Assessment of Rural Livelihood Resilience in Egypt

Basma Hassan Saad[1]

ABSTRACT

In the pursuit of sustainable development, understanding the dynamics of rural livelihoods has become increasingly critical, particularly in regions where economic vulnerabilities are pronounced. Alexandria Governorate, with its unique socio-economic landscape, presents a compelling case for an in-depth exploration of rural livelihoods, specifically examining the factors that contribute to resilience amidst chronic challenges such as poverty, environmental degradation, and social instability. This study searches in identifying and analyzing the multifaceted dimensions that influence resilience among rural communities. While existing literature has acknowledged these challenges, there is a notable gap pertaining to localized assessments that consider both the unique attributes of Alexandria's rural population and the interplay of external pressures, such as climate change and market fluctuations. Addressing this gap is vital not only for academic discourse but also for informing policymakers and stakeholders in crafting effective interventions that bolster rural livelihood resilience in Egypt.

This study finds that the total rural livelihood resilience score in the three villages of study area don't show a significant gab. (Algharbanieat and Baheej) villages less resilient village compared with (Abusir) village which is consider more resilient village. The Environmental Factors have medium score on the measurement but all other factors (Economic Factors, Social and Cultural Factors, Institutional and Policy Factors, Technological Factors) have low score. This study recommends to working on raise the level of livelihood resilience in the study area by improving the factors affected on livelihood resilience level by integration all items for every factor to get more resilient rural communities

Keywords: Community Resilience, Social vulnerability, Livelihood Resilience, Community Disaster management, Rural Development.

INTRODUCTION

Livelihood resilience is a critical area of study within the field of sociology, especially for understanding the adaptive capacities of communities' settings (Tanner *et al.*, 2015). This concept encompasses the ability of households and communities to withstand, recover from, and adapt to various shocks and stresses, such as economic downturns, environmental changes, and social disruptions. As the world faces increasing challenges from climate change, globalization, and rapid urbanization, assessing the resilience of livelihoods becomes ever more pertinent (Kuipers and de Jong, 2023).

Rural areas present distinct contexts for livelihood resilience due to their differing socio-economic structures, resource availability, and institutional frameworks. Urban areas, characterized by dense populations and diverse economic activities, often face unique challenges such as housing insecurity, pollution, and infrastructural strains. Conversely, rural areas, with their reliance on agriculture and natural resources, are particularly vulnerable to environmental changes and market fluctuations (Wintergalen *et al.*, 2022). Understanding these divergent contexts is crucial for developing tailored strategies that enhance resilience.

Highlights various frameworks and methodologies for assessing livelihood resilience, drawing from interdisciplinary approaches that include environmental science, economics, and social theory. These assessments typically consider factors such as asset ownership, social networks, and access to services, which collectively determine a community's capacity to cope with and adapt to adversity. Moreover, the literature underscores the importance of considering both structural and agency-based factors, recognizing that resilience is shaped by broader socio-political dynamics as well as individual and collective actions.

In exploring the factors influencing livelihood resilience in rural areas, it is essential to account for the differential impacts of climate change. Urban areas may experience heightened risks from extreme weather events and infrastructural failures, while rural areas might face challenges related to agricultural productivity and water scarcity. These impacts necessitate context-specific interventions and policies that address the unique vulnerabilities and strengths of each setting (Liu *et al.*, 2020).

The study of livelihood resilience not only contributes to academic discourse but also informs policymaking and development practice. By identifying effective strategies and interventions, researchers and practitioners can support communities in building resilience against future uncertainties. This literature review aims to synthesize current knowledge on rural livelihood resilience, providing a comprehensive

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[1] Assistant Professor, Department of Rural Development, Faculty of Agriculture, Alexandria University, Egypt.
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understanding of the conceptual frameworks, methodologies, influencing factors, and policy implications that shape resilience in diverse contexts.

In Egypt, the resilience of livelihoods in rural areas is a critical subject of study, particularly given the socio-economic challenges and environmental pressures that characterize the region. Livelihood resilience refers to the capacity of individuals and communities to withstand and recover from stresses and shocks, maintain or improve their living standards, and adapt to changing conditions. This concept is especially pertinent in a country like Egypt, where the interplay between urbanization, climate change, and economic transformation presents unique challenges and opportunities for different population groups (Tsai *et al.,* 2022).

