its indicators were rated as highly important. "Enhancing quality and aligning the product with market needs and demand," with a mean of 4.58, ranked first. "Improving product packaging and appearance," with 4.46, "innovation and improvement of product design," with 4.42, and "increasing product marketability and professional presentation," with 4.38, followed. In addition, "receiving and communicating market feedback for product improvement," with 4.33, and "diversifying and improving product characteristics in accordance with the market," with 4.29, were also assessed. The standard deviations of the indicators ranged from 0.58 to 0.73. This pattern indicates that, from the experts' perspective, the primary condition for enhancing the commercial value of a product is its compatibility with market expectations. Actions such as improving appearance and design and obtaining market feedback support this process.

The second mechanism, supply chain organization, had a mean of 4.43, and all five of its indicators received high importance ratings. "Aggregating and coordinating women's production for regular market supply," with a mean of 4.56, received the highest score within this mechanism. This was followed by "standardizing the production process and product characteristics," with 4.47, and "coordinating the timing and volume of product supply," with 4.44. "Increasing the capacity to respond to continuous and larger orders," with 4.38, and "establishing common procedures for supply control and management," with 4.31, followed. The standard deviations of the indicators ranged from 0.59 to 0.72. These results indicate that, from the experts' perspective, reducing dispersion and transforming individual producers' capacities into coordinated and manageable supply constitute essential components of the cooperative's role in supply organization. These measures can strengthen responsiveness to continuous demand and support a more regular market presence.

In the third mechanism, market identity-building and credibility creation, a mean of 4.44 was obtained, and all four indicators were rated as highly important. "Developing the brand and creating a distinctive identity for rural women's products," with a mean of 4.54, received the highest score.

"Designing identity-oriented and professional packaging," with 4.43, "enhancing the product image and credibility among customers," with 4.41, and "building trust through introducing the origin and characteristics of the product," with 4.36, followed. The standard deviations of these indicators ranged from 0.61 to 0.71, indicating relatively limited dispersion in the experts' views. From this perspective, the marketability of a product does not depend solely on its technical characteristics. Rather, how the product is represented and how market recognition and trust are established also affect its economic value. The cooperative can support a shared or local identity, create coherence in packaging, and clearly present product characteristics and origin. These measures can facilitate the differentiation of women's products in a competitive market environment.

The fourth mechanism, strategic connection to sales networks, obtained the highest mean among the five mechanisms, at 4.47. "Creating and expanding in-person and digital sales channels," with 4.60, recorded the highest mean among the 24 indicators. "Establishing connections with stores, bazaars, and exhibitions," with 4.52, and "using social networks and digital marketing tools," with 4.48, ranked next. In addition, "expanding women's communication and business networks" had a mean of 4.39, while "developing connections with intermediaries and distribution networks" had a mean of 4.34. The standard deviations of the indicators ranged from 0.55 to 0.72. The lowest dispersion was related to creating and expanding sales channels, while the highest was related to connections with intermediaries. These results highlight the importance of market access in the experts' assessment. The cooperative can reduce the limited direct access of small-scale producers to customers and sales opportunities by developing in-person and digital pathways and facilitating connections with market actors.

In the fifth mechanism, empowerment for growth and scalability, a mean of 4.41 was obtained. "Strengthening business management and development skills," with a mean of 4.51, received the highest score, followed by "increasing women's ability in marketing and customer communication," with 4.46, "strengthening economic planning and decision-making skills," with 4.35, and "creating the necessary capacity for activity development and scalability," with 4.32. The standard deviations of the indicators ranged from 0.62 to 0.73. These results indicate that empowerment within the framework under study is not limited to general training. Rather, it encompasses the development of practical capabilities for managing economic activities, interacting with the market, and planning for development. Therefore, cooperative training and advisory services become aligned with the logic of commercialization when they strengthen women's practical capabilities to sustain and develop their economic activities (Table 4 and 5).

Table 4. Assessment of the importance of the components of the mechanisms of rural cooperatives' role-playing in the second Delphi stage

Components	Component / Indicator	Mean	Standard Deviation
Product Value Re-creation	Enhancing quality and aligning the product with market needs and demand	4.58	0.58
	Innovation and improvement of product design	4.42	0.66
	Improving packaging and product appearance	4.46	0.64
	Increasing product marketability and professional presentation	4.38	0.71
	Diversifying and improving product characteristics in accordance with the market	4.29	0.73
	Receiving and communicating market feedback for product improvement	4.33	0.69
	Mechanism Mean	4.41	0.67
Supply Chain Organization	Aggregating and coordinating women's production for regular market supply	4.56	0.59
	Standardizing the production process and product characteristics	4.47	0.63
	Coordinating the timing and volume of product supply	4.44	0.65
	Establishing common procedures for supply control and management	4.31	0.72

Components	Component / Indicator	Mean	Standard Deviation
	Increasing the capacity to respond to continuous and larger orders	4.38	0.68
	Mechanism Mean	4.43	0.65
Market Identity-Building and Credibility Creation	Developing the brand and creating a distinctive identity for rural women's products	4.54	0.61
	Designing identity-oriented and professional packaging	4.43	0.67
	Enhancing the product image and credibility among customers	4.41	0.69
	Building trust through introducing the origin and characteristics of the product	4.36	0.71
	Mechanism Mean	4.44	0.67
Smart Connection to Sales Networks	Creating and expanding in-person and digital sales channels	4.60	0.55
	Establishing connections with stores, bazaars, and exhibitions	4.52	0.60
	Developing connections with intermediaries and distribution networks	4.34	0.72
	Using social networks and digital marketing tools	4.48	0.64
	Expanding women's communication and business networks	4.39	0.69
	Mechanism Mean	4.47	0.64
Empowerment for Growth and Scalability	Strengthening business management and development skills	4.51	0.62
	Increasing women's ability in marketing and customer communication	4.46	0.65
	Strengthening economic planning and decision-making skills	4.32	0.70
	Creating the necessary capacity for activity development and scalability	4.32	0.73
	Mechanism Mean	4.41	0.68
Total Questionnaire	24 indicators	4.43	0.66

Table 5- Status of the identified mechanisms and indicators at the end of the second stage and their entry into the third Delphi stage

Row	Main Mechanism of Rural Cooperatives' Role-Playing	Number of Indicators	Mean of the Mechanism in the Second Stage	Status at the End of the Second Stage
1	Product Value Re-creation	6	4.41	Confirmed and entered the third Delphi stage
2	Supply Chain Organization	5	4.43	Confirmed and entered the third Delphi stage
3	Market Identity-Building and Credibility Creation	4	4.44	Confirmed and entered the third Delphi stage
4	Smart Connection to Sales Networks	5	4.47	Confirmed and entered the third Delphi stage
5	Empowerment for Growth and Scalability	4	4.41	Confirmed and entered the third Delphi stage
Total	Five main mechanisms	24	4.43	Confirmation of the five-dimensional structure and entry into the third Delphi stage

Overall, the mean of the 24 indicators was 4.43, and the total standard deviation was 0.66. Comparison of the mean scores of the mechanisms showed that strategic connection to sales networks, with 4.47, was at the highest level, followed by market identity-building and credibility creation with 4.44,

supply chain organization with 4.43, and product value re-creation and empowerment for growth and scalability, both with 4.41. At the indicator level, the three components with the highest mean scores were, respectively, creating and expanding in-person and digital sales channels, enhancing quality and aligning the product with market needs and demand, and aggregating and coordinating women's production for regular market supply. In contrast, diversifying and improving product characteristics in accordance with the market had the lowest mean. Nevertheless, it remained within the high-importance range.

These findings also indicate that the cooperative's role in commercialization is chain-like in nature. Product value creation, supply organization, market credibility, sales access, and business development capacity are complementary components of a single process. Accordingly, the findings of the second stage supported the adequacy of the five-dimensional structure derived from the qualitative stage and indicated that none of the 24 indicators required removal for continuation of the process. However, the proximity of the mean scores at the mechanism level indicates that the differences in their importance at this stage were insufficient to determine definitive priorities. Therefore, all 24 indicators were transferred to the third Delphi stage without deletion. This allowed the experts to reconsider their judgments based on statistical feedback and enabled the assessment of the convergence of their views and the final prioritization of the mechanisms through which rural cooperatives contribute to commercialization.

4-3- Results of the Third Delphi Stage; Reaching Consensus and Final Prioritization of the Barriers

In the third Delphi stage, the results obtained from the second stage, including the mean importance ratings of the identified indicators and mechanisms, were provided to the experts as statistical feedback. The purpose of this stage was to provide an opportunity to reconsider previous judgments, increase the convergence of viewpoints, and reach final agreement on the importance and priority of the mechanisms through which rural cooperatives can contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women. In this stage, the same 24 experts who had participated in the previous rounds re-evaluated the 24 indicators organized into five main mechanisms: product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability. The experts conducted this reassessment with awareness of the results of the previous stage.

To examine the degree of agreement among the 24 experts regarding the priority of the 24 indicators, Kendall's coefficient of concordance (W) was calculated. The results showed a Kendall's W of 0.81, with $\chi^2(23) = 447.12$ and $p < 0.001$. The degrees of freedom were 23, corresponding to the 24 indicators included in the analysis. The high value of Kendall's W indicates a high level of agreement among the experts in ranking the indicators. The statistically significant result indicates that the observed agreement was greater than would be expected by chance. Accordingly, the third Delphi stage provided evidence of a high level of convergence among the experts' judgments regarding the importance and priority of the 24 indicators.

The findings of this stage, consistent with the results of the second stage, indicate that strategic connection to sales networks, market identity-building and credibility creation, supply chain organization, product value re-creation, and empowerment for growth and scalability constitute the five main mechanisms related to the commercialization process of rural women's home-based products. Among these, mechanisms directly related to market access, demand creation, regular supply capacity, and enhancement of product credibility were considered more important. This pattern is also consistent with the results of the second stage, in which creating and expanding in-person and digital sales channels, enhancing quality and aligning the product with market needs and demand, and aggregating and coordinating women's production for regular market supply received the highest mean importance ratings.

Accordingly, the results of the third stage indicate that the role of rural cooperatives in the commercialization of home-based products cannot be defined solely in terms of product supply or distribution. Cooperatives can act as intermediary institutions between producers and markets by enhancing product value and marketability, organizing dispersed production, creating market identity and credibility, connecting producers to sales channels, and strengthening women's

managerial and commercial capabilities. These five mechanisms collectively form a chain of complementary interventions. This chain begins with product preparation and improvement, proceeds through production organization and the creation of market credibility, and culminates in market-oriented business development through connection to sales networks and strengthening women's growth capacity. Therefore, given the high level of agreement among the experts (W = 0.81) and confirmation of its statistical significance, the third Delphi stage was considered the final stage of the assessment, consensus-building, and prioritization process for the mechanisms identified in the study. Consequently, the five main mechanisms and 24 indicators resulting from the qualitative and Delphi stages were established as the final framework for explaining the role of rural cooperatives in the commercialization of home-based products and the development of market-oriented businesses among rural women (Table 6).

Table 6- Results of Kendall's Concordance Test

Statistical Indicator	Value
Number of experts (N)	24
Number of final indicators (K)	24
Kendall's coefficient of concordance (W)	0.81
Chi-square value (Chi-Square)	447.12
Degrees of freedom (df)	23
Significance level (p-value)	<0.001

4-4. Comparison of Indicator Ranks in the Second and Third Stages

To assess the stability of the experts' judgments and examine the effect of statistical feedback, the ranks of the 24 identified indicators in the second and third Delphi stages were compared. In the third stage, the means from the second stage were provided to the same 24 experts so that they could reconsider their previous judgments. Comparison of the ranks makes it possible to assess the convergence of viewpoints. The results of Table 7 show that changes in the ranks of the indicators were limited and that no indicator was removed from the final structure. The majority of the indicators retained their ranks or experienced only limited shifts. Therefore, the statistical feedback in the third stage mainly resulted in a partial refinement of the ordering of the indicators and did not alter the conceptual framework of the study.

At the level of the main mechanisms, 'strategic connection to sales networks,' with a mean of 4.47 in the second stage, showed the highest initial mean importance. It was followed by "market identity-building and credibility creation," with 4.44, "supply chain organization," with 4.34, and the two mechanisms of "product value re-creation" and "empowerment for growth and scalability," both with 4.41. This ordering indicates that the experts attached greater importance to mechanisms related to market access, credibility creation, supply organization, and enhancement of product marketability. Kendall's coefficient of concordance in the third stage was 0.81 and statistically significant. Therefore, the priority structure demonstrated a high level of convergence. At the indicator level, "creating and expanding in-person and digital sales channels," with a mean of 4.60, "enhancing quality and aligning the product with market needs and demand," with 4.58, and "aggregating and coordinating women's production for regular market supply," with 4.56, had the highest mean importance ratings. These three indicators represent complementary commercialization capabilities. This synergy indicates that the success of cooperatives depends on linking product readiness, supply capacity, and sustained market access. In contrast, "diversifying and improving product characteristics in accordance with the market," with a mean of 4.29, had the lowest mean. Nevertheless, this indicator still had high importance.

Comparison of the two stages shows that the feedback from the second round did not result in a fundamental change in the experts' judgment pattern. The retention of ranks or limited shifts in the indicators, together with the high Kendall's coefficient of concordance, indicates an appropriate level of expert consensus. Product value re-creation through quality and packaging enhancement increases product marketability. Supply chain organization through production aggregation and standardization strengthens the ability to respond to

regular demand. Identity-building and credibility creation enhance customer trust. At the same time, connection to sales networks expands access to in-person and digital markets, while women's managerial and commercial empowerment increases the capacity for business growth and scalability.

Overall, rather than redefining the conceptual framework, the third Delphi stage primarily served to consolidate, refine, and validate the identified priorities. The retention of the high importance of all 24 indicators, the limited changes in ranks, and the concordance coefficient of 0.81 provide appropriate evidence of the stability and convergence of the experts' judgments. Accordingly, the study's five-dimensional framework represents a complementary set of commercialization requirements in which product improvement, supply coordination, identity and trust creation, sales channel development, and strengthening managerial capabilities are pursued in an integrated manner. This finding highlights the necessity for cooperatives to move beyond their traditional role of supply and distribution toward a role as market-development intermediaries. In this role, they link women's productive capacity, support resources, and market opportunities and create the conditions for the formation of market-oriented businesses (Table 7).

Table 7- Comparison of the Ranks of Indicators of the Mechanisms of Rural Cooperatives' Role-Playing in the Second and Third Delphi Stages

Row	Main Mechanism	Indicator	Mean in the Second Stage	Rank in the Second Stage	Rank Status in the Third Stage
1	Smart Connection to Sales Networks	Creating and expanding in-person and digital sales channels	4.60	1	Limited change / final rank to be entered
2	Product Value Re-creation	Enhancing quality and aligning the product with market needs and demand	4.58	2	Limited change / final rank to be entered
3	Supply Chain Organization	Aggregating and coordinating women's production for regular market supply	4.56	3	Limited change / final rank to be entered
4	Market Identity-Building and Credibility Creation	Developing the brand and creating a distinctive identity for rural women's products	4.54	4	Limited change / final rank to be entered
5	Smart Connection to Sales Networks	Establishing connections with stores, bazaars, and exhibitions	4.52	5	Limited change / final rank to be entered
6	Empowerment for Growth and Scalability	Strengthening business management and development skills	4.51	6	Limited change / final rank to be entered
7	Smart Connection to Sales Networks	Using social networks and digital marketing tools	4.48	7	Limited change / final rank to be entered
8	Supply Chain Organization	Standardizing the production process and product characteristics	4.47	7	Limited change / final rank to be entered
9	Smart Connection to Sales Networks	Expanding women's communication and business networks	4.39	9	Limited change / final rank to be entered
10	Product Value Re-creation	Increasing product marketability and professional presentation	4.38	10	Limited change / final rank to be entered
11	Supply Chain Organization	Increasing the capacity to respond to continuous and larger orders	4.38	10	Limited change / final rank to be entered
12	Market Identity-Building and Credibility Creation	Designing identity-oriented and professional packaging	4.43	6	Limited change / final rank to be entered

Row	Main Mechanism	Indicator	Mean in the Second Stage	Rank in the Second Stage	Rank Status in the Third Stage
13	Supply Chain Organization	Coordinating the timing and volume of product supply	4.44	5	Limited change / final rank to be entered
14	Market Identity-Building and Credibility Creation	Enhancing the product image and credibility among customers	4.41	7	Limited change / final rank to be entered
15	Market Identity-Building and Credibility Creation	Building trust through introducing the origin and characteristics of the product	4.36	12	Limited change / final rank to be entered
16	Smart Connection to Sales Networks	Developing connections with intermediaries and distribution networks	4.34	14	Limited change / final rank to be entered
17	Product Value Re-creation	Innovation and improvement of product design	4.42	8	Limited change / final rank to be entered
18	Product Value Re-creation	Improving packaging and product appearance	4.46	9	Limited change / final rank to be entered
19	Product Value Re-creation	Receiving and communicating market feedback for product improvement	4.33	15	Limited change / final rank to be entered
20	Product Value Re-creation	Diversifying and improving product characteristics in accordance with the market	4.29	24	Limited change / final rank to be entered
21	Supply Chain Organization	Establishing common procedures for supply control and management	4.31	16	Limited change / final rank to be entered
22	Empowerment for Growth and Scalability	Increasing women's ability in marketing and customer communication	4.46	9	Limited change / final rank to be entered
23	Empowerment for Growth and Scalability	Strengthening economic planning and decision-making skills	4.35	13	Limited change / final rank to be entered
24	Empowerment for Growth and Scalability	Creating the necessary capacity for activity development and scalability	4.32	17	Limited change / final rank to be entered

4.5. Analysis of the Importance of the Main Dimensions

To determine the relative importance of the mechanisms through which rural cooperatives contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women, the findings of the qualitative and quantitative stages of the study were examined. These mechanisms include product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability. These dimensions were initially identified through qualitative content analysis and were assessed and refined in terms of importance during the Delphi stages. The results showed that all five mechanisms were highly important and that the role of cooperatives was multidimensional and complementary. The proximity of the mean scores also indicates that the commercialization of home-based products cannot be reduced to a single intervention.

In the second Delphi stage, "strategic connection to sales networks," with a mean of 4.47, ranked first. This mechanism emphasizes the creation and development of in-person and digital sales channels, connections with stores, bazaars, and exhibitions, and the use of social networks and digital marketing tools. At the indicator level, "creating and expanding in-person and digital sales channels," with a mean of 4.60, obtained the highest score among the study indicators. Therefore, from the experts' perspective, cooperatives can play an

effective role in commercialization when producers' access to markets is transformed from sporadic and individual contact into sustained interaction.

"Market identity-building and credibility creation," with a mean of 4.44, ranked second. Within this mechanism, "developing the brand and creating a distinctive identity for rural women's products," with a mean of 4.54, was the most important indicator. Professional and identity-oriented packaging, enhancement of the product image, and the creation of customer trust were also important. This finding confirms that commercialization is not merely an increase in sales volume but also requires the creation of perceived value and the establishment of trust in the product.

"Supply chain organization," with a mean of 4.43, ranked third. "Aggregating and coordinating women's production for regular market supply," with a mean of 4.56, received the highest score within this mechanism. Production and product-characteristic standardization, coordination of the timing and volume of supply, and establishment of common supply control and management procedures were the other components of this dimension. From this perspective, the cooperative has an organizing and intermediary role that transforms dispersed production into coordinated supply.

"Product value re-creation," with a mean of 4.41, jointly ranked fourth. Its most important indicator was "enhancing quality and aligning the product with market needs and demand," with a mean of 4.58. Innovation, design improvement, and packaging were other components of this mechanism. Accordingly, cooperatives can reduce the gap between the logic of home-based production and market requirements by transferring market information and facilitating product modification.

"Empowerment for growth and scalability" also jointly ranked fourth, with a mean of 4.41. Strengthening business management and development skills, with a mean of 4.51; increasing marketing and customer communication capabilities, with a mean of 4.46; strengthening economic planning and decision-making, with a mean of 4.35; and creating development and scalability capacity, with a mean of 4.32, were the four indicators of this mechanism. Accordingly, empowerment in this study extends beyond general training and encompasses women's practical capacity for economic activity (Table 8 and 9).

Table 8- Mean Importance of the Main Mechanisms of Rural Cooperatives' Role-Playing in the Commercialization of Women's Home-Based Products

Main Mechanism of Rural Cooperatives' Role-Playing	Mean Importance (out of 5)	Relative Position in the Second Stage	Overall Interpretation
Smart Connection to Sales Networks	4.47	1	The most important mechanism; indicates the importance of creating and expanding in-person and digital sales channels and developing connections with markets, stores, exhibitions, intermediaries, and distribution networks
Market Identity-Building and Credibility Creation	4.44	2	Emphasizes the creation of a distinctive identity, brand, professional packaging, enhancement of the product image, and creation of trust and credibility in the market
Supply Chain Organization	4.43	3	Indicates the importance of aggregating and coordinating production, standardization, regulating the timing and volume of supply, and increasing the capacity to respond to continuous orders
Product Value Re-creation	4.41	4 (joint)	Emphasizes quality enhancement, alignment of the product with market needs, innovation, design, packaging, diversification, and the use of market feedback
Empowerment for Growth and Scalability	4.41	4 (joint)	Includes strengthening business management and development skills, marketing, customer communication, planning and economic decision-making, and activity development capacity
Overall mean of 24 indicators	4.43	—	Indicates the high importance of the five mechanisms of cooperatives' role-playing as a whole from the experts' perspective

Table 9- Process of Identifying, Assessing, and Establishing the Mechanisms of Rural Cooperatives' Role-Playing across the Different Stages of the Study

Main Mechanism of Role-Playing	First Stage; Qualitative Identification	Second Stage; Importance Assessment	Third Stage; Agreement and Final Priority Assessment
Product Value Re-creation	Identification of 6 indicators related to quality, innovation, design, packaging, marketability, diversification, and market feedback	Importance assessment of 6 indicators by experts; mechanism mean of 4.41	Reassessment of evaluations and examination of expert agreement; retention of all 6 indicators in the final structure
Supply Chain Organization	Identification of 5 indicators related to production aggregation, standardization, supply coordination, supply management, and response to orders	Importance assessment of 5 indicators by experts; mechanism mean of 4.43	Reassessment of evaluations and examination of expert agreement; retention of all 5 indicators in the final structure
Market Identity-Building and Credibility Creation	Identification of 5 components	Importance assessment of 4 indicators by experts; mechanism mean of 4.44	Reassessment of evaluations and examination of expert agreement; retention of all 4 indicators in the final structure
Smart Connection to Sales Networks	Identification of 6 components	Importance assessment of 5 indicators by experts; mechanism mean of 4.47	Reassessment of evaluations and examination of expert agreement; retention of all 5 indicators in the final structure
Empowerment for Growth and Scalability	Identification of 4 indicators related to business management, marketing, economic planning, development, and scalability	Importance assessment of 4 indicators by experts; mechanism mean of 4.41	Reassessment of evaluations and examination of expert agreement; retention of all 4 indicators in the final structure
Total	Identification of 24 indicators across five main mechanisms	Importance assessment of 24 indicators; overall mean of 4.43	Assessment of expert agreement; none of the 24 indicators removed and the five-dimensional structure established with W = 0.81

The results of Table 9 show that the process of identifying and establishing the mechanisms through which rural cooperatives contribute to commercialization was conducted as a sequential exploratory mixed-methods process. In the first stage, qualitative content analysis of the experts' views led to the identification of five main mechanisms and 24 indicators. In the second stage, the importance of all indicators was assessed on a five-point scale, and the overall mean importance of the indicators was 4.43. In the third stage, feedback from the previous stage was provided to the experts, and their evaluations were reassessed. Kendall's coefficient of concordance, equal to 0.81, indicated a high level of agreement among the experts. None of the 24 indicators was removed from the final structure. Therefore, the final structure of the study comprises five complementary mechanisms and 24 indicators. Together, these provide a framework for explaining the role of rural cooperatives in the commercialization of home-based products and the development of market-oriented businesses among rural women.

4-6. Final Ranking of the Indicators

Following the qualitative stage and three rounds of the Delphi process, and after reaching a high level of agreement among the experts, the final structure of the role of rural cooperatives in the commercialization of women's home-based products was established in the form of five main mechanisms and 24 indicators. These mechanisms include "product value re-creation," "supply chain organization," "market identity-building and credibility creation," "strategic connection to sales networks," and "empowerment for growth and scalability." The mean importance scores obtained in the second Delphi round were used to assess the initial relative importance of the mechanisms and to provide statistical feedback to the experts. The third Delphi round was then used to reassess the

indicators, examine the convergence of expert judgments, and establish the final prioritization.

According to the mean importance scores from the second Delphi round, "strategic connection to sales networks," with a mean of 4.47, had the highest initial importance among the five mechanisms. This mechanism emphasizes creating and expanding pathways for rural women's products to access markets through in-person and digital sales channels, stores, markets, exhibitions, distribution networks, and digital marketing tools. At the indicator level, "creating and expanding in-person and digital sales channels," with a mean of 4.60, received the highest score among the 24 indicators. "Market identity-building and credibility creation," with a mean of 4.44, showed the second-highest initial importance. Its importance is related to the role of cooperatives in creating a distinctive identity for products, strengthening the brand, improving packaging, enhancing product image, and establishing trust and credibility in the market. Among these indicators, "developing the brand and creating a distinctive identity for rural women's products," with a mean of 4.54, received a high importance score.

"Supply chain organization," with a mean of 4.43, showed the third-highest initial importance. The indicator "aggregating and coordinating women's production to ensure regular market supply," with a mean of 4.56, was among the highest-rated indicators in the study. Product standardization, coordination of the timing and volume of supply, and increasing the capacity to respond to continuous orders were also identified as important components of this mechanism.

The two mechanisms of "product value re-creation" and "empowerment for growth and scalability" both obtained a mean of 4.41 in the second Delphi round. Product value re-creation emphasized improving quality and aligning products with market needs, while empowerment focused on strengthening management, marketing, planning, and business development capabilities. These results indicate that commercialization requires complementary attention to both product marketability and women's managerial and business capacities.

In the third Delphi round, the second-stage results were provided to the same experts as statistical feedback, allowing them to reconsider their judgments. The final prioritization was therefore established after this reassessment and the examination of expert agreement. Kendall's coefficient of concordance was 0.81, with a statistically significant chi-square value (χ^2 = 447.12, df = 23, $p < 0.001$), indicating a high level of convergence among the experts. None of the 24 indicators was removed during the third-round reassessment. Thus, the final framework retained all five mechanisms and 24 indicators, with the second-round mean scores serving as descriptive evidence of relative importance and the third-round reassessment providing the basis for final prioritization and confirmation of the framework.

Overall, the final findings indicate that the role of rural cooperatives in commercialization encompasses five complementary mechanisms: enhancing product value, organizing supply, building market identity and credibility, connecting producers to sales networks, and strengthening women's capacity for business growth and scalability. Together, these mechanisms provide an integrated framework for explaining how rural cooperatives can facilitate the transition from dispersed home-based production toward market-oriented businesses (Table 10 and Figure 1).

Table 10. Initial Relative Importance of the Main Mechanisms Based on Mean Scores in the Second Delphi Round and Their Final Prioritization after Third-Round Reassessment

Row	Main Mechanism of Rural Cooperatives' Role-Playing	Number of Indicators	Mean Importance	Final Rank
1	Smart Connection to Sales Networks	5	4.47	1
2	Market Identity-Building and Credibility Creation	4	4.44	2
3	Supply Chain Organization	5	4.43	3
4	Product Value Re-creation	6	4.41	4
5	Empowerment for Growth and Scalability	4	4.41	5
6	Five Main Mechanisms	24	4.43	–

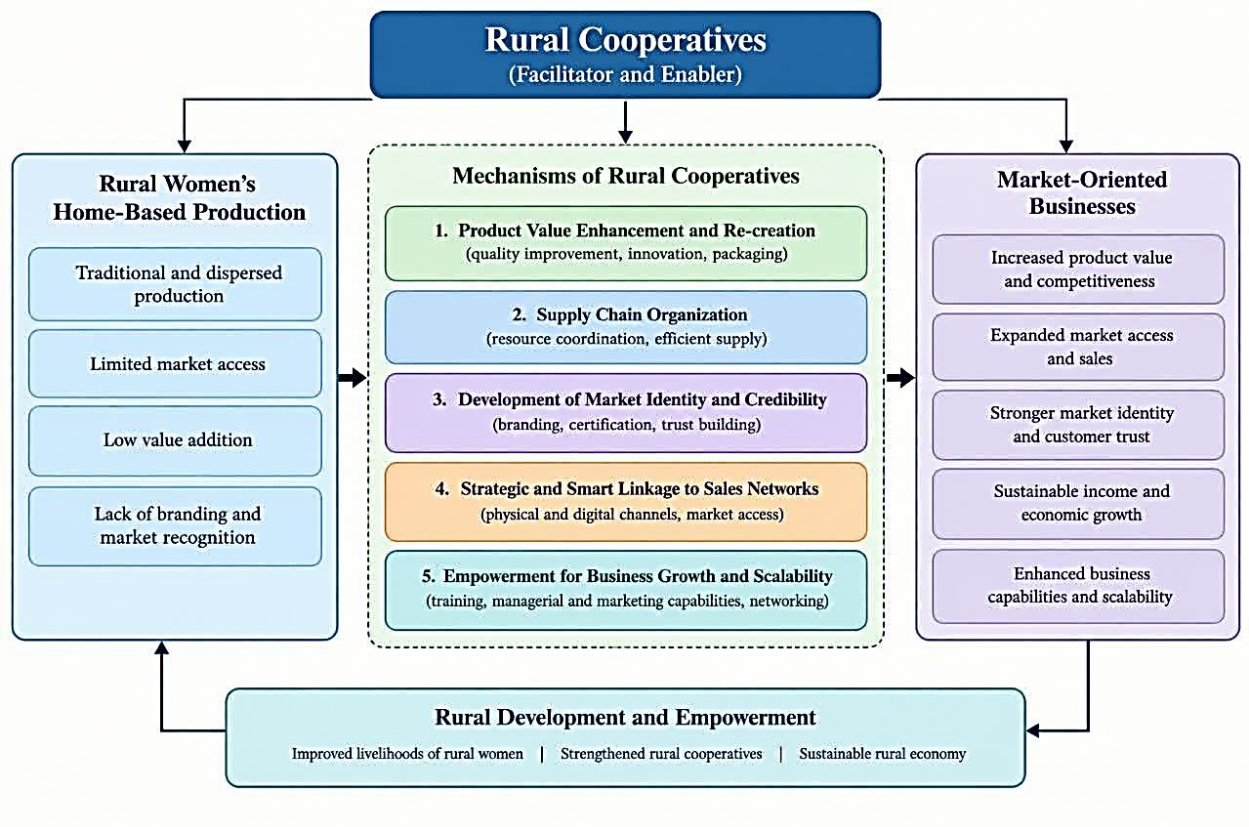


Figure 1. Final Model of the Mechanisms of Rural Cooperatives' Contribution to the Commercialization of Home-Based Products and Development of Market-Oriented Businesses among Rural Women

The conceptual model illustrates an integrated framework explaining how rural cooperatives can facilitate the commercialization of rural women's home-based products and support the development of market-oriented businesses. Rather than conceptualizing cooperatives merely as institutions for production support or product distribution, the model positions them as intermediary and market-development institutions that connect women's productive capacities with value-chain requirements, market opportunities, and business development capabilities. This interpretation is consistent with the qualitative findings and the subsequent Delphi validation, which confirmed five complementary mechanisms as the final analytical structure.

At the core of the model are five interrelated mechanisms. The first, Product Value Enhancement and Re-creation, concerns improving product quality, aligning products with market needs, innovation and design, packaging, marketability, and the use of market feedback. Its importance reflects the need to reduce the gap between traditional home-based production and market expectations. The second mechanism, Supply Chain Organization, transforms dispersed individual production into a more coordinated supply system through aggregation, standardization, supply coordination, and improved responsiveness to regular and larger orders.

The third mechanism, Development of Market Identity and Credibility, emphasizes branding, professional and identity-oriented packaging, product image, and customer trust. This mechanism demonstrates that commercialization depends not only on producing a marketable product but also on establishing a recognizable identity and credibility in the marketplace. The fourth mechanism, Strategic and Smart Linkage to Sales Networks, connects rural women's products to physical and digital sales channels, stores, bazaars, exhibitions, intermediaries, distribution networks, and digital marketing platforms. This mechanism received the highest overall importance among the five dimensions, with a mean of 4.47, while the creation and expansion of physical and digital sales channels was the highest-rated individual indicator (4.60).

The fifth mechanism, Empowerment for Business Growth and Scalability, focuses on strengthening women's business management, marketing, customer communication, economic planning, decision-making, and capacity for business development. Thus, empowerment is conceptualized not as general training alone, but as the development of practical capabilities required to sustain and expand market-oriented economic activities.

Overall, the model represents commercialization as a complementary and sequential process rather than the outcome of a single intervention. Product improvement enhances marketability; supply-chain organization creates reliable supply capacity; market identity and credibility strengthen differentiation and trust; sales-network development expands market access; and women's business capabilities provide the capacity for continuity, growth, and scalability. The Delphi findings support this integrated structure, with all 24 indicators retained and an overall mean importance of 4.43. Moreover, the high and statistically significant Kendall's coefficient of concordance ($W = 0.81$; $\chi^2 = 447.12$; $df = 23$; $p < 0.001$) indicates substantial convergence among experts regarding the final framework.

Accordingly, the model suggests that rural cooperatives can contribute to the transition from dispersed home-based production to sustainable market-oriented businesses by coordinating product, supply, identity, market access, and business-capacity interventions within an integrated commercialization pathway. This provides the central theoretical contribution of the study: the intermediary role of rural cooperatives lies in connecting production capabilities with the institutional, organizational, and market mechanisms required for commercialization and business development.

5. Discussion and Conclusion

The present study was conducted to explore the mechanisms through which rural cooperatives contribute to the commercialization of home-based products and the development of market-oriented businesses among rural women in Sarab Kalan Village, Ilam Province. The study employed a sequential exploratory mixed-methods design. In the qualitative phase, semi-structured interviews and open-ended questionnaires were used, while validation was conducted through three Delphi rounds involving 24 experts in the fields of cooperatives, women's entrepreneurship, rural development, business management, and marketing. The findings demonstrated the role of cooperatives through five main mechanisms: product value re-creation, supply chain organization, market identity-building and credibility creation, strategic connection to sales networks, and empowerment for growth and scalability. Therefore, the commercialization of home-based products is not a one-dimensional process but requires the simultaneous coordination of product, supply, identity, market, and human capabilities.

The first indicator was product value re-creation. This mechanism suggests that commercialization begins when a home-based product becomes marketable to customers in terms of quality, design, packaging, innovation, and alignment with market demand. In this process, the cooperative should transfer market feedback to producers so that production can shift from a traditional pattern toward products aligned with market demand. This finding is consistent with Alaeddinivandi & Soleymanipour (2025) regarding the importance of skills and economic attitudes, and with Golshani & Shiri (2025) concerning the need to enhance technical and specialized competencies. However, the present study does not regard skills merely as an individual characteristic; rather, it situates them in connection with market information and product improvement.

The second indicator was supplying chain organization. Cooperatives can transform dispersed production into a collective and reliable capacity by aggregating women's production, standardizing products, controlling quality, and coordinating the timing and volume of supply. This finding is consistent with Golshani & Shiri (2025), who emphasized family-based and participatory businesses. Nevertheless, the difference lies in the level of analysis. That study considers participation as a strategy for entrepreneurship development, whereas the present study views it as a mechanism for the operational coordination of supply.

The third indicator was market identity-building and credibility creation. This mechanism highlights that quality alone is not sufficient for market success. Women's products also require branding, professional packaging, presentation of origin, and a distinctive identity. This finding is consistent with

Lopez-Toro et al. (2026), who reported locality as an important factor in success and as the most influential factor affecting business performance. However, the present study shows that locality becomes an economic advantage when it is made identifiable to customers through branding, packaging, and product storytelling.

The fourth indicator was strategic connection to sales networks. Sustainable access to customers through stores, marketplaces, exhibitions, social networks, and digital tools constitutes a fundamental link between production and income. This finding is consistent with Dolatabadi et al. (2025) regarding the importance of communication and social networks, and with Tabatabaeeamid & Shahraki (2026) concerning educational, policy, and digital barriers. It is also consistent with Rajeev et al. (2026) regarding the role of technology and supportive policies in strengthening women's capabilities and agency. The difference in the present study is that technology is not regarded as an independent objective but rather as part of the mechanism connecting production, marketing, and sales.

The fifth indicator was empowerment for growth and scalability. This mechanism highlights that women need skills in business management, pricing, marketing, negotiation, customer relations, and planning to move beyond initial sales. This finding is consistent with Alaeddinivandi & Soleymanipour (2025) regarding the importance of skills and economic attitudes, and with Nannetti & Operti (2026) regarding the role of incubators, coaching, networking, and access to technical and commercial knowledge. The main difference is that the present study situates this function within the capacity of rural cooperatives.

Overall, the greatest consistency between the findings and the literature was observed in four areas: skills and training, networking, technology and support, and the economic utilization of local capacities. In contrast, some differences were also identified. Grangeiro et al. (2026) emphasized economic motivation and external support in initiating and developing informal entrepreneurship, whereas the present study focuses on transforming existing production into market-oriented businesses. Likewise, the effect of formal business registration emphasized by Lopez-Toro et al. (2026) was not included among the five mechanisms identified in the present study because this study focused on value creation, supply, market, and empowerment. These differences should be understood primarily as resulting from differences in context, population, and the stage of the entrepreneurial process rather than as direct contradictions between the findings. This distinction highlights the added value of the present study in explaining how dispersed capacities can be transformed into sustainable economic performance.

Therefore, the most important contribution of the present study is the provision of a process-oriented understanding of the role of cooperatives. The five mechanisms are not independent. Value re-creation prepares the product for the market; supply organization enables regular provision; identity-building creates differentiation and trust; connection to sales networks converts created value into customers and income; and empowerment enables continuity and growth.

Overall, the findings indicate that the transition from home-based production to a market-oriented business is not solely the result of increased production but rather the outcome of coordinating five complementary mechanisms along the value chain. Validation of the framework through three Delphi rounds involving 24 experts and quantitative assessment using a five-point scale provided an appropriate basis for formulating this model. Nevertheless, because the study focused on Sarab Kalan Village and on experts' perspectives, the generalizability of the findings should be approached with caution. Future studies can test these five mechanisms in other regions and, by incorporating the perspectives of women and customers, longitudinally assess their effects on sales, income, market diversification, sustainability, and business scale. Ultimately, a rural cooperative can fulfill its role in women's economic development when it evolves from an institution focused on supply and distribution into an active institution for market development, value chain organization, and economic empowerment.

Recommendations

1. Establishing an integrated product development and market preparation system: Cooperatives should create the conditions for improving the quality, design, packaging, and innovation of women's products by monitoring demand and transferring customer feedback. In addition, the local characteristics of products should be

transformed into competitive advantages and marketable value through professional branding.

2. Organizing production and creating an integrated supply chain: Cooperatives should transform women's dispersed capacities into collective and reliable production capacity through production aggregation, standardization, quality control, and coordination of the volume and timing of supply. This measure increases their ability to respond regularly to orders and enter larger markets.

3. Developing sales networks and establishing sustainable market connections: Cooperatives should strengthen women's access to diverse markets by simultaneously developing in-person and digital channels through stores, exhibitions, marketplaces, and social networks. Diversification of sales channels reduces dependence on the local market and the risks associated with women's individual entry into the market.

4. Establishing a commercial empowerment system and supporting business growth: Women's training should focus on practical skills such as pricing, financial management, marketing, negotiation, and customer relations and should be accompanied by continuous consultation and coaching. Cooperatives should also establish a sustainable network among women, support institutions, educational centers, and market actors to promote business growth and scalability.

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Author Contributions

The authors contributed equally to the development and preparation of this research.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the authorship or publication of this article.

