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Livelihood Resilience of Farmers in Response to Climate Change: A Systematic Review Using PRISMA Approach

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Abstract
Globally, climate change threatens agricultural livelihoods by undermining crop yield, financial stability, food security, and resource base that farmers rely on. This systematic review, guided by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, synthesises 60 peer-reviewed articles (2013-2026) from Scopus, Google Scholar, and ResearchGate to assess farmers' livelihood resilience in response to climate change. The main theoretical lens is the Livelihood Resilience Framework of Speranza *et al.* (2014), which consists of three interconnected dimensions; buffer capacity, self-organization, and learning capacity. The review explains the concept and framework of livelihood resilience and documents how farmers globally are disproportionately affected by climate-related risks, thus highlighting the need for improving livelihood resilience of farmers in response to climate change. Evidence across studies demonstrate that enhanced livelihood resilience is determined by four major categories of factors; government policy, infrastructure, and technology adoption; social capital and collective action; education, training, and information availability; and livelihood diversification with asset accumulation. Promising strategies for improved livelihood resilience include promoting agroforestry, small-scale irrigation, digital literacy, farmer-producer organisations, and institutional support. The review calls for standardised measurement frameworks, context-sensitive policies addressing structural vulnerabilities, and longitudinal research that prioritises marginalised farmers in vulnerable ecosystems; thereby fostering multi-stakeholder efforts for resilient farmer livelihoods in the future.
Keywords: Agriculture, Livelihood resilience, Climate change, farmers, PRISMA, Systematic review

1. Introduction

Agriculture is the foundation of rural economies globally, offering food, income and employment for billions of individuals. However, this industry stands heavily susceptible to the growing effects of climate change. Rising global temperatures, changing precipitation patterns, frequent extreme weather occurrences, and the rising unpredictability of seasons are significantly affecting farmers' livelihoods (IPCC, 2022).

Livelihood serves as a crucial factor in ensuring financial security, nutritional security, and the socio-cultural and economic advancement of farmers. It acts as an essential conduit of survival for rural populations worldwide, especially in countries like India, where most individuals rely on agriculture for their financial, nutritional, socio-cultural, and economic wellbeing (Food and Agriculture Organization [FAO], 2015).

Climate change presents a significant threat to agricultural livelihoods (Mango *et al.*, 2025). It has evolved from a potential danger into a stark reality that is fundamentally undermining the biophysical and socioeconomic foundations of agricultural livelihoods, on global, national, and regional levels. Climate-related pressures have greatly affected crop yields, income stability, and the overall livelihood security of farmers, making them increasingly vulnerable to it.

According to the Intergovernmental Panel on Climate Change (IPCC, 2022), there has been an increase in the average global surface temperature by about 1.1°C above pre-industrial levels, while agricultural areas in sub-Saharan Africa, South Asia, and Central America face disproportionately harsh effects. According to Iizumi *et al.* (2014), climate variability alone accounts for roughly 32–39% of annual variations in global cereal crop yields, highlighting the profound vulnerability of agricultural systems to climate change.Arumugam *et al.* (2021) discovered that over 60% of smallholder farmers in drought-affected areas of India reported significant reductions in crop yields in the last ten years due to irregular onset of monsoon and heat stress.

Due to the effects of climate change, the depletion of natural resources, including eroded soils, decreased freshwater availability, and diminishing agrobiodiversity have significantly weakened the resource base upon which agricultural communities establish sustainable livelihoods (Adger *et al.*, 2014). Furthermore, severe weather occurrences like cyclones, floods, and droughts cause major economic disruptions that can delay the progress of farm households in terms of accumulated resources and savings by years (Fenton *et al.,* 2017). The traditional approach to agricultural development, which focuses primarily on productivity increases through technology and input intensification, is unable to address the intricate and multifaceted vulnerabilities brought about by climate change (Thornton *et al.*, 2014).In light of the growing influence of climate change on farmers' livelihoods, building livelihood resilience among farmers against climate stress has become increasingly important. Livelihood resilience, in the context of climate change, can be defined as the ability of farmers and communities to anticipate, absorb, and recover from climate-related stresses and shocks while maintaining their core functions. It is vital for sustainable rural development amid changing climate scenarios. Livelihood resilience has emerged as a particularly valuable analytical lens because it shifts the focus from vulnerability and deficits to capacities and adaptive potential (Frankenberger *et al.,* 2013).

1.1. **Research gap and contribution:** Despite the availability of an increasing volume of literature on the impacts of climate change on the livelihood of farmers, there has been limited research on the livelihood resilience of farmers in response to climate change as a holistic concept. Existing reviews are mostly focussed on individual aspects like crop yield reduction, food insecurity, or adaptation strategies, without integrating these outcomes within a cohesive resilience framework. Moreover, there are limited reviews that apply the livelihood resilience framework across diverse geographical locations, hazard types, and varied socio-economic contexts. This is because most prior reviews are either geographically narrow or methodologically heterogenous. Furthermore, the role of enabling factors or drivers of livelihood resilience such as digital literacy, farmer producer organisations (FPOs), rural tourism, and institutional support has not been comprehensively examined in any prior literature as such. This paper addresses these gaps by providing a comprehensive review of existing literature on livelihood resilience of farmers in response to climate change. The review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to maintain methodological rigor and transparency (Page *et al.,* 2021) and utilizes the Livelihood Resilience Framework created by Speranza *et al.* (2014) as its main theoretical perspective.

1.2. **Aim and significance of the study:** The primary aim of this systematic review is to compile and critically analyse the available scientific evidence base on farmers' livelihood resilience in response to climate change, using the Livelihood Resilience Framework of Speranza *et al.* (2014) as the analytical lens and the PRISMA 2020 framework (Page *et al.,* 2021) as the methodological guide. This study is significant in a number of ways. In order to create successful

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resilience-building interventions for farming communities, policymakers and development practitioners urgently need synthesised, evidence-based knowledge since climate change is increasingly intensifying its detrimental effects on farm livelihoods. The study holds crucial relevance for sustainable development, as livelihood resilience connects with SDG-2 (Zero Hunger), SDG-11 (Sustainable Cities and Communities), and SDG-13 (Climate Action) of the United Nations Sustainable Development Goals (United Nations, 2015). It is especially important for South Asian and African contexts, since most farming communities rely on smallholder agriculture, which is still among the most vulnerable to climate change. By focusing on the Livelihood Resilience framework by Speranza *et al.* (2014), the review offers an integrated, theoretically grounded viewpoint that concurrently looks at assets, institutions, and adaptive learning; dimensions that are often looked at separately in the body of current literature. Lastly, by offering evidence-based recommendations for creating programs that improve farmers' capacity for adaptation, the study advances the expanding fields of climate studies and livelihood research.