Urban areas in Egypt, are experiencing rapid growth and development. This urban expansion brings about significant changes in employment patterns, access to resources, and social dynamics. However, it also introduces vulnerabilities related to housing, infrastructure, and social inequality (Kandal *et al.,* 2019). Understanding the resilience of urban livelihoods involves examining how urban dwellers cope with these challenges, the strategies they employ to secure their livelihoods, and the role of policy interventions in enhancing their adaptive capacities (Ghoneim and Abdellatif, 2022).

Conversely, rural areas in Egypt, which are often characterized by agricultural-based economies, face distinct challenges, including water scarcity, land degradation, and limited access to markets and services (Helmy, 2019). The resilience of rural livelihoods is closely linked to the sustainability of agricultural practices, diversification of income sources, and the ability of rural households to adapt to environmental and economic changes (Olabomi *et al.,* 2021). The traditional knowledge and community networks in rural areas also play a significant role in shaping resilience outcomes.

This study aims to provide a comprehensive assessment of livelihood resilience in rural settings in Egypt. By exploring the different dimensions of resilience, including social, economic, and environmental factors, the study seeks to identify the strengths and weaknesses inherent in each context. Through a comparative analysis, this study will highlight the distinct and shared challenges faced by rural populations and discuss potential strategies for enhancing livelihood resilience across the country. This study not only contributes to the academic understanding of resilience but also offers practical insights for policymakers and development practitioners working to improve the well-being of Egypt's diverse communities.

Research Problem:

Coastal areas are dynamic and vulnerable to environmental change including sea level rise, Hotter temperatures, More severe storms, Increased drought, A warming, Loss of species, Not enough food, More health risks, Poverty and displacement caused by climate change (www. un.org).

Coastal communities generally have a high dependency on the coastal ecosystem to support their livelihood. The livelihoods of coastal resource-dependent communities are strongly linked to the well-being of coastal and marine ecosystems. This expanded understanding of tropical coastal resources is the key to stability for households and communities in Egypt’s coastal zones.

Alexandria governorate has been profoundly affected by climate change, manifesting in various ways that significantly impact both the environment and human livelihoods (Mohamed, 2023). Historical climate data reveal a troubling trend of rising temperatures and changing precipitation patterns. Coastal erosion and rising sea levels pose severe threats to the urban infrastructure and housing, exacerbated by the increasing frequency of extreme weather events (Lakenarine *et al.,* 2020). Agriculture and rural livelihoods are also under strain, while public health concerns grow due to these environmental changes. Efforts to adapt and mitigate these impacts involve both government policies and community-led initiatives, underscoring the importance of resilience and local action in the face of global climate challenges.

The rural areas of Alexandria face numerous challenges, including limited access to resources, infrastructural deficits, and economic instability. However, these regions also present opportunities for development through targeted interventions and sustainable practices that leverage the unique socio-economic dynamics.

The rural areas of Alexandria have increasingly witnessed a range of climate-related disasters, profoundly affecting their agricultural productivity (Afifi *et al.,* 2023). These disasters, including floods, droughts, and extreme weather events, occur with alarming frequency, disrupting the socio-economic fabric of these communities. The rural populace has employed various adaptation and mitigation strategies, often supported by government and NGO interventions (Seddeek and Elsayed, 2022). Case studies highlight the unique vulnerabilities and resilience of rural areas compared to urban settings. Traditional knowledge plays a critical role in disaster resilience, while future projections indicate escalating risks that necessitate comprehensive planning and response mechanisms.

Traditional agricultural practices in Alexandria's rural areas have historically shaped local livelihoods, but modern techniques are increasingly influential. Agriculture remains a cornerstone of local economies, yet the sustainability of current methods is uncertain amid escalating climate change impacts (Mahmoud, 2016). Agricultural productivity is further influenced by labor dynamics, while government policies and technological advancements play critical roles. Farmers face significant economic challenges, although some have achieved success through innovative initiatives. These dynamics collectively underscore the need for a nuanced understanding of agricultural practices and their implications for livelihood resilience in Alexandria.