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Original Article

واکاوی سازوکارهای نقش‌آفرینی تعاونی‌های روستایی در تجاری‌سازی محصولات خانگی و توسعه کسب‌وکارهای بازارمحور در میان زنان روستایی (مطالعه موردی: روستای سراب‌کلان)

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چکیده مبسوط

۱. مقدمه

فعالیت‌های تولیدی زنان روستایی در حوزه محصولات غذایی، صنایع‌دستی و سایر محصولات خانگی، از ظرفیت‌های مهم توسعه اقتصادی روستاها و تقویت مشارکت اقتصادی زنان به شمار می‌روند. بااین‌حال، برخورداری از مهارت‌های تولیدی به‌تنهایی برای دستیابی به درآمد پایدار و توسعه کسب‌وکار کافی نیست؛ زیرا پراکندگی تولید، ضعف در ایجاد ارزش افزوده، محدودیت دسترسی به بازار، فقدان هویت تجاری مشخص و ناپایداری شبکه‌های فروش، مانع تبدیل فعالیت‌های خانگی به کسب‌وکارهای بازارمحور می‌شوند. در این میان، تعاونی‌های روستایی می‌توانند با سازمان‌دهی ظرفیت‌های پراکنده تولیدکنندگان، تسهیل ارتباط با بازار و ارائه خدمات تخصصی، نقش واسطه‌ای مؤثری در فرایند تجاری‌سازی ایفا کنند. با وجود مطالعات متعدد درباره کارآفرینی زنان روستایی و کارکردهای تعاونی‌ها، سازوکارهای مشخصی که از طریق آن‌ها تعاونی‌ها تولیدات خانگی را به فعالیت‌های اقتصادی پایدار و بازارمحور تبدیل می‌کنند، کمتر به‌صورت یکپارچه بررسی شده‌اند. ازاین‌رو، پژوهش حاضر با هدف شناسایی و تبیین سازوکارهای نقش‌آفرینی تعاونی‌های روستایی در تجاری‌سازی محصولات خانگی و توسعه کسب‌وکارهای بازارمحور زنان، در روستای سراب‌کلان شهرستان سیروان استان ایلام انجام شده است.

۲. مبانی نظری تحقیق

چارچوب نظری پژوهش بر تلفیق نظریه زنجیره ارزش و نظریه شبکه‌های اجتماعی و کسب‌وکار استوار است. بر اساس نظریه زنجیره ارزش، ارتقای کیفیت، نوآوری، بهبود طراحی و بسته‌بندی، برندسازی، سازمان‌دهی عرضه و توسعه بازاریابی، فعالیت‌هایی به‌هم‌پیوسته‌اند که می‌توانند ارزش اقتصادی محصولات و قابلیت رقابت‌پذیری آن‌ها را افزایش دهند. در مقابل، نظریه شبکه‌های اجتماعی و کسب‌وکار بر اهمیت روابط میان تولیدکنندگان، مشتریان، توزیع‌کنندگان، نهادهای پشتیبان و سایر بازیگران اقتصادی در دسترسی به اطلاعات، منابع و فرصت‌های بازار تأکید می‌کند. تلفیق این دو رویکرد، امکان تحلیل نقش تعاونی‌ها را هم در سازمان‌دهی فرایند خلق و تحقق ارزش و هم در ایجاد و تقویت ارتباطات اقتصادی فراهم می‌سازد. بر این اساس، تجاری‌سازی محصولات خانگی فرایندی چندبعدی تلقی می‌شود که تحقق آن مستلزم هماهنگی میان ویژگی‌های محصول، سازمان‌دهی عرضه، ایجاد اعتماد در بازار، توسعه شبکه‌های فروش و تقویت توانمندی‌های مدیریتی و تجاری زنان است.

۳. روش تحقیق

پژوهش از نظر هدف، کاربردی و از نظر روش، دارای رویکرد آمیخته اکتشافی متوالی است. در مرحله کیفی، داده‌ها از طریق مصاحبه‌های نیمه‌ساختاریافته و پرسش‌نامه‌های باز از خبرگان حوزه‌های تعاونی، کارآفرینی زنان، توسعه روستایی، مدیریت کسب‌وکار و بازاریابی گردآوری و با استفاده از تحلیل محتوای کیفی بررسی شدند. سپس، مؤلفه‌ها و شاخص‌های استخراج‌شده در سه دور اجرای تکنیک دلفی با مشارکت ۲۴ نفر از خبرگان، با نمونه‌گیری هدفمند، ارزیابی، اصلاح و اولویت‌بندی شدند. ابزار مرحله کمی، پرسش‌نامه بسته مبتنی بر طیف پنج‌درجه‌ای لیکرت بود. برای تحلیل داده‌ها از میانگین، انحراف معیار و ضریب توافق کندال استفاده شد. همچنین، پایایی کل پرسش‌نامه و ابعاد آن با ضریب آلفای کرونباخ بررسی شد. مقدار آلفای کرونباخ برای کل پرسش‌نامه ۰/۹۰ و برای پنج سازوکار بین ۰/۸۶ تا ۰/۹۱ بود که نشان‌دهنده همسانی درونی مطلوب ابزار پژوهش است.

۴. یافته‌های تحقیق

نتایج تحلیل محتوای کیفی و ارزیابی‌های دلفی، پنج سازوکار اصلی و ۲۴ شاخص را برای تبیین نقش تعاونی‌های روستایی در تجاری‌سازی

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محصولات خانگی شناسایی و تأیید کرد. این سازوکارها عبارت‌اند از: ۱) بازآفرینی ارزش محصول از طریق ارتقای کیفیت، نوآوری، بهبود طراحی و بسته‌بندی و انطباق با نیاز بازار؛ ۲) سازمان‌دهی زنجیره تأمین از طریق تجمیع و هماهنگی تولید، استانداردسازی محصولات و تنظیم زمان و حجم عرضه؛ ۳) ایجاد هویت و اعتبار بازاری از طریق برندسازی، بسته‌بندی حرفه‌ای، معرفی منشأ محصول و تقویت اعتماد مشتریان؛ ۴) اتصال راهبردی به شبکه‌های فروش از طریق توسعه کانال‌های حضوری و دیجیتال، ارتباط با فروشگاه‌ها، بازارها، نمایشگاه‌ها و بهره‌گیری از بازاریابی دیجیتال؛ و ۵) توانمندسازی برای رشد و توسعه کسب‌وکار از طریق تقویت مهارت‌های مدیریت، بازاریابی، ارتباط با مشتری، برنامه‌ریزی اقتصادی و تصمیم‌گیری.

میانگین اهمیت مجموع ۲۴ شاخص برابر با ۴٫۴۳ از پنج و انحراف معیار آن ۰٫۶۶ بود که اهمیت بالای سازوکارهای شناسایی‌شده را از دیدگاه خبرگان نشان می‌دهد. در ارزیابی مرحله دوم دلفی، اتصال راهبردی به شبکه‌های فروش با میانگین ۴٫۴۷ در رتبه نخست قرار گرفت. پس از آن، ایجاد هویت و اعتبار بازاری با میانگین ۴٫۴۴ و سازمان‌دهی زنجیره تأمین با میانگین ۴٫۴۳ قرار داشتند. بازآفرینی ارزش محصول و توانمندسازی برای رشد و توسعه کسب‌وکار نیز هر دو میانگین ۴٫۴۱ را کسب کردند. در سطح شاخص‌ها، توسعه کانال‌های فروش حضوری و دیجیتال با میانگین ۴٫۶۰، ارتقای کیفیت و انطباق محصول با نیاز بازار با میانگین ۴٫۵۸ و تجمیع و هماهنگی تولید برای عرضه منظم با میانگین ۴٫۵۶، بالاترین امتیازها را داشتند. کمترین میانگین، معادل ۴٫۲۹، به تنوع‌بخشی و بهبود ویژگی‌های محصول متناسب با بازار اختصاص یافت؛ بااین‌حال، این شاخص نیز از اهمیت بالایی برخوردار بود. در دور سوم دلفی، ضریب توافق کندال برابر با ۰٫۸۱ و از نظر آماری معنادار بود=χ^2 ۴۴۷٫۱۲، ۲۳=df، ۰٫۰۰۱>p . در این مرحله، هر ۲۴ شاخص در چارچوب نهایی حفظ شدند.

۵. بحث و نتیجه‌گیری

یافته‌ها نشان می‌دهند که تجاری‌سازی محصولات خانگی زنان روستایی صرفاً با افزایش تولید یا فراهم‌کردن امکان توزیع محقق نمی‌شود، بلکه به هماهنگی مجموعه‌ای از مداخلات در زنجیره ارزش و شبکه‌های بازار نیاز دارد. بر این اساس، تعاونی‌های روستایی می‌توانند از نهادهایی عمدتاً متمرکز بر تأمین و توزیع، به نهادهای واسط توسعه بازار تبدیل شوند؛ نهادهایی که از طریق بهبود محصول، سازمان‌دهی عرضه، ایجاد هویت تجاری، گسترش شبکه‌های فروش و تقویت توان مدیریتی زنان، زمینه شکل‌گیری کسب‌وکارهای بازارمحور را فراهم می‌کنند. با توجه به بالاترین امتیاز اتصال به شبکه‌های فروش، توسعه هم‌زمان بازارهای حضوری و دیجیتال، در کنار تضمین کیفیت و عرضه منظم، باید از اولویت‌های عملیاتی تعاونی‌ها باشد. پیشنهاد می‌شود تعاونی‌ها نظامی یکپارچه برای توسعه محصول و انتقال بازخورد مشتریان، استانداردسازی و تجمیع تولید، برندسازی و بازاریابی چندکاناله و آموزش کاربردی مدیریت و فروش ایجاد کنند. با توجه به تمرکز مطالعه بر یک روستا و اتکای ارزیابی‌ها به دیدگاه خبرگان، تعمیم نتایج به سایر مناطق مستلزم بررسی‌های تکمیلی است. پژوهش‌های آینده می‌توانند با مشارکت مستقیم زنان تولیدکننده و مشتریان و با استفاده از داده‌های طولی، آثار این سازوکارها را بر فروش، درآمد، پایداری فعالیت اقتصادی و مقیاس کسب‌وکار ارزیابی کنند.

کلیدواژه‌ها: تعاونی‌های روستایی، کارآفرینی زنان، تجاری‌سازی محصولات خانگی، کسب‌وکارهای بازارمحور، زنجیره ارزش، توسعه روستایی.

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Original Article

Marketing Performance in Agricultural Firms across Geographically Isolated Regions in Kohgiluyeh and Boyer-Ahmad province

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Abstract
Purpose- Agricultural firms in geographically isolated regions face severe marketing constraints due to limited market access, infrastructural deficits, and information asymmetries. The purpose of this study is to investigate how strategic agility capabilities enable such firms to overcome these barriers and enhance marketing performance, drawing on dynamic capability's theory and the resource-based view.
Design/methodology/approach- A descriptive-analytical design was employed using a questionnaire survey administered to 285 agricultural firm owners in a mountainous region of Iran, selected through simple random sampling. Data reliability was confirmed via Cronbach's alpha ($\alpha > 0.70$), and validity was verified by academic experts in entrepreneurship and agricultural economics. Data were analyzed using SPSS 21 software, employing Pearson correlation and multiple linear regression analysis to test the hypothesized relationships between agility dimensions—product agility, people and knowledge agility, cooperative agility, and organizational agility—and marketing performance, while controlling for individual characteristics.
Findings- Strategic agility explains 57% of the variance in marketing performance. Product agility emerges as the strongest predictor ($\beta = 0.44$, $p < 0.01$), followed by people and knowledge agility ($\beta = 0.254$, $p < 0.01$). Cooperative and organizational agility show positive but statistically non-significant relationships, suggesting that contextual constraints in isolated settings may moderate their effectiveness. These findings indicate that internal capabilities, particularly product development and human capital, are critical for overcoming geographic disadvantages, whereas external facing capabilities may require supportive institutional conditions to become fully effective.
Practical implications- The cross-sectional design limits causal inference, and the single province focus restricts generalizability. Reliance on self-reported measures and absence of firm level controls (e.g., size, age) are additional limitations. Future research should employ longitudinal designs, include objective performance indicators, and compare multiple regions to establish boundary conditions.
Originality/value- This study extends strategic agility theory to agricultural entrepreneurship in resource constrained, peripheral regions, providing empirical evidence that internal agility capabilities can mitigate geographic isolation. It offers actionable guidance for entrepreneurs to prioritise product adaptation and knowledge management, and for policymakers to design capacity building programmes that enhance competitiveness in isolated rural areas.
Keywords- Strategic agility, Marketing performance, Agricultural entrepreneurship, Resource-based view, Dynamic capabilities, Geographic isolation.

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1. Introduction

The agricultural sector's contribution to sustainable development has garnered increasing scholarly attention as climate change, population growth, and market volatility intensify pressures on global food systems (Darnhofer et al., 2016; Basso & Antle, 2020; Wuepper et al., 2021). While agricultural entrepreneurship offers promising pathways for poverty alleviation and rural development (Naminse & Zhuang, 2018), firms operating in geographically isolated regions confront unique challenges that substantially constrain their marketing effectiveness and competitive positioning (Lowder et al., 2016; Tschirley & Riley, 2021). These challenges include limited market access, inadequate transportation infrastructure, information asymmetries, restricted institutional support, and heightened vulnerability to climatic and economic shocks (Wuepper et al., 2021; Kitole et al., 2024). Despite the growing recognition of these multifaceted constraints, our understanding of how agricultural firms in peripheral regions can develop organizational capabilities to overcome geographical isolation and enhance marketing performance remains theoretically and empirically underdeveloped (Anim et al., 2025).

Strategic agility—defined as an organization's capacity to rapidly adapt its strategies and resource configurations in response to environmental changes (Doz & Kosonen, 2008; Ahammad et al., 2021)—has emerged as a promising theoretical framework for understanding firm adaptation in volatile and resource-constrained environments. Strategic agility encompasses multiple dimensions, including product agility, people and knowledge agility, cooperative agility, and organizational agility (Goldman et al., 1995; Chan et al., 2017; Sambamurthy et al., 2003). While extensive research has examined strategic agility in manufacturing and service sectors (Tallon & Pinsonneault, 2011; Shin et al., 2015), its application to agricultural contexts remains surprisingly underexplored, particularly in developing country settings where resource constraints and institutional voids are prevalent (Arokodare & Asikhia, 2020; Kurniawan et al., 2020). This gap is consequential because agricultural firms operate under distinct conditions characterized by production seasonality, biological production uncertainties, perishable products, and pronounced market imperfections that differ fundamentally from manufacturing contexts (Kamble et al., 2020; Wolfert et al., 2017; Afrakhteh & Jamshidzehi Shahbakhsh, 2022; Kumar et al., 2023).

Drawing on the resource-based view (Barney, 1991; Wernerfelt, 1984) and dynamic capabilities theory (Teece et al., 1997; Teece, 2007; Helfat & Peteraf, 2003), this study addresses two interrelated research questions. First, how do different dimensions of strategic agility influence marketing performance among agricultural firms in geographically isolated regions? Second, which dimensions of strategic agility are most critical for overcoming resource constraints and achieving marketing effectiveness in such contexts? By examining these questions, we contribute to multiple streams of literature. We extend strategic agility theory to agricultural entrepreneurship, an understudied context that presents unique theoretical and empirical challenges. We provide empirical evidence on the relative importance of agility dimensions, offering insights into how resource-constrained firms can strategically prioritize capability development. Furthermore, we address persistent calls for more contextually grounded research on marketing capabilities in developing economies (Mabhungu, 2017; Singh & Sharma, 2023).

From a practical standpoint, this research offers valuable guidance for agricultural entrepreneurs and policymakers. For entrepreneurs, our findings illuminate which agility capabilities most effectively enhance marketing performance, enabling more targeted resource allocation in resource-scarce environments. For policymakers, we provide evidence supporting investments in infrastructure, training, and institutional mechanisms that facilitate agility development in peripheral regions. Given the growing international policy interest in inclusive agricultural value chains, rural entrepreneurship, and sustainable development (Kitole et al., 2024; United Nations, 2015), understanding how firms can overcome geographical isolation through strategic agility has important implications for achieving sustainable development goals related to poverty reduction, food security, and decent work.

The remainder of this paper proceeds as follows. Section 2 provides a comprehensive review of relevant literature, developing theoretical

foundations and proposing testable hypotheses. Section 3 describes the research methodology, including study context, sampling procedures, measurement approaches, and analytical techniques. Section 4 presents empirical results, including descriptive statistics, correlation analysis, and regression findings with appropriate diagnostic tests. Section 5 discusses theoretical and practical implications, while Section 6 concludes with study limitations and future research directions.

2. Research Theoretical Literature

2.1 Theoretical Foundations: Resource-Based View and Dynamic Capabilities

The resource-based view provides a foundational lens for understanding how firms achieve competitive advantage through their unique resource endowments (Barney, 1991; Wernerfelt, 1984; Peteraf, 1993). According to RBV, sustainable competitive advantage derives from resources and capabilities that are valuable, rare, imperfectly imitable, and non-substitutable. In agricultural contexts, VRIN resources may include specialized agronomic knowledge, established customer relationships, unique land characteristics, proprietary production techniques, and organizational routines that facilitate market responsiveness (Nazifi et al., 2025; Ainm et al., 2025; Barney et al., 2021). However, RBV has been critiqued for its relative static orientation, prompting scholars to develop dynamic capabilities theory to explain how firms reconfigure resources in changing environments (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003). Dynamic capabilities refer to "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997). This theoretical perspective is particularly relevant for agricultural firms facing volatile market conditions, climatic uncertainties, evolving consumer preferences, and technological disruptions (Kumar et al., 2023; Basso & Antle, 2020; Wuepper et al., 2021). Dynamic capabilities enable firms to sense opportunities and threats, seize market openings, and transform their resource configurations accordingly (Teece, 2007; Helfat & Peteraf, 2003; Schilke, 2014). Strategic agility represents a manifestation of dynamic capabilities, encompassing the specific routines and processes through which firms adapt their strategies and operations to environmental changes (Ahammad et al., 2021; Doz & Kosonen, 2008; Teece et al., 2016).

The integration of RBV and dynamic capabilities theory offers a comprehensive framework for understanding how agricultural firms in geographically isolated regions can achieve marketing effectiveness. While RBV emphasizes the importance of internal resources—including human capital, knowledge assets, and organizational routines—dynamic capabilities explain how firms develop, deploy, and reconfigure these resources to respond to market opportunities and threats (Kale et al., 2019; Arokodare & Asikhia, 2020). In contexts characterized by geographical isolation and market imperfections, the ability to develop agility capabilities may be particularly critical for overcoming environmental constraints and achieving competitive positioning (Kurniawan et al., 2020; Teece, 2015).

2.2 Strategic Agility: Conceptualization and Dimensions

Strategic agility represents a multidimensional construct encompassing an organization's capacity to rapidly adapt its strategies, structures, and operations in response to environmental changes (Goldman et al., 1995; Doz & Kosonen, 2008; Weill et al., 2021). Building on the work of Chan et al. (2017), Ahammad et al. (2021), and Teece et al. (2016), we conceptualize strategic agility as comprising four interrelated dimensions: product agility, people and knowledge agility, cooperative agility, and organizational agility. Each dimension reflects distinct but complementary capabilities that collectively enable firms to navigate market volatility and achieve superior performance.

Product agility refers to an organization's capacity to rapidly develop, modify, and introduce products in response to changing market demands and competitive pressures (Lee, 2004; Ahammad et al., 2021; Christopher & Towill, 2001). In agricultural contexts, product agility encompasses flexibility in production planning, responsiveness to shifting consumer preferences regarding quality and sustainability attributes, and capacity to innovate product offerings through value addition (Kamble et al., 2020; Susitha et al., 2024; Wamba et al., 2020). Firms exhibiting high product agility can more effectively align their product portfolios with market opportunities, enhancing customer satisfaction and competitive positioning (Sukaatmadja et al., 2021; Morgan et al., 2009). The

adoption of digital technologies and precision agriculture has been shown to enhance product agility through real-time decision-making capabilities (Kumar et al., 2023; Wolfert et al., 2017).

People and knowledge agility emphasize the importance of human capital, organizational learning, and knowledge management in enabling rapid adaptation (Al-azzam et al., 2018; Tschirley & Riley, 2021; Argote & Ingram, 2000). This dimension encompasses workforce skills and adaptability, knowledge sharing mechanisms, collaborative decision-making processes, and continuous learning orientation (Nonaka & Takeuchi, 1995; Grant, 1996). In agricultural contexts, people and knowledge agility enables firms to respond more effectively to market information, adopt innovative practices, and develop capabilities that enhance marketing effectiveness (Crawford, 2006; Kumar et al., 2023; Anim et al., 2025). Recent research emphasizes the critical role of agricultural extension services, farmer training programs, and knowledge networks in building people and knowledge agility (Kitole et al., 2024).

Cooperative agility captures an organization's capacity to leverage external partnerships, collaborative relationships, and value chain integration to enhance strategic responsiveness (Kurniawan et al., 2020; van de Vrande et al., 2009; Dyer & Singh, 1998). This dimension recognizes that firms increasingly rely on external resources and knowledge to complement internal capabilities (Lavie, 2006; Powell et al., 1996). In agricultural contexts, cooperative agility enables firms to access market information, coordinate with supply chain partners, achieve economies of scale through collective action, and share risks (Kilelu et al., 2013; Markelova et al., 2009). Farmer organizations, producer groups, and value chain partnerships represent institutional mechanisms through which cooperative agility is developed (Vorley et al., 2009; Hellin et al., 2009).

Organizational agility encompasses the internal structures, processes, and decision-making routines that enable firms to respond rapidly to environmental changes (Singh et al., 2013; Overby et al., 2006; Weill et al., 2021). This dimension includes expedited decision-making processes, effective communication systems, and accessible performance-enhancing information (Gunasekaran, 1999; Sambamurthy et al., 2003). Agricultural firms with high organizational agility can more effectively coordinate activities, respond to market intelligence, and implement strategic changes in a timely manner (Tallon & Pinsonneault, 2011). Recent research highlights the importance of digital information systems, agile management practices, and flexible organizational structures for building organizational agility in agricultural contexts (Kumar et al., 2023).

2.3 Strategic Agility and Marketing Performance

Marketing performance represents a critical organizational outcome encompassing customer acquisition, retention, and sales growth (Leonidou et al., 2013; Katsikeas et al., 2016; Morgan et al., 2009). Drawing on performance measurement theory (Neely et al., 2005; Kaplan & Norton, 1996), we conceptualize marketing performance as reflecting the effectiveness of a firm's marketing strategies in achieving market penetration, customer satisfaction, and revenue growth. In agricultural contexts, marketing performance is particularly important given the perishable nature of many agricultural products, seasonal production patterns, and intense market competition (Sukaatmadja et al., 2021; Vadivelu & Kiran, 2013).

The relationship between strategic agility and marketing performance is grounded in dynamic capabilities theory, which suggests that agility capabilities enable firms to sense market opportunities, seize them effectively, and transform their resource configurations to sustain competitive advantage (Teece, 2007; Helfat & Peteraf, 2003; Schilke, 2014). Specifically, firms with higher levels of strategic agility can more rapidly identify shifts in consumer preferences, adjust their marketing strategies accordingly, and implement changes to product offerings, pricing, distribution, and promotion (Arokodare & Asikhia, 2020; Kurniawan et al., 2020). This responsiveness enables them to achieve superior marketing outcomes in terms of customer satisfaction, market share, and profitability (Shin et al., 2015; Ofoegbu & Akanbi, 2012).

Product agility is particularly critical for marketing performance as it directly enables firms to align their product offerings with evolving customer needs and preferences (Ahammad et al., 2021; Lee, 2004; Christopher & Towill, 2001). In agricultural contexts, this may involve developing new products, improving product quality, introducing value-added processing, or adapting product characteristics to meet market standards (Kamble et

al., 2020; Susitha et al., 2024; Kumar et al., 2023). Research by Bozic & Dimovski (2019) demonstrates that firms implementing agile product development achieve superior marketing outcomes through enhanced customer satisfaction and loyalty. Empirical evidence from agricultural contexts indicates that firms capable of agile product development can better respond to market volatility and changing consumer preferences (Sukaatmadja et al., 2021).

Hypothesis 1a (H1a): Product agility positively influences marketing performance.

People and knowledge agility enhance marketing performance by enabling firms to leverage human capital and knowledge resources effectively (Al-azzam et al., 2018; Tschirley & Riley, 2021; Argote & Ingram, 2000). Firms with highly skilled, adaptable workforces can more effectively interpret market signals, develop innovative marketing strategies, and implement responsive customer engagement approaches (Crawford, 2006; Nonaka & Takeuchi, 1995; Grant, 1996). Knowledge management systems that facilitate information sharing and organizational learning enable firms to respond more rapidly to market changes (Anim et al., 2025; Kumar et al., 2023). In agricultural contexts, where market information is often asymmetric and geographically distributed, people and knowledge agility becomes particularly important for effective marketing decision-making (Kitole et al., 2024; Stifel & Minten, 2008).

Hypothesis 1b (H1b): People and knowledge agility positively influences marketing performance.

Cooperative agility facilitates marketing performance through enhanced access to external resources, market intelligence, and partner capabilities (Kurniawan et al., 2020; van de Vrande et al., 2009; Dyer and Singh, 1998). Collaborative relationships enable firms to leverage complementary resources, share market information, and coordinate marketing activities across the value chain (Lavie, 2006; Powell et al., 1996). In agricultural contexts, cooperative arrangements such as farmer organizations, producer groups, and value chain partnerships can enhance market access, bargaining power, and information sharing (Kilelu et al., 2013; Markelova et al., 2009). Organizations cultivating cooperative agility can better leverage external resources and insights, leading to enhanced innovation and market responsiveness (Kurniawan et al., 2020; Vorley et al., 2009; Hellin et al., 2009).

Hypothesis 1c (H1c): Cooperative agility positively influences marketing performance.

Organizational agility enables firms to adapt their internal structures and processes to environmental changes, facilitating more effective marketing strategy implementation (Singh et al., 2013; Overby et al., 2006; Weill et al., 2021). Firms with expedited decision-making processes and effective communication systems can respond more rapidly to market opportunities and threats (Gunasekaran, 1999; Sambamurthy et al., 2003). In agricultural contexts, where production and market conditions can change rapidly, organizational agility enables firms to coordinate activities, allocate resources, and adjust strategies in a timely manner (Tallon & Pinsonneault, 2011; Teece et al., 2016).

Hypothesis 1d (H1d): Organizational agility positively influences marketing performance.

2.4 Contextual Factors: Geographic Isolation and Resource Constraints

Geographic isolation represents a critical contextual factor shaping the relationship between strategic agility and marketing performance in agricultural contexts (Stifel & Minten, 2008; Lowder et al., 2016; Tschirley & Riley, 2021). Firms in geographically isolated regions face unique challenges, including limited market access, inadequate infrastructure, restricted information flows, and reduced institutional support (Roumiyani et al., 2017; Wuepper et al., 2021). These constraints may moderate the effectiveness of agility capabilities in several ways.

First, geographic isolation may amplify the importance of product agility, as firms have limited options for market diversification and must therefore optimize their product offerings for available markets (Kamble et al., 2020; Basso and Antle, 2020; Kumar et al., 2023). Second, isolation may increase the criticality of people and knowledge agility, as firms cannot easily recruit external expertise and must therefore develop internal human capital capabilities (Crawford, 2006). Third, cooperative agility may be particularly important in isolated contexts, as firms must develop collaborative arrangements to overcome market access constraints and achieve economies of scale (Kilelu et al., 2013; Markelova et al., 2009). Fourth, organizational agility may be constrained in isolated contexts due to limited

institutional support and infrastructure, potentially weakening its relationship with marketing performance (Singh et al., 2013; Overby et al., 2006).

Based on these contextual considerations, and drawing on prior research suggesting differential effects of agility dimensions (Ahammad et al., 2021; Arokodare & Asikhia, 2020; Kurniawan et al., 2020), we propose the following additional hypothesis:

Hypothesis 2 (H2): Product agility and people and knowledge agility have stronger positive effects on marketing performance than cooperative agility and organizational agility in geographically isolated agricultural contexts.

While we expect all agility dimensions to positively influence marketing performance (H1a-H1d), we hypothesize that product agility and people and knowledge agility will demonstrate stronger effects in geographically isolated contexts. This is consistent with resource-based logic, suggesting that internal capabilities may be more critical when external resources and institutional support are limited (Barney, 1991; Wernerfelt, 1984; Peteraf, 1993). Furthermore, it aligns with dynamic capabilities theory, which emphasizes the importance of internal reconfiguration capabilities in resource-constrained environments (Teece, 2007; Helfat & Peteraf, 2003; Schilke, 2014).

3. Research Methodology

3.1 Geographical Scope of the Research

This study was conducted in Kohgiluyeh and Boyer-Ahmad province, located in southwestern Iran. The province is characterized by mountainous terrain as part of the larger Zagros Mountain range, with elevations exceeding 4,000 meters. This topography creates diverse microclimates influencing agricultural practices while simultaneously constraining transportation and infrastructure development (Gheiji et al., 2020). The province includes several valleys and plateaus providing arable land, but village geographic isolation complicates market access and essential service delivery, reinforcing cycles of economic deprivation.

The selection of this study context was purposive, based on several criteria. First, the province exhibits characteristics typical of geographically isolated agricultural regions in developing countries, including limited market access, infrastructure constraints, and economic vulnerability (Stifel and Minten, 2008; Lowder et al., 2016; Tschirley and Riley, 2021). Second, the predominantly agricultural economy, with crops including wheat, barley, and various fruits, alongside livestock farming, represents a context where marketing performance is critical for rural livelihoods. Third, the region's challenges—including climatic fluctuations, market volatility, and limited adoption of modern agricultural practices—reflect conditions common in many developing country agricultural contexts (Sow et al., 2023). This context enables investigation of how strategic agility capabilities can help firms overcome geographical isolation and achieve marketing effectiveness.

3.2. Methodology

This research employs a cross-sectional survey design, which is appropriate for examining relationships among variables and testing hypotheses (Creswell and Creswell, 2017). The study population comprised 1,100 gardeners actively engaged in agricultural production in the province. Using Krejcie and Morgan's (1970) table for sample size determination, we selected 285 respondents through simple random sampling to ensure representativeness (Cochran, 1977). This sampling approach minimizes selection bias and enables generalizability of findings to the broader population of agricultural firms in similar contexts.

Data were collected through face-to-face structured interviews using a standardized questionnaire. This approach was selected for several reasons: high illiteracy rates in rural areas precluded self-administration; face-to-face interviews enabled clarification of questions and ensured response completeness; and the approach facilitated building rapport with respondents in traditional rural communities. Interviews were conducted by trained enumerators familiar with the local context and agricultural practices.

The questionnaire comprised three sections addressing marketing performance, strategic agility dimensions, and demographic characteristics. All multi-item measures employed Likert scales with established validity and reliability in prior research. Table 1 provides comprehensive measurement details.

Table 1. Construct Measurement and Reliability Analysis

Construct	Items	Definitions	Loading range	CR	AVE	Alpha
Product Agility	9	It encompasses the community's interest in conversion industries, commitment to value addition, quality of information received from agricultural experts, innovation in service offerings, and the trust and cooperation among suppliers and customers. This agility enables gardeners to respond proactively to market demands and optimize their business strategies, ultimately driving economic success within the agricultural sector. 9 Likert scale items determine the responsiveness and adaptability of gardeners in a community regarding their ability to effectively engage with market opportunities, enhance product offerings, and foster sustainable relationships with stakeholders.	0.52- 0.79	0.91	0.53	0.91
People and Knowledge Agility	7	This agility reflects the community's overall ability to adapt, grow, and improve through open communication, collective efforts, and supportive networks, ultimately fostering a resilient agricultural environment. It is measured using a survey instrument consisting of seven statements, each evaluated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to determine the capacity of gardeners within a community to effectively share knowledge, collaborate in planning and decision-making, adhere to cooperative regulations, engage in expert-led training, recognize the value of development initiatives, receive timely compensation for damages, and access skilled horticultural workers.	0.71- 0.80	0.91	0.59	0.92
Cooperative Agility	4	This agility reflects the collaborative capabilities of the gardening community to respond to market needs, emphasizing strategic timing, product integrity, and customer engagement as critical components for fostering a competitive advantage and sustaining growth in the agricultural sector. The variable is measured by 4 Likert scale items measuring the ability of gardeners within a community to effectively time their offerings, introduce products to the market early, maintain commitment to quality, and establish strong customer relationships.	0.57- 0.80	0.83	0.55	0.85
Organizational Agility	4*	Encompasses the responsiveness, flexibility, and the capacity of	0.54- 0.80	0.74	0.50	0.72

Construct	Items	Definitions	Loading range	CR	AVE	Alpha
		agricultural organizations in a community to make swift decisions, provide accessible performance-enhancing information, and effectively communicate strategies to gardeners to adapt to evolving circumstances, optimize operational performance, and ensure enhancing overall productivity and efficiency in agricultural practices. Organizational Agility is evaluated through three statements, each rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), reflecting Expedited Decision-Making Processes, Accessibility of Performance-Enhancing Information, and Effective Communication of Gardening Strategies.				
Marketing Performance	3	Emphasizes the ability of businesses to track customer acquisition, retention rates, and sales growth, providing a comprehensive understanding of marketing impact on overall business performance on a 5-point Likert scale ranging from 1 (never) to 5 (always).	0.84-0.88	0.90	0.75	0.83

Abbreviations: AVE, average variance explained; CR, composite reliability.
Notes: Fornell and Larcker (1981) recommended a CR value of 0.60 or more and an AVE greater than 0.4. Following the factor analysis, one item from organizational agility was excluded from the analysis due to low factor loadings.

a) Marketing Performance

Agricultural marketing performance was measured using Leonidou et al.'s (2013) three-item scale assessing: (1) customer acquisition relative to previous year, (2) customer retention rates, and (3) sales growth percentage. Items were rated on a 5-point Likert scale (1 = never/strongly decrease to 5 = always/strongly increase). This measure captures key dimensions of marketing effectiveness, including market penetration, customer loyalty, and revenue growth (Katsikeas et al., 2016; Morgan et al., 2009). Cronbach's alpha of 0.83 indicates good internal consistency.

b) Strategic Agility

Following Goldman et al.'s (1995) framework and subsequent operationalizations (Chan et al., 2017; Ahammad et al., 2021; Sambamurthy et al., 2003), strategic agility was measured across four dimensions:

Product agility (9 items): Assessed community interest in conversion industries, commitment to value addition, quality of information from agricultural experts, innovation in service offerings, and trust and cooperation among suppliers and customers (Cronbach's $\alpha = 0.91$).

People and knowledge agility (7 items): Evaluated open knowledge sharing, team-based planning, cooperative rule adherence, expert-led training, perception of development initiatives, compensation receipt, and access to trained horticultural workers (Cronbach's $\alpha = 0.92$).

Cooperative agility (4 items): Measured strategic timing of offerings, early market introduction, commitment to high-quality chemical-free products, and customer relationship maintenance (Cronbach's $\alpha = 0.85$).

Organizational agility (4 items, with one excluded after confirmatory factor analysis due to low factor loading): Captured expedited decision-making processes, accessibility of performance-enhancing information, and effective strategy communication (Cronbach's $\alpha = 0.72$).

Items were rated on 5-point Likert scales (1 = strongly disagree to 5 = strongly agree). Composite reliability (CR) ranged from 0.74 to 0.91, and average variance extracted (AVE) ranged from 0.50 to 0.75, exceeding recommended thresholds (CR $\geq$ 0.60; AVE $\geq$ 0.40) (Fornell & Larcker, 1981).

c) Control Variables

Consistent with prior research on organizational performance (Kale et al., 2019; Shin et al., 2015), we controlled for respondent characteristics that might influence marketing performance: gender, age, education level, agricultural experience, and income dependency on gardening. These controls account for potential confounding effects of individual and firm characteristics on the relationships of interest.

Because all variables were collected via a single questionnaire from the same respondents at one time, common method bias (CMB) was assessed. Harman's single-factor test was conducted using unrotated principal component analysis on all measurement items. The first factor accounted for 39.9% of the variance, which is below the 50% threshold, suggesting that CMB is not a serious concern (Podsakoff et al., 2003).

Face validity was established through expert panel evaluation, with agricultural marketing experts and academics reviewing the questionnaire for item relevance, clarity, and comprehensiveness. Adjustments were made based on their recommendations to ensure each item effectively evaluated intended constructs (DeVellis, 2017).

Construct validity was assessed through expert panel review, corrected item-to-total correlations, and principal-axis factor analysis. One item from organizational agility was excluded due to a low factor loading (<0.40). Retained items loaded on their intended constructs, and reliability and AVE values were acceptable (Table 1).

Discriminant validity was assessed using Fornell and Larcker's (1981) criterion, with the square root of AVE for each construct exceeding inter-construct correlations (Table 4). This confirms that constructs are distinct and measure different aspects of strategic agility and marketing performance.

Ethical considerations were prioritized throughout the research process. Prior to interviews, informed consent was secured from each participant, who received comprehensive explanation of study objectives and involvement specifics. Participants were informed of their right to withdraw at any point without repercussions. Interview duration was monitored and maintained within reasonable limits to respect participant boundaries.

All collected data were anonymized to prevent individual identification. Personal information was stored securely and kept separate from data analysis files. Identifying information was removed from transcripts and reports to ensure responses could not be traced to participants. These precautions maintained ethical standards and built trust between researchers and participants, creating respectful environments for sharing perspectives.

d) Data Analysis

Data analysis proceeded in several stages. First, descriptive statistics, including frequencies, means, and standard deviations, summarized respondent characteristics and variable distributions. Second, Pearson correlation analysis examined bivariate relationships among variables. Third, multiple regression analysis tested hypothesized relationships, with marketing performance as the dependent variable and agility dimensions as independent variables, controlling for demographic characteristics. Collinearity diagnostics (tolerance and variance inflation factor) assessed multicollinearity. All analyses were conducted using SPSS 21 software (Field, 2018).

4. Research Findings

4.1 Respondent Characteristics

Table 2 presents demographic characteristics of the 285 respondents. The sample is predominantly male (88.8%), reflecting gender patterns in agricultural entrepreneurship in the study region. Average respondent age is 51.7 years (SD = 12.3), indicating experienced agricultural practitioners. Education levels are relatively high for a rural developing country context: 38.3% hold bachelor's degrees or higher (30.2% bachelor's, and 8.1% master's degrees), while 29.5% hold a diploma and 13.3% hold an associate degree. However, 18.9% have no formal education, reflecting continuing educational challenges in rural areas. Notably, 36.5% of respondents are government retirees engaging in horticulture as a second occupation, suggesting agricultural entrepreneurship as a supplementary income source.

Agricultural experience averages 20.7 years (SD = 9.8), with 47.7% possessing 11-20 years and 29.5% possessing over 21 years of experience. This extensive experience suggests accumulated knowledge and skills that may enhance decision-making and innovative practices. Regarding income dependency, 27.7% derive less than 10% of income from gardening, 32.6% derive 10-30%, 29.5% derive 30-50%, and 10.2% derive over 50% of income from gardening activities. The substantial reliance on gardening for over half of respondents

(10.2%) underscores horticulture's livelihood significance, while the diversity of income dependency suggests differentiated support strategies may be necessary.

Table 2. Demographic landscape of the Respondents

Criteria	Level	Frequency	Percentage
Gender	Male	253	88.8%
	Female	32	11.2%
Education	No Education	38	13.3%
	High School Diploma	54	18.9%
	Associate Degree	84	29.5%
	Bachelor's Degree	86	30.2%
	Master's Degree	23	8.1%
Age	30 years and younger	56	19.6%
	31-45 years	49	17.2%
	46-55 years	130	45.6%
	56 years and older	50	17.5%
Experience in Agriculture	5-10 years	65	22.8%
	11-20 years	136	47.7%
	21 years and more	84	29.5%
Gardening Income Dependency	Lower that 10%	79	27.7%
	10-30%	93	32.6%
	30-50%	84	29.5%
	Upper than 50%	29	10.2%

4.2 Descriptive Statistics of Strategic Agility Dimensions

Table 3 presents descriptive statistics for strategic agility dimensions and individual items. Across dimensions, mean scores range from 2.51 to 3.88, indicating moderate to relatively high levels of agility. The highest overall means are observed for cooperative agility (mean range 3.57-3.73) and product agility (mean range 3.52-3.88), while organizational agility items receive the lowest scores (means 2.51-2.56). This pattern suggests that while agricultural firms exhibit relatively strong collaborative and product development capabilities, organizational structures and processes may be less agile.