1.3. **Research objectives:** The objectives of this review are outlined as follows:

(1) to document the nature and extent of climate change impacts on agricultural livelihoods globally and nationally;

(2) to elucidate the conceptual foundations of livelihood resilience;

(3) to apply the Livelihood Resilience framework to organise and interpret current evidence; (4) to synthesise results on the strategies and conditions associated with improved livelihood resilience; and

(5) to identify knowledge gaps and suggest directions for future research.

1.4. **Research outline:** The following sections comprise the organization of the paper. The first section of "Introduction" establishes the context, which is followed by "Research gap and contribution", "Aim and significance of the study", and "Research objectives". The section that follows explains the conceptual understanding of livelihood, resilience, and livelihood resilience, with a detailed explanation of the livelihood resilience framework by Speranza *et al.* (2014). The section of "Materials and Methods" that follows explains the methodology and approach used to conduct the literature review, detailing the PRISMA 2020 methodology, the search strategy and databases used, the inclusion and exclusion criteria applied, and the data extraction and synthesis procedure. The next section that follows is the "Results and Discussion" section that synthesises the evidence of the review in a structured manner, with a detailed summary of the included studies and a thorough analysis of the literature. This is followed by "Recommendations from the study", "Conclusion", "Implications of the study", and "Limitations of the study". The review ends with "Acknowledgement" and "Conflict of interest" section.

2. Concept of Livelihood, Resilience and Livelihood Resilience

2.1. **Livelihood:** The concept of livelihood can be defined as the resources, assets utilised and the activities undertaken that determine the living of an individual (Chambers and Conway 1992; IPCC, 2014). The Sustainable Livelihoods Framework (SLF) developed by the United Kingdom Department for International Development (1999) operationalises the livelihood concept through five interdependent capital assets; natural capital (land, water, biodiversity), physical capital (infrastructure, tools), human capital (skills, knowledge, labour), social capital (networks, institutions, trust), and financial capital (savings, credit). Climate change simultaneously affects all the livelihood assets, thereby enhancing the effectiveness of the integrated livelihoods perspective in comprehending multi-faceted vulnerability (Thornton *et al.,* 2014)

Climate change affects all the five livelihood capitals simultaneously and in an interconnected way, making the integrated livelihoods perspective especially effective for grasping multi-dimensional vulnerability (Thornton *et al.,* 2014).

2.2. **Resilience:** The idea of 'resilience' originates from ecological sciences, where Holling (1973) first introduced it to define the ability of a system to withstand disturbance and reorganize during change, while maintaining its fundamental function, structure, and identity. Folke *et al.* (2016) defined resilience in socio-ecological systems as an adaptive, multi-dimensional attribute that includes the ability to endure disturbances and the potential for deliberate changes in system structures. Resilience is essential for farming communities, who must cope with climate shocks and adapt to long-term structural changes in agricultural systems. Reflecting on the earlier works done, resilience is characterized as the capacity of individuals to prevent, resist, absorb, adapt, respond, cope, and recover in the face of stress, all while preserving their function and identity (IPCC, 2014; OECD, 2020). In relation to the livelihood of farmers, fostering resilience is essential for securing the existence and survival of agricultural communities globally.

2.3. **Livelihood Resilience: The Concept :** Livelihood resilience is defined as the ability of a farmer to cope, adapt and recover from stress (economic, political, environmental, or social) while maintaining or improving their well being and livelihood opportunities (Tanner *et al.,* 2014). It is characterised by farmers' assets and the strategies adopted to maintain and increase assets, self-organize, and learn (He *et al.,* 2024).

It signifies the ability of farming households and communities to anticipate, prepare, respond, and adapt to incremental change and unexpected shocks in order to survive, adapt, and thrive while protecting their core livelihood functions (Frankenberger *et al.,* 2013). It explicitly combines the asset-based and institutional approach of the livelihoods literature with the dynamic, systems-oriented view of resilience.

Speranza *et al.* (2014) characterized livelihood resilience as the capacity of households, communities, and nations to endure and recover from shocks and stresses, as well as to adapt and evolve positively in response to long-term changes and uncertainties, while ensuring that resilience is sustained and improved for future generations. This definition is particularly well suited to address the complex, multidimensional issues that climate change poses to agricultural systems because it clearly acknowledges both short-term coping mechanisms and long-term transformative potential, along with its intergenerational aspect.

Livelihood resilience is important for advancement of the United Nations Sustainable Development Goals (SDGs) for 2030 and crucial for farmer upliftment (Bahadur *et al.,* 2015). It aligns with SDG-2 (food security), SDG-11 (sustainable communities), and SDG-13 (climate action) (United Nations, 2015).

Livelihood resilience stands as a key concept that determines how farmers absorb, adapt, and recover from climatic and non-climatic stresses. It depends as much on the intrinsic capabilities of the system as on the external social and environmental factors. In context of climate change, "Livelihood Resilience" of a farmer can be stated as the ability of his livelihood to sustain and improve upon its normal functioning despite facing climatic stress; while also coping, adapting and recovering from the stress.

2.4. **Livelihood Resilience Framework:** The Livelihood Resilience Framework developed by Speranza *et al.* (2014) offers a theoretically sound and empirically applicable framework for examining how farming households and communities generate and maintain resilience in the face of climate variability and change. Based on both the sustainable livelihoods approach and socio-ecological systems theory, Speranza *et al.* (2014) conceptualised livelihood resilience as consisting of three interrelated and mutually reinforcing dimensions:

a) Buffer capacity
b) Self-organisation
c) Learning capacity

The framework is especially useful because it provides a practical foundation for both analysis and intervention design by going beyond static assessments of risk to capture the dynamic processes by which resilience is developed, maintained, and eroded over time.

Buffer Capacity: Buffer capacity is defined as the amount of change that a farmer can withstand while maintaining his normal function. It comprises all the assets, entitlements (access) and ownership to these assets, which serve as a stock for farmers during times of stress (Speranza, 2013). It refers to the stock of assets and resources, encompassing natural, physical, human, social, and financial capitals, that enable farmers to withstand shocks and stresses. The greater and more diversified the assets are, the greater the farmer's capacity to withstand weather disturbances without collapsing into poverty.

Natural capital is an essential component of buffer capacity for farming communities. Access to fertile land, dependable water sources, forests, and agrobiodiversity provides a direct base for livelihoods and serves as an ecological safety net during periods of climate stress (Tesfaye & Seifu, 2016). However, climate change is systematically depleting natural capital through deforestation, soil degradation, groundwater depletion, and loss of crop genetic diversity, thereby reducing the buffer capacity of farmers (Thornton *et al.,* 2014). According to Mbow *et al.* (2014), agroforestry systems, which purposefully diversify the natural capital base of farmers, significantly enhanced the resilience of smallholder farmers to rainfall variability in sub-Saharan Africa.