Assessing the resilience of rural livelihoods is crucial for understanding the capacity of rural communities to withstand and recover from adverse conditions. This understanding helps identify vulnerabilities and strengths within rural livelihoods, providing vital insights to inform policy and development programs aimed at enhancing resilience. Such assessments support sustainable rural development and poverty alleviation, while also enhancing food security and agricultural productivity (Pitaloka and Abdurrahim, 2023). Furthermore, they play a significant role in mitigating the impacts of climate change and environmental degradation. Promoting social equity and inclusive growth in rural areas, these assessments facilitate resource allocation and investment in rural infrastructure, strengthen local governance and community-based management, and contribute to national economic stability and growth.

Research Objectives:

The research aimed mainly to comprehensively assess the resilience of rural livelihoods in the Alexandria governorate of Egypt. This involves examining the socio-economic factors, environmental conditions, and institutional frameworks that influence the sustainability and adaptability of rural communities. By focusing on these dimensions, the research aims to identify the strengths and vulnerabilities within these communities, providing a nuanced understanding of their capacity to withstand and recover from various stresses and shocks. This assessment will contribute to the development of strategies that enhance the resilience and overall well-being of rural populations in this region.

Review of Previous Literature:

Theoretical frameworks for understanding livelihood resilience encompass a wide array of definitions and scopes, integrating key theoretical models and interdisciplinary approaches. These frameworks consider the pivotal roles of social, economic, and environmental factors, while also acknowledging the historical context and evolution of the concept. By incorporating elements of vulnerability and adaptive capacity, these models elucidate the relationship between resilience and sustainability. However, critiques and limitations of current theories highlight the need for refinement. Empirical studies applying these frameworks have offered valuable insights, paving the way for future directions in livelihood resilience research.

A few researchers investigated livelihood resilience assessment especially in Egypt. Hassan *et al.* (2014) examined local people's views on the causes, effect and socio-economic impact of desertification and degradation to the community. The study involved a cross-sectional survey conducted with four community categories, namely nomadic pastoralist, agro-pastoralists, villagers and Internally Displaced Persons (IDPs), from Addado, Buhodle and northern Galkaayo of central and northern part of Somalia; through questionnaire-based interviews. Descriptive statistics attribute environmental changes to negative implications of human activities on the environment: the menace of which led to a decline in forage, current loss of biodiversity and the related changes in the environment, permanent migration, increased poverty and health problems. The startling results of this study conclusively demonstrate that the challenges involve proper interventions for tree planting against desertification as well as for community empowerment through public education and formation of community based environmental associations to coordinate the overall environmental management activities and to raise public awareness.

Alary *et al.* (2015) focused on the assessment of the contribution of sheep and goats to reduce poverty and vulnerability in rural farming systems of three agroecological areas in Egypt: the pastoral area of the Northwestern coast (Matruh governorate), the irrigated areas of the Nile Valley (Sohag governorate) and the oasis area of the West Desert (New Valley governorate). An empirical study on 90 farms in the three agroecological areas on different social and economic indicators related to poverty gave indicators on the roles of sheep and goats in different farm types according to resource endowment (e.g. land, livestock, capital) and human resources. The results showed that sheep and goats provided the main source of income to landless and very small land owners to escape the poverty trap. Moreover, the livestock asset generated other sources of wealth that were not taken into account in the monetary poverty approach.

Baffoe and Matsuda (2018) assessed the asset levels of farm households from a gender perspective. In doing so, the study theorized and empirically tested assets on case bases. A household questionnaire survey was used to collect data from two hundred households in the Fanteakwa district of eastern Ghana. An asset index was used to compute the asset levels, while Kruskal–Wallis statistics was employed to compare the significance of the temporal changes. The results show a minimum level of asset endowment. Natural, social and financial assets were the three most endowed assets, with physical and human assets being the least. A gender analysis shows no significant difference, even though the levels of assets for the female-headed households were slightly higher than those of the male-headed households. However, the study found a 22.7% increment in the accumulation of financial assets among the female-headed households over the last 5 years compared to a 9.3% decrement in the same assets for their male-headed counterparts. Applying our theory, the results present an unbalanced and unstable asset situation among the household heads. The study call for improvement in physical and human assets. The overall study results imply an improvement in gender-asset accessibility in the context of rural Ghana.