Within product agility, "Value of Cooperation in Problem-Solving" (M = 3.88, SD = 0.97) and "Promotion of Value Addition by Officials" (M = 3.80, SD = 1.05) receive highest ratings, indicating recognition of collaboration and value addition importance. "Efforts to Identify New Profitable Services" (M = 3.52, SD = 1.02) receives lowest rating, suggesting opportunities for enhanced market orientation and service innovation. The coefficient of variation (CV) ranges from 0.25 to 0.31, indicating relatively consistent responses.

In people and knowledge agility, "Team-Based Planning for Harvest" (M = 3.47, SD = 1.10) and "Encouragement of Open Sharing of Feedback" (M = 3.29, SD = 1.06) receive highest ratings, suggesting collaborative planning emphasis. "Receipt of Compensation for Damages" (M = 3.02, SD = 1.08) and "Expert-Led Training on Pests and Diseases" (M = 3.09, SD = 1.09) receive lowest ratings, indicating gaps in compensation systems and professional development. CV ranges from 0.32 to 0.36, reflecting moderate variability.

Cooperative agility demonstrates consistently high ratings, with "Maintaining Customer Relationships" (M = 3.73, SD = 1.06) and "Importance of Early Market Introduction" (M = 3.69, SD = 1.05) receiving highest scores. This suggests strong emphasis on customer engagement and market timing. Organizational agility items receive substantially lower ratings, with "Accessibility of Performance-Enhancing Information" (M = 2.51, SD = 0.80) and "Effective Communication of Gardening Strategies" (M = 2.51, SD = 0.85) indicating significant organizational constraints. These findings suggest that while agricultural firms demonstrate collaborative and product agility, they face challenges in decision-making speed and

information accessibility—critical organizational capabilities for strategic responsiveness.

Table 3. Descriptive Statistics of SA Dimensions in Agricultural Practices

SA dimensions	Criteria	Mean*	SD	CV
People and Knowledge Agility	Encouragement of Open Sharing of Feedback	3.29	1.06	0.32
	Team-Based Planning for Harvest	3.47	1.10	0.32
	Adherence to Cooperative Rules and Regulations	3.20	1.05	0.33
	Expert-Led Training on Pests and Diseases	3.09	1.09	0.35
	Perception of Development and Training Initiatives	3.25	1.16	0.36
	Receipt of Compensation for Damages	3.02	1.08	0.36
	Access to Trained Horticultural Workers	3.12	0.98	0.32
Product agility	Interest in Conversion Industries	3.60	1.04	0.29
	Promotion of Value Addition by Officials	3.80	1.05	0.28
	Perception of Information Provided by Supervisors	3.60	1.02	0.28
	Efforts to Identify New Profitable Services	3.52	1.02	0.29
	Perception of Responsiveness of Respected Organization	3.57	1.01	0.28
	Value of Cooperation in Problem-Solving	3.88	0.97	0.25
	Trust in Major Suppliers	3.59	1.10	0.31
	Preference for Long-Term Contracts with Suppliers	3.62	1.04	0.29
	Importance of Long-Term Customer Relationships	3.67	0.91	0.25
Cooperative Agility	Favorable Timing of Offerings	3.57	1.14	0.32
	Importance of Early Market Introduction	3.69	1.05	0.28
	Commitment to High-Quality, Chemical-Free Products	3.57	1.13	0.32
	Maintaining Customer Relationships	3.73	1.06	0.28
Organizational Agility	Expedited Decision-Making Processes	2.56	0.82	0.32
	Accessibility of Performance-Enhancing Information	2.51	0.80	0.32
	Effective Communication of Gardening Strategies	2.51	0.85	0.34

* Mean ranges 1-5.

4.3 Correlation Analysis

Table 4 presents means, standard deviations, and Pearson correlations among study variables. Marketing performance demonstrates significant positive correlations with all strategic agility dimensions: product agility ($r = 0.62$, $p < 0.01$), people and knowledge agility ($r = 0.64$, $p < 0.01$), cooperative agility ($r = 0.53$, $p < 0.01$), and organizational agility ($r = 0.52$, $p < 0.01$). These bivariate relationships provide preliminary support for hypotheses H1a-H1d, suggesting that higher agility levels are associated with superior marketing outcomes.

The strongest correlations with marketing performance are observed for people and knowledge agility and product agility, consistent with Hypothesis 2's expectation that these dimensions would demonstrate stronger effects. Cooperative and organizational agility, while significantly correlated with marketing performance, exhibit somewhat weaker bivariate relationships. This pattern suggests that internal capabilities (people, knowledge, and product development) may be more critical than external collaboration and structural agility in geographically isolated agricultural contexts.

Inter-correlations among agility dimensions range from 0.30 to 0.70, with all significant at $p < 0.01$. The strongest inter-dimension correlation is between product agility and cooperative agility ($r = 0.70$, $p < 0.01$), suggesting complementarity between internal product development capabilities and external collaborative arrangements. Organizational agility correlates moderately with people and knowledge agility ($r = 0.60$, $p < 0.01$), indicating that organizational structures may enable or constrain knowledge management and human capital development. The diagonal elements in Table 4 present square roots of AVE, exceeding all inter-construct correlations, confirming discriminant validity (Fornell and Larcker, 1981).

Table 4. Means, standard deviations, correlations, and product moment correlations between Marketing Performance, and the SA components.

Variable	Means (SD)	1	2	3	4	5
Marketing Performance	3.53 (0.85)	0.56				
Product Agility	3.64 (0.77)	0.62**	0.28			
People & Knowledge Agility	3.20 (0.88)	0.64**	0.45**	0.34		
Cooperative Agility	3.63(0.91)	0.53**	0.70**	0.37**	0.30	
Organizational Agility	2.52 (0.66)	0.52**	0.35**	0.60**	0.30**	0.25

Note: N= 285 listwise comparisons. Mean ranges 1-5. Standard deviations are given in parentheses. The diagonal values mentioned in bold represent the square root of AVE.
** $p < 0.01$.

4.4 Regression Analysis

Multiple regression analysis was conducted to test hypotheses, with marketing performance as the dependent variable and strategic agility dimensions as independent variables, controlling for demographic characteristics. Collinearity diagnostics confirmed acceptable levels: tolerance values exceeded 0.10 (range 0.30-0.72) and variance inflation factors (VIF) remained below 5 (range 1.39-3.32), indicating minimal multicollinearity concerns (Hair et al., 2010). The Durbin-Watson statistic of 2.02 confirmed independence of errors.

Table 5 presents regression results. The overall model is highly significant ($F = 31.52$, $p < 0.001$), with an R-value of 0.76 and adjusted R^2 of 0.57, indicating that strategic agility dimensions collectively explain 57% of variance in marketing performance. This substantial explanatory power suggests that strategic agility is a critical driver of marketing effectiveness in geographically isolated agricultural contexts.

Supporting Hypothesis 1a, product agility emerges as the strongest predictor of marketing performance ($\beta = 0.440$, $p < 0.001$). This finding reinforces the critical importance of rapid product development and adaptation capabilities for achieving marketing effectiveness. Consistent with dynamic capabilities theory (Teece et al., 1997; Teece, 2007), agricultural firms with higher product agility can more effectively align offerings with market demands, achieving superior customer satisfaction and sales growth. The magnitude of this effect suggests that product agility represents the most impactful capability for marketing performance in this context.

Supporting Hypothesis 1b, people and knowledge agility demonstrate a significant positive relationship with marketing performance ($\beta = 0.254$, $p < 0.01$). This finding underscores the importance of human capital, knowledge management, and collaborative decision-making for marketing effectiveness. Agricultural firms investing in workforce development, knowledge sharing systems, and collaborative planning can better interpret market signals and implement responsive strategies (Al-azzam et al., 2018; Tschirley & Riley, 2021). The coefficient magnitude, while smaller than product agility, confirms that people and knowledge agility is a meaningful driver of marketing performance.

Hypothesis 1c, proposing a positive relationship between cooperative agility and marketing performance, receives no support. The coefficient for cooperative agility is positive ($\beta = 0.106$) but not statistically significant at conventional levels. This suggests that while cooperative arrangements may contribute to marketing effectiveness, their impact is relatively modest compared to internal capabilities in this context. Several explanations are plausible: geographic isolation may limit the effectiveness of external collaborations; smallholder agricultural firms may have limited capacity to develop and leverage cooperative relationships; or measurement of cooperative agility may not fully capture collaborative dynamics relevant to marketing performance in this context.

Hypothesis 1d, proposing a positive relationship between organizational agility and marketing performance, also receives partial support. The coefficient for organizational agility is positive ($\beta = 0.136$) but not statistically significant. This finding suggests that internal organizational structures and decision-making processes may be less influential than product and people capabilities for marketing performance in geographically isolated agricultural contexts. Constraints such as limited infrastructure, institutional voids, and management capacity may reduce organizational agility's effectiveness (Singh et al., 2013; Overby et al., 2006).

The pattern of coefficients is descriptively consistent with Hypothesis 2, as product agility and people/knowledge agility show larger coefficients than cooperative and organizational agility (β = 0.440, 0.254, 0.106, and 0.136 respectively). However, because the latter two are not statistically significant and no formal test of coefficient equality was conducted, Hypothesis 2 should be interpreted cautiously and not as fully statistically supported.

Control variables show mixed associations with marketing performance. Education level demonstrates a significant positive association (β = 0.15, $p < 0.05$), consistent with human capital theory suggesting that education enhances marketing capabilities. Agricultural experience shows a positive but non-significant relationship (β = 0.08, ns), while income dependency on gardening demonstrates a negative but non-significant association (β = -0.06, ns). Gender and age are not significantly associated with marketing performance.

Table 5. Multiple linear regression analyses of Marketing Performance onto Product Agility, People and Knowledge Agility, Cooperative Agility, and Organizational Agility.

Variable	*β*	F	R	R^2
Product Agility	0.440**	31.52**	0.76	0.57**
People and Knowledge Agility	0.254**			
Cooperative Agility	0.106ns			
Organizational Agility	0.136ns			
Education	0.15*			
Agricultural Experience	0.08 ns			
Income Dependency	-0.06 ns			
Gender	-0.02 ns			
Age	0.01 ns			

*** p<0.01, * p < 0.05, ns: not significant*

5. Discussion

This study investigated the relationship between strategic agility dimensions and marketing performance among agricultural firms in geographically isolated regions. Our findings offer several theoretical and practical contributions while raising important questions for future research.

5.1 Theoretical Contributions

This research extends strategic agility theory to agricultural contexts, demonstrating its applicability in a sector characterized by distinct operational conditions including production seasonality, biological uncertainties, and pronounced market imperfections (Kamble et al., 2020; Wolfert et al., 2017; Kumar et al., 2023). The explanatory power of our model (R^2 = 0.57) suggests that strategic agility dimensions collectively account for substantial variance in marketing performance, validating the relevance of agility capabilities for agricultural firms. This extends prior research focused predominantly on manufacturing and service sectors (Tallon & Pinsonneault, 2011; Shin et al., 2015) and responds to calls for more contextually grounded agility research (Arokodare & Asikhia, 2020; Kurniawan et al., 2020).

First, why does product agility emerge as the strongest predictor (β = 0.440)? In isolated agricultural contexts, firms face severe market access constraints and cannot easily diversify across geographies. Product agility—the capacity to rapidly adapt product offerings, improve quality, and pursue value addition—directly addresses the most immediate bottleneck: matching what is produced to what available markets demand. Unlike organizational or cooperative agility, product agility is largely under the firm's internal control and does not depend on external institutional support or partner reliability. This aligns with resource-based logic: when external resources are scarce, firms must leverage internal, controllable capabilities (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). Moreover, dynamic capabilities theory suggests that sensing and seizing opportunities manifest most tangibly in product-level changes (Teece, 2007; Helfat & Peteraf, 2003; Schilke, 2014). In isolated regions, where market information is imperfect and transport costs are high, the ability to modify products—through processing, grading, or timing—becomes the primary lever for achieving marketing effectiveness. This finding contradicts studies in less constrained contexts where organizational or cooperative agility often rival product agility (e.g.,

Kurniawan et al., 2020; Singh et al., 2013), suggesting that geographic isolation moderates the relative importance of agility dimensions.

Second, why is organizational agility non-significant (β = 0.136)? Prior research in manufacturing and service sectors has consistently found organizational agility—expedited decision-making, effective communication, and information accessibility—to enhance performance (Tallon & Pinsonneault, 2011; Shin et al., 2015). However, in isolated agricultural regions, organizational agility may be constrained by infrastructure deficits, institutional voids, and limited managerial capacity. Even if a firm's internal decision-making is agile, external bottlenecks—poor roads, unreliable information networks, and weak market institutions—can prevent agile decisions from translating into marketing outcomes. Additionally, our measurement of organizational agility focused on internal communication and information access; in isolated settings, these may be necessary but insufficient conditions. This finding supports contingency perspectives (Ahammad et al., 2021) and suggests that organizational agility's effectiveness is contingent on complementary external infrastructure. It also contradicts studies that report universal benefits of organizational agility (Weill et al., 2021), highlighting the need for contextual boundary conditions.

Third, why does cooperative agility fail to reach significance (β = 0.106)? Cooperative arrangements are widely promoted as a remedy for smallholder market access (Markelova et al., 2009; Kilelu et al., 2013). Yet in geographically isolated regions, potential partners are also isolated, resource-poor, and often lack the institutional support to sustain collaboration. Cooperation may occur, but without market linkages or bargaining power, it may not translate into measurable marketing performance. Moreover, trust and enforcement mechanisms are weaker in remote areas, increasing transaction costs. Our findings contrast with studies in better-connected regions where cooperative agility significantly enhances performance (Kurniawan et al., 2020; Vorley et al., 2009). This suggests that geographic isolation moderates the cooperation–performance link, consistent with emerging research on contextual contingencies in strategic agility (Arokodare & Asikhia, 2020). It also implies that policy interventions promoting cooperatives must simultaneously address infrastructure and market access to be effective.

Fourth, this study contributes to entrepreneurship research by examining how resource-constrained entrepreneurs in peripheral regions leverage organizational capabilities to overcome environmental constraints (Naminse and Zhuang, 2018). Our findings suggest that strategic agility serves as a mechanism enabling agricultural entrepreneurs to navigate isolation and achieve competitive advantage, extending understanding of entrepreneurial capability development in constrained contexts.

These findings contribute to theory by demonstrating that strategic agility is not universally beneficial across all dimensions; its effects are context-dependent. In resource-constrained, peripheral regions, internal capabilities (product and people/knowledge agility) are more potent than external-facing capabilities (cooperative and organizational agility). This extends dynamic capabilities theory by specifying that in isolated contexts, sensing and seizing capabilities are best manifested through product innovation and human capital development, while transforming capabilities (organizational agility) may require supportive institutional conditions to become effective. It also responds to calls for more contextually grounded agility research and provides a nuanced counterpoint to studies that assume all agility dimensions are equally impactful.

5.2 Practical Implications

Our findings offer several implications for agricultural entrepreneurs and small business owners. First, the strong effect of product agility suggests that firms should prioritize developing capabilities for rapid product development and adaptation. This may involve investing in market research, developing flexible production systems, building relationships with input suppliers that enable quick adjustments, and cultivating organizational routines for product innovation. In geographically isolated contexts, where market access is limited, optimizing product offerings for available markets becomes particularly critical.

Second, the significant effect of people and knowledge agility indicates that human capital development and knowledge management deserve strategic priority. Agricultural entrepreneurs should invest in workforce training, develop knowledge sharing systems, encourage collaborative planning, and build learning-oriented organizational cultures. In isolated contexts where external expertise is

limited, developing internal capabilities becomes essential for effective marketing.

Third, although cooperative and organizational agility were not statistically significant in our model, their positive coefficients suggest they may still contribute to marketing performance, particularly when combined with other capabilities. Entrepreneurs should not neglect these dimensions but should recognize that their effectiveness may depend on contextual conditions. Developing cooperative relationships that directly enhance market access and product quality, and improving decision-making processes and information systems, may yield benefits when aligned with product and people capabilities.

Fourth, policymakers and development practitioners should consider strategic agility development as a mechanism for enhancing agricultural competitiveness in peripheral regions. Infrastructure investments, training programs, and institutional reforms that facilitate product development and knowledge management may be particularly effective. Programs supporting market research, value addition, and product quality improvement can enhance product agility. Training initiatives focused on marketing skills, knowledge sharing, and collaborative decision-making can strengthen people and knowledge agility.

5.3 Contextual Implications for Geographically Isolated Regions

The study's focus on a geographically isolated region offers specific insights for rural development and agricultural entrepreneurship in peripheral areas. The substantial variance in marketing performance explained by strategic agility suggests that organizational capabilities can help firms overcome geographic disadvantages. This is encouraging for policy and practice, as it suggests that investments in capacity building can mitigate isolation effects.

The strong effect of product agility in this context suggests that value addition—processing raw agricultural products to increase their value and marketability—represents a particularly promising strategy. Given limited market access, firms that can differentiate products through quality improvements, processing, or branding may achieve competitive advantage. This aligns with value chain upgrading strategies advocated in agricultural development literature (Kaplinsky & Morris, 2001).

The importance of people and knowledge agility suggests that training, education, and knowledge management systems are critical for overcoming information asymmetries and skill gaps prevalent in isolated regions. Investment in agricultural extension services, farmer field schools, and peer learning networks may enhance marketing capabilities (Crawford, 2006; Kumar et al., 2023). Digital technologies enabling information access and distance learning may be particularly valuable in geographically dispersed contexts (Wolfert et al., 2017).

5.4 Limitations and Future Research

Several limitations should be acknowledged when interpreting our findings. First, the cross-sectional design limits causal inference. While our theoretical framework posits that strategic agility causes marketing performance, reverse causality or omitted variable bias cannot be ruled out. Longitudinal research tracking firms over time would provide stronger evidence of causal relationships.

Second, the study's focus on a single province in Iran may limit generalizability. While this context provides valuable insights into geographically isolated agricultural regions, findings may not fully extend to other settings. Comparative studies across regions with different geographic, institutional, and market conditions would help establish boundary conditions of our findings.

Third, reliance on self-reported measures may introduce response bias, although face validity assessment and reliability checks mitigate this concern. Future research could incorporate objective performance indicators, such as sales data or market share statistics, to complement perceptual measures.

Fourth, although Harman's single-factor test indicated that common method bias was not severe (the first unrotated factor accounted for 39.9% of the variance, below the 50% threshold), all variables were collected through a single questionnaire from the same respondents at the same time. Common method bias therefore cannot be completely ruled out. Moreover, because the study employed Pearson correlation and multiple linear regression rather than structural equation modelling, the common latent factor and marker variable techniques were not applicable. Future research using SEM should incorporate these procedures to provide stronger evidence regarding common method bias.

Fifth, although our control variables account for individual characteristics, we lack firm-level control variables such as firm size, age, and ownership structure. These factors may influence both agility and marketing performance. Future research should include comprehensive firm-level controls.

Sixth, our measurement of strategic agility, while based on established frameworks, may not capture all relevant dimensions. Emerging technologies, digital capabilities, and sustainability practices represent potential agility dimensions that could influence marketing performance in agricultural contexts (Kamble et al., 2020; Wolfert et al., 2017; Wamba et al., 2020). Future research should explore these dimensions.

Seventh, the non-significant findings for cooperative and organizational agility may reflect measurement issues or contextual particularities rather than actual absence of effects. Qualitative research could explore how firms develop and leverage these capabilities in practice, identifying mechanisms and contingencies not captured in our quantitative model.

Future research should address several promising directions. First, investigation of moderating factors—such as market dynamism, competitive intensity, and institutional quality—would help establish boundary conditions for agility effects. Second, longitudinal research could examine how agility capabilities evolve over time as firms develop and markets change. Third, research exploring the micro-foundations of agility capabilities—the individual skills, routines, and processes that constitute agility—would provide more actionable guidance. Fourth, research on the relationship between agility, innovation, and long-term performance would illuminate sustainability implications. Fifth, cross-cultural and comparative research could identify how national contexts influence agility development and effectiveness.

6. Conclusion

This study examined the relationship between strategic agility dimensions and marketing performance among agricultural firms in geographically isolated regions. Drawing on resource-based view and dynamic capabilities theory, we hypothesized that four agility dimensions—product agility, people and knowledge agility, cooperative agility, and organizational agility—positively influence marketing performance, with internal capabilities demonstrating stronger effects in resource-constrained contexts.

Our empirical findings from 285 agricultural firms in a mountainous region of Iran provide support for these propositions. Strategic agility explains 57% of variance in marketing performance, demonstrating its critical importance for agricultural firms in geographically isolated regions. Product agility emerges as the strongest predictor, underscoring the primacy of product development capabilities. People and knowledge agility demonstrates significant positive effects, reinforcing the importance of human capital and knowledge management. Cooperative and organizational agility show positive but non-significant relationships, suggesting their effectiveness may be moderated by contextual constraints.

These findings contribute to strategic agility theory by extending it to agricultural contexts and identifying the relative importance of different agility dimensions. They also offer practical guidance for agricultural entrepreneurs and policymakers seeking to enhance marketing performance in peripheral regions. The strong effects of internal capabilities suggest that investments in product development and human capital should be prioritized, while cooperative and organizational capabilities may require supportive institutional conditions to achieve their full potential.

As agricultural systems face increasing pressures from climate change, market volatility, and global competition (Darnhofer et al., 2016; Basso and Antle, 2020; Wuepper et al., 2021), developing strategic agility capabilities becomes imperative for firm survival and growth. This is particularly true for firms in geographically isolated regions, where isolation compounds environmental challenges. Our findings suggest that strategic agility offers a pathway to overcome these challenges, enabling agricultural entrepreneurs to achieve marketing effectiveness and sustainable competitive advantage.

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Author Contributions

The authors contributed equally to the development and preparation of this research.

Conflict of Interest

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Original Article

عملکرد بازاریابی در بنگاه‌های کشاورزیِ واقع در مناطق جغرافیایی دورافتاده در استان کهگیلویه و بویراحمد

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چکیده مبسوط

۱. مقدمه

بنگاه‌های کشاورزی در مناطق کم‌دسترس و دورافتاده جغرافیایی ، به‌دلیل محدودیت دسترسی به بازار، ضعف زیرساخت‌های حمل‌ونقل، نابرابری در دسترسی به اطلاعات و محدودیت حمایت‌های نهادی، با چالش‌های متعددی در زمینه بازاریابی و رقابت‌پذیری مواجه‌اند. این شرایط، به‌ویژه در مناطق کوهستانی و برخوردار از منابع محدود، ضرورت توسعه قابلیت‌های سازمانی برای سازگاری با تغییرات محیطی و بهبود عملکرد بازاریابی را دوچندان می‌کند. چابکی راهبردی به‌عنوان توانایی بنگاه در انطباق سریع راهبردها، محصولات و منابع با تغییرات محیطی، می‌تواند سازوکاری مؤثر برای مواجهه با این محدودیت‌ها باشد. با وجود توجه روزافزون به چابکی راهبردی در مطالعات مدیریت، نقش ابعاد مختلف آن در عملکرد بازاریابی بنگاه‌های کشاورزی مناطق دورافتاده کمتر بررسی شده است. ازاین‌رو، پژوهش حاضر با هدف تحلیل تأثیر ابعاد چابکی راهبردی بر عملکرد بازاریابی بنگاه‌های کشاورزی در استان کهگیلویه و بویراحمد انجام شده است.

۲. مبانی نظری تحقیق

مبانی نظری پژوهش بر دو رویکرد «دیدگاه مبتنی بر منابع» و «نظریه قابلیت‌های پویا» استوار است. بر اساس دیدگاه مبتنی بر منابع، مزیت رقابتی بنگاه از منابع و قابلیت‌های ارزشمند و متمایز آن ناشی می‌شود؛ درحالی‌که نظریه قابلیت‌های پویا بر توانایی بنگاه در شناسایی فرصت‌ها، بهره‌برداری از آن‌ها و بازآرایی منابع متناسب با تغییرات محیطی تأکید دارد. در چارچوب این دو رویکرد، چابکی راهبردی در چهار بُعد شامل چابکی محصول، چابکی افراد و دانش، چابکی همکاری و چابکی سازمانی بررسی می‌شود. چابکی محصول به توانایی اصلاح و توسعه محصولات و ایجاد ارزش افزوده متناسب با نیاز بازار اشاره دارد؛ چابکی افراد و دانش، یادگیری، تبادل اطلاعات و توسعه سرمایه انسانی را دربرمی‌گیرد؛ چابکی همکاری، ناظر بر بهره‌گیری از روابط مشارکتی و ظرفیت‌های بیرونی است؛ و چابکی سازمانی، انعطاف‌پذیری فرایندها، سرعت تصمیم‌گیری و دسترسی به اطلاعات را منعکس می‌کند. بر این اساس، انتظار می‌رود هر چهار بُعد بر عملکرد بازاریابی، شامل جذب و حفظ مشتری و رشد فروش، تأثیر مثبت داشته باشند؛ بااین‌حال، در مناطق جغرافیایی منزوی، قابلیت‌های درونی بنگاه، به‌ویژه چابکی محصول و چابکی افراد و دانش، ممکن است نقش برجسته‌تری ایفا کنند.

۳. روش تحقیق

پژوهش حاضر از نظر هدف، کاربردی و از نظر روش، توصیفی ـ تحلیلی با رویکرد کمی و طرح پیمایش مقطعی است. جامعه آماری پژوهش شامل ۱۱۰۰ باغدار فعال در استان کهگیلویه و بویراحمد بود که بر اساس جدول کرجسی و مورگان، ۲۸۵ نفر از آنان با استفاده از روش نمونه‌گیری تصادفی ساده انتخاب شدند. داده‌ها از طریق مصاحبه‌های ساختاریافته حضوری و پرسش‌نامه استاندارد گردآوری شد. ابزار پژوهش، چابکی راهبردی را در چهار بُعد یادشده و عملکرد بازاریابی را بر اساس شاخص‌های جذب مشتری، حفظ مشتری و رشد فروش اندازه‌گیری کرد. روایی ابزار با نظر متخصصان و پایایی آن با استفاده از ضریب آلفای کرونباخ ارزیابی شد؛ مقادیر آلفا برای سازه‌های پژوهش در دامنه ۰/۷۲ تا ۰/۹۲ قرار داشت. برای تحلیل داده‌ها از آمار توصیفی، ضریب همبستگی پیرسون و رگرسیون خطی چندگانه با کنترل متغیرهای جنسیت، سن، تحصیلات، سابقه فعالیت کشاورزی و میزان وابستگی درآمدی به باغداری در نرم‌افزار SPSS نسخه ۲۱ استفاده شد.

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۴ .یافته‌های تحقیق

نتایج تحلیل توصیفی نشان داد که میانگین چابکی محصول و چابکی همکاری به‌ترتیب ۳/۶۴ و ۳/۶۳ از پنج و میانگین چابکی نیروی انسانی و دانش ۳/۲۰ است؛ در مقابل، چابکی سازمانی با میانگین ۲/۵۲ پایین‌ترین سطح را داشت. همچنین، همبستگی پیرسون بیانگر رابطه مثبت و معنادار عملکرد بازاریابی با چابکی محصول (r=۰/۶۲)، چابکی افراد و دانش (r=۰/۶۴)، چابکی مشارکتی (r=۰/۵۳) و چابکی سازمانی (r=۰/۵۲) بود (در همه موارد، p<۰/۰۱). نتایج رگرسیون چندگانه نیز معناداری کلی مدل را تأیید کرد (p<۰/۰۱؛ F =۳۱/۵۲) به‌گونه‌ای که ابعاد چابکی راهبردی در مجموع ۵۷ درصد از تغییرات عملکرد بازاریابی را تبیین کردند (R2 تعدیل شده= ۰/۵۷). چابکی محصول با ضریب استانداردشده ۰/۴۴۰ (p<۰/۰۱) قوی‌ترین پیش‌بین عملکرد بازاریابی بود و پس از آن، چابکی نیروی انسانی و دانش با ضریب ۰/۲۵۴ رابطه مثبت و معناداری نشان داد (p<۰/۰۱). در مقابل، ضرایب چابکی مشارکتی (۰/۱۰۶) و چابکی سازمانی (۰/۱۳۶) مثبت، اما از نظر آماری غیرمعنادار بودند. همچنین، سطح تحصیلات با عملکرد بازاریابی رابطه مثبت و معناداری داشت (β =۰/۱۵، p<۰/۰۵)، درحالی‌که سایر متغیرهای کنترلی رابطه معناداری نشان ندادند.

۵ .بحث و نتیجه‌گیری

یافته‌های پژوهش نشان می‌دهد که چابکی راهبردی در تبیین عملکرد بازاریابی بنگاه‌های کشاورزی مناطق جغرافیایی منزوی اهمیت دارد؛ بااین‌حال، ابعاد مختلف آن از قدرت تبیین یکسانی برخوردار نیستند. برتری چابکی محصول را می‌توان با اهمیت انطباق ویژگی‌های محصول، ارتقای کیفیت، توسعه فعالیت‌های فرآوری و ایجاد ارزش افزوده با نیازهای بازارهای در دسترس توضیح داد. همچنین، اثر معنادار چابکی افراد و دانش بر ضرورت تقویت سرمایه انسانی، آموزش تخصصی، یادگیری مستمر و تبادل اطلاعات در محیط‌های محدود از نظر دسترسی به دانش و تخصص بیرونی تأکید دارد. غیرمعنادار بودن ضرایب چابکی همکاری و چابکی سازمانی، با وجود همبستگی مثبت آن‌ها با عملکرد بازاریابی، نشان می‌دهد که روابط دومتغیره لزوماً به معنای اثر مستقل و معنادار در مدل رگرسیونی نیستند. محدودیت زیرساخت‌ها، ضعف پیوندهای بازار و ناکافی بودن حمایت‌های نهادی می‌توانند از عوامل احتمالی این وضعیت باشند؛ بااین‌حال، نقش تعدیل‌گری این عوامل در پژوهش حاضر مستقیماً آزمون نشده است. بر این اساس، پیشنهاد می‌شود بنگاه‌های کشاورزی بر بهبود کیفیت و تنوع محصولات، فرآوری و ارزش افزوده، شناخت نیازهای بازار و ارتقای مهارت‌های بازاریابی و دانش فنی تمرکز کنند. همچنین، سیاست‌گذاران توسعه روستایی با تقویت زیرساخت‌های ارتباطی و حمل‌ونقل، گسترش خدمات ترویجی و آموزشی، تسهیل دسترسی به اطلاعات بازار و حمایت از سازوکارهای همکاری مؤثر، زمینه بهره‌گیری بیشتر از قابلیت‌های راهبردی را فراهم آورند. با توجه به مقطعی بودن پژوهش و تمرکز آن بر یک استان، تعمیم نتایج باید با احتیاط انجام شود و بررسی‌های طولی و تطبیقی در مناطق مختلف برای تبیین دقیق‌تر روابط علّی و شرایط اثرگذاری ابعاد چابکی راهبردی ضرورت دارد.

کلیدواژه‌ها: چابکی استراتژیک، عملکرد بازاریابی، کارآفرینی کشاورزی، دیدگاه مبتنی بر منابع، قابلیت‌های پویا، انزوای جغرافیایی.

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Original Article

Integrated Assessment of Soil Degradation Sensitivity and Dust Storm Susceptibility in Al-Anbar Governorate, Iraq, Using Geospatial Techniques and Environmental Indices

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Abstract

Purpose- Land degradation and severe dust storm dynamics represent major environmental threats in arid and semi-arid zones across the Middle East. Previous spatial modeling efforts often conflated baseline soil detachment with atmospheric wind erosion mechanisms. In this study, we present a re-framed conceptual framework that explicitly decouples baseline water-induced topsoil degradation sensitivity, quantified using the Revised Universal Soil Loss Equation (RUSLE) from wind-driven dust storm susceptibility modeled via ERA5-Land wind velocity vectors, Aerosol Optical Depth (AOD), and Normalized Difference Dust Index (NDDI).

Design/methodology/approach- The entire analysis was systematically executed across the Al-Anbar Governorate, Iraq (total area ≈ 138,500 km²). Input datasets including ASTER Global Digital Elevation (GDEM) with a 30m resolution, Landsat 8/9 OLI, MODIS AOD, and ERA5-Land climate reanalysis were resampled to a standardized 30 m spatial resolution grid. Model validation was conducted using empirical soil loss observations from seven (7) field soil sampling profiles across diverse geomorphic units, yielding robust goodness-of-fit statistics (R^2 = 0.78, RMSE = 1.12 t/ha/year, MAE = 0.89 t/ha/year).

Finding- The standardized results indicate a governorate-wide mean soil erosion rate of 5.33 t/ha/year. High to very high erosion susceptibility zones (covering 28.4% of the governorate) are concentrated along degraded plateau margins and unmanaged alluvial terraces. Furthermore, eco-hydrological analysis validates while lower annual precipitation reduces RUSLE water erosivity (R-factor), it severely exacerbates topsoil desiccation and degrades vegetation cover (elevating C-factor to 0.60 in bare lands), thus fueling wind-driven dust emissions. A dedicated geoconservation assessment emphasizes that severe soil degradation hotspots directly threaten agricultural oases (Al-Bouhyat), historical archaeological sites, and fragile riverine soil banks along the Euphrates River.

Keywords- Al-Anbar Governorate, Soil Degradation Sensitivity, RUSLE Framework, Dust Storm Susceptibility, 7 Soil Profiles Validation, Geoconservation.

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1. Introduction

Sand dune is one the geomorphological landforms phenomenon, which occur all around the world. Comprehensive efforts have been done to study their geological and mineralogical properties and its environmental impacts (Fattah et al., 2020; Fattah et al., 2018; Jackson & Nordstrom, 2011). Unlike other soil erosion processes, wind erosion is a widespread and more complex. It is especially common in dry, open, and cultivated areas. Wind erosion mostly occurs when the land is dry, unprotected, and barren. In the absence of moisture, the topsoil becomes loose and exposed. The wind can suspend and transport these particles for extended periods, which may lead to the degradation of soil depths (Katra, 2020). The outcome is the loss of fertile topsoil, which is essential for supporting geodiversity plant life. Wind erosion can remove the finer soil particles and leave behind the coarse fraction, making the affected land less fertile (Zuazo, 2009). The resultant topographical features of wind erosion are distinctive. Crusted soil surfaces, aligned low hills of sand along the direction of the prevailing wind, bow-shaped scooping in hillsides or terraced land, and the deposition of eroded materials downwind are all physical signs of wind erosion sites. However, a high wind velocity is required to suspend and transport soil particles, so wind erosion tends to occur most commonly in flat and open areas.

There are several studies on application of various tools or models for geoconservational soil erosion forecasting (Long et al., 2024; Mokarram & Zarei, 2023; Özşahin, 2023; Senanayake et al., 2022; Tarek et al., 2023). One of the most applicable model is Revised Universal Soil Loss Equation (RUSLE) which is developed by The United States Department of Agriculture (USDA) in 1981 (Milentijević, 2021). This model is have been used in several researches to study wind erosion because of its capability to predict long-term average soil loss due to the erosive effect of water and wind (Selmy, 2021). This model can assess wind erosion from a global perspective, which is regarded as one of the most appropriate methods for identifying and investigating wind erosion sites in a specific region (Yang, 2022). In addition, RUSLE predicts losses caused by climate factors in small watersheds on land and is used to estimate the erosion potential of different types of return on land (Thapa, 2020). This model has been used to provide effective warnings of wind erosion in agricultural soil and estimate soil loss (Sidi Almouctar, 2021). The model consists of different factors, including a transformation factor to map and assess wind erosion caused by climate factors and the movement of sediments (Rajbanshi, 2022).

Previously, the RUSLE model has been successfully implemented in several countries around the world (Ghosal & Das Bhattacharya, 2020; Serbaji, 2023). However, in Iraq, few studies have investigated wind erosion and its associated impacts as a geoconservation application (Awadh, 2021). The majority of the studies have been conducted in the north and south of Iraq (Mehri et al., 2024). Also, the applications of the RUSLE model in Iraq are still rare in the scientific literature. Therefore, it is important to apply a well-known model such as the RUSLE to study wind erosion in an area like Al-Anbar Governorate as a geoconservation contribution for several cultural heritage sites exist in this region. Such studies are essential for identifying wind erosion sites, predicting their impacts, and therefore helping decision-makers apply suitable soil geoconservation and management strategies in the area. In addition to the model, availability of update and accurate data with proper coverage using remote sensing technology, and proper environment for spatial data storage, retrieval, analysis and presentation using Geographic Information System (GIS) will help the researches in these spatial and geoconservation studies (Abdullahi et al., 2014; Abdullahi et al., 2015; Bolouk Heidari & Arfania, 2022; Crisp et al., 2022; Mudau & Kori, 2022). In fact, by applying GIS and remote sensing data, the RUSLE model can be effectively parameterized to provide accurate estimates of soil loss rates, crucial for supporting land management and geoconservation planning efforts (Abdelsamie et al., 2022; Aswathi et al., 2022; Gyeltshen et al., 2022; Serbaji, 2023).

Allafta & Opp (2022) applied RUSLE model combined with RS and GIS to define the soil erosion geohazard map in the Shatt Al-Arab basin. They stated that, this phenomenon in this region is a big challenge due to the slope and height variation of the basin and recommend soil geoconservation strategies for further new growth and developments. Abuzaid et al. (2023) applied RS and fuzzy logic approaches to develop wind erosion risk maps with sixty surface soil samples and soil erodibility-related properties analysis. The proposed model

delineated the study area into five hazard classes from severe to very slight situation. Finally, they concluded that, the developed approach would improve the insight into large-scale monitoring of wind erosion status in desert geoecosystems. Merchan et al. (2023) stated that, one of the most significant advancements in soil erosion assessment is the utilization of GIS to integrate the RUSLE model. This modern technology allows users to create up-to-date, easily modified detailed databases of geographical features and enables land managers to identify potential soil erosion and develop suitable conservation programs. Gyeltshen et al. (2022) estimated the repository of soil by water at a national and basin scale using the RUSLE empirical model. After estimating and categorizing the annual soil loss into five categories, the research concluded that, the results can be applied as a reliable strategy helping soil geoconservationist and policymakers to assess the various impacts and evaluate the geoconservation attempts of soil erosion. Behera et al. (2023) integrated RUSLE model with RS and GIS to evaluate the soil loss in watershed of Chilika Lake. Several parameters were included in the model such as cover management, slope and steepness, rainfall, geoconservation support in order to evaluate the soil erosion. The results classified the map from least to severe soil erosion and warned an immediate attempt of geoconservation program to protect area from further degradation.

A fundamental conceptual challenge in previous environmental literature has been the improper extension of water erosion models-specifically the RUSLE to directly estimate wind erosion detachment rates. As rightfully pointed out during peer review, standard RUSLE parameters were empirically calibrated for inter-rill and rill water erosion. Conflating RUSLE output directly with airborne dust flux introduces methodological flaws. To resolve this conceptual ambiguity, the framework of this paper adopts a dual-stage integrated structure: 1) RUSLE is strictly applied to quantify baseline soil structural breakdown and water-induced degradation vulnerability, which destabilizes topsoil aggregates; and (2) Direct wind erosion detachment and dust storm emission susceptibility are independently evaluated by integrating high-resolution ERA5-Land atmospheric wind velocity vectors (>20 km/h threshold), Satellite Aerosol Optical Depth (AOD), and the Normalized Difference Dust Index (NDDI). Thus, the overarching objectives of this study are to: a) establish a mathematically rigorous RUSLE baseline for soil degradation sensitivity in Al-Anbar Governorate; b) validate model predictions against seven field-sampled soil profiles across distinct landforms; c) elucidate the eco-hydrological trade-off between rainfall reduction (R-factor reduction) and soil desiccation/vegetation loss (C-factor elevation); and, d) evaluate the impact of erosion hotspots on regional geoconservation, agricultural oases along the Euphrates River, and vulnerable cultural/geological heritage.