Financial capital, which includes savings, access to loans, livestock holdings, and remittances, plays a particularly important role in buffer capacity because it enables farmers to finance their recovery following shocks. In situations where banking and insurance markets are underdeveloped; social capital which is operationalised through networks of reciprocity, mutual aid, and community solidarity, also serves as a crucial buffer that replaces conventional financial systems (Fenton *et al.,* 2017).

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Self Organisation: Self organisation refers to the ability of the farmer to form networks with institutional, social and economic environment and maintain his own system while interacting with these external forces. It describes the farmer's ability to effectively network and engage with people outside of their community as well as maintain internal cohesion through cooperation and leadership (Speranza *et al.*, 2014). In the context of climate change, it shows how well the farmers mobilise as a group, coordinate their efforts, and restructure their institutional, social, and governance systems in response to the pressure of climate change. This dimension places a strong emphasis on the communities' agency and capacity to govern their shared resources, adapt local institutions in response to changing circumstances, and interact constructively with external support networks. It includes the ability of communities to engage with external actors, such as government agencies, non-governmental organisations, and private sector partners, in order to access resources, data, and policy support. Milder *et al.* (2011) discovered that farming communities integrated into multi-stakeholder governance platforms outperformed those operating in institutional isolation in terms of climate adaptation and natural resource management across landscape-scale case studies in Africa and Latin America. On the other hand, communities with weak governance systems or high levels of internal inequality were consistently found to have less livelihood resilience to climate shocks, because social fragmentation impairs the collective action that is necessary for self-organization (Adger *et al.,* 2014).

Learning Capacity

Learning capacity is the ability of the farmer to learn, acquire, memorise and disseminate knowledge. It involves adaptive learning, and feedback sharing with other members of the community. It is the capacity with which the farmers reflect critically on their experiences, incorporate new knowledge; including both formal scientific knowledge and traditional ecological knowledge, and innovate in response to changing climate conditions. This dimension acknowledges that the capacity to learn and adapt iteratively across time is just as important as the existing stock of assets or institutional arrangements under situations of high uncertainty and rapid environmental change (Speranza *et al.*, 2014). Learning capacity is what helps farming communities not only recover from past shocks but continuously recalibrate their practices, strategies, and institutions to better manage future risks. Agricultural extension services, participatory research, and Farmer Field School (FFS) are key institutional mechanisms that help farming communities develop their capacity for learning. It has been demonstrated that combining scientific climate data with indigenous and local knowledge results in more contextually appropriate and farmer-owned adaptation plans (Mapfumo *et al.,* 2013).

The framework of Livelihood Resilience as formulated by Speranza et al. (2014) along with all the dimensions, is depicted in Figure 1.

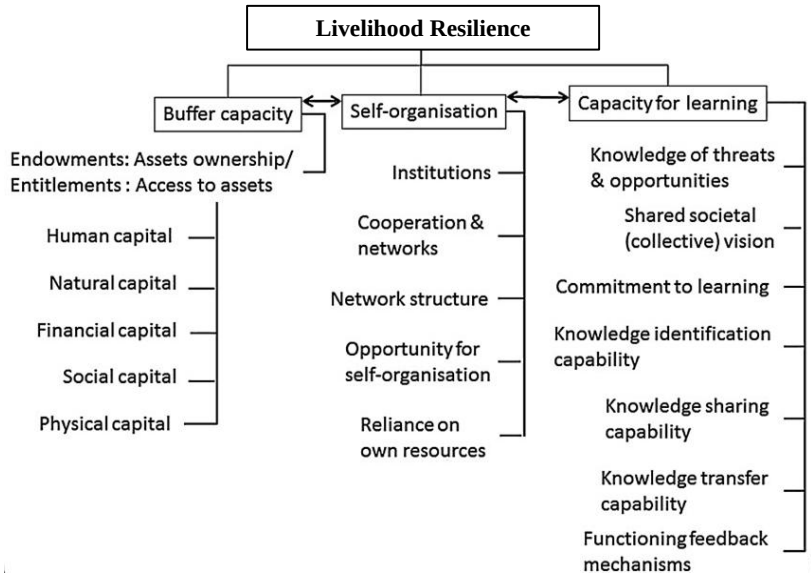

Figure 1. Livelihood Resilience Framework (Speranza *et al.*, 2014)

3. Materials and Methods: This systematic review was conducted to analyse how climate change affects farmers' livelihood and examine the current level of academic literature on the livelihood resilience of farmers in response to climate change. It was designed in full alignment with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines as described by Page *et al.* (2021).

The PRISMA framework is widely recognised as the methodological standard in systematic review because it offers a transparent, structured, and replicable protocol for systematically identifying, screening, and synthesising peer-reviewed literature (Page *et al.,* 2021). The theoretical lens applied to organise and interpret the synthesised evidence is the Livelihood Resilience Framework of Speranza *et al.* (2014), which operationalises resilience through the three dimensions of buffer capacity, self-organisation, and learning capacity.

3.1. **Search strategy and databases:** A comprehensive search of existing literature was carried out across major academic databases such as Scopus, Google Scholar, and ResearchGate. The search included publications from 2013 to 2026. A systematic search was performed using key terms and subject headings related to livelihood resilience, climate change, farmers, buffer capacity, self organisation, learning capacity and sustainable livelihoods. The search was designed to capture crucial findings, ensuring thorough coverage of empirical and theoretical contributions to the field. The search was limited to peer-reviewed research articles and published reviews in English, with no geographic restriction applied.

3.2. **Inclusion and exclusion criteria:** Studies were eligible for inclusion if they met all of the following requirements:

1) They were peer-reviewed research papers, systematic review articles, meta-analyses or theoretically grounded conceptual papers;
2) They explicitly addressed the relationship between climate change and agricultural or rural livelihoods;
3) Their content was substantively relevant to one or more aspects of livelihood resilience;
4) They were published between 2013 and 2026; reflecting the period aligning with the conceptualisation of the Livelihood Resilience Framework (Speranza et al., (2014)) and capturing the most crucial evidence on the subject.
5) They were available in full text in English.

Studies were excluded on the following grounds:

1) If they focused exclusively on non-agricultural livelihood systems,
2) If they were government reports, working papers, policy documents, conference proceedings, theses, dissertations, and other grey literature lacking peer review,
3) If they were duplicate entries, i.e., studies identified in more than one database (in such cases, the studies were retained only once),
4) If they could not be accessed in full text.

3.3. **Data extraction and synthesis:** Data from the 60 included studies were extracted and organised under the headings; author(s) and year of publication, title of the paper, and salient findings. Data extraction was followed by organising the collected evidence around the three dimensions of the Livelihood Resilience Framework and the four major categories of drivers influencing livelihood resilience as identified across the literature.