Abd-Allah *et al.* (2019) aimed to characterize traditional goat production systems in some villages of the Nile Delta in Egypt by conducting structured questionnaire interviews and participatory assessments for five villages of Menoufia governorate involved in farming livestock and in animal health. Elementary data were collected using an interview scheduled. Data composed on socio-demographic characteristics of the farmers were analyzed using frequency counts and percentages. The study indicated that there were different contributions of livestock species to household livelihood. The results recorded that most of the farmers were male in all villages. The livestock owned comprised of buffalo, local cattle, crossbred cattle, sheep, donkey, chicken, rabbits, and ducks. There was general agreement among the respondents that crop farming, livestock, and goats were important for livelihoods, where it recorded the highest percentage (79, 77, and 76%), respectively. Twin kids of goats were the majority type of births (62%), also does with multiple births were more popular and preferred (98%) for farmers compared to single births (2%). With regard to production categories, the number of goat kids born emerged as the highly important categories for keeping goats in the opinion of all farmers (70%). Most of farmers indicated that crop farming and livestock keeping as the main system in their livelihoods (69%). Irrespective of the village, a large percentage of farmers (89%) indicated that cash income from the sale of goats was one of the important reasons for keeping the goat. Daily milk yields were not estimated by farmers and not taken into account. Most of the farmers (90%) indicated that lack of access to improved goats is the main constraint specified. Parasites (both internal and external) and pneumonia were recorded as important disease categories, but internal parasites were given high importance by all farmers (31%). Goats did not sell through any formal market channel in villages under study and goat meat is not found in any butchery or shelves of the villages' supermarkets.

Astuti and Handayani (2020). argued that Rural and urban types of livelihood are widely different. Rural livelihood refers to human dependence on natural resources, while urban livelihood mostly focuses on urban poverty in which natural resources are regarded as a less significant asset. Tambak Lorok, the largest fishing village in Semarang, Indonesia has a unique combination of urban–rural livelihood characteristics. The rural features are indicated by household dependence on natural resources and low educational level of the head of family, while the urban characteristics are indicated by easy access to various infrastructural services. Accordingly, this study aims to assess livelihood vulnerability in Tambak Lorok as a unique mixture of characteristics between urban and rural neighborhoods. Livelihood vulnerability index (LVI) measurement and factor analysis were applied to assess the level of vulnerability and identify the main factors that affected vulnerability at the household level. The result of LVI assessment indicates that residents in the area have low capabilities to cope with their uncertain sources of income due to their limited capacity. They cannot optimize the potential of their proximity to urban services.

Sallam and Ahmed (2020) evaluated the agricultural interventions related to productivity enhancement that may provide solutions to improve smallholder farmers' incomes. By applying Cost-Benefit Analysis (CBA) and conducting risk analysis using the Monte Carlo simulation technique for the proposed agricultural interventions, this paper evaluates the agricultural interventions in rural communities in Upper Egypt aimed at addressing the current challenges by moving from traditional farming to conservation agricultural. Results indicate that the interventions proposed are viable and have high positive socio-economic impacts on the farmers' livelihoods. The interventions will increase job opportunities in the target regions. Also, a very low probability of negative returns is shown. The probability of negative returns to the socio-economy aspects becomes almost zero when we add the economic benefit to society.

Nasrnia and Ashktorab (2021) tried to determine and measure the household livelihood resilience in the

Bakhtegan basin by means of a sustainable livelihood approach. To this end, the household livelihood resilience index was calculated using household capitals. The findings illustrated that household livelihood resilience index 0.359 on average, indicating the low level of resilience among households in the study area. Thereafter, taking data mining technique in determining resilience patterns, four different resilience patterns beginning from lower average resilience in all dimensions than that of other ones. However, the second-pattern households are more resilient. Eventually, this contribution would provide several implications to policymakers and other stakeholders in terms of improving planning and applying appropriate risk management strategies towards improving the resilience of farmers' households in the event of a natural disasters, especially a drought.