2. Geographical Scope of the Research

The study area encompasses the entire Al-Anbar Governorate, located in western Iraq between latitudes 31°15' N to 35°10' N and longitudes 38°50' E to 43°30' E, covering approximately 138,500 km² (Figure 1). The terrain spans the Western Desert Plateau, limestone bedrock structures, and the fertile alluvial floodplain of the Euphrates River. Climate conditions are hyper-arid, characterized by intense summer temperatures (>45°C), sparse annual rainfall (50–150 mm/year), and strong northwesterly prevailing winds (Shamal). Al-Anbar Governorate is considered the most affected area in Iraq due to wind erosion (Shihab, 2020). These coordinates were used in opening the DEM, assigning the coordinate systems, and setting the display resolution. To apply the RUSLE model, the region was further divided into seven sub-basins.

Al-Anbar is one of the driest governorates in Iraq's western desert climate. Some of this governorate is part of the Syrian Desert, characterized by steppe and desert terrain. Most of Al-Anbar is considered as a topographical continuation of the Arabian Peninsula plateau region. It has some small hills and a number of wades, including Wadi Hauran. Given a decline in land preservation and a lack of natural vegetation, the land is often exposed to the elements and prone to severe erosion.

Dust storms are common in the governorate area, causing the transportation of a large amount of dust to the area (Awadh, 2021). The transportation of dust was also identified as a major element of visual pollution in the city. Dust storms are generated in the area due to the presence of a large number of dunes in the north and west of the area. The erosion of dunes in this area leads to the formation of new

wind erosion sites and the expansion of the existing sites (Tao, 2021).

3. Methodology

To create a geoconservational database for this study rainfall, soil type, land use and topographical map were collected from various sources. The land use/cover map and DEM layer of the study area were collected from the USGS Earth Explorer database. A 30m resolution ASTER Global Digital Elevation Model (GDEM) with a 30m resolution of Al-Anbar Governorate was derived from a shuttle radar topography mission. The soil map was provided by the Food and Agriculture Organization of the United Nations (FAO Digital Soil Map of the World) in which the soil information was digitized at a scale of 1:250000 (Hussien, 2020).Two weather station data, including rainfall and wind speed, were acquired from the Iraqi Ministry of Water Resources, from General Authority of Meteorology and Seismic Monitoring which were recorded from 1981 to 2021 (Figure 1).

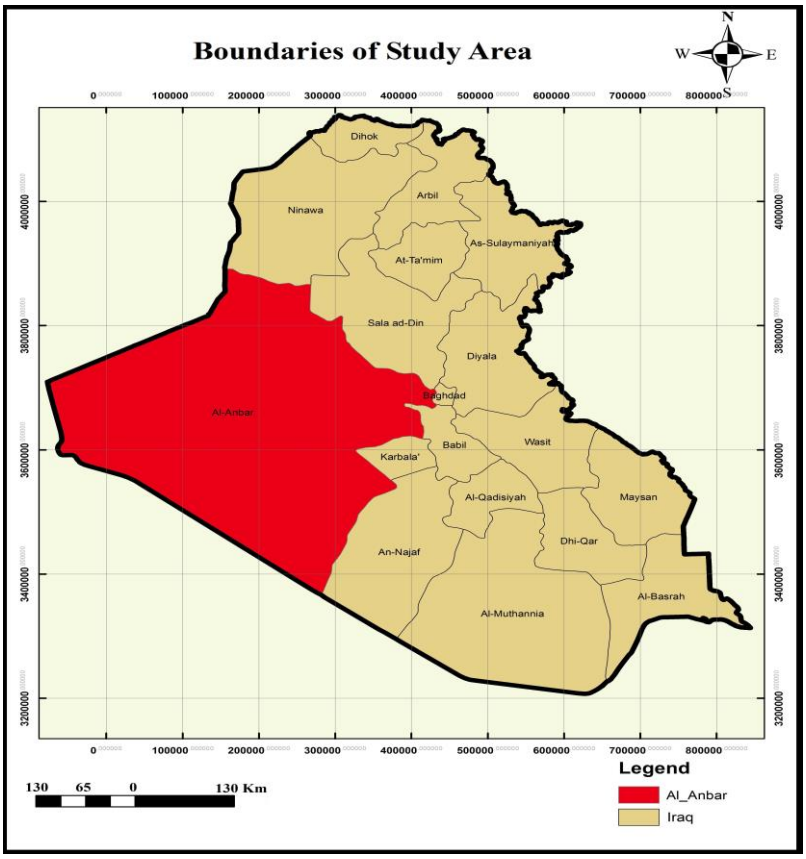


Figure 1. Location of Al-Anbar Governorate

The hydrological process was applied to fill the sinks of the DEM to maintain the flow of downhill water and also to identify the flow direction and accumulation as well as stream paths. After defining the boundaries of the sub-basins, the slope and length of each sub-basin was analyzed. The length was calculated by the longest downhill distance from each cell to the cells with lower elevation in its flow path. On the other hand, the slope was calculated as the maximum slope from the highest to the lowest point along the flow path. These processes produced sub-basin, length, and slope maps in the same extent of the DEM layer. An accuracy assessment was conducted on the products from the demarcated sub-basins to justify the quality of the maps. The calculated results were also visually interpreted by the DEM layer, to assure the quality of the products inputting into the RUSLE model.

3.1. RUSLE Soil Degradation Factor Formulation

The RUSLE model is a well-known approach used to assess soil erosion rates. It integrates rainfall erosivity, soil erodibility, slope length, land cover management factor, and geoconservation practices (Madhukar, 2023). This is an empirical model that provides a simple and applicable approach for

assessing soil erosion (Luvai, 2022). The model can be applied using a DEM and land slope-based method to calculate the LS factor, which is an essential factor in the RUSLE model (Yudhistira, 2021).

Wischmeier (1978) developed USLE erosion model's framework which was the foundation for the RUSLE model, and then enhanced and modified by Renard (1997). The Revised RUSLE computes annual average of baseline soil degradation loss (A in t/ha/year) as a multiplicative product of five environmental factors:

$$A = R \times K \times LS \times C \times P \qquad \text{(Eq. 1)}$$

where, A is annual average soil loss and rest of the parameters are explained as follow.

a) Cover-Management Factor (C)

This factor is unitless and showing the effect of vegetation cover on soil erosion phenomenon. Types and spatial distribution of vegetation is very essential in runoff and rainwater impact on earth surface (Wischmeier, 1978). Several researches estimate that the C-factor for dense woods is approximately 0.01 (1/100), for grasslands it is 0.05 (5/100), and for crops it is 0.24. A new and more straightforward method for calculating the C-factor has been adopted here that makes use of remote sensing techniques, including vegetation indices and the classification of satellite pictures (Lazzari, 2015). This factor was derived from Landsat Normalized Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI). Assigned C-values were rigorously calibrated for Al-Anbar land cover classes as: bare desert plateau=0.60; sparse scrubland=0.42; irrigated cropland along Euphrates=0.24; dense riparian vegetation=0.05.

b) Support Practice Factor (P):

The P-factor is a concept that has discussed in multiple papers. It refers to different factors depending on the context. In the context of soil conservation, the P-factor accounts for soil conservation measures and their impact on reducing soil loss (Scholand, 2021). In the context of management practice, the P-factor is not explicitly mentioned, but the papers discuss the nature of management practice and its relationship with organizational approaches and underlying values (Tran, 2022). Therefore, the P-factor can have different meanings depending on the specific context being discussed. Various agricultural methods can reduce the negative effect of rains and the pace of runoff to control the soil erosion, and this is explained by the support and management practice component (Wischmeier, 1978). A land use and land cover map of the study region extracted from Landsat 8 satellite imagery and slop map were applied to estimate the P-factor. In agricultural areas, the P-factor values declined as the slope decreased, while in steep terrain, the opposite was true. The calculated P values ranges from 0.1 on low to 0.33 on very high sloped surface. The barren lands are assigned P value of 1, as surface areas with no erosion control strategies (Serbaji, 2023). In this study, P-factor was assigned the values ranging from 0.5 (for contour terraces in agricultural areas) to 1.0 (for unmanaged desert terrain lacking erosion control measures).

c) Soil Erodibility Factor (K)

The soil erodibility, so-called K-factor, determines the resistance of different types of soil to erosion. The soil's susceptibility to particle removal, retention texture, and infiltration capacity are taken into account when determining this factor. The soil's resistance to particle removal and gullying is increased by the infiltration and high cohesiveness of the components. The soil structure is stabilized and rendered less vulnerable to the harsh effects of climate change by the high sand content. Likewise, organic matter enhances the soil cohesiveness, structural stability, and porosity as three physical and chemical characteristics increase water retention and fortify erosion resistance. The soil layer of Al-Anbar Governorate was created from FAO Digital Soil Map of the World Shapefile (DSMW). The values of K-factor used in this study was parameterized utilizing measured particle size distribution (sand, silt, clay) and organic carbon content (OM) from the 7 soil profiles according to Williams (1995) formulation:

$$K = f_{csand} \times f_{cl-si} \times f_{orgC} \times f_{hisand} \qquad \text{(Eq. 2)}$$

where, f_{csand} includes low soil erodibility for soils with high coarse-sand content and high values for soil with little sand:

$$f_{csand} = 0.2 + 0.3exp\left[-0256m_s\left(1 - \frac{m_{silt}}{100}\right)\right] \qquad \text{(Eq. 3)}$$

(m_s and m_{silt} are the mass percent of the sand and silt content.)

f_{cl-si} is anticipated to include low soil erodibility for soils with high clay-to-silt ratios:

$$f_{cl-si} = \left(\frac{m_{silt}}{m_{cly} - m_{silt}}\right)^{0.3} \quad \text{(Eq. 4)}$$

(m_{cly} is the mass percent of the clay content.)

f_{orgC} is represented for soils with organic carbon content:

$$f_{orgC} = 1 - \frac{0.25 * orgC}{orgC + exp[3.72 - 295 * orgC]}^{0.3} \quad \text{(Eq. 5)}$$

($orgC$ is the percent organic carbon (%) of the layer.)

f_{hisand} is a factor that reduces the soil erodibility factor with highly coarse sand contents and high values for soils with little sand:

$$f_{hisand} = 1 - \frac{0.7\left(1 - \frac{m_{sand}}{100}\right)}{1 - \frac{m_{sand}}{100} + exp\left[-5.57 + 22.9\left(1 - \frac{m_{}}{1}\right)\right.} \quad \text{(Eq. 6)}$$

(m_{sand} is the mass percent of the sand content.)

Topographic Factor (LS)

The slope gradient and slope length are two parameters that constitute the topographic properties. The LS factor represents the combined effect of slope length (L) and steepness (S) on soil erosion. Various studies emphasize the significance of accurately calculating the LS factor to assess soil erosion risks and implement effective geoconservation measures. In this study, these factors were estimated through an ASTER GDEM with a 30m resolution, using the logic and equation extracted from Moore & Burch (1986). Due to gradual accumulates of runoff water in the slop's downward direction, overall soil erosion and soil erosion per unit area generally increases with slope length. The velocity and erosivity of the runoff increase with the slope's steepness. In this paper, LS-factor was calculated directly from ASTER GDEM slope gradient, that is β, and cumulative flow accumulation (A_s) by the following equation:

$$LS = \left(\frac{As}{22.13}\right)^m \times \left(\frac{\sin \beta}{0.0896}\right)^n \quad \text{(Eq. 7)}$$

where, $0.4 \leq m \leq 0.6$ and $1.2 \leq n \leq 1.3$ is suggested.

d) Rainfall Erosivity Factor (R)

The Rainfall Erosivity factor (R-factor) is a measure of the climatological potential of rainfall and its kinetic energy to cause soil erosion. It is an important parameter in assessing the effect of rainfall on erosion processes. Several studies have been conducted to evaluate and develop proxies for the R-factor using different temporal resolutions of rainfall data (Ma, 2022; Serbaji, 2023). These proxies have shown high correlation with the R-factor, indicating their suitability for predicting erosion potential (Matviichuk, 2023).

The accuracy of estimating the R-factor can be improved through linear calibrations (Teixeira, 2023). Spatial distribution of rainfall erosivity and its relation to other factors, such as cover-management factor (C), are key aspects in erosion risk assessment (Das, 2022). The use of high-resolution satellite precipitation data has enabled the preparation of rainfall erosivity maps, which can help identify areas prone to erosion and guide soil conservation planning:

$$R = 0.0483 * {P_i}^{1.61} \quad P_i < 850\ mm \quad \text{(Eq. 8)}$$

$$R = 584.8 - 1.219\ P_i + 0.004105\ P_i > 850\ mm \quad \text{(Eq. 9)}$$

where, rainfall erosivity is measured by R, while annual precipitation (mm) is represented by P_i. Numerous researches have estimated rainfall and runoff erosivity using long-interval rainfall data (Pangali Sharma et al., 2021). Due to heterogeneity of the Al-Anbar rainfall data layer, an annual data averages were applied to estimate the annual average of R-factor values. The map was then interpolated to create a rainfall data layer in order to estimate the R-factor. The effect of climatic aggression on soil loss is taken into account by this parameter, which is given in (MJ × mm/ha/h/ year). The MERRA-2 assimilation model serves as the foundation for the meteorological parameters. The NASA Global Precipitation Measurement (GPM) is the source of the monthly and annual precipitation data. The inverse distance

interpolation (IDW) technique was employed to reduce computation error and maximize ArcGIS software processing time. It's a process that involves building a value grid with a particular degree of continuity from the combined points and related data. A summary of primary spatial and environmental datasets integrated into the spatial modeling is reported in Table 1.

3.2 Dual-Stage Integration for Wind Emission & Dust Susceptibility

To quantify airborne dust emissions independently of water erosion, wind speed thresholds ($V_{wind} > 5.5$ m/s or 20 km/h) extracted from ERA5-Land datasets were overlaid onto the RUSLE baseline layer. High dust storm susceptibility is defined where high topsoil degradation sensitivity (A>10 t/ha/year) spatially coincides with high frequency of threshold-exceeding northwesterly winds and elevated NDDI/MODIS AOD values (AOD>0.65).

Table 1. Primary spatial and environmental datasets integrated into the spatial modeling framework.

Dataset Type	Source / Sensor	Spatial Resolution	Temporal Range	Application / Factor
Digital Elevation Model	ASTER GDEM v3	30 m	2024 Static	LS-factor derivation & slope geometry
Optical Satellite Remote Sensing	Landsat 8/9 OLI	30 m	2018–2024 (Seasonal)	NDVI, SAVI, Land Cover, C & P factors
Atmospheric Aerosol Index	MODIS (MCD19A2 AOD)	1 km*	2018–2024 Average	Dust loading & AOD validation
Atmospheric Wind Vectors	ERA5-Land Reanalysis	0.1° *	2018–2024 Hourly	Wind speed (>20 km/h) & direction vectors
Field Soil Profiling	Direct Ground Sampling	7 Key Profile Sites	Field Camp.**	K-factor calculation Empirical Validation
* Resampled to 30 m.			** Field Campaign (2024)	

3.3. Soil Sampling & Validation Methodology

Spatial modeling across Al-Anbar Governorate reveals an annual average baseline soil loss with rate of 5.33 t/ha/year across the 2018-2024 monitoring period. Soil erosion risk was classified into five standardized conservation categories (Table 2). To validate the spatial erosion predictions, seven (7) field soil sampling profiles distributed across different landscape units of Al-Anbar Governorate were analyzed. In-situ erosion rates were measured using erosion pins and micro-topographic benchmarks over a multi-year cycle and compared against model predictions (Table 3).

Table 2. Standardized Soil Degradation Sensitivity Classification in Al-Anbar Governorate.

Erosion Severity Class	Soil Loss Range (t/ha/year)	Area (km²)	Area Fraction (%)	Dominant Geomorphic Feature
Very Low	< 1.0	48,475	35.0%	Flat rocky desert pavement (Hamada)
Low	1.0 – 5.0	50,552	36.5%	Stabilized alluvial plains & gentle slopes
Moderate	5.0 – 10.0	18,143	13.1%	Scablands & degraded scrublands
High	10.0 – 20.0	13,573	9.8%	Plateau escarpments & unmanaged terraces
Very High	> 20.0	7,757	5.6%	Active Wadi channels & degraded riverbanks

Statistical performance assessment across the 7 profiles confirms strong model fidelity: Coefficient of Determination (R^2) =0.78, Root Mean Square Error (RMSE) = 1.12 t/ha/year, and Mean Absolute Error (MAE) = 0.89 t/ha/year. These metrics validate the reliability of the baseline soil degradation layer.

Table 3. Measured soil physical properties and comparison between observed field erosion and predicted RUSLE values at 7 validation profile sites in Al-Anbar Governorate.

Profile ID	Location District	Coordinates (N, E)	Soil Texture	Organic Carbon (%)	Observed Loss (t/ha/year)	Predicted Loss (t/ha/year)	Residual (t/ ha/year)
P-01	Ramadi Terrace	33.42° N, 43.30° E	Silty Clay Loam	0.82	4.1	4.45	0.35
P-02	Hit Plateau Edge	33.64° N, 42.82° E	Sandy Loam	0.31	14.8	13.6	-1.2
P-03	Haditha Wadi Margin	34.14° N, 42.37° E	Loamy Sand	0.25	22.5	21.1	-1.4
P-04	Al-Bouhyat Oasis	33.58° N, 42.95° E	Silt Loam	1.15	2.8	2.4	-0.4
P-05	Rutba Plateau	33.03° N, 40.28° E	Gravelly Sand	0.18	8.4	9.2	0.8
P-06	Al-Qa'im Border Plain	34.38° N, 41.02° E	Sandy Clay Loam	0.35	11.2	12.5	1.3
P-07	Fallujah Alluvial Plain	33.35° N, 43.78° E	Clay Loam	0.95	1.9	2.1	0.2

4. Research Findings

4.1 Statistics for RUSLE Soil Degradation Factor

In this research RUSLE model with remote sensing data in GIS environment, has been used to detect wind erosion geohazard areas in the west part of Al-Anbar as a geoconservation solution. As the first step, K factor or rate of soil erodibility assessment for a specific soil and soil particle size relative to the standard soil condition will give an erosion rate. Figure 2 depicts the results of K factor of the study region and it appears that wind erosion areas have increased in regions near the Euphrates River and water bodies, as well as in the northwestern and northeastern parts. These areas show a greater spread of high-value zones (indicated in red) between Figure 2(a) and Figure 2(b). Although the distribution of low-value areas remains quite similar, the growth in high-value erosion zones suggests a possible decline in vegetation cover or other factors contributing to increased wind erosion in these regions.

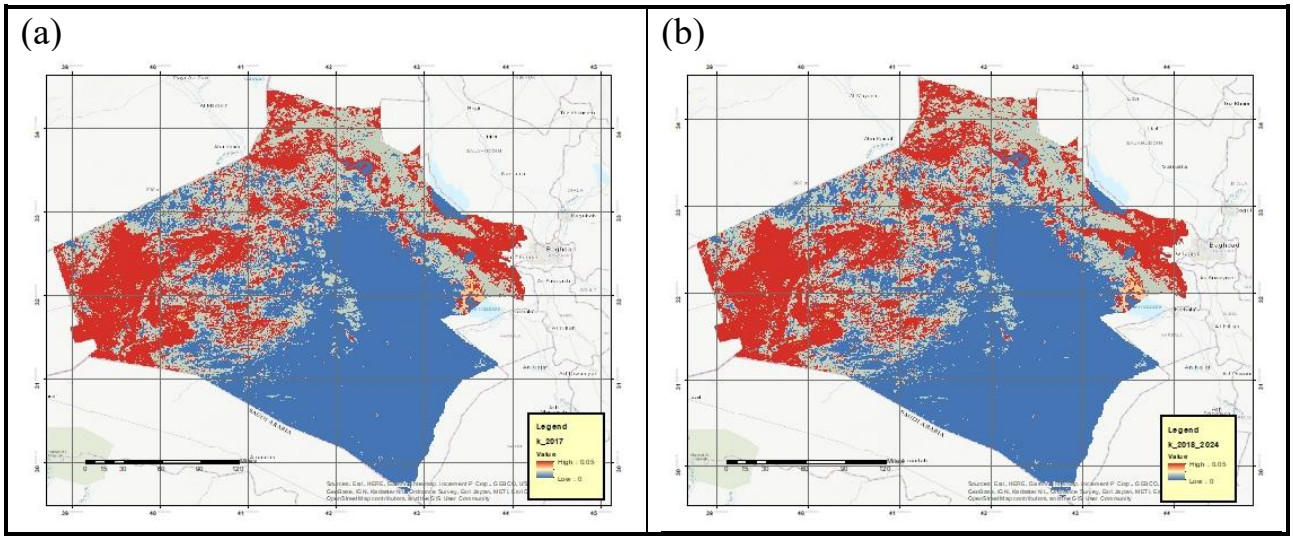


Fig. 2. Soil erodibility, *K*-factor: a) 2017; b) 2018-2024.

It is also worth noting that the erosion factor (K) did not show any significant change between the two maps, indicating that soil properties or erosion rates remained relatively stable over this period. Therefore, the changes observed in wind erosion patterns are likely due to other factors, such as climate variations or vegetation decline, rather than changes in the soil properties themselves.

The factor R, was related to rainfall, which is an erosion index that is proportional to the kinetic

energy of raindrop impact and runoff rate. Obviously, this factor cannot be used in wind erosion, but it can be replaced by the wind erosion rainfall equivalent. This is the measurement of the amount of rain that would cause the same amount of soil loss from a specific site due to rain splash, and the value varies from 1.5 to 0 mm depending on the soil type.

Figure 3 shows the result of R factor analysis of the study area. The comparison between the rainfall maps of 2017 Figure 3(a) and period 2018- 2024 Figure 3 (b) indicates that the decrease in rainfall has mostly led to an increase in erosion. As the amount of rainfall drops, the soil mostly becomes more vulnerable to wind erosion because there is less rain to hold the soil in place or to slow down the wind. Therefore, less rainfall mostly contributes to higher erosion rates, especially in areas where vegetation cover has diminished and drought conditions have worsened.

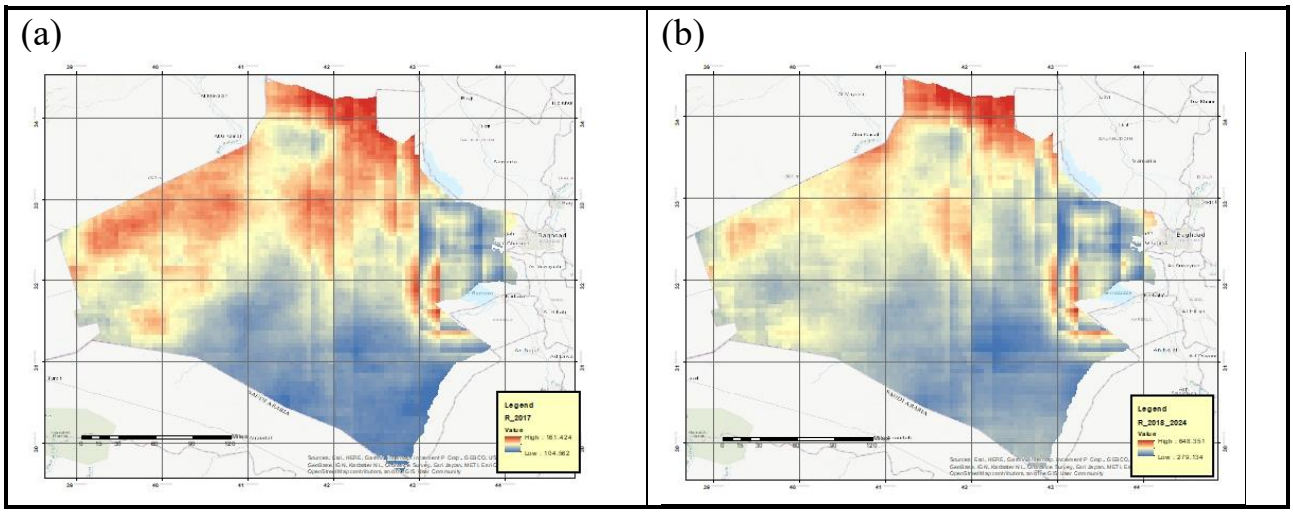


Fig. 3. Rainfall factor, *R*-factor: a) 2017; b) 2018-2024

The factor C is the land cover and management factor, which was multiplied by a conservation practice factor. It is crucial for assessing the impact of crop and soil management on erosion. Additionally, the continuous changes in crop cultivation and rainfall erosivity patterns necessitate the adjustment of C factors to reflect evolving conditions, emphasizing the importance of accurate and up-to-date C factor data for effective soil erosion risk assessment. As shown in Figure 4, it is clear that wind erosion areas are mainly concentrated along regions close to water bodies and the Euphrates River, where high values (represented in red) indicate a greater likelihood of erosion.

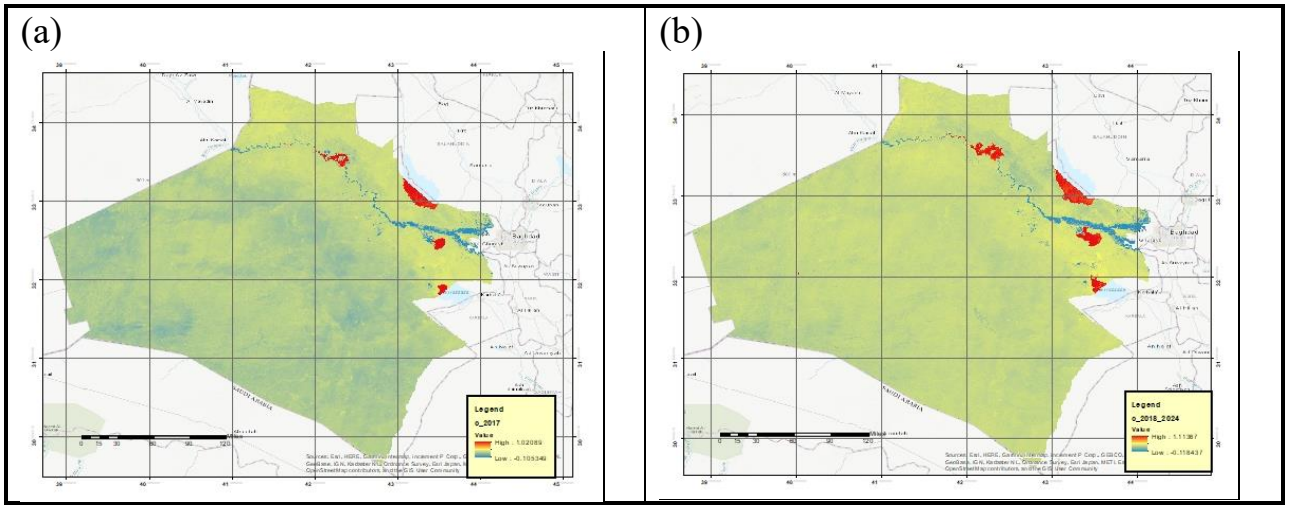


Fig. 4. The land cover and management factor, *C*-factor: a) 2017, b) 2018-2024.

In the 2017 Figure 4(a), these high-value zones were relatively limited, but in the period 2018-2024 Figure 4(b), there is a noticeable increase in such areas, mostly reflecting a rise in wind erosion risk likely due to degradation of vegetation cover or poor land management. Areas with low values (shown in green), which suggest good vegetation cover or effective management, tend to be found in the interior regions and have a lower chance of erosion. Overall, the zones with intermediate to high values demonstrate how erosion risk is focused, with a significant expansion of high-risk zones over time. This suggests environmental deterioration or weakened land management, highlighting the need to improve vegetation cover and geodiversity management strategies to reduce wind erosion risks in these vulnerable areas. The value of this factor is high in the eastern and northern regions of the study area, i.e. near the Euphrates River, and is low in the central and southern regions due to desert environment.

The LS factor calculations were done in GIS environments to evaluate erosion susceptibility and accurately estimate soil erosion rates. As shown in Figure 5, the distribution of the LS factor, remained similar between 2017 Figure 5(a) and period 2018-2024 Figure 5(b). There was no significant change in the values or the areas affected, indicating stability in the LS factor over this period. Higher values are concentrated in regions with steep slopes and longer slope lengths, particularly in the western and northern areas near Al-Rutba. Conversely, lower values are observed in areas with gentler slopes, mainly in the central and southern regions close to the Euphrates River.

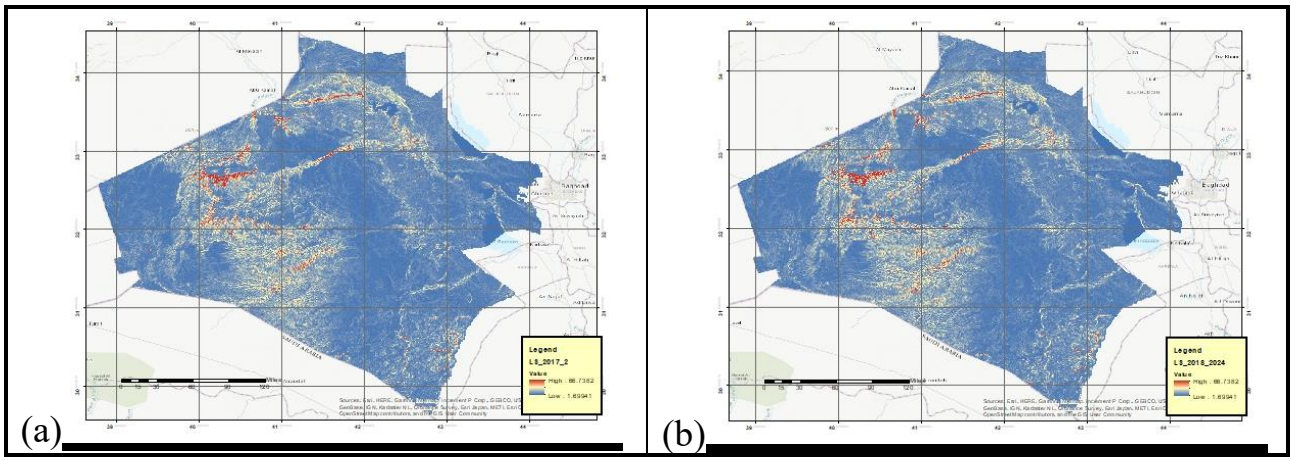


Fig. 5. The slope length factor, *LS*-factor: a) 2017; b) 2018-2024.

The P factor represents the support factor, which accounts for the effect of conservation practices on soil erosion. The P factor was modeled based on DEM map which provides more accurate representation of erosion risk, as it considers the adoption of management practices and their effectiveness in reducing soil loss (Figure 6). The comparison between the two maps shows that the areas with high P factor values, represented in red, are mainly located away from the Euphrates River and are more susceptible to erosion, thus requiring additional protective measures. In contrast, the regions near the river, shown in blue with lower P factor values, are situated along the river's course, and natural conditions or human interventions seem to help reduce the risk of erosion.

It is also noticeable that the second map (Figure 6b), issued in period 2018-2024, shows an expansion of the blue areas compared to the first map (Figure 6a), from 2017. This suggests improvements in protection measures or environmental changes that have contributed to decreasing erosion risk, or possibly increased preventive efforts over time. Overall, proximity to the Euphrates appears to play a significant role in lowering the P factor, making areas near the river more stable, while those farther areas are more vulnerable to environmental issues related to erosion.

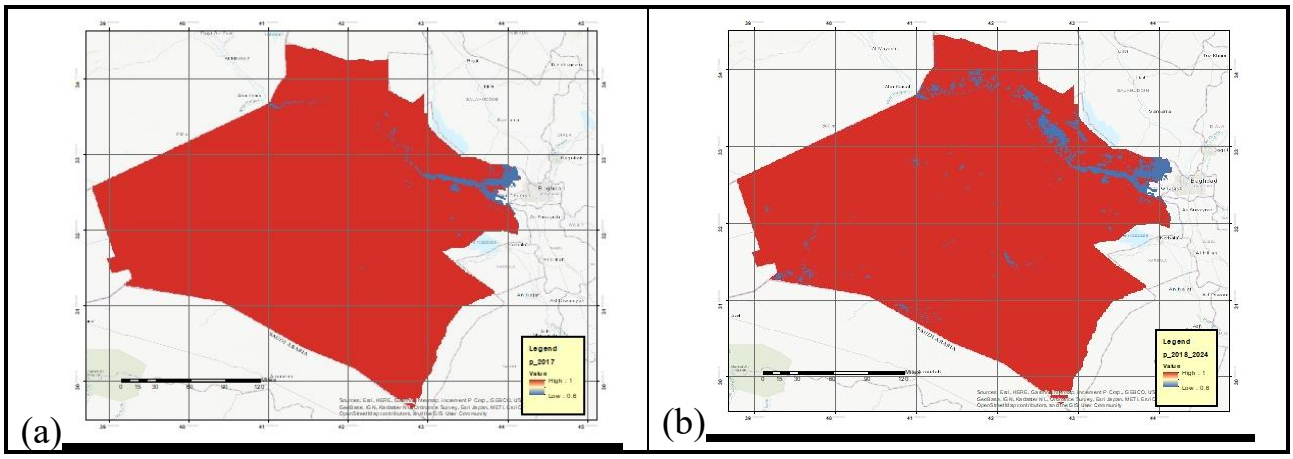


Fig. 6. Support and management practice factor, *P*- factor: a) 2017; b) 2018-2024.

Finally, by finalizing all the selected parameters, RUSLE model classified the soil erosion rate of the study area into five intensity categories: Slight (<0.5), Moderate (0.5-5), High (5-10), Very high (10-15), and Severe (>15). The results of soil loss intensities in 2017 are as follows (Figure 7):

- Slight: 14.29% with 581,700 ton
- Moderate: 66.96% with 25,503,390 ton
- High: 15.45% with 15,996,750 ton
- Very high: 2.24% with 3,878,000 ton
- Severe: 1.04% with 2,664,740 ton

The total loss of produced soil in Al-Anbar Governorate during 2017 was approximately 48,423,580 tons. Al-Anbar Governorate covers an area of 13,850,000 hectares, meaning that the annual average soil loss (per hectare) is 5.33 tons/hectare/year (Figure 7).

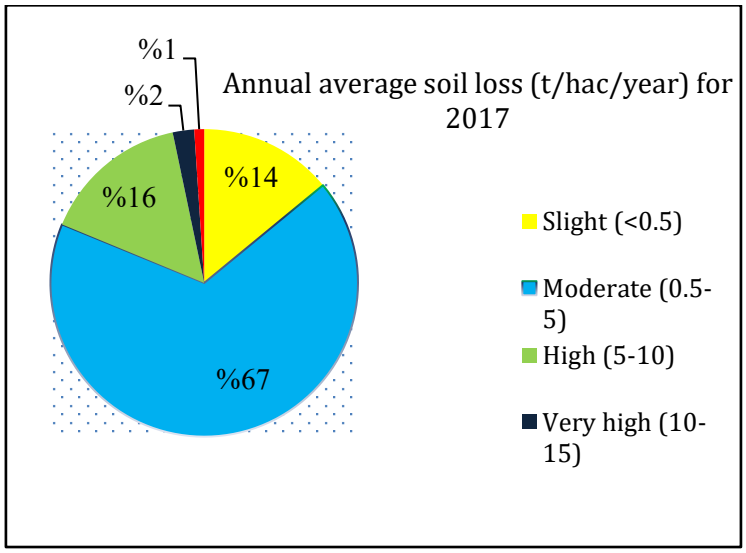


Fig. 7. Annual average soil erosion charter in Al-Anbar Governorate by using RUSLE model for 2017.

The annual average soil erosion rate across the Al-Anbar Governorate is indicative of substantial soil loss, which can impact agricultural productivity, geodiversity and geoecosystem health over time. Figure 8 shows the geographical distribution of wind erosion rate and areas of greatest soil loss during 2017 (Figure 8).

The results of soil loss intensities in the study area rat/year in period 2018-2024 are as follows (Figure 9):

- Slight: 0.9% with 37,395 ton
- Moderate: 46.7% with 17,821,141 ton
- High: 21.1% with 21,917,625 ton
- Very high: 6.7% with 11,599,375 ton
- Severe: 24.5% with 59,381,875 ton

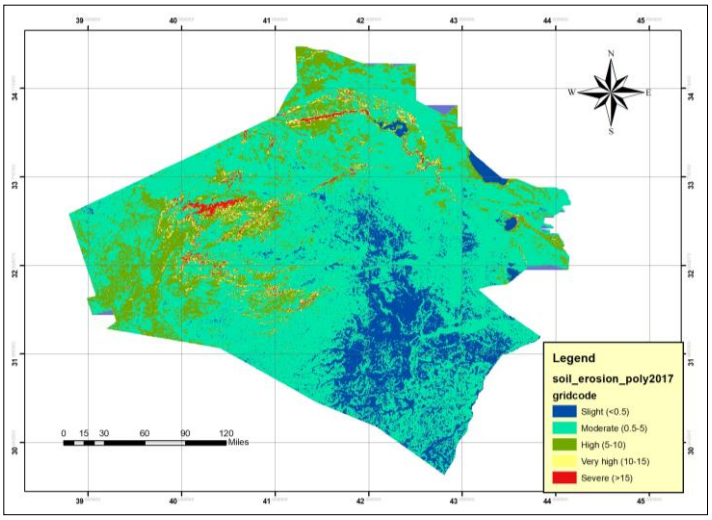


Fig. 8. Annual average soil erosion in Al-Anbar Governorate by using RUSLE model 2017.

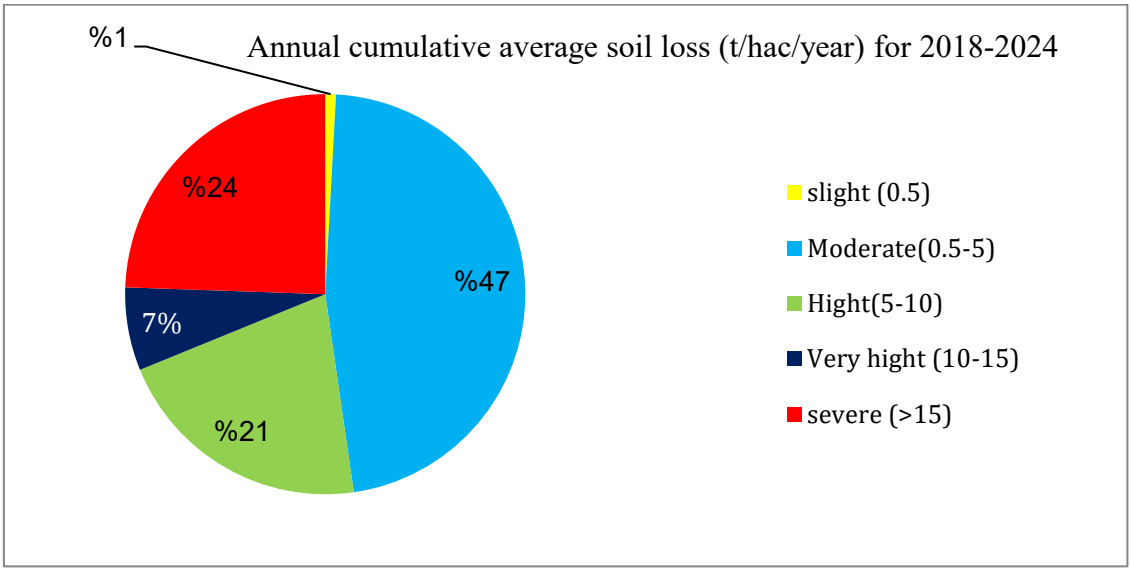


Fig. 9. Annual cumulative soil erosion charter in Al-Anbar Governorate by using RUSLE model rat per year 2017-2024.

The summation of the total loss of soil produced in Al-Anbar Governorate rat/year during period 2018-2024 was approximately 102,751,072 ton (Figure 10). Al-Anbar Governorate covers an area of 13,850,000 hectares, that is, the annual cumulative soil loss (per hectare) is 8 tons/hectare/year.