3.4. **PRISMA framework and screening process:** To guarantee methodological transparency, reproducibility, and rigour in the systematic review process, the PRISMA 2020 framework (Page *et al.,* 2021) was used. PRISMA is now widely acknowledged as the established standard in social sciences since it offers a standardised checklist and flow diagram to direct systematic reviews and meta-analyses.

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The framework structures the review into three sequential stages: Identification, Screening, and Inclusion. The stages of the PRISMA screening procedure are briefly described below.

(i) Identification: A systematic search was performed using key terms related to livelihood resilience, climate change, buffer capacity, self-organisation, learning capacity, and sustainable livelihoods across three major academic databases, namely Scopus, Google Scholar, and ResearchGate. Boolean operators (AND, OR) were used to combine search terms and maximise coverage.

(ii) Screening: The identified records were screened independently against the inclusion and exclusion criteria. Records that did not meet the requirements of inclusion criteria as detailed earlier were excluded at this stage. The full texts of the remaining records were obtained and evaluated in detail against all inclusion and exclusion criteria. Studies were excluded on the grounds mentioned under the exclusion criteria above.

(iii) Inclusion: Studies that passed all eligibility checks were included in the final synthesis.

The complete PRISMA screening procedure adopted for the study is presented in Figure 2.

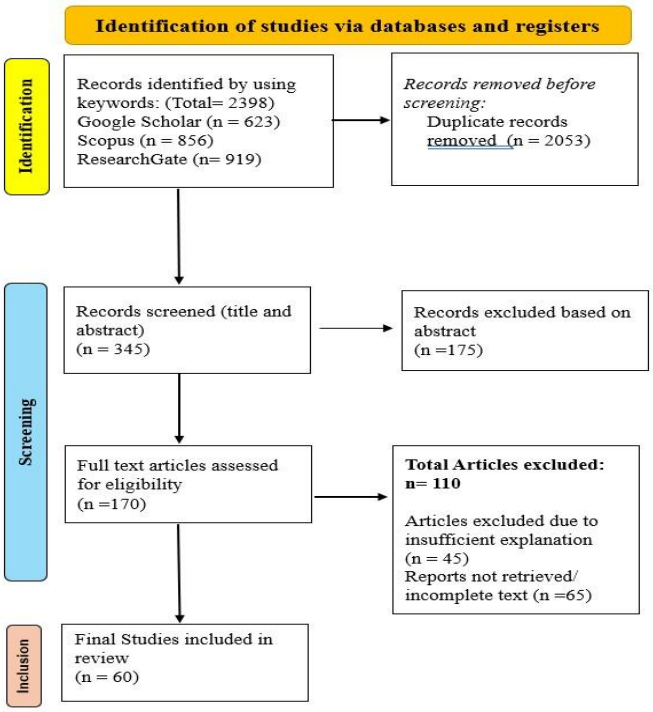

Figure 2. PRISMA screening process for the review [Page *et al.* (2021)]

4. Results and Discussion

4.1. **Overview of included studies:** A total of 60 peer-reviewed studies published between 2013 and 2026 were included in the final analysis. The studies cover a broad geographic area, with the most significant clusters found in China, India, Bangladesh, Vietnam, sub-Saharan Africa (Kenya, Ethiopia, Tanzania), the Middle East and Central Asia (Iran), as well as Europe (Netherlands, Spain). A limited number of studies utilise evidence from South-East Asia, the Pacific area, and South America. The database search revealed 2398 records in total across three databases: Google Scholar (n = 623), Scopus (n = 856), and ResearchGate (n = 919). After eliminating 2053 duplicate entries, 345 distinct records underwent title and abstract screening. At this stage, 175 records were removed based on abstracts. Further, 170 complete text articles were evaluated for eligibility. Out of the 170 full text articles, 110 articles were not included; of which 45 articles were excluded because of inadequate explanation and 65 articles were excluded due to incomplete texts or because they could not be accessed in full. The final review included the remaining 60 studies that fulfilled all the inclusion criteria. Table 1 presents a complete summary of the 60 studies included, detailing the author(s) and year of publication, title of the paper, and salient findings.

Table 1. Summary of studies included in the review

Sl. No.	Author (s) and year of publication	Title of paper	Salient findings
1.	Speranza (2013)	Buffer capacity: capturing a dimension of resilience to climate change in African smallholder agriculture	Conservation agriculture enhances buffer capacity through soil protection, crop adaptation, and livelihood diversification.
2.	Speranza *et al.* (2014)	An indicator framework for assessing livelihood resilience in the context of social-ecological dynamics	Proposed a three-dimensional indicator framework (buffer capacity, self-organisation, learning capacity) for assessing livelihood resilience. Indicators are context-sensitive and integrate social-ecological dynamics.
3.	Tanner *et al.* (2014)	Livelihood resilience in the face of climate change	Proposed a livelihood resilience framework integrating household assets, institutional arrangements, and governance. Emphasised on building resilience and need for multi-scale policy response to improve livelihood resilience.
4.	Tewari *et al.* (2015)	Roles of Government and Community Support, Flood Experience, and Flood Education in Livelihood Resilience	Government support, community networks, flood experience, and flood education each independently contribute to flood resilience. Integration of formal and informal support mechanisms yields the strongest resilience outcomes.
5.	Madhuri *et al.* (2016)	Living with Flood: A Livelihood Resilience Approach of Rural People in Bihar, India	Rural farmers in Bihar exhibit livelihood coping strategies rooted in social networks and traditional knowledge.
6.	Weldegebriel & Amphune (2017)	Livelihood resilience in the face of recurring floods: an empirical evidence from Northwest Ethiopia	Social capital and diversified livelihoods are the dominant positive factors, while limited access to infrastructure and finance reduces resilience.
7.	Islam and Khan (2018)	Threats, vulnerability, resilience and displacement among the climate change and natural disaster-affected people in South-East Asia: an overview	Livelihood Resilience is undermined by governance deficits and infrastructure gaps; displacement is a key coping outcome for the most vulnerable
8.	Phuong *et al.* (2018)	Understanding smallholder farmers' capacity to respond to climate change in a coastal community in Central Vietnam	Smallholder farmers' livelihood resilience in Vietnam is shaped by local knowledge, social networks, and institutional support. Gender and age significantly mediate access to adaptive resources and information.
9.	Quandt (2018)	Measuring livelihood resilience: The Household Livelihood Resilience Approach (HLRA)	Reported variability in resilience across households; diversified livelihoods are key resilience enablers.
10.	Smith and Frankenberger (2018)	Does Resilience Capacity Reduce the Negative Impact of Shocks on Household Food Security? Evidence from the 2014 Floods in Northern Bangladesh	Resilience capacity significantly mitigates food insecurity after flooding.