Chandra and Uniyal (2021) tried to understand the perception of mountain farmers towards the local adaptive capacity at a household level in an agro-ecological landscape. An indicator-based assessment is conducted to examine the 6 determinants and 27 indicators to give a local adaptive capacity index of the villages around Govind Wildlife Sanctuary and National Park, located in the Indian Himalayan region. The findings indicate that, though the connected and isolated villages have a low and very low adaptive capacity, respectively, the effect of various determinants on the local people varies among the village settlements, based on their socio-economic capacity. Despite the government endeavours to build the livelihood of mountain farmers through different programs and policies, it still lacks proactive decision-making. The study suggests an integrated assessment and sustainable enhancement of the landscape as a whole, with a focus on community-level adaptation strategies. It draws attention to the need for enhanced collaboration between research institutions, government and private sectors with the mountain community in the center.

Rudiarto *et al*. (2019) looked at the condition of five villages that suffer the most tidal flood there and tries to measure the livelihood resilience of the people through household survey. Livelihood Resilience Index (LRI) and Resilience Radar are adapted to calculate the score and level of livelihood resilience. Four dimensions (social dimension, economic dimension, environment dimension, and physical-infrastructure dimension) are used to express the livelihood resilience score of each study area. Sriwulan village has the highest score among the study areas, and it has medium level of livelihood resilience while Timbulsloko village which has the lowest score becomes the only study area with low level livelihood resilience. However, this result in score and level categorization are only an attempt to describe the spectrum of livelihood resilience instead of intending to provide a set of classification. It hopefully can help to identify what can be started first in the work of building resilience of the people and community in tidal flood prone areas.

Xiao *et al*. (2022) focused on the rural household's livelihood from the perspective of farmland lease-out. Using 382 rural households' data in Jiangxi Province, this study used the seemingly unrelated regression and binary logistic models to analyze the impact of farmland lease-out on rural households' livelihood capital and livelihood strategy. The results indicated that farmland lease-out did not affect rural households' human capital but had a negative impact on social capital, natural capital and future life expectation, and had a positive impact on financial capital and physical capital. Farmland lease-out had a significant negative impact on agricultural pluriactivity-type livelihood strategies, while having a significant positive impact on off-farm employment livelihood strategies. In addition, the scale of farmland lease-out had a positive impact on the off-farm pluriactivity and off-farm employment livelihood strategies.

The above sums up the findings of some of the literature related to Assessment of Rural Livelihood Resilience in different regions of the world. The study in handles the assessment of Rural Livelihood Resilience in Egypt, and addresses some of the variables considered in previous studies in the composition of the study variables and the method of assessing the Rural Livelihood Resilience. This section of the paper adheres to the theoretical framework of the study. This is made taking into consideration the nature of Rural Livelihood Resilience in general, and particularly in the study area. So, this section presents the definition of Rural Livelihood Resilience and related concepts.

- **The concept of rural livelihood resilience** is becoming increasingly important in discussions about rural development, poverty reduction, and environmental management.
- Rural livelihoods defined as the means of living in rural areas, are shaped by the intricate

interplay of geography, culture, and economy (Yang *et al*, 2021). Understanding the local context is crucial, as it reveals how diverse livelihoods are influenced by the availability of natural resources and environmental conditions. Both agricultural and non-agricultural activities play significant roles in sustaining these livelihoods. Furthermore, social, economic, and political factors exert considerable influence, reflecting the dynamic nature of rural livelihoods as they adapt to external and internal changes. This complexity underscores the need for a nuanced assessment of rural livelihood resilience (Zhang *et al.*, 2023).

• **Resilience in the context of livelihoods** refers to the capacity of rural communities to

Withstand and recover from various adversities while maintaining or improving their living standards. This resilience is crucial for rural areas, as it ensures the sustainability of communities amidst social, economic, and environmental challenges. Key characteristics of resilient livelihoods include adaptability, flexibility, and effective resource management. The ability to diversify income sources strengthens resilience, especially when faced with external shocks. Furthermore, strong community networks and support systems play a vital role in enhancing resilience, enabling communities to better manage resources and mitigate the impacts of stressors (Jaka and Shava, 2018).