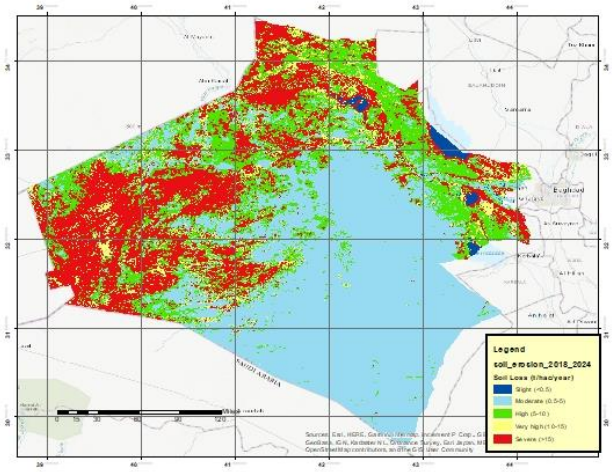


Fig. 10. Annual cumulative soil erosion in Al-Anbar Governorate by using RUSLE model rat per year 2018-2024.

Looking at the provided data, it can be observed a significant change in erosion levels across two different time periods, with a focus on how the areas are represented by colors on the maps. In the first map (Figure 7), which shows the distribution of erosion in 2017, areas with slight erosion are depicted in yellow, accounting for about 14.29% of the total area with approximately 581,700 tons. Moderate erosion areas are shown in light blue, making up around 66.96% of the region, roughly 25,503,390 tons. High erosion zones are represented by light green, covering about 15.45%, with approximately 15,996,750 tons. Very high erosion areas are marked in dark blue, constituting 2.24% of the area with around 3,878,000 tons, while severe erosion zones are indicated by red, representing 1.04% with about 2,664,740 tons. Overall, the total erosion during this period was approximately 48,624,580 tons.

In the period from 2018 to 2024, a noticeable shift appears in the distribution of erosion levels (Figure 9). The areas with very high erosion increased to 6.7%, shown in dark blue, with around 11,599,375 tons. Severe erosion areas also grew significantly, making up 24.5% of the region, shown in red, with approximately 59,381,875 tons. The high erosion zones rose to 21.1%, represented by green, with about 21,917,625 tons. Moderate erosion areas increased to 46.79%, in light blue, with roughly 17,821,141.25 tons. Slight erosion zones, marked in yellow, decreased to just 0.9%, with 37,395 tons. The total erosion in this period reached about 102,751,072.5 tons.

In summary, the colors used on the maps provide a clear visual differentiation of erosion levels. Comparing the color distribution between the two periods shows a clear increase in areas with very high and severe erosion, indicating a worsening situation that requires urgent attention to geoconservation attempts and prevents further soil degradation, especially in regions highlighted by red colors representing the highest risk levels. Past studies showed varying soil loss rates, and the present study aims to refine these estimates by considering prevailing wind directions and vegetative conditions. The present rates are compared with their weighted average rates are used to determine the overall percentage of soil loss for each geographic administrative unit. This gives inaccurate results in units with high variation in rates. Therefore, the current rates are only an indication on a map, as there is no field data or accurate soil and erosion survey available for the entire region to compare and verify the results. Finally, it is worth noting that this study provides an indication of increased wind erosion, which has recently caused an increase in dust storms.

4.2. Eco-Hydrological Coupling: R-Factor Reduction vs. C-Factor Surge

A crucial insight brought forward by the peer-review process concerns the paradoxical interplay between rainfall erosivity (R-factor) and wind detachment in arid environments. In classical RUSLE, a reduction in mean annual precipitation lowers the R-factor, mathematically yielding a smaller water-induced soil erosion rate. However, in Al-Anbar Governorate, this prolonged drought and

reduced rainfall trigger severe eco-hydrological stress:

- Soil Moisture Depletion: Mostly reduced precipitation desiccates topsoil particle binding matrices, eliminating cohesive capillary tension between soil grains.
- Vegetation Cover Degradation: Crop failure and natural scrubland dieback mostly elevate the C-factor from ~0.25 to >0.60 across massive tracts of land.

Consequently, while direct water-driven kinetic detachment (R-factor) generally decreases during drought years, the destabilized, exposed soil surface becomes exceptionally susceptible to wind shear stress. When northwesterly ERA5 winds exceed 20 (km/h), these desiccated topsoils are instantly entrained, driving high AOD (>0.65) and regional dust storms.

4.3 Implications for Geoconservation and Cultural Heritage

For the first time in regional literature, this study evaluates the spatial overlap between soil degradation hotspots and geoconservation assets across Al-Anbar Governorate. High and Very High erosion hotspots (>10 t/ha/year) severely impact three key socio-ecological assets:

- Agricultural Oases: Riparian agricultural zones along the Euphrates River (e.g., Al-Bouhyat and Hit oases) face severe. Topsoil stripping and sand encroachment, threatening ancient traditional irrigation channels (Noria structures).
- Geological Heritage: Unique karst formations, limestone cliffs, and desert wadi ecosystems in western Al-Anbar are suffering accelerated structural weathering and loss of unique pedological features.
- Archaeological Sites: Historic riverine mounds and ancient settlements suffer from both water gullying during flash rains and ongoing abrasive wind deflation, underscoring the urgent need for targeted geoconservation interventions.

5. Conclusion and discussion

Wind erosion is a natural geological process that is caused by the removal and transportation of soil particles by wind. It often occurs in areas with little or no plant cover and the land is overall dry. This detachment depends on the kinetic energy of the impacting wind and the aerodynamic interaction between the wind and the soil. The transport of the soil particles has been related to the horizontal wind velocity close to the soil surface, and the saltation and creep movement of the particles. The overall erosive wind power is quantified using the wind erosion equation (WEQ) which is an empirical equation comprising of three separate indices of erosivity, soil erodibility, and the susceptibility of the soil to erosion. The WEQ has been compared to the RUSLE model and the results led to the conclusion that the RUSLE wind factor can be used as a simple, yet quite general, estimator of wind erosion potential (Favis-Mortlock et al., 2000).

Based on the results obtained from this study, it is evident that wind erosion geohazard in the western part of Ramadi have significantly increased over time. The application of the RUSLE model, integrated with remote sensing data within a GIS environment, allowed for a comprehensive assessment of the spatial distribution and intensity of soil erosion. The findings reveal that areas near water bodies, especially the Euphrates River, and regions in the northwestern and northeastern parts of the study area are particularly vulnerable to erosion, which is reflected in the high-value zones indicated by red and dark orange colors on the maps. The analysis of the various factors influencing erosion underscores the importance of geoconservation strategies and land management conditions. Although the soil erodibility factor (K) remained relatively stable, the decrease in rainfall (R factor) over the years has mostly contributed to an increased susceptibility of the soil to wind erosion, especially in areas where vegetation cover has diminished. The expansion of high and very high erosion risk zones, as shown by the increased red and purple areas in the land cover (C) and support practice (P) factors, highlights ongoing environmental deterioration and potential deficiencies in land management practices.

Furthermore, the stability of the LS factor indicates that the terrain's slope characteristics have not changed significantly, but the increased erosion rates suggest that other factors, such as climate variations and vegetation decline, are playing a more prominent role. The spatial distribution of the P factor suggests that proximity to the Euphrates River provides some natural protection, but the overall increase in erosion risk zones points to the urgent need for improved geodiversity, vegetation cover and better land management and geoconservation strategies.

The comparison of soil loss estimates between 2017 and the period 2018-2024 demonstrates a

substantial rise in total soil loss, from approximately 48.4 million tons to over 102.7 million tons and with a rate of 3.4 t/ha/year to over 8 t/ha/year, with an increase in the percentage of areas experiencing severe erosion rates from approximately 1% to over 24% of the total area. This trend indicates a worsening of erosion conditions, which could have serious implications for soil fertility, agricultural productivity, geodiversity and environmental health in the region.

The study highlights the critical need for targeted erosion control measures, vegetation restoration, and sustainable land management practices to mitigate the increasing wind erosion geohazard in the area. The spatial analysis provided by the RUSLE model offers valuable insights for policymakers and land managers to prioritize interventions and develop geoconservation strategies aimed at reducing erosion and preserving georesources for the future. It has been noted that the wind RUSLE affected soil loss has been quite successful in estimating wind erosion damage in a specific area. From this analyzes, it is clear that the power and the subsequent soil erosion due to wind depends on a variety of complex interactions between climatic factors, soil type, complex land use systems and other geological properties. The estimates of soil loss presented in this study were lower than previous studies in Al-Anbar Governorate. Most of these studies mapped the potential soil loss based on soil type map and assumed an average rate erodibility. In addition, they made arbitrary allocations of supporting data to units of erodibility and soil texture to calculate rates for inter-rill and rill processes. This resulted in rates from less than 1 to more than 16 t/ha/year. The present rate of 5.33 t/ha/year is close to the average for the whole area but is not comparable with existing map. The main reason for this is that the prevailing wind directions were not known to them. As the wind is the main factor of erosion in Iraq in forms ranging from mass movement to abrasion, it is an important input to erosion models. These prevailing wind directions lead us to calculate potential erosion rates both with and without the presence of vegetation. The present paper considers the latter to be the potential under present conditions with a fully vegetated state. The soil loss rates were also calculated under past and present land uses, but this is considered to be future work which will involve making new land cover maps with the same resolution of the soil and vegetation maps.

it is also concluded that, the implementation of the Revised Universal Soil Loss Equation (RUSLE) for studying wind erosion in regions like Iraq, specifically in areas such as Al-Anbar Governorate can provide valuable insights into soil loss dynamics and erosion impacts. By understanding the spatial distribution and intensity of erosion, researchers and policymakers can develop targeted interventions to mitigate soil loss, enhance agricultural productivity, geodiversity, geoheritage sites and preserve the environmental health of the region. This discussion encapsulates the critical aspects of soil and wind erosion in Al-Anbar Governorate, highlighting the importance of continued research and targeted geoconservation efforts. By utilizing the RUSLE model in this context, researchers and decision-makers can better understand the factors contributing to wind erosion and develop strategies for soil geoconservation and sustainable land management practices.

In summary, this study successfully restructured the environmental modeling framework for Al-Anbar Governorate by explicitly decoupling water-induced baseline soil degradation sensitivity (RUSLE) from wind-driven dust storm susceptibility. Empirical validation against 7 field soil sampling profiles demonstrated robust model accuracy ($R^2 = 0.78$, RMSE = 1.12 t/ha/year) with a governorate-wide mean soil erosion rate of 5.33 t/ha/year. Key recommendations for land management in Al-Anbar Governorate include:

- Prioritizing conservation interventions across the identified 21,330 km² of High and Very High erosion hotspots.
- Establishing windbreak shelterbelts and native drought-resistant vegetation strips along wadi margins and agricultural oasis perimeters.
- Integrating geoconservation protection plans into municipal regional planning for historical and geological heritage sites along the Euphrates corridor.

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Author Contributions

The authors contributed equally to the development and preparation of this research.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the authorship or publication of this article.

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Original Article

ارزیابی یکپارچه حساسیت به تخریب خاک و استعداد وقوع طوفان‌های گرد و غبار در استان الانبار عراق با استفاده از تکنیک‌های مکانی-فضایی و شاخص‌های زیست‌محیطی

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چکیده مبسوط

۱.مقدمه

تخریب خاک و افزایش فراوانی و شدت توفان‌های گردوغبار از مهم‌ترین مخاطرات محیطی در مناطق خشک و نیمه‌خشک خاورمیانه به شمار می‌روند که پیامدهای گسترده‌ای برای پایداری منابع طبیعی، بهره‌وری کشاورزی، سکونتگاه‌های انسانی و حفاظت از میراث طبیعی و فرهنگی دارند. در چنین مناطقی، کاهش بارندگی، خشکی سطح خاک، تخریب پوشش گیاهی و وزش بادهای شدید می‌توانند شرایط را برای جداشدن و انتقال ذرات خاک و تشدید گردوغبار فراهم کنند. با وجود اهمیت این مسئله، در برخی مطالعات، حساسیت خاک به فرسایش آبی و استعداد انتشار گردوغبار ناشی از فرسایش بادی به‌صورت یکسان ارزیابی شده‌اند؛ درحالی‌که این دو فرایند، اگرچه با یکدیگر ارتباط دارند، از سازوکارهای متفاوتی پیروی می‌کنند. ازاین‌رو، پژوهش حاضر با هدف ارزیابی یکپارچه حساسیت تخریب خاک و استعداد وقوع توفان‌های گردوغبار در استان الانبار عراق، با بهره‌گیری از سامانه اطلاعات جغرافیایی، سنجش‌ازدور و شاخص‌های محیطی انجام شده است. شناسایی کانون‌های بحرانی تخریب خاک و تعیین مناطق اولویت‌دار برای اقدامات حفاظتی، از اهداف کاربردی این پژوهش است.

۲. مبانی نظری تحقیق

چارچوب نظری پژوهش بر این اصل استوار است که تخریب خاک و انتشار گردوغبار، ضمن برخورداری از پیوندهای محیطی، باید از نظر مفهومی و روش‌شناختی از یکدیگر تفکیک شوند. در این چارچوب، مدل اصلاح‌شده معادله جهانی هدررفت خاک (RUSLE) برای برآورد حساسیت پایه خاک به فرسایش و تخریب، با استفاده از پنج عامل فرسایندگی بارندگی(R) ، فرسایش‌پذیری خاک(K) ، توپوگرافی(LS) ، پوشش و مدیریت زمین (C) و اقدامات حفاظتی (P)به کار گرفته شده است. در مقابل، استعداد انتشار گردوغبار با استفاده از سرعت و جهت باد، عمق نوری هواویزها (AOD) و شاخص نرمال‌شده گردوغبار (NDDI) ارزیابی شده است. بر این اساس، کاهش بارندگی، با وجود کاهش بالقوه فرسایندگی باران، می‌تواند از طریق کاهش رطوبت خاک و تضعیف پوشش گیاهی، سطح خاک را در برابر تنش باد آسیب‌پذیرتر کند. بنابراین، ارزیابی هم‌زمان وضعیت خاک، پوشش گیاهی و شرایط جوی، مبنای شناسایی دقیق‌تر کانون‌های مستعد تخریب و گردوغبار قرار می‌گیرد.

۳. روش تحقیق

پژوهش حاضر از نظر هدف، کاربردی و از نظر روش، مبتنی بر تحلیل‌های مکانی و مدل‌سازی محیطی است. محدوده مطالعه، کل استان الانبار عراق با مساحتی حدود ۱۳۸۵۰۰ کیلومترمربع را در بر می‌گیرد. داده‌های مورد استفاده شامل مدل رقومی ارتفاع ASTER GDEMبا قدرت تفکیک مکانی ۳۰ متر، تصاویر ماهواره‌ای Landsat 8/9، داده‌های عمق نوری هواویزMODIS ، داده‌های بازتحلیل اقلیمیERA5-Land ، اطلاعات خاک و داده‌های بارندگی و باد است. تصاویر و لایه‌های مکانی پس از آماده‌سازی و هم‌مقیاس‌سازی، در محیط سامانه اطلاعات جغرافیایی پردازش شدند. شاخص‌های پوشش گیاهی و ویژگی‌های سطح زمین برای محاسبه عوامل مدل RUSLE به کار رفتند و نقشه حساسیت تخریب خاک تهیه شد. سپس، با تلفیق نتایج مدل با داده‌های سرعت و جهت باد و شاخص‌های گردوغبار، مناطق مستعد انتشار گردوغبار شناسایی شدند. همچنین، برای ارزیابی اعتبار برآوردهای مدل، داده‌های حاصل از هفت

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پروفیل نمونه‌برداری خاک در واحدهای ژئومورفولوژیک مختلف با نتایج مدل مقایسه شدند. ارزیابی آماری با استفاده از ضریب تعیین، ریشه میانگین مربعات خطا و میانگین قدرمطلق خطا انجام گرفت. تحلیل تغییرات نیز با مقایسه وضعیت سال ۲۰۱۷ و دوره ۲۰۱۸ تا ۲۰۲۴ صورت پذیرفت.

۴. یافته‌های تحقیق

نتایج مدل‌سازی، میانگین برآوردشده هدررفت خاک را در سطح استان حدود ۵/۳۳ تن در هکتار در سال نشان داد. بر اساس طبقه‌بندی حساسیت تخریب خاک، حدود ۲۸/۴ درصد از مساحت استان در طبقات حساسیت زیاد و بسیار زیاد قرار گرفت؛ این مناطق عمدتاً در حاشیه فلات‌های فرسایش‌یافته، تراس‌های آبرفتی فاقد مدیریت حفاظتی مناسب، آبراهه‌های فعال و حاشیه‌های تخریب‌شده رودخانه‌ای متمرکز بودند. اعتبارسنجی مدل بر اساس هفت پروفیل خاک، ضریب تعیین ۰/۷۸، ریشه میانگین مربعات خطا برابر با ۱/۱۲ تن در هکتار در سال و میانگین قدرمطلق خطا برابر با ۰/۸۹ تن در هکتار در سال را نشان داد. مقایسه نقشه‌های زمانی نیز از گسترش پهنه‌های دارای شدت زیاد و بسیار زیاد تخریب حکایت داشت؛ به‌طوری‌که سهم طبقه تخریب شدید از حدود ۱ درصد در سال ۲۰۱۷ به حدود ۲۴/۵ درصد در دوره ۲۰۱۸ تا ۲۰۲۴ افزایش یافت. همچنین، سهم مناطق دارای تخریب بسیار زیاد از ۲/۲۴ به ۶/۷ درصد رسید. این تغییرات با کاهش سهم پهنه‌های دارای تخریب خفیف و گسترش مناطق دارای پوشش گیاهی ضعیف همراه بود. تحلیل عوامل محیطی نشان داد که عامل فرسایش‌پذیری خاک (K) و عامل توپوگرافی (LS) در مقایسه زمانی تغییر چشمگیری نداشته‌اند؛ درحالی‌که کاهش بارندگی و افت پوشش گیاهی، به‌ویژه در اراضی برهنه، با افزایش آسیب‌پذیری سطح خاک در برابر فرسایش بادی همراه بوده‌اند. کانون‌های بحرانی عمدتاً در بخش‌های شمالی و غربی استان، حاشیه فلات‌ها و برخی پهنه‌های مجاور رود فرات مشاهده شدند. این شرایط، واحه‌های کشاورزی، به‌ویژه البوحیات، حاشیه‌های رودخانه‌ای و محوطه‌های تاریخی و زمین‌شناختی را در معرض تهدید قرار می‌دهد.

۵. بحث و نتیجه‌گیری

یافته‌ها نشان می‌دهند که ارزیابی حساسیت تخریب خاک، بدون توجه مستقل به سازوکارهای فرسایش بادی و شرایط جوی، نمی‌تواند تصویری جامع از خطر توفان‌های گردوغبار در مناطق خشک ارائه دهد. تلفیق مدل RUSLE با داده‌های سنجش‌ازدور و شاخص‌های جوی، امکان شناسایی مکانی کانون‌های بحرانی و تعیین اولویت‌های حفاظتی را فراهم می‌کند. بااین‌حال، ازآنجاکه RUSLE اساساً برای برآورد فرسایش آبی توسعه یافته است، نتایج آن باید به‌عنوان برآورد حساسیت پایه تخریب خاک تفسیر شود و نه اندازه‌گیری مستقیم شار انتشار گردوغبار. همچنین، محدودبودن اعتبارسنجی میدانی به هفت پروفیل و ناهمگونی قدرت تفکیک داده‌های جوی، ضرورت تفسیر محتاطانه نتایج و توسعه داده‌های میدانی را برجسته می‌کند. بر این اساس، پیشنهاد می‌شود اقدامات حفاظتی در پهنه‌های دارای حساسیت زیاد و بسیار زیاد در اولویت قرار گیرند؛ احیای پوشش گیاهی بومی مقاوم به خشکی، ایجاد بادشکن‌های زیستی، بهبود مدیریت اراضی و حفاظت از واحه‌های کشاورزی و میراث طبیعی و تاریخی در دستور کار قرار گیرد. در مجموع، چارچوب تلفیقی پژوهش می‌تواند به‌عنوان ابزاری برای پشتیبانی از تصمیم‌گیری محیطی، برنامه‌ریزی کاربری زمین و مدیریت پایدار منابع خاک در مناطق خشک مورد استفاده قرار گیرد.

کلیدواژه‌ها: تخریب خاک؛ فرسایش بادی؛ توفان گردوغبار؛ مدل RUSLE؛ سنجش‌ازدور؛ سامانه اطلاعات جغرافیایی؛ استان الانبار.

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Original Article

Foresight of Education and Empowerment of Rural Human Capital in Iran in the Era of Digital Transformation

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Abstract

Purpose- This study aimed to conduct foresight of education and empowerment of rural human capital in Iran in the era of digital transformation and to identify the key factors shaping the future of this field and the alternative scenarios that may emerge from different combinations of future conditions.

Design/methodology/approach- The study adopted a foresight approach and employed scenario planning based on the Global Business Network (GBN) approach, with Martin's foresight model serving as the overall framework. Data were collected through documentary studies and semi-structured interviews with 25 experts from academic, executive and policy-making, technology and digital transformation, and rural development fields. The collected data were analyzed using qualitative content analysis, and the identified factors, trends, opportunities, challenges, and driving forces were organized into six dimensions: sociocultural, technological, economic, environmental, political, and intellectual-philosophical.

Findings- The findings showed that the 38 identified key factors could be grouped into six major driving forces: social and cultural acceptance of digital transformation in rural areas; development of rural digital education technology and infrastructure; economic support and financial sustainability of rural education and empowerment; governance and policy coherence for rural digital transformation; flexibility and redefinition of the rural skills and human capital system; and equity and inclusion in rural education and digital transformation. The combination of the two key uncertainties resulted in four alternative scenarios: Smart Villages, Empowered People; Bright Lights, Dark Homes; Ready Hands, Distant Tools; and A Land Left Behind by Change.

Research limitations/implications- The study focuses on the future of education and empowerment of rural human capital in Iran and relies on documentary evidence and expert judgments. Therefore, the identified scenarios should be interpreted as alternative and plausible futures rather than predictions of a single predetermined future.

Originality/value- This study develops a foresight-based framework for examining the future of rural human capital education and empowerment in the context of digital transformation. The findings emphasize that technological development alone is insufficient for sustainable empowerment and that technological and infrastructural capacity should be considered in interaction with social and cultural readiness, economic support, governance, skills-system flexibility, and equity and inclusion.

Keywords- Foresight; Rural Human Capital; Digital Transformation; Empowerment; Rural Education.

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1. Introduction

The rapid advancement of digital technologies in recent decades has fundamentally transformed the nature of economic, social, and human development (Aflalo et al., 2026). The expansion of the Internet, artificial intelligence, digital platforms, the Internet of Things, and smart technologies is not merely associated with changes in communication tools or increased access to information; rather, it is reshaping patterns of production, employment, learning, service delivery, and social interaction (Muduli & Choudhury, 2026). In this context, digital transformation has become one of the major forces shaping the future of societies. Technological change is rapidly altering the structure of skills demand (Kazemiyeh et al., 2026), while the integration of technical and digital skills with cognitive and social skills is increasingly important for accessing or transitioning toward new employment opportunities (Sun & Ch'ng, 2026). Accordingly, digital transformation has expanded into diverse domains, including business (Kraus et al., 2021), public services (Ulas, 2019), and sustainable development (Rogelj et al., 2021).

The implications of digital transformation are particularly important in rural areas. Although digital technologies have expanded considerably in urban settings, their potential in rural communities remains insufficiently realized (Bhattarai, 2021). Rural areas are commonly characterized by geographical dispersion, distance from urban centers, limited access to educational and specialized services, restricted employment opportunities, and difficulties in accessing broader markets (Shyian et al., 2023). These conditions can constrain the development of rural communities. Digital transformation, however, has the potential to reduce some of these structural and geographical constraints by expanding access to education, information, services, markets, and employment opportunities (Yuan et al., 2025). Digital technologies can enable rural residents to access educational resources, specialized knowledge, public services, broader markets, and wider communication networks without complete dependence on physical mobility (Li et al., 2022). They can also strengthen the utilization of human-resource capacities in rural settings (Utechenko, 2020). Similarly, access to online markets, e-commerce, digital financial services, smart agriculture, and modern business-management tools can create opportunities for increasing productivity, diversifying economic activities, and generating new sources of income in rural areas (Mayer et al., 2018; Demchenko et al., 2023).

Nevertheless, access to technology and communication infrastructure alone does not guarantee sustainable rural development. The developmental effects of technology depend substantially on individuals' knowledge and skills and on the social and cultural readiness of communities to accept technological change (Golovina et al., 2021). Therefore, digital transformation in rural areas is closely interconnected with education, skills development, empowerment, and human-capital development. Rural human capital is particularly important because the ability of rural communities to adapt to technological, economic, social, and environmental changes depends on the knowledge, skills, competencies, experience, and capabilities of their members. Investment in education and empowerment can contribute not only to the development of individual capabilities but also to productivity, employment, entrepreneurship, innovation, and social participation (Lin & Peng, 2025).

International research suggests that rural digital transformation is no longer merely a matter of expanding communications infrastructure; rather, it is a multidimensional process shaped by the interaction of technology, human capital, economic capacity, local governance, and social equity. A 2024 report by the Food and Agriculture Organization of the United Nations emphasizes that, alongside its development opportunities, digital transformation may reproduce or exacerbate existing digital divides when disadvantaged groups are not adequately considered (Hernandez et al., 2024). China provides an example of the links between rural digital-development policies and economic and institutional development. Research on digital villages in China highlights the roles of talent and human capital, financial capital, governance systems, and development planning, suggesting that technological expansion is more likely to contribute to sustainable rural development when accompanied by human-capital development, financing, and institutional capacity (Liu et al., 2024). In India and other developing countries, digital inclusion and the conversion of

technological access into the actual capacity to use technology are also important concerns. Accordingly, access to the Internet should be distinguished from digital skills and the ability to use technology for learning, employment, and economic activity. In Europe, particularly in the Balkan region, urban-rural connectivity gaps and the need for targeted investment in less-advantaged areas have also received attention (Emerllahu & Bogataj, 2024).

Despite these developments, an important research gap remains. Existing studies have addressed different dimensions of digital transformation, rural development, digital skills, human capital, and empowerment; however, these dimensions have often been examined separately. Limited attention has been given to the simultaneous interaction of technological, social and cultural, economic, political, environmental, and intellectual factors in shaping the future of rural human capital education and empowerment. The literature cited in the present study also indicates that rural contexts have received comparatively limited attention in research on human-resource empowerment and digital transformation (Hrustek, 2020; Kraus et al., 2021; Deja et al., 2021). Moreover, the rapid pace of technological change means that the skills required by labor markets are continuously evolving. The World Economic Forum's *Future of Jobs Report 2025* emphasizes the growing importance of artificial intelligence and technological literacy alongside creative thinking, flexibility, resilience, and lifelong learning, suggesting that human-resource education should increasingly prepare individuals for multiple possible futures rather than only for existing occupations (*Future of Jobs Report*, 2025).

This challenge is particularly significant in Iran. Available evidence indicates a persistent urban-rural gap in Internet access and Internet use. In 2021, approximately 69.2% of rural households in Iran had access to the Internet compared with 82.5% of urban households, while Internet use was reported at 65.7% among rural populations compared with 82.6% in urban areas (International Telecommunication Union, 2021). Although the available rural-urban disaggregation cited here is for 2021, complementary ITU figures for 2024 indicate that 85.3% of Iran's population used the Internet and that population coverage by at least LTE/WiMAX reached 94.2% (International Telecommunication Union, 2021; Ahmadi & Jahansoozi, 2026). Thus, the future of rural digital transformation in Iran cannot be understood solely in terms of communication coverage. The quality of access, effective use, digital skills, and the ability to convert digital access into educational, economic, and social opportunities are equally important (Anabestani & Rahimi, 2026; Kazemiyeh et al., 2026). The uneven distribution of advanced digital skills further reinforces the significance of this issue, particularly because the urban-rural gap may be substantially larger for advanced digital skills than for basic digital skills (International Telecommunication Union, 2025). At the same time, rural areas in Iran face limitations in educational opportunities, diversified labor markets, specialized services, and knowledge resources, while a considerable proportion of rural economic activity remains dependent on agriculture, natural resources, and small and local businesses (Azizi & Tajari, 2026c; Liu et al., 2023). Digital transformation can reduce some of these limitations by facilitating access to new markets, distance education, digital financial and administrative services, specialized information, smart agriculture, and emerging forms of employment (Anabestani et al., 2023). However, without sufficient human capacity and digital skills, technological access may not result in effective utilization and may even contribute to the persistence of inequalities between more- and less-advantaged groups and areas (Ye & Yang, 2020).

The uncertainty surrounding future technological developments further strengthens the need for a foresight perspective. It is difficult to determine with certainty which technologies will have the greatest influence on rural economies, which occupations will be transformed, which skills will become more important, or how deeply artificial intelligence and other advanced technologies will penetrate rural activities. These technological developments also interact with demographic change, climate change, economic policies, global market developments, and changing patterns of employment and consumption. Consequently, linear and exclusively predictive approaches are insufficient for addressing the future of rural education and human-capital empowerment. Foresight makes it possible to identify major trends, driving forces, uncertainties, and their interactions and to examine a set of alternative futures rather than assuming a single predetermined future.

Accordingly, the present study was conducted to identify the major factors and driving forces shaping the future of education and empowerment of rural human capital in Iran in the era of digital transformation and to develop alternative scenarios based on the interaction of key uncertainties. The study seeks to answer the following question: What are the most important factors influencing the future of education and empowerment of rural human capital in Iran in the era of digital transformation, and what scenarios may emerge from alternative combinations of these conditions? The originality of the study lies in integrating the educational and empowerment dimensions of rural human capital with the multidimensional context of digital transformation and examining their possible futures through a systematic foresight and scenario-planning approach. Rather than considering digital transformation merely as an issue of infrastructure or technological access, the study examines the interaction of human, social, cultural, technological, economic, political, environmental, and intellectual dimensions and uses this integrated perspective to construct alternative futures for rural human-capital development in Iran.

2. Research Theoretical Literature

2.1 Rural Human Capital, Education, and Empowerment

Rural human capital refers to the combination of knowledge, skills, competencies, experiences, cognitive abilities, professional capacities, and social capabilities embodied in individuals and groups living in rural areas (Moradbakhsh, Hashemi & Pourahmad, 2026). These capabilities enable rural residents to participate more effectively in economic, social, cultural, and environmental activities and to contribute to the rural development process (Karmaker & Cvetković, 2025). From the perspective of human-capital theory, education and skills development represent forms of investment that enhance individual productivity and expand the capacity to participate in economic and social activities (Hanushek & Woessmann, 2020). In rural contexts, human-capital development is particularly relevant because the capacity to exploit local resources, adopt innovations, acquire new skills, establish economic activities, and adapt to environmental change contributes significantly to the development trajectory of rural communities (Joshi, 2019; White, 2021; Liu et al., 2023; Sun et al., 2023; Kosasih & Sulaiman, 2024).

Empowerment extends this perspective by emphasizing the development of individuals' and communities' capacity to understand change, make effective use of opportunities, participate in decision-making, and act upon their own development conditions. In the context of digital transformation, empowerment can no longer be limited to increasing educational attainment or transferring existing occupational skills. Instead, it encompasses continuous learning, adaptation, creative use of technology, entrepreneurship, access to broader markets, participation in the digital economy, and adaptation to technological and environmental changes (Prastiwi et al., 2025; Wang et al., 2023; Ma et al., 2023; Nalikan & Rozikin, 2025; Qudsi & Nurhayati, 2023; Franciskovic-Ingunza et al., 2023; Li et al., 2025; Gong et al., 2025). Consequently, rural human-capital empowerment in the digital era requires a shift from episodic and conventional education toward lifelong, flexible, skill-oriented, technology-supported learning.

2.2 Digital Transformation and the Digital Divide

Digital transformation extends beyond the digitization of existing tools and services. It involves changes in processes, structures, learning practices, employment patterns, service delivery, and relationships between people and technology. In rural areas, the realization of digital transformation is shaped by a broad combination of social, cultural, technological, economic, environmental, political, and intellectual conditions.

Digital divide theory provides an important theoretical basis for understanding these differences. The digital divide does not refer only to physical access to Internet infrastructure and digital devices; it also encompasses differences in the quality of access, digital skills, patterns of use, and the ability to convert technological access into meaningful educational, economic, and social benefits (Azizi & Tajari, 2026a; Ye & Yang, 2020). This perspective is particularly important in rural settings because infrastructure expansion without simultaneous development of human capabilities may not generate the expected developmental outcomes.

The diffusion of innovation perspective also helps explain the social adoption of digital technologies. According to this perspective, the acceptance and diffusion of innovation depend not only on the availability of technology but also on its perceived

usefulness, compatibility with existing values and needs, opportunities for experimentation, and the social conditions surrounding adoption. In rural communities, therefore, digital transformation is influenced by the extent to which technologies are perceived as useful, understandable, compatible with local conditions, and accessible to different social groups (Abad et al., 2026).

2.3 Social Systems and Economic Growth Perspectives

The social-systems perspective emphasizes that social phenomena should be understood as interconnected components rather than isolated variables. From this standpoint, digital transformation in rural communities emerges from interactions among technological infrastructure, social acceptance, cultural values, institutions, economic resources, patterns of learning, and local structures (Amanollahnejad et al., 2026). This perspective supports the need for a multidimensional analysis of rural digital transformation because changes in one component may generate consequences in other components.

Economic growth theory provides another relevant perspective. Digital technologies may affect rural economic growth through improvements in productivity, market access, innovation, entrepreneurship, employment, and human-capital development (Kosasih & Sulaiman, 2024). However, such outcomes depend on complementary conditions, including appropriate infrastructure, sufficient skills, supportive institutions, and access to financial resources. Thus, digital transformation should not be regarded as an independent technological input but as part of a broader development system in which human and institutional capacities shape the extent to which technological opportunities can be realized.

2.4 Foresight and Scenario Planning

The future of rural human-capital education and empowerment is inherently uncertain because technological, economic, social, environmental, and political changes interact continuously. From a foresight perspective, the future is not regarded as a single predetermined state; rather, multiple alternative futures may emerge through the interaction of driving forces, trends, and uncertainties. This perspective provides a foundation for moving beyond conventional prediction toward systematic exploration of plausible futures.

Scenario planning is particularly relevant in this context because it enables researchers and decision-makers to identify major driving forces, determine critical uncertainties, and combine their alternative states to construct coherent and plausible future scenarios. In the present study, the Global Business Network (GBN) approach is used as the basis for scenario development, while Martin's foresight model provides the broader framework for organizing the foresight process. Within this framework, the identification of major environmental forces, key factors, driving forces, and critical uncertainties provides the analytical foundation for developing alternative scenarios.

2.5 Empirical Research on Digital Transformation and Rural Human Capital

Previous empirical research has addressed several dimensions relevant to the present study. Research on digital transformation has highlighted the importance of technological infrastructure, digital access, and the geographical dimension of digital development (Yakimova & Streltsova, 2020; Bhattarai, 2021). Other studies have emphasized the role of digital technologies in improving access to education, information, public services, markets, and employment opportunities in rural areas (Li et al., 2022; Anabestani et al., 2023; Yuan et al., 2025). Research has also documented the potential contribution of e-commerce, digital financial services, smart agriculture, and digital business tools to productivity and income diversification in rural communities (Mayer et al., 2018).

A second group of studies has focused on human capital, skills, and empowerment. These studies indicate that rural development is influenced by residents' ability to acquire new competencies, adapt to changing economic conditions, adopt innovation, and participate in emerging economic activities (White, 2021; Sun et al., 2023; Karmaker & Cvetković, 2025). Recent research has further emphasized continuous learning, technological adaptability, entrepreneurship, and digital participation as increasingly important components of human-capital development in changing environments (Ma et al., 2023; Nalikan & Rozikin, 2025; Li et al., 2025).

A third body of research has examined inequalities associated with digital transformation. These studies show that digital inequality may persist even when basic technological access improves because differences in digital skills, quality of access,

affordability, and the capacity to derive benefits from technology remain significant (Ye & Yang, 2020). Research focusing on rural areas has therefore increasingly emphasized the importance of combining infrastructure development with human-capital development and social inclusion.

The empirical literature also indicates that technological change is reshaping labor-market skill requirements. The *Future of Jobs Report 2025* highlights the increasing significance of artificial intelligence, technological literacy, creative thinking, flexibility, resilience, and lifelong learning. This evidence supports the argument that future-oriented education must prepare individuals not only for current occupational requirements but also for changing and emerging forms of work.

Taken together, the theoretical and empirical literature indicates that rural human-capital development in the digital era is a multidimensional phenomenon. Technological infrastructure, social and cultural acceptance, economic support, policy and governance, skills-system flexibility, and equity and inclusion are interconnected rather than independent factors. At the same time, the reviewed literature is largely concerned with individual dimensions of this problem, while relatively limited attention has been devoted to integrating these dimensions within a foresight framework and exploring how their alternative states may generate different futures for rural human-capital education and empowerment. This gap provides the theoretical and empirical basis for the present scenario-based foresight study in Iran.

3. Research Methodology

The present study was conducted as an interdisciplinary study using a foresight approach and scenario planning as its main methodological tool. The scenario planning process was based on the Global Business Network (GBN) approach, in which scenarios are created through the identification of key uncertainties. The time horizon considered for the foresight process should be sufficiently long to allow major changes in the external environment to emerge, but not so long that the resulting futures become implausible or unmanageable. To structure the foresight process, Martin's foresight model (1995) was employed as an overall framework, and the stages of scenario development were defined within this framework. The stages of scenario development are described below. The foresight horizon was set at Iranian calendar year 1415 (approximately 2036-2037) to examine medium- and long-term trends in digital transformation and their potential implications for rural human-capital education, skills development, and empowerment. The scenarios are not deterministic predictions; rather, they present coherent alternative images of plausible futures that can inform strategic decision-making, educational policy, and flexible rural-development planning.

3.1 Step 1: Environmental Scanning

The first step involved environmental scanning to identify the future of education and empowerment of rural human capital in Iran in the era of digital transformation. At this stage, the STEEP framework, consisting of sociocultural, technological, economic, environmental, and political factors, is commonly employed. However, because philosophical perspectives and patterns of thinking can influence educational futures, intellectual and philosophical factors were also added to the framework, resulting in the STEEP-I framework.

Data were collected through document review and semi-structured interviews with 25 purposively selected key experts (Table 1). Participants were purposively selected on the basis of their experience, expertise, and familiarity with different dimensions of rural human-capital education and empowerment in the era of digital transformation. They included academic experts, executive managers and policy-makers, technology and digital-transformation specialists, and rural activists and facilitators, allowing the topic to be examined from academic, policy, technological, and implementation perspectives. However, expertise in rural development is not equivalent to direct representation of the lived experiences of all rural groups. Therefore, the interviews and Delphi process primarily reflect participants' expert judgments about the driving forces and uncertainties shaping the future of rural education and empowerment; they should not be interpreted as directly representing the views of all rural stakeholders. The documentary-study population consisted of documents and studies related to major future trends and their effects on education and empowerment of rural human capital in the era of digital transformation (Table 2).