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11.	Mallick (2019)	The Nexus between Socio-Ecological System, Livelihood Resilience, and Migration Decisions: Empirical Evidence from Bangladesh	Livelihood resilience strongly mediates migration decisions in vulnerable socio-ecological systems.
12.	Rudiarto *et al.* (2019)	Rural Livelihood Resilience: An Assessment of Social, Economic, Environment, and Physical Dimensions	Tidal flood-affected villages show low livelihood resilience across social, economic, environmental, and infrastructure dimensions. Infrastructure improvement is the most critical intervention for enhancing resilience.
13.	Sarker *et al.* (2019)	Vulnerability and livelihood resilience in the face of natural disaster: a critical conceptual review	Reviews the conceptual integration of vulnerability and resilience in livelihood systems. Identifies gaps in combining these frameworks for natural disaster contexts, emphasising the role of institutional support.
14.	Sina *et al.* (2019)	A conceptual framework for measuring livelihood resilience: Relocation experience from Aceh, Indonesia	Post-disaster relocation can both enhance and diminish resilience depending on community engagement.
15.	Buitenhuis *et al.* (2020)	Does the Common Agricultural Policy enhance farming systems' resilience? Applying the Resilience Assessment Tool (ResAT) to to a farming system case study in the Netherlands	Agricultural policy partially supports farmers' resilience Payment schemes benefit larger farms; small farmers' resilience remains structurally underfunded.
16.	Kakehazar *et al.* (2020)	Livelihood Resilience to Climate Change in Family Farming System (Case Study: Wheat Farmers' Mahidasht in Kermanshah)	Farmers in Iran face low livelihood resilience to climate change, which was influenced by gender, marital status, age, and level of education.
17.	Kumar *et al.* (2020)	Climate risk, vulnerability and resilience: Supporting livelihood of smallholders in semiarid India	Smallholder livelihood resilience in semi-arid India is hampered by chronic income variability.
18.	Liu *et al.* (2020)	Exploring Livelihood Resilience and Its Impact on Livelihood Strategy in Rural China	Livelihood resilience positively influences livelihood strategy diversification in ecologically resettled communities. Social and human capital are the strongest predictors of resilience in post-relocation contexts.
19.	Matter *et al.* (2021)	Buffer-Capacity-Based Livelihood Resilience to Stressors—An Early Warning Tool and Its Application in Makueni County, Kenya	Buffer capacity indicators can serve as early warning signals for livelihood insecurity. The framework enables continuous monitoring of household resilience and supports proactive policy responses.
20.	Nasrnia and Ashktorab (2021)	Sustainable livelihood framework-based assessment of drought resilience patterns of rural households of Bakhtegan basin, Iran	Financial and physical capital deficits are the primary constraints of livelihood resilience; social capital offers partial compensation.
21.	Pagnani *et al.* (2021)	Adaptive strategies enhance smallholders' livelihood resilience in Bihar, India	Adaptive strategies (crop diversification, off-farm employment, social networks) significantly enhance farmers' livelihood resilience in Bihar. Human and social capital are the most consistent resilience enablers across strategies.
22.	Sharma and Rao (2021)	Climate vulnerability assessment and livelihood resilience of coastal communities: A Review of trends and linkages	Strong linkage between climate vulnerability and livelihood resilience research in coastal socio-ecological systems.
23.	Zhou *et al.* (2021)	Livelihood resilience and strategies of rural residents of earthquake-threatened areas in Sichuan Province, China	Physical and financial capitals affected livelihood resilience. Livelihood diversification and community social networks were the key resilience enablers.
24.	Dongdong *et al.* (2022)	How do ecological vulnerability and disaster shocks affect livelihood resilience building of farmers and herdsmen: An empirical study based on CNMASS data	Ecological vulnerability and disaster shocks jointly reduce livelihood resilience of farmers.
25.	Gaworek-Michalczenia *et al.* (2022)	Evaluating the impact of adaptation interventions on vulnerability and livelihood resilience	Adaptation interventions modestly improve livelihood resilience but are constrained by structural poverty.
26.	Lecegui *et al.* (2022)	Implementing the livelihood resilience framework: An indicator-based model for assessing pastoral farming systems	Economic robustness and social embeddedness are critical dimensions for long-term farm viability.
27.	Liu *et al.* (2022)	Livelihood Resilience of Rural Residents under Natural Disasters in China	Natural disaster exposure significantly undermines rural livelihood resilience. Social and human capital are the most protective dimensions, while physical vulnerability and income poverty compound resilience deficits.
28.	Luo *et al.* (2022)	Do Livelihood Strategies Affect the Livelihood Resilience of Farm Households in Flooded Areas? Evidence From Hubei Province, China	Farmers with diversified non-agricultural livelihood strategies demonstrate higher resilience to flood shocks. Social capital and off-farm income are critical buffers against flood-related livelihood disruption.
29.	Zhao *et al.* (2022)	Farmer households' livelihood resilience in ecological-function areas: case of the Yellow River water source area of China	Financial and natural capital are most constrained; non-farm employment is the primary adaptive mechanism.
30.	Aschinger *et al.* (2023)	Smallholder livelihood resilience to climate variability in South-Eastern Kenya, 2012-2015	Climate variability disproportionately impacts farmers' livelihoods with limited asset bases and low institutional support.
31.	Erwin *et al.* (2023)	Self-organization for community resilience in an invisible agricultural community	Farmers develop livelihood resilience through collective action and social networks.
32.	Han *et al.* (2023)	Improving Farmer Livelihood Resilience to Climate Change in Rural Areas of Inner Mongolia, China	Farmer livelihood resilience is low but heterogeneous across Inner Mongolia. Human capital and diversified livelihoods most strongly predict resilience; government extension services are key institutional supports.
33.	Hu and Dong (2023)	Measuring livelihood resilience of farmers and diagnosing obstacle factors under the impact of COVID-19 in Jiangsu Province, China	Social capital and digital connectivity are identified as key obstacle factors needing targeted policy attention for resilience recovery.
34.	Mume *et al.* (2023)	Impact of small-scale irrigation on the livelihood and resilience of smallholder farmers against climate change stresses: Evidence from Kersa district, eastern Oromia, Ethiopia	Small-scale irrigation adopters have significantly higher livelihood resilience than non-adopters.
35.	Sun *et al.* (2023)	Measuring farmers' sustainable livelihood resilience in the context of poverty alleviation: a case study from Fugong County, China	Farmers' livelihood resilience is low in post-poverty-alleviation areas. Social and financial capitals are the weakest dimensions, underscoring the need for sustained support.
36.	Tang *et al.* (2023)	Impact of livelihood capital and rural site conditions on livelihood resilience of farm households: evidence from contiguous poverty-stricken areas in China	Livelihood capital (especially financial and human) is the strongest determinant of farm household resilience. Rural site conditions (remoteness, infrastructure) moderate the effect of livelihood capital on resilience.
37.	Tohidimoghadam *et al.* (2023)	Towards farmers' livelihood resilience to climate change in Iran: A systematic review	Livelihood resilience among farmers is shaped by human, social, natural, physical, and financial capitals.
38.	Zhang *et al.* (2023)	Study on Livelihood Resilience of Rural Residents under the Rural Revitalization Strategy in Ethnic Areas of Western Sichuan, China	Livelihood resilience in rural areas is positively influenced by diversified income sources and human capital. Rural revitalization policy improves resilience outcomes.
39.	Zhao *et al.* (2023)	Measurement and Spatial Differentiation of Farmers' Livelihood Resilience Under the COVID-19 Epidemic Outbreak in Rural China	COVID-19 significantly reduced livelihood resilience, with strong spatial differentiation across regions. Financial capital and social capital were the most critical resilience dimensions during the pandemic.
40.	Caviedes *et al.* (2024)	Indigenous and local knowledge on social-ecological changes is positively associated with livelihood resilience	Indigenous and local ecological knowledge is positively correlated with livelihood resilience.
41.	Enayati *et al.* (2024)	Navigating sustainability and resilience: a collective case study of four indian communities	Social capital and institutional trust are foundational to livelihood resilience, while economic diversification bridges sustainability and resilience goals.