• **Interconnection Between Rural Livelihood and Resilience.** Rural livelihoods encompass the diverse means by which individuals and communities sustain their well-being, often integrating agricultural and non-agricultural activities. Resilience in rural contexts refers to the capacity to adapt to, withstand, and recover from socio-economic and environmental challenges. Strategies employed by rural populations, such as diversified income sources and resource management, play a critical role in fostering resilience. Natural resources are pivotal in this regard, enhancing the ability of communities to withstand shocks. Socio-economic factors, including poverty and access to services, significantly impact resilience, while strong community networks bolster adaptive capacities. Despite these strategies, sustaining resilience remains challenging due to numerous obstacles (Zhang *et al.,* 2023).

• **Interconnection Between Rural Livelihood Resilience and rural development.** The intricate relationship between rural livelihood and resilience is a critical area of exploration, particularly in the context of rural development initiatives. These initiatives can significantly impact the resilience of livelihoods by introducing key factors that enhance both development and resilience. Community participation plays a crucial role in this process, as it strengthens resilience by fostering collective action and empowerment. Economic diversification is another vital element, offering a buffer against external shocks. Infrastructure development enhances rural livelihoods by providing essential services, while environmental sustainability ensures long-term resilience. Social networks and support systems are indispensable, as are education and skill development, which equip individuals to adapt to challenges. Integrating resilience into rural development strategies necessitates careful consideration of policy implications, ensuring that these efforts are sustainable and effective (Liu *et al*., 2020).

Most researchers agreed that Rural livelihood resilience in general refers to the ability of rural communities to withstand, adapt to, and recover from various shocks and stresses, such as environmental, social, political, or economic challenges (Liu *et al.*, 2020). This concept focuses on how rural residents perceive changes in their environment and modify their behaviors to maintain or improve their livelihoods (Zhou *et al*., 2021).

As seen in the literature review section, a variety of indices exist to assess the rural livelihood resilience, with different types of data sets. Some of these indices called Livelihood Vulnerability Index (LVI) by Hahn *et al*. (2009). The LVI measurement largely fits to the study context and target population (i.e., smallholder communities in sub–Saharan Africa) and similar sample size based on primary data obtained through a cross-sectional survey. The LVI also helps to capture the key factors that reflect the vulnerability situation of smallholder farming communities in the face climate induced environmental hazards. Similar to the LVI Weldegebriel and Amphune (2017) employed seven key variables, which relate to socio-demographic characteristics (SDC) (household size, dependency ratio, age, gender of household head and education), livelihood strategies (LS), health status (HS), food security status (FSS), access to water (AW), social network (SN), and flood disaster (FD) and its impact. Moreover, FAO (2016) find the Resilience Index Measurement and Analysis (RIMA) which estimates household resilience to food insecurity with a quantitative approach to establish a cause effect relationship between resilience and its critical determinants.

RIMA is context- and shocks-specific; it can be adopted for impact evaluation, reflecting the Theory of Change (ToC) and Logframe of interventions. Within a Monitoring Evaluation and Learning (MEAL) framework.

Data and Methodology:

The study is conducted in Alexandria Governorate, which is divided into 10 districts include (Al-Montaza First District, Al-Montazah Second District, Sharq District, Wasat, Gharb, El Gomrok, Al-Amriya first District, Al-Amriya Second, Al-Ajmi, Borj Alarab District (C). This study was conducted in Borj Aarab center which is considered the rural center in the governorate and administratively classified to 1 center called Borj Alarab and 3 main villages called Abusir, Algharbanieat, and Baheej (Table 1).

Table 1. Data for Borj Alarab Center

NO	Village	Number of affiliated villages	Number of hamlets	Number of populations	Number of Households	Sample Size (Households)	Percentage of sample
1	Abusir	15	21	35000	7000	50	24.39
2	Algharbanieat	14	67	36000	7200	63	30.73
3	Baheej	12	80	75000	15000	92	44.88
Total				146000	29200	205	100

Source: prepared by researcher using information from Information Center of the Borj Alarab Alqadeem center, Information Center of the Local Unit of Baheej Village, Information Center of the Local Unit of Abusir Village, and Information Center of the Local Unit of Algharbanieat Village (2023).

The study population is all the households in the three villages. Sample size is determined according to Taro Yamane formula (Snedecor and Cochran, 1980). The sample size is (205 Households).