Table 1. Distribution of the Research Experts

Area of expertise	Inclusion criteria	Female	Male
Academic experts	At least 5 years of relevant research or teaching experience	3	4
Executive and policy-making experts	Relevant executive or managerial experience; direct experience in policy-making, planning, or implementation of projects related to rural areas, education, skills development, or digital transformation; familiarity with issues and challenges of rural areas	1	5
Technology and digital transformation specialists	Relevant academic qualification or substantial specialized experience; at least 5 years of professional experience in technology or digital transformation; experience in projects related to digitalization and digital education	2	4
Rural activists and facilitators (entrepreneurs and business owners)	At least a master's degree and experience in using educational technologies	3	3

Table 2. Search Specifications and the Process of Selecting and Screening Research Documents

Component	Description
Search databases	Google Scholar, Scopus, Web of Science, ERIC, and Iranian scientific databases, including the Jihad Daneshgahi Scientific Information Database, Magiran, and Noormags (2020–2026)
Persian keywords	Digital transformation, rural human capital, rural education, rural empowerment, rural digital skills
English keywords	Digital Transformation, Rural Human Capital, Rural Education, Rural Empowerment, Rural Digital Skills
Sources examined	Research articles, scientific reports, and relevant policy and higher-level official documents
Document selection criteria	Documents directly related to foresight, digital transformation, education and empowerment, rural human capital, and digital skills, preferably published during 2020–2026
Document exclusion criteria	Duplicate documents, studies without direct relevance to the research topic, sources without full text, non-scientific materials, and sources without clear scientific or organizational credibility were excluded
Screening process	Duplicate documents were removed; the titles and abstracts of the sources were then reviewed for relevance; the full texts of eligible documents were examined; and finally, documents directly related to the research objectives were selected for qualitative content analysis
Document analysis method	First, concepts and themes related to education, empowerment, rural human capital, digital transformation, digital skills, driving forces, challenges, opportunities, and future trends were extracted. The themes were then organized into main and subcategories and used to identify trends, drivers of change, influential factors, and key uncertainties

Regarding the semi-structured interview process, the main interview questions were designed around four areas: (1) In your view, what are the most important trends and changes that currently and in the future affect education and empowerment of rural human capital in the era of digital transformation? (2) In your opinion, what factors and forces may contribute to the expansion or limitation of this field? (3) What opportunities and challenges do you anticipate in the education and empowerment of rural human capital in the era of digital transformation? (4) In your view, what factors can contribute to achieving a desirable state of education and empowerment of rural human capital in Iran in the era of digital transformation?

Follow-up questions were also asked, where appropriate, to deepen and clarify the experts' perspectives. Each interview lasted an average of 25 minutes, and interviews continued until sufficient informational adequacy and appropriate coverage of the dimensions under study were achieved. The interview content was recorded, transcribed, and prepared for analysis after obtaining participants' consent. The interview data were analyzed using qualitative content analysis. To enhance the credibility of the analysis, the coding process was reviewed and re-examined. A portion of the extracted codes and categories was provided to experts to assess their consistency with the interview content and research objectives. In addition, the coding and categorization processes

were reviewed in stages to ensure consistency between the codes and the initial data and to prevent unrelated interpretations.

3.2 Step 2: Identification of Key Forces

The data obtained from the documentary study were coded, and the interviews were analyzed using qualitative content analysis. The resulting codes were then merged, leading to the identification of 96 initial key variables or factors. These factors, which could potentially influence education and empowerment of rural human capital in Iran in the era of digital transformation, were organized into six dimensions, as presented in Table 3.

Table 3. Key Dimensions, Factors, and Illustrative Interview Evidence

Dimension	Key factors	Illustrative interview excerpts
Sociocultural factors	Rural demographic changes; migration and loss of human capital; aging of the rural population; retention and presence of rural youth; rural social participation and cohesion; social networks and local communication; attitudes toward and acceptance of education; attitudes toward and acceptance of technology and innovation; cultural readiness for digital transformation; digital literacy of rural households; digital generational gap; participation and role of rural women; participation and access of disadvantaged groups; educational and digital equity; cultural and ethnic diversity; motivation and culture of lifelong learning; rural entrepreneurial culture; changes in rural lifestyles; changes in rural employment patterns; rural cultural capital; local learning networks and environments	Interviewee 2: “Acceptance of digital education in villages depends on families’ attitudes and their familiarity with technology.” Interviewee 16: “If training is not aligned with local culture and the needs of rural youth and women, participation declines.”
Technological	Rural communication infrastructure and access; access to and affordability of digital equipment and services; quality of communication services; digital education infrastructure and models; artificial intelligence; educational technologies; access to and quality of digital educational content; rural digital services and platforms; information literacy; cybersecurity and digital trust; localization and adaptation of technology to rural needs; low-cost technologies; electrification and sustainability of energy required for technology; digital divide; speed of technological change; updating and adaptation of technological infrastructure; access to technical support services	Interviewee 7: “Weak Internet connectivity and the cost of digital equipment limit many rural residents’ access to online education.” Interviewee 11: “Developing user-friendly platforms and educational content tailored to rural conditions can improve the effectiveness of digital learning.”
Economic	Economic capacity and purchasing power of rural households; cost of rural education; investment in digital infrastructure and technology development; financing and investment in rural education; private-sector investment; access to financial resources and facilities for rural businesses; diversity of employment opportunities; rural entrepreneurship; development of knowledge-based rural economy and businesses; access to national and global markets; productivity and economic returns of education and human capital; return on digital investment; economic	Interviewee 2: “The cost of attending courses and purchasing digital equipment is a major obstacle for low-income rural households.” Interviewee 19: “Continuity of educational programs depends on sustainable financing and private-sector participation.”

Dimension	Key factors	Illustrative interview excerpts
	incentives for education; knowledge-based economy; financial sustainability of educational programs	
Environmental	Climate change and rising temperatures; natural disasters; degradation and erosion of natural resources; decline in agricultural productivity; changes in agricultural production patterns; food security; economic resilience to crises; environmental and climate education and literacy; education for sustainable development; smart agriculture; green technologies; renewable energy; water-use efficiency; waste management; biodiversity; adaptation to climate change; resilient infrastructure	Interviewee 3: "Climate change and water scarcity mean that farmers need training in new, environmentally adapted practices." Interviewee 14: "Training in modern agricultural technologies can help reduce water consumption and increase rural resilience."
Political	Rural development, education, and skills-development policies; digital transformation policies; artificial intelligence and the digital economy; digital governance; rural governance; policy stability; long-term planning and policy foresight; stakeholder and private-sector participation in policy-making; decentralization and the role of local institutions in rural governance; technology laws and regulations; regional, educational, and digital equity; support for disadvantaged groups; policy monitoring and evaluation; policy enforcement; educational human resource management	Interviewee 5: "Frequent changes in policies and managers prevent some rural educational programs from continuing." Interviewee 10: "Coordination between government and local institutions is essential for developing digital infrastructure and skills."
Intellectual and philosophical	Foresight and mental readiness for the future of education; systems thinking; critical thinking; social and digital responsibility; equity and equality of technological and learning opportunities; localization of knowledge; human–technology relationship; rural identity; acceptance of changes in occupational roles; redefinition of the concept of skills and competencies; redefinition of the concepts of human capital, education, and empowerment	Interviewee 1: "In the future, skills development will not be limited to learning one occupation; the ability to adapt to technological change will also matter." Interviewee 16: "Rather than viewing technology only as a tool, the relationship between people, local knowledge, and technology should be considered in empowering rural residents."

3.3 Step 3: Extraction of Driving Forces

Driving forces are fundamental forces that operate as causes underlying other variables and have the potential to generate major changes. Driving forces have three characteristics: high influence, high uncertainty, and relative independence.

To determine the driving forces affecting education and empowerment of rural human capital in the era of digital transformation, the key factors identified in the previous stage were incorporated into a Delphi questionnaire. Following the identification of factors affecting the future of education and empowerment of rural human capital through document review and semi-structured interviews, an initial list of factors was extracted, and the Delphi questionnaire was developed after coding and categorization.

In the questionnaire, the identified factors were presented as specific items, and the experts were asked to assess the importance and uncertainty of each factor in shaping the future of education and empowerment of rural human capital in the era of digital transformation. A five-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree) was used to assess the factors.

The content validity of the questionnaire was assessed using expert judgment. The initial questionnaire was provided to subject-matter experts, who were asked to assess the appropriateness, clarity, and relevance of each

factor to the research topic. Items considered ambiguous or conceptually overlapping were revised, merged, or removed based on expert feedback. Following these revisions, the final version of the questionnaire was prepared for the first Delphi round.

In the first Delphi round, the factors identified in the qualitative stage were provided to 20 experts, and each factor was assessed in terms of importance and uncertainty. After collecting the questionnaires, descriptive indicators and the level of expert agreement were calculated for each factor. Factors that did not reach an acceptable level of importance and agreement according to the predetermined criteria were removed from the list, while factors with ambiguity or conceptual overlap were revised or merged where necessary. As a result, 53 factors remained from the 96 initial factors for examination in the second Delphi round.

In the second Delphi round, the list of 53 remaining factors, together with the results of the first round, was provided to the same group of experts so that they could reconsider their assessments with knowledge of the group's overall views. After analyzing the results of the second round, the factors were classified based on two criteria: importance and uncertainty. Expert consensus was defined as achieving an acceptable level of agreement in the evaluation of each factor. Finally, 38 factors with high importance and high uncertainty were selected as key factors for continuing the foresight process and developing the scenarios (Table 4).

Table 4. Mean Importance Scores for the 38 Key Factors (Second Delphi Round)

Mean importance score	Key factor	No.	Mean importance score	Key factor	No.
4.55	Policies on digital transformation, artificial intelligence, and the digital economy	20	4.60	Attitudes toward and acceptance of technology and innovation	1
4.60	Digital governance	21	4.55	Cultural readiness for digital transformation	2
4.30	Rural governance	22	4.50	Digital literacy of rural households	3
4.40	Long-term planning and policy foresight	23	4.20	Generational digital divide	4
4.20	Policy stability	24	4.45	Participation and access for disadvantaged groups	5
4.35	Policy implementation guarantees	25	4.75	Rural communication infrastructure and access	6
4.50	Redefining the concepts of skills and competencies	26	4.65	Quality of communication services	7
4.20	Acceptance of changes in occupational roles	27	4.70	Infrastructure and models for digital education	8
4.40	Foresight and mental readiness for the future of education	28	4.30	Artificial intelligence	9
4.30	Systems thinking	29	4.45	Educational technologies	10
4.45	Critical thinking	30	4.50	Access to and quality of digital educational content	11
4.25	The relationship between humans and technology	31	4.35	Updating and adaptation of technology infrastructure	12
4.50	Redefining the concepts of human capital, education, and empowerment	32	4.50	Financing and investment in rural education	13
4.60	Educational and digital equity	33	4.60	Investment in digital infrastructure and technology development	14
4.55	Regional, educational, and digital equity	34	4.15	Private-sector investment	15

Mean importance score	Key factor	No.	Mean importance score	Key factor	No.
4.45	Support for disadvantaged groups	35	4.20	Financial resources and business loans for rural enterprises	16
4.40	Participation and access for disadvantaged groups	36	4.55	Financial sustainability of educational programs	17
4.30	Decentralization and the role of local institutions	37	4.10	Economic incentives for education	18
4.35	Stakeholder and private-sector participation in policy-making	38	4.45	Rural development, education, and skills-training policies	19

Content Validity Index (CVI) was also used to assess the content validity of the questionnaire. To calculate the CVI, experts were asked to indicate the relevance of each item using a four-point scale: 1 = not relevant; 2 = requires major revision; 3 = relevant but requires revision; and 4 = highly relevant. The number of experts selecting options 3 and 4 was divided by the total number of experts. If the resulting value was less than 0.70, the item was rejected; values between 0.70 and 0.79 required revision; and values greater than 0.79 were considered acceptable. In the present study, all items obtained values above 0.70.

Ultimately, the matrix provided a useful and concise clustering of the factors influencing the phenomenon under study, through which 38 key factors with high influence and uncertainty were selected. These factors were grouped according to shared concepts and underlying causes, forming six major categories or driving forces, which are presented in Table 5 along with their alternative states.

Table 5. Driving Forces Affecting Education and Empowerment of Rural Human Capital in the Era of Digital Transformation

No	Key factors	Driving forces	Alternative states
1	1. Attitudes toward and acceptance of technology and innovation; 2. Cultural readiness for digital transformation; 3. Digital literacy of rural households; 4. Digital generational gap; 5. Participation and access of disadvantaged groups	Social and cultural acceptance of digital transformation in rural areas	1. High acceptance and readiness 2. Resistance and low readiness
2	1. Rural communication infrastructure and access; 2. Quality of communication services; 3. Digital education infrastructure and models; 4. Artificial intelligence; 5. Educational technologies; 6. Access to and quality of digital educational content; 7. Updating and adaptation of technological infrastructure	Development of rural digital education technology and infrastructure	1. Rapid and inclusive technological development 2. Slow and unequal technological development
3	1. Financing and investment in rural education; 2. Investment in digital infrastructure and technology development; 3. Private-sector investment; 4. Access to financial resources and facilities for rural businesses; 5. Financial sustainability of educational programs; 6. Economic incentives for education	Economic support and financial sustainability of rural education and empowerment	1. Extensive and sustainable investment and financial support 2. Limited and unstable investment and financial support
4	1. Rural development, education, and skills-development policies; 2. Digital transformation policies, artificial intelligence, and the digital economy; 3. Digital governance; 4. Rural governance; 5. Long-term planning and policy foresight; 6. Policy stability; 7. Policy enforcement	Governance and policy coherence for rural digital transformation	1. Integrated, stable, and future-oriented policy-making 2. Fragmented, unstable, and short-term policy-making

No	Key factors	Driving forces	Alternative states
5	1. Redefinition of the concept of skills and competencies; 2. Acceptance of changes in occupational roles; 3. Foresight and mental readiness for the future of education; 4. Systems thinking; 5. Critical thinking; 6. Human–technology relationship; 7. Redefinition of the concepts of human capital, education, and empowerment	Flexibility and redefinition of the rural skills and human capital system	1. Dynamic, future-oriented, and adaptive skills system 2. Static, traditional, and inflexible skills system
6	1. Educational and digital equity; 2. Regional, educational, and digital equity; 3. Support for disadvantaged groups; 4. Participation and access of disadvantaged groups; 5. Decentralization and the role of local institutions; 6. Stakeholder and private-sector participation in policy-making	Equity and inclusion in rural education and digital transformation	1. Equitable and inclusive access 2. Unequal and concentrated access

3.4 Step 4: Identification of Key Uncertainties

In scenario planning using the Global Business Network approach, uncertainties are selected from among the driving forces based on expert judgments. At this stage, the list of driving forces was provided to the experts so that they could rate them according to two criteria: degree of influence (importance) and uncertainty (ambiguity). The ratings were made using a three-point scale (1, 0.5, and 0.1), and the final score for each factor was calculated by multiplying its influence score by its uncertainty score.

Accordingly, the two driving forces with the highest scores—social and cultural acceptance of digital transformation in rural areas and development of rural digital education technology and infrastructure—were identified as the key uncertainties for scenario generation (Table 6).

Each selected uncertainty consisted of two alternative states that, when combined with one another, formed the logic of the scenarios. Social and cultural acceptance of digital transformation in rural areas comprised two alternative states: high acceptance and readiness, and resistance and low readiness. Development of rural digital education technology and infrastructure also comprised two alternative states: rapid and inclusive technological development, and slow and unequal technological development.

Table 6. Ranking of the Driving Forces

No	Driving forces	Importance score	Uncertainty score	Final score
1	Social and cultural acceptance of digital transformation in rural areas	0.89	0.82	0.73
2	Development of rural digital education technology and infrastructure	0.93	0.76	0.71
3	Economic support and financial sustainability of rural education and empowerment	0.86	0.71	0.61
4	Governance and policy coherence for rural digital transformation	0.81	0.68	0.55
5	Flexibility and redefinition of the rural skills and human capital system	0.84	0.61	0.51
6	Equity and inclusion in rural education and digital transformation	0.79	0.57	0.45

3.5 Step 5: Scenario Development

After identifying the key uncertainties, a 2×2 scenario matrix was constructed based on their alternative states. Before writing the scenarios, the overall narrative structure needs to be determined. Three common narrative structures in this regard are winners and losers, challenge and response, and evolution. In the present study, the challenge-and-response structure was employed. In this structure, conditions are depicted in which the outcomes of actions taken by groups and individuals in response to challenges constitute the basis of the story.

These narrative structures reflect the key factors and important trends identified through interviews and

documentary studies in the scenarios and contribute to enriching them. Scenario titles should also be creative and evocative of their overall nature. For this purpose, titles inspired by philosophical concepts were used to name the scenarios.

After establishing the logic and overall structure of the scenarios, the narrative of each scenario was developed. Finally, the scenarios were reviewed and refined based on the criteria of internal consistency, plausibility, challenge, and relevance.

It should also be noted that, in qualitative research, the criterion of credibility concerns not merely the results but also the process through which the results are reached and derived. In this study, peer review and respondent validation were used to examine credibility and ensure meaningful convergence among findings derived from multiple sources.

4. Research Findings

Based on the results of environmental scanning, documentary analysis, expert interviews, and the Delphi process, six major driving forces affecting the future of education and empowerment of rural human capital were identified. Among these driving forces, social and cultural acceptance of digital transformation in rural areas and development of rural digital education technology and infrastructure were identified as the two key uncertainties with the highest levels of importance and uncertainty. The combination of the alternative states of these two uncertainties formed the future scenario space and resulted in four distinct futures for education and empowerment of rural human capital in Iran in the era of digital transformation. The four alternative scenarios are presented in Table 7, and the general framework of each scenario is described below.

Table 7. Alternative Scenarios for Education and Empowerment of Rural Human Capital in the Era of Digital Transformation

Social and cultural acceptance of digital transformation	Development of rural digital education technology and infrastructure	Scenario
High acceptance and readiness	Rapid and inclusive technological development	Scenario 1: Smart Villages, Empowered People
Low acceptance / resistance and low readiness	Rapid and inclusive technological development	Scenario 2: Bright Lights, Dark Homes
High acceptance and readiness	Slow and unequal technological development	Scenario 3: Ready Hands, Distant Tools
Low acceptance / resistance and low readiness	Slow and unequal technological development	Scenario 4: A Land Left Behind by Change

4.1 Scenario 1: Smart Villages, Empowered People

In this scenario, digital transformation in rural areas occurs simultaneously with rapid and inclusive development of technology and infrastructure, along with high social and cultural acceptance and readiness. In such a future, digital technology gradually moves from being a peripheral tool to becoming an integral part of everyday life and the rural development process, while access to the Internet, digital services, educational platforms, and emerging technologies expands across rural areas. Reduced access costs, improved communication quality and coverage, and the development of infrastructure suited to the geographical conditions of rural areas enable residents to make greater use of educational, informational, and economic opportunities.

In this context, social acceptance of technology also increases in parallel with infrastructural development. Rural households, different social groups, and different generations perceive technology not as a threat to their way of life but as a tool for expanding opportunities for learning, employment, and social participation. The expansion of digital literacy and the emergence of a culture of lifelong learning create the conditions for creative and purposeful use of technology. Consequently, the gap between access to technology and the ability to benefit from it is reduced, while the human capacities of rural areas to adapt to economic and social changes are strengthened.

In such an environment, education and empowerment also move away from limited and episodic models and become continuous, flexible processes aligned with environmental changes. Digital skills, critical thinking, problem-solving, entrepreneurship, information literacy, and the ability to adapt to new technologies become increasingly important. The concept of rural human capital is also redefined in this scenario, such that

indigenous knowledge and professional and experiential skills are combined with digital knowledge and the ability to use technology.

At the same time, technological development is accompanied by transformations in the economic structure of rural areas. Access to broader markets, e-commerce, digital financial services, smart agriculture, knowledge-based businesses, and new occupations creates more diverse opportunities for the economic utilization of human capital. Consequently, education is no longer merely a means of increasing individual knowledge but becomes one of the core elements of increasing productivity, diversifying the rural economy, and creating new income-generating opportunities.

Under these conditions, governance also moves toward integrated, future-oriented, and participatory policy-making, and efforts are made to align digital development with the social, economic, and environmental requirements of rural areas. Attention to educational and digital equity, support for disadvantaged groups, and participation of local institutions and the private sector prevent technological development from contributing to widening existing gaps. Therefore, in this scenario, digital transformation not only changes rural infrastructure but also strengthens human capabilities, expands learning and employment opportunities, and contributes to the emergence of a dynamic and future-adaptive rural human capital.

4.2 Scenario 2: Bright Lights, Dark Homes

In this scenario, technology and digital infrastructure develop at an appropriate speed and scale, but social and cultural acceptance of digital transformation remains low. From a technical perspective, many rural areas have access to the Internet, equipment, platforms, and new technologies; however, the availability of infrastructure does not necessarily imply its effective use. Technology has entered the rural environment, but part of the population continues to show caution or resistance toward the changes resulting from it.

Under these conditions, the main gap is no longer between the presence or absence of technology, but between access, acceptance, and effective use. Some households and social groups may have access to digital tools and services, but because of low digital literacy, concerns about the consequences of technology, weak digital trust, or generational differences, they may not fully utilize the available capacities. As a result, technological investments do not necessarily translate to the same extent into educational, economic, and social opportunities.

In the field of education and empowerment, technology creates new possibilities, but the culture of learning and technology use has not developed in parallel. Digital programs and content are available, but their use may focus more on access to information than on generating changes in learning and empowerment patterns. Under these conditions, lifelong learning and the development of new skills encounter cultural and attitudinal barriers, and part of the investment in educational infrastructure becomes disconnected from the actual capacity of society to benefit from it.

This situation can also be reflected in the rural labor market and economy. Although digital tools provide opportunities to enter new markets and establish innovative businesses, low social acceptance can slow the emergence of such activities. Therefore, the main issue in this scenario is not a lack of technology but the conversion of existing technology into real human and economic capacity. In such a future, policies focused solely on developing equipment and infrastructure cannot adequately respond to rural needs. Enhancing digital literacy, social trust, the culture of learning, participation of different groups, and readiness to accept change becomes as important as technological development itself. Otherwise, rural areas may become digitally equipped in appearance and infrastructure, while a substantial portion of their human capacity remains outside this process. This condition is represented by the title Bright Lights, Dark Homes.

4.3 Scenario 3: Ready Hands, Distant Tools

In this scenario, unlike the previous one, social and cultural acceptance of digital transformation is high, but technological and infrastructural development proceeds slowly and unevenly. Rural communities have greater readiness to learn about and use technology, and residents, particularly younger generations, recognize the opportunities created by digital transformation for education, employment, and economic activities. However, the necessary facilities to translate this readiness into action are not available in all areas.

Under these conditions, demand for digital education and skills increases, but infrastructural capacity to respond to this demand is limited.

Differences in Internet quality and coverage, the cost of equipment and services, unequal access to educational platforms and content, and inadequate technical support prevent the opportunities created by social readiness from being realized equally across rural areas. Consequently, the digital divide is attributable less to social resistance than to differences in access to facilities and infrastructure.
In this future, rural human capital has substantial potential in terms of motivation and readiness for change, but the lack of adequate tools prevents this potential from being fully realized. Individuals may be willing to acquire new skills, use digital markets, or establish new businesses, but limitations in connectivity, equipment, services, and financial resources reduce the possibility of realizing these capabilities. As a result, a gap emerges between readiness for change and the practical ability to implement change.
This situation is also reflected in the rural economy. Greater awareness of opportunities associated with e-commerce, digital financial services, smart agriculture, and new businesses increases potential demand for participation in the digital economy, but infrastructural weaknesses hinder the balanced expansion of such activities. Consequently, some areas or groups with better infrastructure benefit more rapidly from emerging opportunities, while more disadvantaged areas face a greater risk of falling further behind.
From this perspective, the central challenge in this scenario is to create a bridge between human readiness and technological capacity. The social and cultural capital required to accept transformation exists, but development policies need to combine this readiness with sustained investment in infrastructure, reduced access costs, expanded digital services, financial support, and infrastructure suited to the needs of rural areas. Otherwise, a society that is ready for change will not be able to fully benefit from digital transformation because the necessary tools are unavailable.

4.4 Scenario 4: A Land Left Behind by Change

In this scenario, the development of digital technology and infrastructure is slow and unequal, while social and cultural acceptance of digital transformation also remains low. This situation combines two fundamental constraints that reinforce one another. On the one hand, weak infrastructure, access costs, low service quality, and regional inequality restrict digital opportunities; on the other hand, low social readiness and acceptance reduce effective demand for and use of technology. Under such conditions, digital transformation cannot become an inclusive component of the rural development process, and education and empowerment remain largely dependent on traditional models and existing skills. New learning opportunities become available only in limited and fragmented forms, while a culture of lifelong learning and the redefinition of skills fail to develop at the necessary pace. Consequently, the gap between the skills required by the future economy and the existing capabilities of rural human capital widens.
The continuation of this situation can have broader consequences for rural human capital. Limited educational and new employment opportunities, particularly for young people, may reduce the attractiveness of remaining in rural areas and create conditions for the departure of some of the active and educated workforce. Conversely, the decline in human capital can further weaken the capacity of rural areas to adopt technology, establish new businesses, and participate in the digital economy, thereby creating a cycle of human and technological underdevelopment.
In this scenario, the rural economy also faces greater constraints. Limited access to new markets, financial services, and economic information, together with restricted investment and private-sector activity, reduces the potential for diversification of the rural economy. At the same time, low social demand for technology and weak infrastructure reduce incentives for further investment, potentially creating a cycle of low demand, low investment, and limited opportunities. Simultaneously, educational and digital inequalities intensify, and groups and areas that were initially less advantaged become even more distant from the opportunities created by digital transformation. Under such circumstances, short-term and fragmented policies cannot by themselves change the existing trajectory. An integrated approach is required that links infrastructure development with enhanced digital literacy, strengthened social acceptance, skills redefinition, support for disadvantaged groups, and strengthening the capacity of local institutions.
Therefore, A Land Left Behind by Change represents a future in which the simultaneous weakness of technology and social readiness limits

the ability to benefit from the potential of digital transformation and increases the distance between rural areas and emerging economic, educational, and social trends. In this context, the issue is not merely technological lag but also the risk of continuing and reproducing human, economic, and educational gaps.

Economic and environmental factors should also be considered as contextual conditions affecting the empowerment of rural human capital. From an environmental perspective, climate change, water scarcity, and changes in rural production conditions may alter the skills required and increase the importance of training in resource management, smart agriculture, and adaptation to environmental risks. From an economic perspective, the financial sustainability of education, household affordability, investment in digital infrastructure, and the capacity to create employment aligned with new skills affect the extent to which rural residents can benefit from digital transformation. Thus, access to technology and social acceptance alone are not sufficient to achieve the desirable scenario; positive outcomes depend on the links among education, financing, economic opportunities, and the capacity to adapt to environmental conditions. To improve the policy usefulness of the scenarios, the following indicators are proposed for future monitoring: employment rates among trained individuals, labor productivity, the urban-rural skills gap, completion rates for digital-education courses, net migration among the working-age population, the financial sustainability of educational programs, and the uptake of climate-adaptive skills. These indicators can be used to monitor future developments and compare the trajectories associated with the scenarios. Given the foresight nature of the study, the expected direction of change in these indicators can be discussed in relation to each scenario; however, determining target values or making reliable quantitative projections would require baseline data and additional analysis.

5. Discussion and Conclusion

The findings of the study showed that the future of education and empowerment of rural human capital in Iran in the era of digital transformation is not the result of the influence of a single factor or merely technological development; rather, it is shaped by the interaction of a set of social, cultural, technological, economic, political, and intellectual factors. Among the identified driving forces, social and cultural acceptance of digital transformation in rural areas and development of rural digital education technology and infrastructure had the highest levels of importance and uncertainty and were therefore identified as the two key uncertainties. The significance of this finding lies in the fact that the future of digital transformation in rural areas cannot be explained solely by the level of access to technology. Instead, the way rural communities interact with technology and their readiness to accept and effectively use technological changes, together with infrastructural capacity, will determine future trajectories.

From the perspective of digital divide theory, the digital divide is not limited to the absence of physical access to technology; it also encompasses differences in the ability to use technology effectively, digital skills, quality of access, and the ability to transform access into real opportunities (Azizi & Tajari, 2026b). Accordingly, a village may have a relatively favorable communication infrastructure, but if households lack sufficient digital literacy or have negative attitudes toward technology, the actual potential of digital transformation may not be realized. This is why the Bright Lights, Dark Homes scenario demonstrates that infrastructure development, without the necessary social and cultural capacity, does not necessarily result in the empowerment of human capital. Conversely, the Ready Hands, Distant Tools scenario shows that the existence of social and cultural readiness, without appropriate infrastructure, cannot lead to the full realization of digital opportunities. In this situation, demand and motivation for learning and using technology exist, but limitations in connectivity quality, access to equipment, digital content, services, and financial resources reduce the possibility of transforming this readiness into actual capacity.

Therefore, the findings indicate a reciprocal relationship between social capacity and technological capacity. Digital development can contribute to human capital empowerment when both the ability to use and the opportunity to use technology are simultaneously available. This finding can also be explained through the logic of diffusion of innovation theory. Technology adoption in a society is not merely a function of the existence of an innovation; it also depends on individuals' perceptions of its usefulness, its compatibility with existing values and needs, opportunities for

experimentation and learning, and the social conditions of adoption. In rural communities, where social, cultural, and economic structures have particular characteristics, technology becomes a transformative force when it is connected to living conditions, real needs, and local capacities. Therefore, low social acceptance in the Bright Lights, Dark Homes scenario can be interpreted as an indication of a gap between technological supply and the social context of technology use. Under such conditions, even advanced technologies may fail to produce the expected effects in education and empowerment.

The findings also showed that the concept of rural human capital needs to be redefined under conditions of digital transformation. Traditional human capital models place greater emphasis on knowledge, educational attainment, and skills related to existing activities, whereas in a rapidly changing digital environment, the capacity for continuous learning, adaptability, digital literacy, critical thinking, problem-solving, entrepreneurship, and creative use of technology becomes increasingly important. The identification of flexibility and redefinition of the rural skills and human capital system as a driving force indicates that the main issue is not merely the transfer of new skills, but a change in the definition of what it means to be empowered in the rural society of the future.

This issue is also important from the perspective of human capital theory. If education is viewed as an investment to increase individual and social capabilities, digital transformation changes both the scope and nature of this investment. Education is no longer intended only to increase productivity in existing occupations; it should also prepare individuals for reskilling, occupational change, creation of new activities, and adaptation to economic and environmental transformations. From this perspective, the empowerment of rural human capital should move away from limited and short-term training toward the development of sustainable capabilities for continuous learning and adaptation.

Another important finding concerns the position of economic and governance factors alongside the two key uncertainties. Although these two driving forces were not ultimately selected as the main axes of scenario development, their scores indicated that economic support and financial sustainability of rural education and empowerment and governance and policy coherence for rural digital transformation are influential factors in shaping future pathways. This finding shows that digital development is not merely a technological process and that its realization requires an appropriate economic and institutional environment. Infrastructure, education, digital services, and empowerment programs all depend on financial resources, policy stability, institutional coordination, and implementation capacity.

From this perspective, the scenarios developed in the study should not be regarded as four completely separate conditions, but rather as four different pathways of interaction between society and technology. In Smart Villages, Empowered People, synergy between social readiness and infrastructure development enables technology to become a real opportunity for enhancing human capital. In Bright Lights, Dark Homes, technological capacity advances beyond social capacity, and consequently part of the available technological resources remains underutilized. In Ready Hands, Distant Tools, social capacity advances beyond technological capacity, and the main problem is the inability to transform readiness into real opportunities. Finally, A Land Left Behind by Change represents a condition in which weaknesses in both dimensions reinforce one another, increasing the likelihood of reproducing digital and human underdevelopment.

This pattern highlights the importance of a systems approach to rural development. From a systems perspective, change in one component can produce consequences in other components. For example, digital infrastructure development can increase access to education and markets, but its effects are limited when skills and social acceptance are absent. Conversely, increased skills and willingness to use technology, without adequate access, may not lead to the realization of expected opportunities. Therefore, education, technology, the economy, culture, and governance cannot be considered separately in rural policy-making.

The findings also indicate that equity and inclusion should be regarded as fundamental considerations in the future of digital education and empowerment. Uneven infrastructure development can increase disparities between rural areas and even among different groups within the same rural community. In this context, the issue is not merely whether individuals have access to the Internet; the quality of access, ability to use technology, cost of

equipment and services, learning opportunities, and the capacity to transform digital skills into economic opportunities are also important. Therefore, if digital transformation proceeds without consideration of regional and social differences, it may create new forms of inequality rather than reduce existing inequalities.

Likewise, the future of rural human capital education and empowerment cannot be considered independently of environmental and climatic developments. Climate change, declining natural resources, and changes in production patterns alter the skills required by rural residents. Under such conditions, future human capital should possess not only digital skills but also the capacity to adapt to environmental changes, use smart technologies, improve resource efficiency, and engage in sustainable economic activities. Therefore, the relationship between digital transformation and the green transition can represent an important dimension of the future of rural empowerment.

Based on the findings of the study and the four scenarios developed for the future of rural human capital education and empowerment in the era of digital transformation, it is suggested that policy-making in this field move beyond a purely technological approach and pursue infrastructure development and human capacity development simultaneously. Since social and cultural acceptance of digital transformation and the development of rural digital education technology and infrastructure were identified as the two key uncertainties, digital development programs should not only expand access to the Internet and digital equipment but also focus on enhancing digital literacy, increasing social readiness, strengthening trust, and developing a culture of lifelong learning.

Furthermore, in view of the driving force of flexibility and redefinition of the rural skills and human capital system, education and empowerment should move from the transfer of fixed and short-term skills toward the development of continuous learning capabilities, reskilling, technological adaptation, and skills aligned with future occupations. In this regard, linking digital education with real economic opportunities—including entrepreneurship, e-commerce, digital financial services, smart agriculture, and knowledge-based businesses—can create conditions for converting acquired skills into employment and income opportunities.

Given the importance of economic support and financial sustainability, investment in digital infrastructure and empowerment programs should move beyond short-term and project-based arrangements and be supported by sustainable financing mechanisms. Attention to equity and inclusion is also essential because differences in economic, geographical, generational, and social conditions may cause the benefits of digital transformation to be distributed unequally. Therefore, targeted support for disadvantaged areas and groups, together with simultaneous attention to access, affordability, connectivity quality, and the ability to use technology, should be incorporated into policy-making.

Moreover, given the role of governance and policy coherence, coordination among education, technology, employment, economic, and rural development policies is necessary. The use of foresight-oriented approaches and continuous monitoring of technological trends can also help reduce short-term and reactive decision-making. Alongside these measures, the participation of local institutions, the private sector, rural organizations, and rural residents themselves in designing and implementing digital transformation programs can improve the alignment of programs with the actual needs and capacities of different rural areas.

Given the presence of environmental factors among the influential variables, it is also recommended that future education and empowerment programs include skills related to smart agriculture, resource management, water and energy efficiency, green technologies, and adaptation to climate change.

Finally, like any foresight study, the present research has several limitations. First, the scenarios developed were based on expert judgments and perceptions and therefore do not represent deterministic predictions of the future. Rather, they constitute coherent images of possible futures based on the knowledge and assessments of experts at the time of the study. Second, although efforts were made to select experts with experience in academic, policy-making, technological, and rural-activity domains, the sample was selected purposively and therefore did not directly reflect the perspectives of all stakeholders, particularly the broad population of rural residents and different social groups. Third, the rapid pace of technological change, particularly in artificial intelligence, digital platforms, and smart technologies, means that some of the identified

trends and uncertainties may change over time. Therefore, the scenarios presented require periodic review and updating. Fourth, the predominantly qualitative nature of the study meant that the consequences of each scenario were not measured quantitatively in terms of indicators such as employment, income, productivity, or human capital levels, but rather the study focused primarily on explaining possible future pathways. In addition, the complexity of interactions among social, technological, economic, environmental, and political factors means that some long-term feedback effects cannot be fully captured within the present scenario framework.

Accordingly, future studies are recommended to employ mixed methods, quantitative modeling, system dynamics, and regional studies to examine the consequences of each scenario in greater detail. Finally, given the changing economic, policy, and technological conditions, the findings of this study should be considered as a framework for thinking about the future and increasing preparedness for different possible futures, rather than as a deterministic prediction of a specific situation. Therefore, continuous revision of the scenarios based on new data and the participation of diverse stakeholders can help maintain their validity and usefulness in planning and policy-making processes.

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Conflict of interest

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آینده‌نگاری آموزش و توانمندسازی سرمایه انسانی روستایی ایران در عصر تحول دیجیتال

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چکیده مبسوط

۱.مقدمه

تحول دیجیتال در سال‌های اخیر، شیوه‌های آموزش، یادگیری و توانمندسازی سرمایه انسانی را به‌طور چشمگیری دگرگون کرده است. گسترش اینترنت، پلتفرم‌های آموزشی، هوش مصنوعی، فناوری‌های آموزشی و خدمات دیجیتال، فرصت‌های تازه‌ای برای ارتقای دانش، مهارت و قابلیت‌های افراد فراهم کرده است. این تحولات در نواحی روستایی از اهمیت بیشتری برخوردارند زیرا آموزش و توانمندسازی سرمایه انسانی می‌تواند در ارتقای قابلیت‌های اقتصادی و اجتماعی، تنوع‌بخشی به فرصت‌های شغلی، کاهش مهاجرت نیروی انسانی و تقویت ظرفیت‌های توسعه محلی نقش داشته باشد. پژوهش حاضر با هدف آینده‌نگاری آموزش و توانمندسازی سرمایه انسانی روستایی ایران در عصر تحول دیجیتال انجام شده و درصدد پاسخ به این پرسش است که مهم‌ترین عوامل مؤثر بر آینده این حوزه کدام‌اند و ترکیب وضعیت‌های مختلف چه سناریوهایی را شکل می‌دهد؟

۲.مبانی نظری تحقیق

سرمایه انسانی روستایی مجموعه‌ای از دانش، مهارت‌ها، قابلیت‌ها، تجربیات و ظرفیت‌های افراد ساکن در نواحی روستایی است که می‌تواند در فرآیند توسعه اقتصادی، اجتماعی و محیطی مورد استفاده قرار گیرد. آموزش و توانمندسازی، از مهم‌ترین سازوکارهای ارتقای این سرمایه محسوب می‌شوند و در عصر تحول دیجیتال، مفهوم آن‌ها نیز از آموزش‌های سنتی و محدود به آموزش مستمر، انعطاف‌پذیر، مهارت‌محور و مبتنی بر فناوری گسترش یافته است. تحول دیجیتال نیز فراتر از دیجیتالی‌کردن ابزارها، به تغییر در فرایندها، ساختارها، شیوه‌های یادگیری، الگوهای اشتغال و روابط میان انسان و فناوری اشاره دارد. در محیط روستایی، تحقق این تحول تحت تأثیر مجموعه‌ای از عوامل اجتماعی، فناورانه، اقتصادی، محیطی، سیاسی و فکری قرار می‌گیرد. از منظر آینده‌نگاری، آینده یک وضعیت از پیش تعیین‌شده نیست، بلکه می‌تواند تحت تأثیر پیشران‌ها و عدم‌قطعیت‌های مختلف به مسیرهای متفاوتی حرکت کند. در این میان، برنامه‌ریزی سناریو امکان شناسایی و تصویرسازی آینده‌های بدیل را فراهم می‌کند.

۳.روش تحقیق

پژوهش حاضر از نظر رویکرد، آینده‌نگارانه و از نظر روش، مبتنی بر برنامه‌ریزی سناریو با رویکرد GBN است و مدل آینده‌نگاری مارتین به‌عنوان چارچوب کلی پژوهش مورد استفاده قرار گرفت. داده‌های مورد نیاز از طریق مطالعات اسنادی و مصاحبه‌های نیمه‌ساختاریافته با ۲۵ نفر از خبرگان حوزه‌های دانشگاهی، اجرایی و سیاست‌گذاری، فناوری و تحول دیجیتال و فعالان و تسهیلگران روستایی گردآوری شد. داده‌های حاصل با استفاده از تحلیل محتوای کیفی بررسی و عوامل، روندها، فرصت‌ها، چالش‌ها و نیروهای مؤثر استخراج و در شش بعد اجتماعی‌فرهنگی، فناورانه، اقتصادی، محیطی، سیاسی و فکری‌فلسفی سازمان‌دهی شدند. در نهایت عوامل شناسایی‌شده در قالب پرسشنامه دلفی در اختیار خبرگان قرار گرفت و اهمیت و میزان عدم‌قطعیت آن‌ها در دو دور ارزیابی شد. از میان ۹۶ عامل اولیه، ۵۳ عامل پس از دور نخست و ۳۸ عامل کلیدی پس از دور دوم شناسایی شد. سپس عوامل کلیدی بر اساس اشتراک مفهومی و علل زیربنایی در قالب شش پیشران اصلی سازمان‌دهی شدند. اهمیت و عدم‌قطعیت پیشران‌ها بررسی و با استفاده از حاصل‌ضرب این دو شاخص، عدم‌قطعیت‌های کلیدی تعیین شدند. در نهایت دو پیشران با بیشترین امتیاز، یعنی پذیرش اجتماعی و فرهنگی تحول دیجیتال و توسعه فناوری و زیرساخت‌های آموزش دیجیتال، به‌عنوان دو محور اصلی سناریونویسی انتخاب و با ترکیب وضعیت‌های بدیل آن‌ها، ماتریس ۲×۲ و چهار سناریوی آینده تدوین شد.