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42.	Esmailzadeh *et al.* (2024)	Measuring Livelihood Resilience in Multi-Hazard Regions: A Case Study of the Khuzestan Province in the Persian Gulf Coast	Multi-hazard exposure significantly reduces livelihood resilience in Khuzestan. A composite resilience index reveals spatial heterogeneity, with rural southern districts most vulnerable.
43.	Kapruwan *et al.* (2024)	Household livelihood resilience of pastoralists and smallholders to climate change in Western Himalaya, India	Social capital and diversification are critical in adapting to climate change.
44.	Ma *et al.* (2024)	Digital Literacy and the Livelihood Resilience of Livestock Farmers: Empirical Evidence from the Old Revolutionary Base Areas in Northwest China	Digital literacy significantly enhances livestock farmers' livelihood resilience by improving access to market information and diversified income opportunities.
45.	Molla *et al.* (2024)	Assessing livelihood resilience in drought-affected areas: Lessons from Raya Kobo district, northeast Ethiopia	Drought reduces livelihood resilience through asset depletion. Social capital and livelihood diversification are effective in building resilience.
46.	Pal *et al.* (2024)	Sustaining livelihoods and building resilience: Policy implications for the Lower Mekong Basin	Smallholder livelihoods are exposed to natural hazards and climate change. Skills, indigenous knowledge, social networks, and financial assets enhance resilience.
47.	He *et al.* (2024)	Linking smallholders' livelihood resilience with their adaptation strategies to climate impacts: insights from the Tibetan Plateau	Government credit, cooperatives, and training significantly boost resilience.
48.	Prat-Benhamou *et al.* (2024)	How do farm and farmer attributes explain perceived resilience?	Farm size, diversification, and farmer education positively predict perceived resilience
49.	Saad (2024)	Assessment of Rural Livelihood Resilience in Egypt	Rural livelihood resilience in Alexandria is constrained by limited financial and physical capital. Social cohesion and agricultural diversification emerge as key positive drivers.
50.	Wang *et al.* (2024)	Impact of policy measures on smallholders' livelihood resilience: Evidence from Hehuang Valley, Tibetan Plateau	Government policies such as subsidies, cooperatives, and vocational training positively impact smallholders' livelihood resilience.
51.	Yang *et al.* (2024)	The impact of livelihood resilience and climate change perception on farmers' climate adaptation behavior decision	Livelihood resilience and climate change perception together drive farmers' adaptation behaviour. Higher resilience increases the likelihood of adopting proactive adaptation measures.
52.	Biswas and Sharma (2025)	Development of infrastructure and its impact on sustainable livelihood resilience in the rural areas of the Rarh region in India	Infrastructure development (roads, electricity, digital connectivity) significantly enhances sustainable livelihood resilience in rural India.
53.	Das *et al.* (2025)	Determinants of farm household resilience and its impact on climate-smart agriculture performance: Insights from coastal and non-coastal ecosystems in Odisha, India	Farmers' resilience is a significant positive determinant of climate-smart agriculture adoption. Human capital, social networks, and access to extension services are the strongest resilience drivers.
54.	Devi and Boram (2025)	Adaptive Strategies and Livelihood Resilience among Riverine Communities Facing Flood and Erosion Hazards in Assam, India.	Riverine communities near Assam wildlife sanctuaries develop mixed adaptive strategies combining traditional knowledge and livelihood diversification to cope with floods and erosion.
55.	Kumari and Sajjad (2025)	Assessing livelihood resilience among rural communities in Dimapur district, India: Policy implications	Rural communities in Dimapur show moderate livelihood resilience with significant variation by social group. Natural capital dependency and limited financial access are the primary challenges affecting livelihood resilience.
56.	Liu *et al.* (2025)	Livelihood Resilience and Disaster Preparedness Among Farmers in Flood Risk Areas of Rural China	Livelihood resilience positively enhances flood disaster preparedness behaviours. Financial and social capital are the strongest mediators between resilience and preparedness.
57.	Martín-García *et al.* (2025)	Farms' economic resilience: assessment, drivers and policy-making	Diversified and irrigated farms show the highest robustness in livelihood resilience.
58.	Niu and Zhou (2025)	How rural tourism development affects farmers' livelihood resilience: based on comprehensive survey data of rural revitalization in China	Rural tourism development positively impacts farmer livelihood resilience by diversifying income streams and strengthening social capital. Effects are greater for households with prior tourism-related skills.
59.	Sun (2025)	Livelihood Resilience and Its Influence on Livelihood Strategy of People in the State-Owned Forest Areas in Northeast China and Inner Mongolia	Higher livelihood resilience is associated with greater adoption of alternative livelihood strategies.
60.	Mannepalli *et al.* (2026)	Measuring Farmers' Livelihood Resilience under Climate Stress: Evidence from Semi-Arid Rajasthan	Reported low to moderate level of livelihood resilience in semi-arid India, with financial capital and institutional access being the most critical constraints.