۴.یافته‌های تحقیق

*. نویسندهٔ مسئول:
دکتر مصطفی عزیزی شمامی
آدرس: گروه علوم تربیتی، دانشکده علوم انسانی و اجتماعی، دانشگاه مازندران، بابلسر، ایران.
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یافته‌های پژوهش نشان داد که ۳۸ عامل کلیدی شناسایی‌شده در قالب شش پیشران اصلی شامل پذیرش اجتماعی و فرهنگی تحول دیجیتال در روستا، توسعه فناوری و زیرساخت‌های آموزش دیجیتال روستایی، حمایت اقتصادی و پایداری مالی آموزش و توانمندسازی روستایی، حکمرانی و انسجام سیاستی تحول دیجیتال روستایی، انعطاف‌پذیری و بازتعریف نظام مهارت و سرمایه انسانی روستایی و عدالت و فراگیری در آموزش و تحول دیجیتال روستایی قابل دسته‌بندی هستند. که در نهایت چهار سناریوی متفاوت شامل: سناریوی اول: روستاهای هوشمند، انسان‌های توانمند، سناریوی دوم: چراغ‌های روشن، خانه‌های خاموش، سناریوی سوم: دست‌های آماده، ابزارهای دور و سناریوی چهارم: سرزمین جامانده از تغییر را شکل دادند.

۵.بحث و نتیجه‌گیری

نتایج پژوهش نشان می‌دهد که آینده آموزش و توانمندسازی سرمایه انسانی روستایی در عصر تحول دیجیتال، حاصل عملکرد منفرد فناوری نیست، بلکه از تعامل پیچیده میان ظرفیت فناورانه و زیرساختی، آمادگی اجتماعی و فرهنگی، منابع اقتصادی، حکمرانی، نظام مهارت و عدالت و فراگیری شکل می‌گیرد. شناسایی پذیرش اجتماعی و فرهنگی و توسعه فناوری و زیرساخت به‌عنوان دو عدم‌قطعیت کلیدی نشانمی‌دهد که برخورداری از فناوری بدون آمادگی اجتماعی نمی‌تواند به توانمندسازی واقعی منجر شود و از سوی دیگر وجود جامعه‌ای آماده و پذیرای تغییر نیز بدون دسترسی عادلانه به زیرساخت‌ها و ابزارهای دیجیتال، به تحقق کامل ظرفیت‌های انسانی منجر نخواهد شد. بر این اساس روستاهای هوشمند، انسان‌های توانمند تصویری از آینده‌ای است که در آن توسعه فناوری با آمادگی انسانی و اجتماعی همراه شده است. در مقابل، سه سناریوی دیگر نشان‌دهنده پیامدهای احتمالی عدم توازن میان این دو محور هستند. بنابراین سیاست‌گذاری برای آینده مطلوب آموزش و توانمندسازی سرمایه انسانی روستایی نیازمند توجه هم‌زمان به توسعه زیرساخت‌های دیجیتال، ارتقای سواد و پذیرش دیجیتال، آموزش مهارت‌های جدید، تقویت یادگیری مادام‌العمر، حمایت از گروه‌های کم‌برخوردار و ایجاد سازوکارهای پایدار اقتصادی و نهادی است. در مجموع یافته‌ها تأکید می‌کند که تحول دیجیتال زمانی می‌تواند به توانمندسازی پایدار سرمایه انسانی روستایی منجر شود که فناوری، انسان، سیاست و عدالت در یک چارچوب یکپارچه و آینده‌نگر قرار گیرند.

کلید واژه ها: آینده‌نگاری، سرمایه انسانی روستایی؛ تحول دیجیتال؛ توانمندسازی؛ آموزش روستایی.

تشکر و قدردانی

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Original Article

Identification and Prioritization of Sociological and Institutional Barriers to Rural Economic Development in Mazandaran Province Using the Delphi Method

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Abstract

Purpose- Rural economic development is fundamental to balanced regional growth and reducing spatial inequalities, requiring integrated attention to economic, social, and institutional dimensions. Despite substantial natural and human resources, rural areas of Mazandaran Province face persistent structural challenges. Many of these constraints stem from sociological and institutional factors that have not been systematically identified or prioritized. This study aims to identify, categorize, and prioritize the sociological and institutional barriers affecting rural economic development in Mazandaran Province.

Design/methodology/approach- This applied, exploratory qualitative study employed the Delphi technique. The participants included 18 expert's university faculty in development sociology, economics, and rural planning, along with specialists from executive rural development agencies and local managers selected through purposive sampling based on expertise and regional experience. Data were collected in three rounds: initial identification of barriers through semi-structured interviews and open-ended questionnaires; evaluation of their importance using a Likert-scale questionnaire; and final prioritization through controlled feedback to achieve consensus. Data were analyzed using mean, standard deviation, and Kendall's Coefficient of Concordance.

Findings- Barriers were classified into four dimensions: economic, social, cultural, and institutional. Major economic constraints included weak production and marketing infrastructure, limited access to financial resources, and reliance on traditional sectors. Social barriers involved declining social capital, youth outmigration, and weak participation. Cultural obstacles included conservative attitudes toward entrepreneurship and weak innovation culture. Institutional barriers such as centralized decision-making, bureaucratic complexity, poor inter-agency coordination, and ineffective support policies were identified as the most influential. Prioritization results indicated that institutional and social barriers exert the strongest impact on slowing rural economic development.

Originality/value- Sustainable rural development in Mazandaran Province requires addressing interconnected institutional and social weaknesses alongside economic reforms. Strengthening social capital, improving local governance, reducing bureaucracy, enhancing institutional coordination, and promoting rural entrepreneurship are essential to accelerating economic development.

Keywords- Rural Economic Development, Sociological Barriers, Institutional Factors, Delphi Method, Mazandaran Province.

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1. Introduction

In recent decades, the concept of rural development has shifted from a purely agriculture-oriented and physical perspective to a multidimensional and spatial paradigm (Hodge & Midmore, 2008). Just as the modernization of physical and industrial infrastructure was regarded as a prerequisite for economic growth in the twentieth century, in the twenty-first century "social capital" and "institutional efficiency" have become the fundamental foundations of sustainability and dynamism in rural communities within regional development systems. Under these conditions, villages are defined not only as centers for the production of raw materials but also as living spaces whose economic success depends more than on natural resources on the quality of local governance, institutional capacities, and sociological structures (Li et al., 2024). From this perspective, the development gap between urban and rural areas is no longer understood solely through levels of financial investment but is redefined in terms of inequalities in access to institutional opportunities, decision-making power, and the cohesion of social structures (Mahon, 2023).

A major issue that must be considered is that the economic and social development of villages has always been one of the fundamental and strategic challenges for policymakers and planners in developing countries (Kim & Lee, 2022). Despite the emphasis of development programs on reducing the urban–rural divide and improving the livelihoods of rural communities, many of these areas still struggle with phenomena such as poverty, unemployment, migration, and declining quality of life (Atta-Ankomah et al., 2024). This situation indicates that traditional and one-dimensional approaches especially those focused solely on economic and physical aspects have been unable to address the deeper and more complex roots of rural underdevelopment (Badri et al., 2022).

This important issue in Mazandaran Province which possesses considerable potential natural, agricultural, and human resources raises the question of why implemented programs and investments have not yielded desirable and sustainable outcomes. It appears that, in addition to obvious economic and infrastructural barriers, a set of structural and institutional factors, as well as sociological components such as cultural patterns, mechanisms of social participation, and local governance structures, play a significant role in slowing or halting the development process. The lack of precise and systematic identification of these hidden barriers and their interactions has caused development interventions to lack the necessary effectiveness and has diverted resources toward temporary and inefficient solutions instead of addressing the root causes of problems. Therefore, a deeper understanding of the nature of these challenges and their influence on rural economic development is an unavoidable necessity for designing realistic and sustainable policies.

Despite the growing body of research on rural development, several gaps remain in understanding the barriers to rural economic development, particularly in the context of Mazandaran Province. Previous studies have examined specific aspects of rural development, including agricultural skills, rural women's entrepreneurship, sustainable entrepreneurship, educational inequality, and infrastructural constraints. Although these studies have contributed to identifying important economic, social, and managerial challenges, their findings are often organized around particular sectors, population groups, or individual dimensions of development. Consequently, a more integrated understanding of how economic constraints interact with sociological and institutional barriers remains necessary. In particular, the roles of social capital, local participation, entrepreneurial culture, administrative bureaucracy, institutional coordination, and centralized decision-making need to be examined within a common analytical framework.

A further gap concerns the systematic prioritization of these barriers. Identifying development constraints does not, in itself, establish which factors should receive priority in policymaking or how experts assess their relative importance. A structured approach is therefore needed to distinguish the most critical barriers from those that are comparatively less influential, while incorporating the knowledge and experience of specialists familiar with local development conditions. Moreover, the specific institutional and socioeconomic context of Mazandaran Province warrants particular attention, as its rural development challenges need to be understood in relation to local governance arrangements, productive capacities, and patterns of social

participation rather than inferred solely from findings reported in other geographical settings.

To address these gaps, the present study adopts a three-round Delphi approach to identify, classify, and prioritize the barriers to rural economic development in Mazandaran Province across economic, social, cultural, and institutional dimensions. Its contribution lies in bringing these dimensions together within a single analytical framework and establishing a systematic ranking of the identified barriers based on expert assessments and the degree of agreement among participants. In this way, the study seeks to provide a context-sensitive empirical basis for understanding the relative importance of rural development constraints and informing more coordinated and locally responsive policy interventions.

Given these premises, the present study, drawing on modern institutional development approaches, seeks to examine how internal variables (entrepreneurial culture, social capital, and participation) interact with external pressures (centralized administrative systems and ineffective support policies) in explaining the economic situation of rural areas in Mazandaran Province. Accordingly, the main research question is: "What are the most important sociological and institutional barriers affecting rural economic development in Mazandaran Province, and how are these factors prioritized based on expert opinion?" The present study is organized into five sections. The first section introduces the research problem, its significance, and the existing gaps in the literature on rural economic development. The second section reviews the theoretical literature and previous studies on sociological and institutional barriers to rural development. The third section describes the research methodology, including the research approach, statistical population, sampling method, data collection tools, and the stages of the Delphi technique. The fourth section analyzes the findings, identifies the main dimensions of the barriers, and prioritizes them based on expert viewpoints. Finally, the fifth section presents the discussion, conclusion, policy recommendations, and research limitations.

2. Research Theoretical Literature

In rural development studies, especially when the focus of the research is on identifying social and institutional barriers, the use of multidimensional theoretical frameworks is of particular importance; because the economic development of villages is the result of a complex interaction among economic structures, formal institutions, cultural patterns, and social relations. Therefore, in analyzing the barriers to rural economic development in Mazandaran Province, it is not possible to rely solely on economic approaches; rather, it is necessary to consider the role of institutional and sociological factors alongside one another. Accordingly, the present study is based on three complementary approaches, including new institutionalism theory, social capital theory, and the community-based development approach. These three approaches, by emphasizing the role of institutions, social networks, and local participation, provide the possibility of a more comprehensive explanation of the barriers and challenges of economic development in rural communities.

2-1. New Institutionalism Theory

New institutionalism is one of the most important theoretical approaches in analyzing the processes of economic and social development, which was expanded in the final decades of the twentieth century by thinkers such as Douglas North, Oliver Williamson, and Daron Acemoglu (Acemoglu, & Robinson, 2022; Krul, 2018). This approach is based on the fundamental assumption that the economic performance of societies depends not only on natural resources, physical capital, or labor force, but also on the quality and efficiency of the institutions that organize economic and social behaviors (Zhao & Liu, 2024). From North's perspective, institutions are a set of formal and informal rules that shape human interactions and, by reducing uncertainty, make the formation of sustainable economic activities possible. These rules include formal laws, government policies, administrative structures, social norms, and cultural patterns, which together create a framework for economic decision-making (North, 1991). According to this view, in societies where efficient, transparent, and accountable institutions exist, transaction costs are reduced and a suitable environment is created for investment, innovation, and entrepreneurship. In contrast, weak institutions, complex bureaucracy, excessive centralization in decision-making, and the lack of coordination among responsible organizations can constitute serious barriers to economic development (Khan et al., 2024). In many rural areas of developing countries, institutional inefficiency manifests itself

in different forms; including weak local management systems, the absence of effective support policies, limitations in access to financial resources, and administrative complexities that hinder productive economic activities (Rodriguez-Pose & Hardy, 2015).

In this regard, rural economic development is not merely the result of increased production or investment, but rather the outcome of creating efficient institutional structures that can provide the necessary conditions for the economic participation of rural people. In other words, if development policies are designed without attention to the quality of institutions, they may fail to achieve sustainable results even when financial and natural resources are available (Westlund & Borsekova, 2023). Under such conditions, reforming institutional structures, improving local governance, increasing coordination among development organizations, and reducing bureaucratic barriers are considered among the essential prerequisites for achieving economic development in rural areas (Besley et al., 2022). Therefore, institutionalism theory provides an appropriate basis for analyzing the role of managerial and policy structures in the formation or persistence of barriers to rural economic development.

2-2. Social Capital Theory

Social capital theory is one of the important approaches in the social sciences that examines the role of social relations, trust, and interaction networks in facilitating collective action and economic development (Grootaert & van Bastelaer, 2002). This concept was first seriously introduced in the works of thinkers such as Pierre Bourdieu, James Coleman, and Robert Putnam, and gradually became one of the key concepts in the analysis of local and rural development. Social capital refers to a set of norms, values, communication networks, and mutual trust among individuals that facilitates cooperation and coordination in society (Portes, 1998). From Bourdieu's perspective, social capital is a type of social power resource that is formed through individuals' membership in stable networks of social relations (Bourdieu, 2006). Coleman also considers social capital as a factor that reduces the costs of social and economic interactions through creating trust and shared norms (Coleman, 2019). In contrast, Putnam emphasizes the role of public trust and civic participation in strengthening the efficiency of social and economic institutions. According to these views, societies that possess a high level of social capital usually enjoy greater cooperation, more active participation, and a higher ability to solve collective problems (Putnam, 2020). In rural communities, social capital plays a very important role in the development process. Kinship relations, mutual trust, cooperation in economic activities, and participation in local decision-making can provide the basis for the formation of collective economic activities, production cooperatives, and local initiatives. In contrast, declining social trust, weak collective participation, and the spread of individualism can hinder the formation of joint development actions (Liu et al., 2024). Widespread youth migration, declining social interactions, and weak local institutions are also among the factors that may weaken social capital in rural communities (Huang et al., 2023).

From the perspective of economic development, social capital acts as a complementary factor to physical and human capital. The existence of networks of trust and cooperation can facilitate the process of information exchange, access to resources, and the formation of economic activities (Zhang et al., 2024). For this reason, many development researchers believe that strengthening social capital in local communities can play an important role in the success of development programs (Sakamoto, 2024). As a result, social capital theory provides an appropriate framework for analyzing the role of trust, social participation, and relations among individuals in the formation or persistence of barriers to rural economic development.

2-3. Community-Based Development Approach

The community-based development approach is one of the important approaches in local and rural development studies that emphasizes the role of the active participation of the local community in the process of planning and implementing development programs. This approach emerged in response to traditional development models that were mainly designed from the top down (Turner & Hume, 2022). In traditional models, decisions were usually made at central levels and local communities had a limited role in determining priorities and implementing programs. Experience showed that such approaches, in many cases, were accompanied by limited success because of ignoring the real needs and capacities of local communities (Hrivnák et al., 2021). In contrast, the community-based

development approach emphasizes the principle that local residents should be regarded as the main actors in the development process. Within this framework, people's participation in decision-making, planning, and project implementation not only helps increase the efficiency of development programs, but also strengthens the sense of ownership and responsibility among community members (Oakley, 1991). Thinkers such as Robert Chambers and Norman Uphoff are among the theorists who have emphasized the importance of public participation and the empowerment of local communities in the development process (Chambers, 2022; Uphoff, 2019).

According to this approach, sustainable development is achieved when the internal capacities of the community are strengthened and individuals are able to play an active role in decision-making processes and resource management (Berkes et al., 2001). In rural communities, this can be realized through strengthening local councils, production cooperatives, self-help groups, and other people-based institutions. Such mechanisms make broader participation of rural people in economic and social activities possible and provide the ground for the formation of local initiatives (Mansuri & Rao, 2013). At the same time, the absence of appropriate institutional platforms for public participation, centralization in the decision-making system, and weak local mechanisms can hinder the realization of the community-based development approach. Under such conditions, development programs may be designed without considering the real needs of the community and, as a result, may lack the necessary effectiveness (Ahmed, 2024; Kim & Lee, 2023). Therefore, the community-based development approach provides an appropriate framework for analyzing the role of local participation, community empowerment, and the interaction between people and managerial institutions in the process of rural economic development.

Overall, the three theoretical approaches of new institutionalism, social capital, and community-based development complement one another in analyzing the barriers to rural economic development. Institutionalism theory emphasizes the role of governance structures and institutional policies in shaping the economic environment, while social capital theory addresses the importance of trust, cooperation, and social networks in facilitating economic activities. Alongside these two, the community-based development approach emphasizes the active participation of the local community and the empowerment of rural people in the development process. The combination of these three approaches makes it possible to provide a comprehensive analysis of the economic, social, and institutional barriers to rural development in Mazandaran Province and provides a theoretical basis for identifying and prioritizing these barriers in the present study.

2-4. Empirical Research Background

Falsoleiman et al. (2025), in a study aimed at examining the skill requirements of agricultural development and the barriers to its training in the rural areas of Faryab County, showed that the penetration coefficient of skill training in horticultural, livestock, and agricultural activities varies across different rural districts, and that the Golashgerd rural district had the highest level of training penetration. Their findings also showed that the barriers to acquiring agricultural skills can be classified into individual, social, economic, and infrastructural–spatial barriers. Mohammadi (2025), in a study aimed at analyzing the barriers to the development of rural women's entrepreneurship in the villages of Marivan County, also concluded that weaknesses in management, policymaking, and development planning, and consequently the unsuitability of the business environment, are among the most important factors limiting women's entrepreneurship in rural areas. Also, Hosseinikahnouj & Sojasi Geidari (2025) with the use of the fuzzy Delphi method in examining the challenges and drivers of the development and commercialization of rural knowledge-based businesses showed that factors such as failure to employ creative and problem-finding human resources, financial instability, inability to adapt products to market needs, the expansion of administrative bureaucracy, and the absence of financial support for patent registration are among the most important barriers to the success and commercialization of knowledge-based businesses in rural areas. In addition, Darvari et al. (2025), in a study on the development of sustainable entrepreneurship in coastal villages, showed that economic barriers are the most important challenge to entrepreneurship development in these areas, followed respectively by infrastructural, support

and assistance, psychological, cultural, policymaking, and educational barriers. In foreign studies as well, different dimensions of rural development barriers have been considered. Chen (2025), in a study on educational inequality and social development in less developed areas, showed that weak human capital and limited access to education are important factors in the reproduction of poverty and deprivation in rural areas, and that the educational gap between urban and rural areas can reduce economic opportunities and social participation in these areas. Kumar & Singh (2025), through a systematic review of rural development studies, also concluded that many studies suffer from conceptual dispersion and weak theoretical frameworks, and that rural development should be regarded as a multidimensional process in which social, institutional, environmental, and governance factors simultaneously play roles. Saha et al. (2025), in examining development challenges in the villages of Bangladesh, also showed that rural underdevelopment is not caused only by economic limitations, but that factors such as limited access to education, low economic participation of women, weak communication infrastructure, and dependence on traditional production methods also play an important role in this regard. In this context, Shafieisabet & Khaksar (2024), by examining modern approaches to rural development planning, emphasized that an exclusive focus on economic indicators cannot lead to sustainable rural development, and that institutional, managerial, and social dimensions must also be taken into account in development planning. In addition, Cejudo-García et al. (2022), in a study on rural regional development, showed that achieving sustainable development in these areas requires coordination among economic activities, local institutions, public services, and social capital, and that weak institutional coordination and inequality in access to services are among the most important barriers to rural development. In general, a review of foreign studies shows that the barriers to rural development are not limited only to the lack of economic resources, but that social, institutional, managerial, and structural factors also play an important role in the formation of these barriers. Therefore, a comprehensive analysis of rural development barriers requires simultaneous attention to the different economic, social, and institutional dimensions; an approach that has also been taken into consideration in the present study.

2-5. Critical Assessment of Previous Research

A critical assessment of the reviewed literature reveals both important contributions and areas requiring further investigation. Previous Iranian studies have identified diverse barriers to rural development, including skill deficiencies, limited entrepreneurial opportunities, financial constraints, infrastructural weaknesses, and shortcomings in policymaking and management (Falsoleiman et al., 2025; Mohammadi, 2025; Hosseinikahnouj & Sojasi Geidari, 2025; Darvari et al., 2025). These studies provide valuable empirical insights into specific sectors and population groups. However, their respective research focuses differ, making it necessary to examine how the identified barriers relate to one another within a broader framework of rural economic development. For example, research on agricultural skills and rural entrepreneurship highlights particular economic and human-capital constraints, whereas studies addressing knowledge-based businesses emphasize commercialization and institutional support. Although these perspectives are complementary, their findings do not, by themselves, establish the relative importance of the different categories of barriers across the wider rural development context of Mazandaran Province.

International studies further demonstrate that rural development is a multidimensional process shaped by the interaction of educational opportunities, human capital, infrastructure, social participation, institutional capacity, and governance arrangements (Chen & Liu, 2025; Shafieisabet & Khaksar, 2024; Cejudo-García et al., 2022; Kumar & Singh, 2025). An important contribution of this literature is its rejection of explanations that attribute rural underdevelopment exclusively to insufficient financial resources. Nevertheless, differences in geographical settings, institutional arrangements, and research objectives mean that findings from other regions cannot be directly generalized to Mazandaran Province without contextual assessment. Moreover, while the reviewed studies collectively identify a broad range of development constraints, a clearer comparative understanding is needed of their relative importance and the extent to which economic, social, cultural, and institutional barriers should be considered together in local development planning.

The theoretical approaches discussed in this study help address this analytical challenge. New institutionalism explains how governance structures, administrative procedures, and institutional coordination shape economic opportunities; social capital theory highlights the role of trust, networks, and collective action; and the community-based development approach emphasizes local participation and community agency. Considered together, these perspectives provide a basis for interpreting rural development barriers as interconnected rather than isolated problems. However, the theoretical integration of these perspectives must be accompanied by an empirical procedure capable of identifying and prioritizing the barriers relevant to the specific regional context.

In response to these considerations, the present study applies a three-round Delphi process involving experts familiar with rural development in Mazandaran Province. Its distinctive analytical contribution is the systematic identification, classification, and prioritization of economic, social, cultural, and institutional barriers within a single regional study. By combining qualitative identification with successive expert assessment and an evaluation of agreement, the study seeks to complement sector-specific research with a more integrated account of the constraints perceived as important by regional experts. The resulting priorities are intended to inform context-sensitive policymaking, while recognizing that expert consensus represents informed professional judgment rather than direct measurement of the causal effects of individual barriers.

3. Research Methodology

This study is applied in terms of purpose and qualitative with an exploratory approach in terms of nature, which was conducted using the Delphi technique. The main objective of the study is to identify and prioritize sociological and institutional barriers affecting rural economic development in Mazandaran Province. Considering the complexity and multidimensional nature of rural development and the necessity of utilizing the knowledge and experience of specialists, the Delphi method was selected as a systematic approach for collecting and converging expert opinions. Through several rounds of questioning and controlled feedback, this method seeks to achieve an acceptable level of consensus among experts regarding a research problem.

Table 1. Demographic Characteristics of the Research Experts

Row	Variable	Category	Frequency	Percentage
1	Gender	Male	14	78.8
		Female	4	22.2
2	Age	30–40 years	3	16.7
		40–50 years	8	44.4
		50–60 years	5	27.8
		Over 60 years	2	11.1
3	Education	MA	6	33.3
		PhD	12	66.7
4	Specialized Work Experience	10–15 years	4	22.2
		16–20 years	7	38.9
		More than 21 years	7	38.9
5	Organizational Affiliation	Universities and Academic Centers	7	38.9
		Executive Organizations Related to Rural Development	8	44.4
		Regional Planning and Management Centers	3	16.7

The statistical population of this study consists of experts and specialists familiar with issues of rural development in Mazandaran Province. These experts included university faculty members in the fields of development sociology, economics, rural planning, and geography; specialists and managers of executive agencies related to rural development (including the Agricultural Jihad Organization, the Housing Foundation of the Islamic Revolution, governorates, and provincial offices); and managers and experts with executive experience in regional planning and development. The sample was selected using purposive sampling. The criteria for selecting the experts were as follows:

1. Having academic education related to sociology, economics, planning, or rural development;
2. Having at least five years of research or executive experience in regional or rural development;
3. Sufficient familiarity with the economic and social conditions of Mazandaran Province;
4. Willingness to participate in the multi-stage research process.

Based on these criteria, 18 experts were selected to participate in the Delphi process. This number is considered appropriate for achieving scientific consensus in Delphi studies, due to the emphasis placed on the professional quality of participants (Table 1).

Regarding the data collection tools, two main instruments were used:

1. Semi-structured interviews:

In the first stage, semi-structured interviews were conducted to explore experts' views regarding the most significant barriers to rural economic development. These interviews included open-ended questions focusing on the social, cultural, economic, and institutional dimensions of rural development.

2. Delphi questionnaire:

Based on the findings of the qualitative stage, a questionnaire was designed consisting of a set of items related to the barriers to rural economic development. Experts assessed the importance of each factor using a five-point Likert scale (very low, low, medium, high, very high).

Regarding the implementation of the Delphi technique, the process was carried out in three rounds:

Round 1

At this stage, data were collected through semi-structured interviews and open questionnaires to obtain experts' views on the main sociological and institutional barriers to rural economic development in Mazandaran Province. The data obtained from this round were transcribed and qualitatively analyzed, resulting in the extraction of an initial set of indicators and barriers.

Round 2

In this round, the extracted indicators were organized into a structured questionnaire and presented to the experts to evaluate the importance of each factor. The data collected at this stage were used to calculate the mean and standard deviation of each indicator.

Round 3

In the third round, the statistical results of the second round were provided to the experts as controlled feedback. Experts were asked to reconsider their judgments if they wished, based on the overall results. This process helped increase convergence of opinions and achieve consensus.

Data analysis was conducted at both qualitative and quantitative levels:

• ***Qualitative analysis:***

Data from the interviews were analyzed using thematic analysis through open, axial, and selective coding. Similar concepts were categorized into conceptual themes.

• ***Quantitative analysis:***

Data from the Delphi questionnaires were analyzed in SPSS software. Descriptive statistics, including mean, standard deviation, and ranking, were used to determine the importance of the barriers. Additionally, Kendall's coefficient of concordance was employed to measure the level of agreement among experts.

The formula for Kendall's coefficient is as follows:

$$W = \frac{12S}{m2\,(n3-n)}$$

Where:

W = Kendall's coefficient of concordance
S = sum of squared deviations of ranks
m = number of experts
n = number of indicators

To assess the reliability of the data collection tool, Cronbach's alpha coefficient was used. The reliability was evaluated in the second round of Delphi, which included 24 indicators remaining from the first stage. The results showed that Cronbach's alpha for the entire questionnaire was 0.87, indicating a desirable level of reliability and internal consistency among the indicators. Based on accepted criteria in social science research, alpha values above 0.70 indicate acceptable reliability.

To further examine the reliability of the research instrument, Cronbach's alpha was calculated separately for the four dimensions. As shown in the table, the alpha values for all dimensions were above 0.70, indicating acceptable reliability of the questionnaire in the second Delphi round. Furthermore, the overall alpha coefficient (0.87) demonstrates a desirable internal consistency among the indicators (Table 2).

Table 2. Cronbach's Alpha Coefficients for Different Dimensions of the Delphi Questionnaire

Dimension	Number of Indicators	Cronbach's Alpha
Economic	9	0.89
Social	6	0.85
Institutional	5	0.81
Cultural	4	0.78
Total Questionnaire	24	0.87

4. Findings

The present study was conducted based on three rounds of the Delphi method, with the aim of identifying, refining, and prioritizing the sociological and institutional barriers to rural economic development in Mazandaran Province. The analysis of findings was carried out in four stages: extracting indicators in the first round, evaluating and refining indicators in the second round, achieving expert consensus in the third round, and finally, determining the final prioritization of barriers.

a) Results of the First Round of Delphi: Extraction of Indicators

In the first round, as previously explained, data were collected through semi-structured interviews with 18 experts in the fields of development sociology, regional economics, rural planning, and executive management. Data were analyzed using qualitative content analysis. In the open-coding stage, 63 initial concepts were extracted, which, after merging and refinement in the axial-coding stage, were consolidated into 24 main indicators. These indicators were categorized into four dimensions: economic, social, cultural, and institutional (Table 3).

Table 3. Dimensions and Indicators Extracted in the First Round of Delphi

Dimension	Indicators
Economic	Lack of investment in rural areas; weak economic and productive infrastructure; limited access to markets; shortage of financial and credit facilities; low productivity of agricultural activities; dependence of rural economy on traditional activities
Social	Out-migration of young labor force; decline in active rural population; weak social participation in development programs; low entrepreneurial skills; weak social capital and local trust; inequality of economic opportunities between rural and urban areas
Cultural	Weak entrepreneurial culture; low tendency toward economic innovation; conservative attitudes toward investment; low level of economic awareness; cultural resistance to economic change; weak culture of collective work
Institutional	Weak coordination among development institutions; administrative bureaucracy in development projects; instability of government support policies; centralized decision-making; weak regional planning; inefficiency of the rural business support system

b) Results of the Second Round of Delphi: Assessment of Indicator Importance

In the second round, a questionnaire containing the 24 extracted indicators was designed, and experts evaluated the importance of each indicator on a five-point Likert scale. Before analyzing the data, the reliability of the instrument was assessed using Cronbach's alpha, which was calculated at 0.87 indicating acceptable reliability. To analyze the data, mean, standard deviation, and coefficient of variation were used. Indicators with a mean score below 3.50 or a coefficient of variation above 0.30 were eliminated (Table 4).

Table 4. Descriptive Statistics of Indicators in the Second Round of Delphi

No.	Indicator	Mean	SD	CV
1	Lack of investment in rural areas	4.63	0.52	0.11
2	Weak economic and productive infrastructure	4.55	0.58	0.13
3	Out-migration of young labor force	4.48	0.61	0.14
4	Shortage of financial and credit facilities	4.42	0.64	0.14

No.	Indicator	Mean	SD	CV
5	Administrative bureaucracy in development projects	4.36	0.66	0.15
6	Weak coordination among development institutions	4.30	0.69	0.16
7	Low entrepreneurial skills	4.24	0.71	0.17
8	Limited access to markets	4.18	0.74	0.18
9	Weak entrepreneurial culture	4.10	0.76	0.19
10	Low tendency toward economic innovation	4.04	0.79	0.20

The descriptive statistics of indicators in Round Two show that experts identified a group of economic, institutional, and social factors as the most significant barriers to rural economic development in Mazandaran Province. According to the results, the indicator "lack of investment in rural areas" with the highest mean (4.63) ranked first. This demonstrates that, from the experts' perspective, insufficient capital resources and weak investment flows constitute a fundamental developmental challenge.

Weak economic and productive infrastructure ranked second (mean: 4.55), highlighting the importance of transportation networks, logistical services, and production facilities for rural economic growth. The third most important barrier was "out-migration of young labor force" (mean: 4.48), indicating that the departure of skilled and active workers undermines local entrepreneurial and productive capacity. The "shortage of financial and credit facilities" (mean: 4.42) further reflects the limitations rural residents face in accessing financial resources to establish or expand economic activities.

Institutional factors including administrative bureaucracy and weak coordination also ranked among the high-importance indicators. Generally, the low coefficients of variation (mostly below 0.20) indicate a relatively high level of expert consensus. In this stage, four indicators were removed due to not meeting the required criteria (Table 5).

Table 5. Indicators Removed in the Second Round

No.	Indicator	Mean	SD	Reason for Removal
1	Low level of economic awareness among rural residents	3.21	0.98	Mean below threshold
2	Cultural resistance to economic change	3.08	1.02	Insufficient expert consensus
3	Weak culture of collective work	3.15	0.94	High CV and dispersed opinions
4	Dependence of rural economy on traditional activities	3.27	0.96	Did not meet minimum required score

c) Results of the Third Round of Delphi: Achieving Expert Consensus

In the third round, experts were provided with the results of the second round including means and rankings to revise their evaluations if necessary. Kendall's W was used to measure agreement (Table 6).

Table 6. Results of Kendall's Coordination Test

Statistical Index	Value
Number of Experts (N)	18
Number of Final Indicators (K)	20
Kendall's W	0.74
Chi-Square	253.68
Degrees of Freedom	19
Significance Level	0.000

The results indicate a high level of agreement among experts. Kendall's W = 0.74 confirms strong convergence of expert opinions, and the Chi-Square significance ($p < 0.05$) shows that this agreement did not occur by chance (Table 7, 8 and 9).

d) Comparison of Rankings Between Rounds Two and Three

Table 7. Comparison of Indicator Rankings in Rounds Two and Three

No.	Indicator	Rank (Round 2)	Rank (Round 3)	Rank Change
1	Lack of investment	1	1	-
2	Weak economic infrastructure	2	2	-
3	Out-migration of young labor force	3	3	-
4	Shortage of financial facilities	4	4	-
5	Administrative bureaucracy	5	5	-
6	Weak institutional coordination	6	6	-
7	Low entrepreneurial skills	7	7	–1
8	Limited market access	8	8	+1
9	Weak entrepreneurial culture	9	9	-
10	Low tendency toward innovation	10	10	-

(Note: From the 20 final indicators, only the 10 with the highest mean importance are included.)

e) Analysis of Main Dimensions

Table 8. Mean Importance of Barrier Dimensions

Main Dimension	Mean Importance (out of 5)	Final Rank	Interpretation
Economic	4.57	1	Highest weight and consensus; reflects the role of infrastructure, capital, and financial resources
Institutional	4.42	2	Related to administrative bureaucracy, weak coordination, and inefficiencies
Social	4.29	3	Reflects challenges in labor force, migration, and participation
Cultural	4.11	4	Lowest rank; influential, but with lower expert consensus

f) Distribution of Indicators Across Delphi Rounds

Table 9. Distribution of Indicators by Dimension in Different Delphi Stages

Dimension	Round 1	Round 2 (After Removal)	Round 3 (Final)
Economic	18	13	9
Institutional	14	10	6
Social	12	9	3
Cultural	10	8	2
Total	54	40	20

g) Final Ranking of Barriers

At the end of the third round of the Delphi process, out of all the indicators examined, 20 indicators succeeded in meeting the required criteria for final acceptance and were identified as the final indicators of rural economic development barriers in Mazandaran Province. However, to enhance analytical focus and highlight the most critical components, the final ranking section presents only the 10 indicators that obtained the highest average importance scores among the approved indicators. Therefore, the final ranking table reflects the top 10 indicators out of the 20 final indicators, rather than all accepted indicators (Table 10).

Table 10. Final Ranking of the Most Important Barriers to Rural Economic Development

Rank	Key Barrier	Mean Importance
1	Lack of investment in rural economic activities	4.78
2	Weak economic and productive infrastructure in rural areas	4.71
3	Limited access to financial resources and credit	4.65
4	Absence of cohesive planning and management in rural development	4.60

Rank	Key Barrier	Mean Importance
5	Weak governmental support for rural economic activities	4.55
6	Low levels of entrepreneurial skills and training in rural areas	4.49
7	Out-migration of young and active labor force from rural areas	4.43
8	Limited access to markets for rural products	4.37
9	Lack of transportation and communication infrastructure	4.31
10	Weak access to production technologies and innovations	4.26

h) Interpretation and Analysis

Based on the results of Table 10, several important points must be highlighted.

The first point concerns the dominance of structural and economic barriers. Shortage of investment, weak infrastructure, and limited access to financial resources are among the most critical challenges. The first-place ranking of insufficient investment indicates that, from the perspective of experts, directing capital flows toward rural productive activities is considered the primary prerequisite for development. Alongside this, the weakness of physical and economic infrastructure indicates that many villages in the province still face fundamental developmental issues such as transportation facilities, processing industries, and production support services.

In addition to these economic factors, the human capital crisis emerges as another major challenge. The ranking of young labor out-migration in third place demonstrates that the departure of skilled and energetic labor from rural areas weakens local productive and entrepreneurial capacities. This phenomenon, beyond being a result of limited employment opportunities, itself becomes a factor perpetuating economic stagnation in rural regions and forms a cycle of reproducing underdevelopment.

Furthermore, the results of Table 10 indicate the presence of institutional and managerial barriers to rural development. The prominence of administrative bureaucracy and weak coordination among executive agencies demonstrates that part of the developmental challenges stems from inefficiencies within management structures. Overlapping responsibilities among institutions involved in rural development and the complexity of administrative procedures not only slow the implementation of programs but also lead to the waste of scarce development resources.

Additionally, the skill gap and limited access to markets are identified as other significant obstacles to rural development in Mazandaran Province. Many rural products lack competitiveness in broader markets due to weak modern skills, absence of effective marketing, and limited integration into value chains.

Overall, it must be acknowledged that the issue of rural economic development in Mazandaran Province is confronted with a set of interconnected barriers that influence one another in a chain-like relationship. Accordingly, achieving sustainable development in these areas requires a comprehensive approach that simultaneously and coherently pursues institutional reforms, infrastructure enhancement, economic investment, human capital empowerment, and improved market access. Such an approach can help break the cycle of underdevelopment and promote economic dynamism in the rural regions of Mazandaran Province (Figure 1).

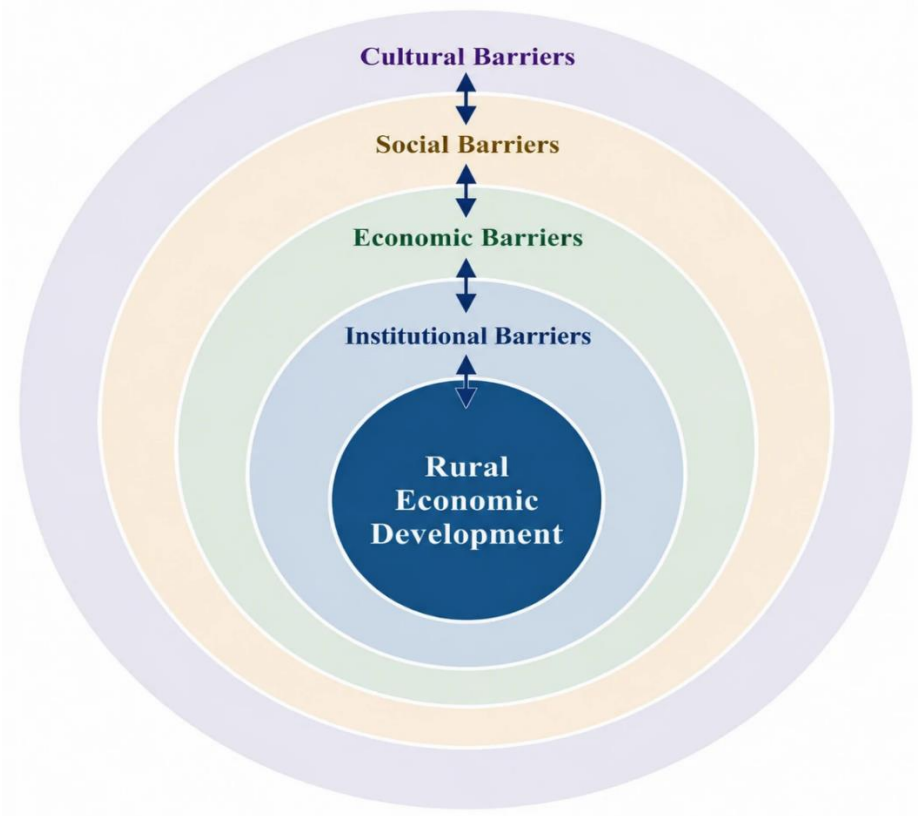


Figure 1. Model of the Sociological and Institutional Barriers to Rural Economic Development in Mazandaran Province

The final model of the study indicates that the barriers to rural economic development in Mazandaran Province are multilayered, chain-like, and mutually reinforcing in nature, and none of the dimensions operates independently. In this model, institutional barriers are located at the central core and serve as the foundation for the emergence of other constraints. Factors such as administrative bureaucracy, centralization, and weak coordination among the institutions responsible for development disrupt the process of decision-making and implementation of development programs, and consequently limit the possibility of attracting investment, supporting economic activities, and implementing development projects. Therefore, institutional weakness provides the grounds for the emergence of many problems in other areas.

At the next level are the economic barriers, which represent the tangible manifestation of institutional limitations. Insufficient investment, weak infrastructure, limited access to financial and credit resources, and weakness in rural product markets are among the most important challenges that directly affect production, employment, and the income level of rural households. At the third layer are the social barriers, which include the migration of young and skilled labor, the decline in the active population, and weak social participation. The reduction of economic opportunities leads to the migration of human resources and, consequently, to a decline in development capacities within rural society.

At the outermost level are the cultural barriers, which affect the development process in the long term. Factors such as weak entrepreneurial culture, low inclination toward innovation, and conservative attitudes toward change can reinforce the persistence of developmental stagnation. Overall, this model shows that rural economic development requires a comprehensive and coordinated approach in which institutional reforms, the strengthening of economic infrastructure, and social and cultural empowerment are addressed simultaneously.

5. Discussion and Conclusion

Rural development is one of the fundamental components in achieving sustainable development in different societies. Rural areas, in addition to being responsible for a significant share of agricultural production and ensuring food security, play an important role in preserving natural resources, maintaining population balance, and sustaining settlement systems. Therefore, rural development is not merely synonymous with increasing economic production; rather, it is a

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multidimensional process that encompasses improvements in the economic, social, institutional, and cultural conditions of rural communities. Achieving this can enhance the quality of life of rural residents, reduce poverty, and create equal opportunities for development. In Iran as well, rural development holds special importance, since a significant portion of the country's population lives in rural areas and these regions play a major role in agricultural production and food security. However, many villages in the country face challenges such as weak infrastructure, insufficient investment, limited employment opportunities, migration of young labor, and shortcomings in certain managerial structures. These conditions have caused the development gap between urban and rural areas to persist, and have made the need for effective policies in rural development more pressing.

Accordingly, the authors of the present study aimed to identify and prioritize the sociological and institutional barriers to rural economic development in Mazandaran Province. The main research question was centered on identifying the most significant social, economic, institutional, and cultural barriers affecting the economic development of rural areas in the province and determining the relative importance of these barriers.

The findings of this study first indicated that the economic development of rural areas in Mazandaran Province is influenced by a set of barriers across economic, social, institutional, and cultural dimensions, which affect one another through a chain-like relationship. In the economic dimension, insufficient investment in rural productive activities was identified as the most important barrier, reflecting a weak flow of capital toward productive rural sectors. Additionally, weak economic and service infrastructure such as processing industries, transportation facilities, and marketing networks constitutes another major challenge in this domain. Limited access of rural producers to financial and credit resources is also considered another important economic barrier that restricts the development of economic activities.

In the social dimension, the migration of young labor from villages to cities was identified as one of the fundamental challenges. This issue reduces the active population, weakens productive capacities, and diminishes economic dynamism in rural areas. Furthermore, a decline in motivation for economic activity among some rural residents and weak social participation in certain development activities were also identified as key social barriers in the study's findings.

In the institutional dimension, administrative bureaucracy, the complexity of licensing procedures, and weak coordination among executive agencies involved in rural development were identified as the most significant institutional obstacles. The presence of complex and sometimes overlapping administrative structures leads to slow and inefficient implementation of development programs.

In the cultural dimension as well, weak entrepreneurial culture, low inclination toward innovation, and the limited number of successful economic experiences in some rural areas were identified as factors that can slow the economic development process. Together with other economic and institutional barriers, these factors create a cycle of reproduced underdevelopment in certain villages.

Accordingly, comparing the results of the present study with previous research shows a considerable alignment across many cases. The findings of this study correspond with those of Falsoleiman et al. (2025), as that study also emphasized economic and infrastructural barriers to rural development. This alignment can be attributed to similarities in economic structures and levels of infrastructural development in many rural areas, which cause development challenges to have similar characteristics across regions. Likewise, the results of this study are consistent with those of Mohammadi (2025), in which weak policymaking and inefficiencies in certain managerial structures were identified as factors limiting economic activities in rural areas. This alignment can be traced to the decisive role of managerial institutions in directing development programs and their impact on the economic performance of rural regions.

At the international level, the findings are consistent with those of Chen (2025), whose study shows that weak human capital and migration of young labor from rural to urban areas constitute one of the most important challenges in rural development. The similarity between these findings and the results of the present study indicates that migration and the declining rural workforce represent shared challenges among many developing countries. The results of this study are also aligned with those of

Shafieisabet & Khaksar, (2024), in which limited economic opportunities and infrastructural weaknesses were identified as the main barriers to rural development. This alignment suggests that rural development in many regions of the world faces similar structural challenges, the resolution of which requires coordinated and long-term development policies.

Overall, the findings of the present study indicate that the economic development of rural areas in Mazandaran Province is constrained by a set of multidimensional barriers that operate within an interconnected system. Therefore, overcoming these challenges requires adopting a comprehensive approach that simultaneously addresses the economic, institutional, social, and cultural dimensions of development.

5.1. Recommendations

1. Improving institutional structures and reducing administrative bureaucracy: One of the most important steps in facilitating rural economic development is reforming administrative processes and increasing coordination among executive agencies involved in rural development. Reducing administrative complexity, clarifying licensing procedures, and establishing coordinated mechanisms among responsible institutions can help attract investment and ensure effective implementation of development programs.
2. Strengthening economic and productive infrastructure in rural areas: Developing infrastructure such as transportation networks, processing industries, storage and processing facilities for agricultural products, and marketing networks can play a crucial role in enhancing rural economic productivity. Investment in these areas not only reduces production costs but also improves rural producers' access to broader markets.
3. Empowering human capital and developing entrepreneurial skills: Strengthening professional and entrepreneurial skills among rural residents especially youth can create the foundation for local businesses and reduce migration. Organizing practical training courses, supporting innovative ideas, and establishing entrepreneurship consultation centers in rural areas can promote economic dynamism.
4. Strengthening entrepreneurial and innovation culture in rural communities: Sustainable economic development in rural areas requires changing mindsets and reinforcing a culture of participation, creativity, and innovation. Supporting cooperative activities, promoting successful rural entrepreneurial models, and strengthening social and local networks can contribute to the formation of new and sustainable economic activities in these regions.

5.2. Limitations of the Study and Future Research

Despite its contributions to identifying and prioritizing barriers to rural economic development in Mazandaran Province, this study has several limitations that should be considered when interpreting its findings.

1. Expert-based assessment: The study relied on the judgments of 18 experts selected through purposive sampling. Although their professional knowledge provided valuable insights into rural development challenges, their assessments may not fully capture the experiences and priorities of rural households, entrepreneurs, farmers, and other local stakeholders.

2. Geographical scope: The research focused exclusively on Mazandaran Province. Given the differences in socioeconomic conditions, institutional arrangements, productive capacities, and local governance across regions, the identified priorities should not be generalized directly to other provinces without further empirical investigation.

3. Methodological characteristics of the Delphi technique: The three-round Delphi process facilitated the systematic identification and prioritization of barriers based on expert assessments and consensus. However, the resulting rankings reflect the perceived relative importance of the barriers rather than direct measurements of their actual effects on rural economic development.

4. Scope of empirical validation: Although the study classifies barriers into economic, social, cultural, and institutional dimensions, the findings are based primarily on expert evaluations. Further research using quantitative indicators and field-level data could examine how these barriers are associated with measurable outcomes, such as rural employment, household income, entrepreneurship, and the sustainability of local economic activities.

5. Prioritization versus policy effectiveness: The study establishes a hierarchy of perceived barriers but does not directly evaluate the effectiveness of specific interventions designed to address them. Future research could assess the feasibility, costs, and outcomes of targeted policy measures, particularly those addressing the highest-priority

barriers, and investigate whether coordinated interventions across economic, social, cultural, and institutional dimensions produce more sustainable rural development outcomes.

Addressing these limitations through comparative regional studies, broader stakeholder participation, quantitative analysis, and evaluations of policy interventions could strengthen the empirical basis for rural development planning. Such efforts would also help translate the priorities identified in this study into more context-sensitive, coordinated, and evidence-based policy recommendations for Mazandaran Province and comparable rural settings.

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Author Contributions

The authors contributed equally to the development and preparation of this research.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the authorship or publication of this article.

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Original Article

شناسایی و اولویت‌بندی موانع جامعه‌شناختی و نهادی توسعه اقتصادی روستایی در استان مازندران با استفاده از روش دلفی

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چکیده مبسوط

۱. مقدمه

توسعه اقتصادی روستایی فرایندی چندبعدی است که علاوه بر منابع مالی، ظرفیت‌های تولیدی و زیرساخت‌های فیزیکی، از ساختارهای اجتماعی، الگوهای فرهنگی و کیفیت نهادهای مدیریتی تأثیر می‌پذیرد. با وجود برخورداری استان مازندران از ظرفیت‌های طبیعی، کشاورزی و انسانی قابل‌توجه، مناطق روستایی این استان همچنان با چالش‌هایی نظیر کمبود سرمایه‌گذاری، محدودیت فرصت‌های اشتغال، مهاجرت نیروی کار جوان، ضعف زیرساخت‌های تولیدی و ناکارآمدی برخی سازوکارهای مدیریتی مواجه‌اند. استمرار این مسائل نشان می‌دهد که تبیین مشکلات توسعه روستایی صرفاً بر اساس کمبود منابع اقتصادی کافی نیست و باید روابط متقابل میان موانع اقتصادی، اجتماعی، فرهنگی و نهادی نیز بررسی شود. ازاین‌رو، پژوهش حاضر با هدف شناسایی، طبقه‌بندی و اولویت‌بندی موانع مؤثر بر توسعه اقتصادی روستایی در استان مازندران انجام شده است تا با تعیین مهم‌ترین محدودیت‌ها، زمینه لازم برای تدوین سیاست‌های یکپارچه و متناسب با شرایط منطقه‌ای فراهم شود.

۲. مبانی نظری تحقیق

چارچوب نظری پژوهش بر تلفیق سه رویکرد نهادگرایی جدید، سرمایه اجتماعی و توسعه جامعه‌محور استوار است. بر اساس رویکرد نهادگرایی جدید، عملکرد اقتصادی جوامع تنها به منابع و سرمایه فیزیکی وابسته نیست، بلکه کیفیت قوانین، سیاست‌ها، ساختارهای اداری و سازوکارهای تصمیم‌گیری نیز در شکل‌گیری فرصت‌های اقتصادی نقش تعیین‌کننده دارند. در این چارچوب، تمرکزگرایی، پیچیدگی بوروکراتیک و ضعف هماهنگی میان سازمان‌های مسئول می‌توانند هزینه فعالیت‌های اقتصادی را افزایش داده و زمینه سرمایه‌گذاری و کارآفرینی را محدود کنند. نظریه سرمایه اجتماعی نیز با تأکید بر اعتماد متقابل، شبکه‌های ارتباطی، همکاری جمعی و مشارکت اجتماعی، این عوامل را از پیش‌شرط‌های اقدام جمعی و توسعه اقتصادی محلی می‌داند. بر اساس رویکرد توسعه جامعه‌محور، مشارکت فعال ساکنان روستا در تصمیم‌گیری، برنامه‌ریزی و اجرای طرح‌ها، موجب افزایش تناسب برنامه‌های توسعه‌ای با نیازهای محلی و تقویت احساس مسئولیت و مالکیت اجتماعی می‌شود. تلفیق این سه رویکرد، مبنایی برای تحلیل هم‌زمان محدودیت‌های اقتصادی و نقش عوامل اجتماعی، فرهنگی و نهادی در توسعه اقتصادی روستایی فراهم می‌کند.

۳. روش تحقیق

پژوهش حاضر از نظر هدف، کاربردی و از نظر ماهیت، کیفی با رویکرد اکتشافی است که با استفاده از روش دلفی در سه دور انجام شد. مشارکت‌کنندگان شامل ۱۸ نفر از اعضای هیئت علمی حوزه‌های جامعه‌شناسی توسعه، اقتصاد، برنامه‌ریزی روستایی و جغرافیا، کارشناسان دستگاه‌های اجرایی مرتبط با توسعه روستایی و مدیران دارای تجربه در برنامه‌ریزی منطقه‌ای بودند که به روش نمونه‌گیری هدفمند انتخاب شدند. در دور نخست، داده‌ها از طریق مصاحبه‌های نیمه‌ساختاریافته و پرسش‌های باز گردآوری و با استفاده از کدگذاری باز، محوری و انتخابی تحلیل شد. در دور دوم، شاخص‌های استخراج‌شده در قالب پرسش‌نامه‌ای با طیف پنج‌درجه‌ای لیکرت در

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اختیار خبرگان قرار گرفت و اهمیت هر شاخص بر اساس میانگین، انحراف معیار و ضریب تغییرات ارزیابی شد. شاخص‌های دارای میانگین کمتر از ۳٫۵۰ یا ضریب تغییرات بیشتر از ۰٫۳۰ حذف شدند. در دور سوم، نتایج دور قبل به‌صورت بازخورد کنترل‌شده ارائه شد تا امکان بازنگری ارزیابی‌ها و دستیابی به توافق بیشتر فراهم شود. تحلیل‌های آماری با استفاده از نرم‌افزار SPSS و ضریب توافق کندال انجام گرفت. آلفای کرونباخ کل پرسش‌نامه برابر با ۰٫۸۷ بود که بیانگر پایایی مطلوب ابزار پژوهش است.

۴. یافته‌های تحقیق

نتایج دور نخست به استخراج ۲۴ شاخص و طبقه‌بندی اولیه موانع در چهار بعد اقتصادی، اجتماعی، فرهنگی و نهادی منجر شد. پس از ارزیابی‌های متوالی، ۲۰ شاخص در مرحله نهایی تأیید شدند. ضریب توافق کندال برابر با ۰٫۷۴ و مقدار معناداری کمتر از ۰٫۰۵ بود که نشان‌دهنده توافق قابل‌توجه میان خبرگان در رتبه‌بندی شاخص‌هاست. بر اساس میانگین اهمیت ابعاد، موانع اقتصادی با میانگین ۴٫۵۷ در رتبه نخست، موانع نهادی با میانگین ۴٫۴۲ در رتبه دوم، موانع اجتماعی با میانگین ۴٫۲۹ در رتبه سوم و موانع فرهنگی با میانگین ۴٫۱۱ در رتبه چهارم قرار گرفتند.

در رتبه‌بندی نهایی شاخص‌ها، کمبود سرمایه‌گذاری در فعالیت‌های اقتصادی روستایی با میانگین ۴٫۷۸ مهم‌ترین مانع شناخته شد. ضعف زیرساخت‌های اقتصادی و تولیدی با میانگین ۴٫۷۱ و محدودیت دسترسی به منابع مالی و اعتباری با میانگین ۴٫۶۵ در رتبه‌های دوم و سوم قرار گرفتند. فقدان برنامه‌ریزی و مدیریت منسجم توسعه روستایی با میانگین ۴٫۶۰، ضعف حمایت‌های دولتی از فعالیت‌های اقتصادی روستایی با میانگین ۴٫۵۵ و پایین‌بودن سطح مهارت‌ها و آموزش‌های کارآفرینی با میانگین ۴٫۴۹، رتبه‌های بعدی را به خود اختصاص دادند. مهاجرت نیروی کار جوان و فعال با میانگین ۴٫۴۳، محدودیت دسترسی به بازار محصولات روستایی با میانگین ۴٫۳۷، ضعف زیرساخت‌های حمل‌ونقل و ارتباطات با میانگین ۴٫۳۱ و دسترسی محدود به فناوری‌های تولید و نوآوری با میانگین ۴٫۲۶ نیز در میان ده مانع اول قرار گرفتند. این یافته‌ها نشان می‌دهند که محدودیت‌های سرمایه‌گذاری و زیرساختی در کنار ضعف‌های مدیریتی، کمبود مهارت و مهاجرت نیروی انسانی، از مهم‌ترین موانع ادراک‌شده توسعه اقتصادی روستایی در استان هستند.

۵. بحث و نتیجه‌گیری

یافته‌های پژوهش نشان می‌دهد که توسعه اقتصادی روستایی در استان مازندران با مجموعه‌ای از موانع به‌هم‌پیوسته مواجه است و رفع جداگانه هر یک از آن‌ها نمی‌تواند به پایداری نتایج توسعه‌ای منجر شود. اگرچه موانع اقتصادی در رتبه‌بندی ابعاد جایگاه نخست را دارند، ضعف‌های نهادی و مدیریتی می‌توانند بر امکان جذب سرمایه، اثربخشی حمایت‌های دولتی و اجرای طرح‌های زیربنایی تأثیر بگذارند. هم‌زمان، محدودیت فرصت‌های اقتصادی و ضعف ظرفیت‌های محلی، زمینه مهاجرت نیروی کار جوان را تقویت کرده و توان تولیدی و کارآفرینی روستاها را کاهش می‌دهد. بنابراین، توسعه اقتصادی پایدار مستلزم اتخاذ رویکردی یکپارچه با تأکید بر اصلاح فرایندهای اداری، کاهش بوروکراسی، تقویت هماهنگی میان دستگاه‌های اجرایی، بهبود زیرساخت‌های تولید و حمل‌ونقل، تسهیل دسترسی به سرمایه و بازار، توسعه آموزش‌های مهارتی و کارآفرینی و تقویت مشارکت و سرمایه اجتماعی است. با توجه به اتکای پژوهش بر قضاوت ۱۸ خبره و محدودبودن قلمرو آن به استان مازندران، نتایج بیانگر اولویت‌های ادراک‌شده متخصصان است و نباید بدون بررسی‌های تکمیلی به سایر مناطق تعمیم داده شود. انجام مطالعات میدانی با مشارکت مستقیم روستاییان و ارزیابی کمی پیامدهای سیاست‌های پیشنهادی می‌تواند زمینه اعتبارسنجی بیشتر یافته‌ها و ارتقای اثربخشی برنامه‌های توسعه روستایی را فراهم سازد.

کلیدواژه‌ها: توسعه اقتصادی روستایی، موانع جامعه‌شناختی، عوامل نهادی، روش دلفی، استان مازندران.

تشکر و قدردانی

مطالعه حاضر برگرفته از رساله دکتری سمیه باقری‌نیا امیری گروه مدیریت و اقتصاد، دانشکده علوم انسانی، واحد قائم‌شهر، دانشگاه آزاد اسلامی، قائم شهر، ایران. است.

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فهرست مندرجات

عنوان	صفحه
■ شناسایی و اولویت‌بندی ابعاد حکمروایی محلی و سرمایه اجتماعی و دلالت‌های آن‌ها برای تاب‌آوری روستایی در برابر مخاطرات طبیعی (مطالعه موردی: روستای آهار) مدینه خسروجردی- مهدی نوری‌پور- آیت‌اله کرمی- سعید صالحی- مریم آفریدونی	(۳۰-۱)
■ واکاوی سازوکارهای نقش‌آفرینی تعاونی‌های روستایی در تجاری‌سازی محصولات خانگی و توسعه کسب‌وکارهای بازارمحور در میان زنان روستایی (مطالعه موردی: روستای سراب‌کلان) سامیه تشویقی- زهرا میرحسینی- حسین آقاجانی مرسا	(۵۹-۳۱)
■ عملکرد بازاریابی در بنگاه‌های کشاورزیِ واقع در مناطق جغرافیایی دورافتاده در استان کهگیلویه و بویراحمد مریم شریف‌زاده- اکرم عزیزی‌فر	(۸۲-۶۱)
■ ارزیابی یکپارچه حساسیت به تخریب خاک و استعداد وقوع طوفان‌های گرد و غبار در استان الانبار عراق با استفاده از تکنیک‌های مکانی-فضایی و شاخص‌های زیست‌محیطی اسیل مزهر حسین- علیرضا امامی- محمد یوسف فتاح- صالح عبداللهی	(۹۸-۸۳)
■ آینده‌نگاری آموزش و توانمندسازی سرمایه انسانی روستایی ایران در عصر تحول دیجیتال مصطفی عزیزی شمامی- مجتبی تجری	(۱۰۱-۹۹)
■ شناسایی و اولویت‌بندی موانع جامعه‌شناختی و نهادی توسعه اقتصادی روستایی در استان مازندران با استفاده از روش دلفی سمیه باقری‌نیا امیری- سید احمد جعفری کلاریجانی- اسدالله مهرآرا- محمدحسن شاکی- شایسته واردی	(۱۲۸-۱۰۳)

داوران این شماره به ترتیب حروف الفبا

دکتر نسیم ایزدی (استادیار ترویج و آموزش کشاورزی دانشگاه بوعلی سینا)

دکتر علی باقرزاده (دانشیار اقتصاد دانشگاه آزاد اسلامی واحد خوی)

دکتر سید علی بدری (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه تهران)

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دکتر مهدی چراغی (استادیار جغرافیا وبرنامه‌ریزی روستایی دانشگاه زنجان)

دکتر ساره حسینی (استادیار منابع طبیعی دانشگاه علوم کشاورزی و منابع طبیعی ساری)

دکتر عیسی پوررمضان (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه آزاد اسلامی واحد رشت)

دکتر مریم شریف‌زاده (دانشیار ترویج و آمو زش کشاورزی دانشگاه یاسوج)

دکتر خدیجه شکرالله (ددانشیار جغرافیا و شهر پایدار کالج مسیحی فورمن/پاکستان)

دکتر سید امیرمحمد علویزاده (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه پیام نور)

دکتر علی‌اکبر عنابستانی (استاد جغرافیای انسانی و آمایش دانشگاه شهید بهشتی)

دکتر علی گلی (دانشیار جغرافیا و برنامه‌ریزی روستایی دانشگاه شیراز)

دکتر ولی‌الله نظری (استادیار جغرافیا و برنامه‌ریزی روستایی دانشگاه فرهنگیان)

دکتر زهرا یکتامهر (استادیار جغرافیا و برنامه‌ریزی شهری دانشگاه آزاد اسلامی مشهد)

۹. ۳. انواع نقل قول‌ها (مستقیم و غیر مستقیم)، نقل به مضمون و مطالب به دست آمده از منابع و مآخذ، با حروف نازک و استفاده از نشانه‌گذاری‌های مرسوم، مشخص شود و نام صاحبان آثار، تاریخ و شماره صفحات منابع و مآخذ، بلافاصله در میان پرانتز نوشته شود.

۱۰. مقالات برگرفته از رساله و پایان‌نامه دانشجویان با نام استاد راهنما، مشاوران و دانشجو به صورت توأمان و با مسؤولیت استاد راهنما منتشر می‌شود.

۱۱ . چنانچه مخارج تحقیق یا تهیه مقاله توسط مؤسسه‌ای تأمین مالی شده باشد، باید در بخش تشکر و قدردانی مشخص گردد.

۱۲ . شیوه ارزیابی مقالات: مقالات ارسالی که شرایط پذیرش را احراز کنند، برای داوران خبره در آن موضوع ارسال می‌شوند. داوران محترم، جدای از ارزشیابی کیفی مقالات، راهبردهای سازنده‌ای پیشنهاد می‌کنند. پیشنهادهای داوران محترم به طور کامل، اما بدون نام و نشان داور، برای نویسنده مقاله ارسال خواهد شد.

۱۳ . مجله حق رد یا قبول و نیز ویراستاری مقالات را برای خود محفوظ می‌دارد و مقالات مسترد نمی‌گردد. اصل مقالات رد یا انصراف داده شده پس از سه ماه از مجموعه آرشیو مجله خارج خواهد شد و مجله پژوهش و برنامه‌ریزی روستایی هیچ مسئولیتی در این ارتباط نخواهد داشت.

۱۴ . مسؤولیت ارائه صحیح مطالب مقاله بر عهده‌ی نویسندگان مقاله است. از این‌رو، نسخه‌ای از مقاله آماده چاپ برای انجام آخرین تصحیحات احتمالی به نشانی الکترونیکی نویسنده ارسال خواهد شد. چنانچه ظرف مدت یک هفته پاسخی از سوی نویسندگان واصل نگردید به معنای موافقت آنها با اصلاحات انجام شده تلقی و نسبت به چاپ آن اقدام می‌شود.

۱۵. دریافت مقاله صرفاً از طریق سامانه مجله (http://jrrp.um.ac.ir) خواهد بود و مجله از پذیرش مقالات دستی یا پستی معذور خواهد بود.

۱۶. نویسندگان گرامی، مقالاتی که مطابق فرمت مجله تهیه نشده باشند به نویسنده بازگردانده شده و در فرآیند ارزیابی قرار نخواهد گرفت.

۱۷. فایل های ضروری برای ارسال از طریق سامانه عبارتند از:

الف) فایل مشخصات نویسندگان: در محیط word شامل اسامی و مشخصات نویسندگان به فارسی و انگلیسی.

ب) فایل اصلی مقاله بدون مشخصات: در محیط word شامل متن اصلی مقاله بدون اسامی و مشخصات نویسندگان.

ج) فایل چکیده مبسوط (مکمل) مقاله: شامل چکیده مبسوط فارسی در قالب یک فایل در محیط Word.

۱۸. شرایط جزئی تر و دقیق تر نیز در فایل راهنمای نگارش و ارسال مقاله توسط نویسندگان ارائه شده است.

۱۹. مقاله پس از ارزیابی علمی به زبان انگلیسی برگردانده شده و نویسنده(گان) موظف به ترجمه آن در مراکز ویراستاری معتبر خواهند بود و تا قبل از انجام ترجمه، امکان ارسال گواهی پذیرش مقدور نمی‌باشد. لذا پیشنهاد می‌شود فارسی زبانان مقاله خود را به زبان فارسی تهیه و ارسال نموده و پس از طی فرایند ارزیابی علمی و پذیرش نسبت به ترجمه آن اقدام شود.

آدرس پستی: مشهد- میدان آزادی- پردیس دانشگاه فردوسی مشهد- دانشکده ادبیات و علوم انسانی- دفتر مجلهٔ پژوهش و برنامه‌ریزی روستایی.

کد پستی: ۹۱۷۷۹۴۸۸۸۳ تلفن و نمابر: ۰۵۱-۳۸۷۹۶۸۴۰ پست الکترونیکی Rplanning@um.ac.ir

وب سایت: http://jrrp.um.ac.ir/

فرم اشتراک (یک ساله/ دوشماره) **مجلهٔ پژوهش و برنامه‌ریزی روستایی**

این جانب ..... شغل ..... با ارسال فیش بانکی به مبلغ ..... ریال به حساب جاری شماره **۴۲۵۲۹۹۶۳۸** بانک تجارت شعبه دانشگاه مشهد کد **۴۲۵۰** به نام عواید اختصاصی دانشکده ادبیات و علوم انسانی، متقاضی اشتراک فصلنامه از شماره .....هستم. چنانچه صاحبان مقالات منتشر شده متقاضی دریافت مجلّه و تیراژه‌ی آن از طریق پست پیشتاز باشند، باید هزینه‌ی آن را به شماره حساب مذکور واریز و اصل فیش پرداختی را به نشانی دفتر مجلّه ارسال کنند.

نشانی: ..... کدپستی: .....

شرایط پذیرش مقاله

برای سرعت بخشیدن به امر داوری و چاپ مقالات، از همهٔ پژوهشگرانی که مایل به چاپ مقالات علمی خود در این نشریه هستند، درخواست می‌شود به نکات زیر توجه کافی داشته باشند:

۱ . مقالهٔ ارسال شده نباید قبلاً در هیچ نشریهٔ داخلی یا خارجی چاپ شده باشد. هیئت تحریریه انتظار دارد نویسندگان محترم تا هنگامی که جواب پذیرش از نشریه نرسیده است، مقالهٔ خود را به مجلهٔ دیگری برای چاپ ارسال نفرمایند.

۲ . مقالات انگلیسی با قلم نازک Times New Roman11 با نرم افزار Word تهیه شود. مقالات، روی کاغذ A4 (با حاشیه از بالا ۳ و پایین ۲ و راست ۲ و چپ ۲ سانتی‌متر) تایپ شود. متن به صورت دو ستونی با رعایت فاصله ۱ سانتی‌متر بین دو ستون و فواصل بین خطوط به صورت single باشد. ۳ . حجم مقاله نباید ازحدود ۹۵۰۰ کلمه و یا حداکثر ۱۵ صفحهٔ چاپی به قطع نشریه بیشتر باشد (با در نظر گرفتن محل جداول، اشکال، خلاصه فارسی و فهرست منابع).

۴ . عنوان مقاله با در نظرگرفتن فواصل بین کلمات نباید از ۶۰ حرف تجاوز کند و با قلم Times New Roman14 سیاه تایپ شود.

۵ . نام نویسندهٔ مقاله با قلم سیاه Times New Roman10 عنوان علمی یا شغلی او با قلم Times New Roman10 در زیر عنوان مقاله ذکر شود. ضمناً آدرس الکترونیکی و شماره تلفن نویسندهٔ مسؤول در پاورقی آورده شود.

۶ . چکیدهٔ مقاله ساختاریافته با قلم نازک Times New Roman 11 به صورت تک ستونی باشد.

۷ . شکل‌ها و نمودارهای مقاله حتماً اصل و دارای کیفیت مطلوب باشد. فایل اصلی اشکال (تحت Word ،PDF ،Excel) و با دقت ۳۰۰ dpi ارائه شود. اندازهٔ قلم‌ها خصوصاً در مورد منحنی‌ها (legend) به گونه‌ای انتخاب شوند که پس از کوچک‌شدن مقیاس شکل برای چاپ نیز خوانا باشند.

۸ . ساختار مقاله شامل عناصر زیر است:

۸. ۱ صفحهٔ عنوان: در صفحهٔ شناسنامه باید عنوان مقاله، نام و نام خانوادگی نویسنده (نویسندگان)، درجهٔ علمی، نشانی دقیق (کد پستی، تلفن، دورنگار و پست الکترونیکی)، محل انجام پژوهش، مسؤول مقاله و تاریخ ارسال) درج شود. عهده‌دار مکاتبات باید با علامت ستاره مشخص شود.

۸. ۲ چکیده: شامل چکیده‌های فارسی ساختار یافته (شامل هدف؛ روش؛ یافته‌ها؛ محدودیت‌ها؛ راهکارهای عملی؛ اصالت و ارزش و واژگان کلیدی (۳ تا ۶ کلمه)) است. تا حد امکان چکیدهٔ مقاله از ۳۰۰ کلمه تجاوز نکند . علاوه بر چکیده ساختار یافته، لازم است چکیدهٔ مبسوط فارسی بین ۷۵۰ تا ۱۰۰۰ کلمه نیز حاوی مقدمه، مبانی نظری، روش، نتایج و بحث، نتیجه‌گیری و کلیدواژه‌های مقاله تهیه شود، به طوری که حاوی اطلاعاتی از کل مقاله باشد و بتوان جداگانه آن را چاپ کرد. با توجه به این که مقاله بعدا به صورت کامل به انگلیسی برگردانده خواهد شد، نیازی به ترجمه چکیده مبسوط به انگلیسی نیست.

۸. ۳ مقدمه: شامل ۱- طرح مسئله؛ ۲- اهمیت و ضرورت؛ ۳- اهداف و سوالات اصلی تحقیق.

۸. ۴ ادبیات نظری تحقیق: شامل ۱- تعاریف و مفاهیم؛ ۲- دیدگاه‌ها و مبانی نظری؛ ۳- پیشینه نظری تحقیق و ... .

۸. ۵ روش‌شناسی تحقیق: در برگیرندهٔ ۱- محدوده و قلمرو پژوهش؛ ۲- روش تحقیق و مراحل آن (روش تحقیق، جامعهٔ آماری، روش نمونه‌گیری، حجم نمونه و روش تعیین آن، ابزار گردآوری داده‌ها و اعتبارسنجی آن‌ها)؛ ۳- سؤال‌ها و فرضیه‌ها؛ ۴- معرفی متغیرها و شاخص‌ها؛ ۵- کاربرد روش‌ها و فنون.

۸. ۶ یافته‌های تحقیق: ارائهٔ نتایج دقیق یافته‌های مهم با رعایت اصول علمی و با استفاده از جداول و نمودارهای لازم.

۸. ۷ بحث و نتیجه‌گیری: شامل آثار و اهمیت یافته‌های پژوهش و یافته‌های پژوهش‌های مشابه دیگر با تأکید بر مغایرت‌ها و علل آن، توضیح قابلیت تعمیم‌پذیری و کاربرد علمی یافته‌ها و ارائهٔ رهنمودهای لازم برای ادامهٔ پژوهش در ارتباط با موضوع، نتیجه‌گیری و توصیه‌ها و پیشنهادهای احتمالی.

۸. ۸ تشکر و قدردانی: قبل از منابع مورد استفاده ارائه شود و از ذکر عناوین دکتر و مهندس خودداری شود.

۹. نحوهٔ ارجاعات: منابع و مآخذ باید به صورت درون‌متنی و همچنین در پایان مقاله ذکر شود.

۹. ۱ ارجاعات در متن مقاله باید به شیوهٔ داخل پرانتز (APA) نسخه ۶ باشد؛ به گونه‌ای که ابتدا نام مؤلف یا مؤلفان، سال انتشار و صفحه ذکر شود. شایان ذکر است که ارجاع به کارهای چاپ شده فقط به زبان فارسی بوده و در اسامی لاتین معادل آن در زیر نویس همان صفحه ارائه شود. به عنوان نمونه: (شکوئی، ۱۳۸۷، ص. ۵۰) یا (وودز، ۲۰۰۵، ص. ۲۷).

۹. ۲ در پایان مقاله، منابع مورد استفاده در متن مقاله، به ترتیب الفبایِ نام خانوادگی نویسنده بر اساس الگوی فهرست نویسی APA تنظیم گردد.

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بسم الله الرحمن الرحيم

دانشکده ادبیات و علوم انسانی

مجلّهٔ پژوهش و برنامه‌ریزی روستایی

سال پانزدهم، شمارهٔ ٤، پاییز ١٤٠٥، شمارهٔ پیاپی ٥٥

صاحب امتیاز: دانشگاه فردوسی مشهد

مدیر مسئول: دکتر حمید شایان

سردبیر: دکتر علی‌اکبر عنابستانی

هیئت تحریریه (به ترتیب حروف الفبا) :

کریستوفر برایانت	استاد برنامه‌ریزی روستایی و توسعه (دانشگاه مونترال کانادا)
خدیجه بوزرجمهری	دانشیار جغرافیا و برنامه‌ریزی روستایی (دانشگاه فردوسی مشهد)
سعید پیراسته	دانشیار جغرافیا و مدیریت محیطی (دانشگاه واترلو کانادا)
جعفر جوان	استاد جغرافیای روستایی (دانشگاه فردوسی مشهد)
محمدرضا رضوانی	استاد جغرافیا و برنامه‌ریزی روستایی (دانشگاه تهران)
عبدالرضا رکن‌الدین افتخاری	استاد جغرافیا و برنامه‌ریزی روستایی (دانشگاه تربیت مدرس)
عباس سعیدی	استاد جغرافیای روستایی (دانشگاه شهید بهشتی)
حمید شایان	استاد جغرافیای روستایی (دانشگاه فردوسی مشهد)
خدیجه شکرالله	دانشیار جغرافیا (کالج مسیحی فورمن/پاکستان)
سید اسکندر صیدایی	دانشیار جغرافیا و برنامه‌ریزی روستایی (دانشگاه اصفهان)
علی عسگری	استاد مدیریت بحران (دانشگاه یورک کانادا)
علی‌اکبر عنابستانی	استاد جغرافیای انسانی و آمایش (دانشگاه شهید بهشتی)
آنا فرمینو	استاد جغرافیا و برنامه‌ریزی منطقه‌ای (دانشگاه لیسبون جدید پرتغال)
ماریجا ماسکین	استاد موسسه معماری و شهرسازی و برنامه‌ریزی فضایی صربستان
مجتبی قدیری معصوم	استاد جغرافیای روستایی (دانشگاه تهران)
دو-چول کیم	استاد مدیریت محیط زیست روستایی (دانشگاه اوکایاما ژاپن)
سیدحسن مطیعی لنگرودی	استاد جغرافیای روستایی (دانشگاه تهران)

مقالات نمودار آرای نویسندگان است و به ترتیب وصول و تصویب درج می‌شود.

دستیار سردبیر: زهرا یکتامهر

ویراستار انگلیسی: مهرناز عنابستانی

مدیر اجرایی: زهرا بنی‌اسد

حروف‌نگاری و صفحه‌آرایی : معصومه ایرانپاک

شمارگان: ۵۰ نسخه

نشانی: مشهد، دانشگاه فردوسی مشهد، دانشکدهٔ ادبیّات و علوم انسانی دکتر علی شریعتی، کد پستی ۹۱۷۷۹۴۸۸۸۳ ، نمابر: ۳۸۷۹۶۸۴۰ (۰۵۱)

بها: داخل کشور: ۲۰۰۰۰۰ ریال (تک‌شماره) خارج کشور: ۲۵ دلار (آمریکا- سالانه)، ۲۰ دلار (سایر کشورها- سالانه)

درگاه الکترونیکی: http://jrrp.um.ac.ir/ E-mail:Rplanning@um.ac.ir

*** این مجله در جلسهٔ کمیسیون بررسی نشریات علمی کشور مورخ ۱۳۹۲/۲/۲۵ رتبهٔ علمی- پژوهشی دریافت و طی نامهٔ شمارهٔ ۳/۱۸/۳۵۷۲۸ در تاریخ ۱۳۹۲/۳/۱۳ ابلاغ گردیده است.**

این مجلّه در پایگاه های زیر نمایه می‌شود:

- **پایگاه استنادی علوم جهان اسلام (ISC)**
- **پایگاه اطلاعات علمی جهاد دانشگاهی (SID)**
- **پایگاه بانک اطلاعات نشریات کشور (Magiran)**
- **فهرست دسترسی آزاد مجلات (Doaj)**
- **Index Copernicus- RICeST- ISI-Noormags- Googlescholar- Civilica- Oaji**

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مجله پژوهش و برنامه ریزی روستایی

سال پانزدهم، شماره ۴ پاییز ۱۴۰۵، شماره پیاپی ۵۵

■ **شناسایی و اولویت‌بندی ابعاد حکمروایی محلی و سرمایه اجتماعی و دلالت‌های آن‌ها برای تاب‌آوری روستایی در برابر مخاطرات طبیعی (مطالعه موردی: روستای آهار)** ۱

مدینه خسروجردی- مهدی نوری‌پور- آیت‌اله کرمی- سعید صالحی- مریم آفریدونی

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■ **عملکرد بازاریابی در بنگاه‌های کشاورزیِ واقع در مناطق جغرافیایی دورافتاده در استان کهگیلویه و بویراحمد** ۶۱

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■ **شناسایی و اولویت‌بندی موانع جامعه‌شناختی و نهادی توسعه اقتصادی روستایی در استان مازندران با استفاده از روش دلفی** ۱۲۳

سمیه باقری‌نیا امیری- سید احمد جعفری کلاریجانی- اسدالله مهرآرا- محمدحسن شاکی- شایسته واردی

شاپا: ۲۷۹۱-۲۷۸۳