Source: compiled from the author's analysis

4.1.1. **Impact of climate change on farmers' livelihoods:** The examined literature indicates that climate change, through floods, droughts, erratic rainfall, and extreme temperatures, presents significant threat to agricultural livelihoods, with effects influenced by existing socioeconomic vulnerabilities. Flood is the hazard that has been researched the most. Luo *et al.* (2022) discovered that escalating global warming has posed severe flood risks to Hubei Province farmers, with overall livelihood resilience staying low and varying significantly based on livelihood strategy. Weldegebriel and Amphune (2017) recorded that continuous flooding in Northwest Ethiopia damaged farmland, livestock, and infrastructure, while also weakening the social networks that communities rely on for recovery. In flood-risk areas of rural China, Liu *et al.* (2025) found that climate change raises both the frequency and severity of floods, thus making the enhancement of livelihood resilience an immediate policy focus.Droughts are equally destructive, especially in arid and semi-arid areas. Molla *et al.* (2024) reported an average livelihood resilience score of 0.3999 in drought-affected northeast Ethiopia, highlighting water harvesting, land quality, education, income diversification, and social trust as essential yet lacking factors of livelihood resilience. In semi-arid regions of India, Kumar *et al.* (2020) discovered that although smaller landholdings heighten climate vulnerability to drought, diversifying into livestock and off-farm income helps moderate this vulnerability. Mannepalli *et al.* (2026) reported moderate overall livelihood resilience with a Livelihood Resilience Index (LRI) score of 0.563 in semi-arid Rajasthan; however, food and income resilience were critically weak, with livestock loss representing a constant long-term risk.

Beyond single hazards, Pal *et al.* (2024) demonstrated that smallholders in the Lower Mekong Basin experience combined exposure to hazards, climate change, and environmental degradation, while current policies do not effectively implement integrated resilience assessments. Islam and Khan (2018) emphasized that the effects of climate and disasters in South-East Asia displace significant populations, leading to persistently low livelihood resilience in resettled population. Climate change also influences farmers' adaptation practices, as confirmed by Yang *et al.* (2024), who discovered that livelihood resilience positively moderates the connection between climate change perception and adaptive behaviour, indicating that farmers with lower resilience struggle more to respond to climate issues. He *et al.* (2024) demonstrated that in the Tibetan Plateau, the implementation of adaptation strategies is strongly connected to higher livelihood resilience, highlighting the reciprocal relationship between climate exposure and resilience outcomes.

4.1.2. **Livelihood Resilience and its dimensions:** The three-dimensional framework formulated by Speranza *et al.* (2014), comprising buffer capacity, self-organisation, and learning capacity, is the most widely utilised livelihood resilience framework in this analysis. Evidence from the included studies strongly presented evidence in support of this.

1) Buffer capacity: Matter *et al.* (2021) utilized buffer capacity as an early warning indicator in Makueni County, Kenya, discovering a notable positive relationship between buffer capacity and maize yields, as well as a significant negative relationship with the incidence of pests and diseases. Across research conducted in China, buffer capacity is reliably recognized as the weakest of the three dimensions. Liu *et al.* (2025) discovered that buffer capacity had the lowest score (0.223) among farmers at risk of flooding in Sichuan province of China, whereas Hu and Dong (2023) identified buffer capacity issues as the primary challenge to livelihood resilience in Jiangsu Province amid COVID-19. Zhou *et al.* (2021) discovered that a greater buffer capacity in earthquake-impacted Sichuan was associated with farmers' inclination to participate in non-farming pursuits, demonstrating how asset holdings facilitate livelihood diversification.

2) Self organisation: Self organisation refers to the ability to form flexible social networks and collective arrangements to handle uneven situations. Erwin *et al.* (2023) showed that informal farmworkers in Majes, Peru, formed associations to enhance resource access and strengthen community resilience via commons

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praxis, prefigurative politics, and economic autonomy; all without formal institutional backing. On the other hand, they discovered that corruption and undemocratic practices can weaken self-organisation, emphasizing the significance of institutional quality. In various Chinese studies, self-organisation scores are consistently greater than buffer capacity and learning capacity. Sun (2025) and Zhao *et al.* (2022) both identified self-organisation as the most significant resilience dimension among forest-dependent and Yellow River basin farmers, respectively, due to robust communal norms. He *et al.* (2024) discovered that membership in cooperatives and government-backed institutional frameworks are essential elements of self-organisation that influence the adoption of adaptation strategies on the Tibetan Plateau.

3) Learning capacity: Learning capacity refers to the acquisition of knowledge and skills that enable adaptive responses to change. According to Tohidimoghadam *et al.* (2023), learning capacity means acquiring knowledge and skills to form a resilient structure, and it is one of the three fundamental aspects of farmers' livelihood resilience to climate change. Liu *et al.* (2020) discovered that among poor resettlement households in Shaanxi; drivers like assess to capital, social cooperation networks, transportation convenience, skills gained through education and rural-urban migration considerably increase livelihood resilience. The most important resilience benefits of a climate adaptation project in Tanzania, according to Gaworek-Michalczenia *et al.* (2022), were enhancing education and diversifying information sources. Nevertheless, efficacy may be compromised if knowledge is not put into practice. Hu and Dong (2023) reported that the absence of agricultural technical services is the primary specific barrier, while learning capacity disorder is the second most significant resilience obstacle in Jiangsu.

There is interdependence among the three dimensions. According to Sun *et al.* (2023), buffer capacity, self organisation and learning capacity; all develop together and the absence of any one of these factors compromises the overall level of sustainable livelihood resilience. Aschinger *et al.* (2023) validated the framework as a trustworthy instrument for tracking resilience over time by confirming longitudinally in Kenya that positive relationships between all three dimensions and food security are maintained during drought and recovery years.

4.1.3. Factors affecting Livelihood Resilience

Across the reviewed studies, four broad categories of factors consistently emerge as drivers of improved livelihood resilience.

- **Livelihood diversification and asset accumulation**: The most consistently supported determinant of livelihood resilience is diversification of income across agricultural and non-agricultural activities. According to Tang *et al.* (2023), livelihood capital significantly and positively improved livelihood resilience ($\beta = 0.874$, $p < 0.001$) in 1,500 impoverished Chinese households. Kumar *et al.* (2020) showed that among smallholders in semi-arid India, diversification into livestock and off-farm income considerably mitigates climate vulnerability. According to Pagnani *et al.* (2021), crop diversification is one adaptive strategy that greatly enhances food security in Bihar and is influenced by the endowments of livelihood resources.
- **Education, training, and information access**: Human capital endowments are critical factors that determine livelihood resilience. According to Han *et al.* (2023), farmers' resilience to climate change in Inner Mongolia is positively correlated with education level, agricultural technology training, and information access. Ma *et al.* (2024) showed that through learning, network, and income diversification strategies, digital literacy greatly improves the livelihood resilience of cattle farmers in Northwest China. Molla *et al.* (2024) recommended that the main policy priorities for Ethiopian populations affected by drought should be education, agricultural extension, and skill training.
- **Social capital, collective action, and community organisations**: All three aspects of livelihood resilience are enhanced by robust social networks and collective institutions. According to Smith and Frankenberger (2018), social capital in Bangladesh independently lessens the effects of flood on food security. According to He *et al.* (2024), cooperative membership is a crucial factor that determines adaptation and livelihood resilience on the Tibetan Plateau, thus focussing more on collective effort. According to Gaworek-Michalczenia *et al.* (2022), the most important resilience advantage of a climate adaptation initiative in Tanzania was the development of social networks.
- **Government policy, infrastructure, and technology adoption**: Public investments and institutional assistance are catalysts of building resilience. Wang *et al.* (2024) discovered that while subsidies for skills training had no significant impact on livelihood resilience of smallholder farmers in the Tibetan plateau; low-interest loans, irrigation facilities, improved seed, and information sharing greatly increased the livelihood resilience. This indicates that policy design is just as important as provision. In rural India, Biswas and Sharma (2025) discovered a positive causal link between sustainable livelihood resilience and infrastructural development. According to Mume *et al.* (2023), small-scale irrigation adoption in Ethiopia increased crop productivity by 84.72 quintals per hectare, followed by higher income, and enhanced resilience capacity index when compared to non-adopters, thus demonstrating the transformative power of focused technology investment.

The evidence clearly shows that rather than depending only on one intervention, enhancing livelihood resilience necessitates integrating asset diversification, knowledge building, social cohesion, institutional support, and appropriate technology in ways relevant to local circumstances. The most resilient households incorporate a number of enabling characteristics, while the least resilient households are characterised by a single source of income, asset poverty, social isolation, and limited institutional access.

5. Recommendations from the study

Drawing from the synthesis of findings across the reviewed papers, a number of practical recommendations arise for researchers, policymakers, and development practitioners aiming to comprehend and enhance livelihood resilience.

First of all, there is an immediate requirement for standardized methods in assessing livelihood resilience. A greater consensus on basic indicator sets and assessment frameworks that can be adapted to different situations and would enable cross-study comparability would be extremely beneficial to the field.

Policy frameworks should take into consideration the entire spectrum of livelihood resilience dimensions instead of focusing only on short-term shock prevention or asset enhancement. It necessitates policies that address structural causes of vulnerability, such as land tenure insecurity, gender disparities, market exclusion, and insufficient public services. Generic resilience interventions are unlikely to be successful whereas context-sensitive and inclusive methods that involve communities in evaluating livelihood resilience and developing strategies are crucial.

Governments and development agencies should allocate resources toward incorporating livelihood resilience evaluations into official planning and policy frameworks, as suggested by Pal *et al.* (2024) for the Lower Mekong Basin and Gaworek-Michalczenia *et al.* (2022) for climate adaptation evaluation. This integration would allow for more systematic tracking of resilience trends, more responsive resource distribution, and enhanced accountability in adaptation initiatives.

Factors that promote resilience such as digital literacy, rural tourism, farmer producer organizations, and digital financial services require focused policy consideration and research investment. These new assets and institutions hold considerable promise for improving livelihood resilience in swiftly changing rural economies, yet their resilience effects are still not fully comprehended.

Hence, upcoming studies should emphasize on longitudinal, mixed-methods, and intersectional strategies capable of reflecting the dynamic, gendered, and socially varied aspects of livelihood resilience. Special focus must be placed on the resilience paths of the most disadvantaged groups such as women, smallholder farmers in vulnerable ecosystems, pastoralists, and forest-reliant communities, as their resilience issues are often the most intense and least addressed by current policy structures.

6. Conclusion

This review compiles findings from 60 peer-reviewed studies to outline the current understanding of livelihood resilience in various geographical settings and types of hazards. The analysis reveals that livelihood resilience is a multifaceted, evolving concept shaped by the intricate interactions of livelihood capitals, adaptive strategies, institutional support, and the nature of external stressors. The evidence consistently indicates that diversified livelihood capital stocks, especially the combination of human, social, financial, physical, and natural resources, are essential for livelihood resilience in different scenarios. Adaptive strategies greatly mitigate the adverse effects of climate change, natural disasters, and socioeconomic shocks on household and community livelihoods in farm scenarios. When effectively crafted and contextually relevant, government policies and institutional support can be strong drivers for resilience development, although their impacts are influenced by local institutional frameworks and community social dynamics. The review advocates for comprehensive, context-sensitive policy guidelines that implement livelihood resilience in all three areas of buffer capacity, self-organization, and learning capacity, while enabling vulnerable communities to endure, adapt to, and transform their livelihoods in the face of increasing climate change and other challenges. Failure to tackle the fundamental causes of persistent livelihood vulnerability such as asset disparity, gender bias, institutional marginalization, and environmental decline will hinder even the most sincere attempts at

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building resilience, thereby continuing cycles of vulnerability that climate change threatens to worsen. Achieving lasting livelihood resilience necessitates ongoing, collaborative commitment from various stakeholders to both short-term risk mitigation and long-term structural change in response to climate change.

7. Implications of the study

The findings of the review highlight that integrated, multi-sectoral policy approaches are necessary for improving livelihood resilience, rather than discrete interventions. Frameworks that simultaneously address knowledge systems, collective action, and asset endowments should be adopted by policymakers. Enhancing access to low-interest loans, high-quality inputs, and irrigation are important goals, as is including livelihood resilience evaluations into planning, monitoring, and assessment of climate adaptation. The Livelihood Resilience Framework can be used to recalibrate current interventions in order to more effectively address the challenges faced by vulnerable farmers. To improve access to markets, financial services, and climatic information, investments in rural digital infrastructure are also crucial.

In addition to combining indigenous and scientific knowledge, agricultural extension systems must enhance learning capacity through participatory methods including farmer field schools, demonstration plots, and peer knowledge exchange platforms. Institutional support for collective action is equally important with a focus on strengthening farmer organisations and guaranteeing inclusive, responsible governance systems.

From a research viewpoint, the review highlights the importance of systematic methodologies for advancing evidence-based agricultural research, as well as the necessity of standardised resilience indicators, longitudinal and gender-disaggregated studies, and cross-country comparisons.

8. Limitations of the study

This review was conducted rigorously in line with PRISMA 2020, but several limitations still remain. Although major databases (Scopus, Google Scholar, ResearchGate) were used, others such as Web of Science were not searched, potentially limiting coverage. A meta-analysis was not feasible due to high heterogeneity in study designs and measures, restricting quantitative comparisons. The review ignores grey literature and concentrates on studies from 2013 to 2026, leaving out important information from practitioner work and policy papers.

Although the Livelihood Resilience Framework by Speranza *et al.* (2014) offers a solid analytical foundation, it might not adequately capture context-specific or culturally embedded features of livelihood resilience. Future research could benefit from merging it with additional frameworks. Lastly, the cross-sectional synthesis finds trends and correlations but is unable to prove causal relationship. Further research can be done to unearth more underlying aspects of livelihood resilience.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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