The Rural livelihood resilience refers to the ability of rural communities to withstand, adapt to, and recover from various shocks and stresses, such as environmental, social, political, or economic challenges (Liu *et al*., 2020). This concept focuses on how rural residents perceive changes in their environment and modify their behaviors to maintain or improve their livelihoods (Zhou *et al*., 2021).

The study made a measurement scale to measure the total degree for rural livelihood resilience. Two answers were given to the respondents (Agree = support Rural Livelihood Resilience which stands on 1, disagree = Doesn't support Rural Livelihood Resilience which stands on zero. The degree of measurement's reliability estimated using the Alpha Coefficient of Cronbach, with alpha value standing at 0.741, which implies acceptable reliability (Tavakol and Dennick, 2011). Table (2) displays the variables used in the study with their indicators, definitions, and their items included.

Table 2. Definition, Indicators and Items of Rural Livelihood Resilience Measurements

Measurement	Indicators	Definition	Items
Rural Livelihood Resilience	Economic Factors	The capacity of individuals and communities to endure, adapt, and thrive amidst economic shocks and stresses and better support sustainable rural development.	1. Income Diversification. 2. Employment Rates. 3. Access to Financial Services. 4. Market Access and connectivity. 5. Government economic support programs.
	Social and Cultural Factors	The capacity of communities to withstand and recover from socio-economic and cultural shocks and better support sustainable rural development.	1. Education Levels. 2. Access to Health Services. 3. Social networks and support systems. 4. Cultural beliefs and values. 5. Gender Equity.
	Environmental Factors	How can community sustain the livelihoods amidst environmental changes and better support sustainable rural development?	1.Agricultural Productivity. 2.Adaptive Strategies to Climate Changes. 3.Biodiversity Loss. 4.Deforestation and Land Degradation. 5.Water quality and availability.

Institutional and Policy Factors	The capacity of institutions to endure, adapt and transform in the face of external pressures, with sustaining rural development.	1. Policy stability. 2. Access to Government Services. 3. Effective local governance. 4. Government Institutions and their Roles. 5. Role of Non-Governmental Organizations (NGOs).
Technological Factors	How Technology shaping the resilience of rural livelihoods, encompassing a broad spectrum of elements which will enhance community preparedness and promote technological innovations, ultimately fostering sustainable development in rural areas?	1. Access to information and communication technologies (ICT). 2. Agricultural innovations and Technology Adoption. 3. Infrastructure development. 4. Disaster risk management technologies. 5. Strategies for technological skill development.

Source: prepared by the researcher.

Findings and Discussion:

This study tries to see rural livelihood resilience through dimensions interlinked factors which are (Economic Factors, Social and Cultural Factors, Environmental Factors, Institutional and Policy Factors, Technological Factors. By identifying how each dimension shapes the level of rural livelihood resilience.

Table (3) shows the total level and total score of the rural livelihood resilience measurement in the three villages of study area on a scale that varies between zero point to 1 point. The end score of the measurement don't show a significant gab. Two villages of the study area (Algharbanieat Baheej) have a low level of rural livelihood resilience, but 1 village of the study area (Abusir) have a medium level of rural livelihood resilience. Abusir village was the highest village on rural livelihood resilience with score 0.41 and with a medium level of rural livelihood resilience, while Algharbanieat and Baheej villages were the lowest villages on rural livelihood resilience with score 0.37 for Baheej village and low level of rural livelihood resilience and 0.30 for Algharbanieat village and low level of rural livelihood resilience.

On the level of the factors that constitute the rural livelihood resilience measurement as it shown in Table (4), it seems that the Environmental Factors have medium score on the rural livelihood resilience measurement with a score 0.43 but Economic Factors, Social and Cultural Factors, Institutional and Policy Factors, Technological Factors have low score on the rural livelihood resilience measurement with a score (0.38, 0.36, 0.33, 0.30) respectively, and the total average of the factors score is 0.36 with low level of rural livelihood resilience, which means that in order to achieve a higher level of rural household's livelihood resilience in the study area we should to improve the total score and level of the measurement by improving the score for every items for those factors and raise the level and score for each factor to get more resilient households and communities and achieve the integrated and sustainable rural development for our local communities and the national community.

Table 3. Rural Livelihood Resilience Factors Score in each of studied villages

Rural Livelihood Resilience Factors	**Villages**					
	Abusir		**Algharbanieat**		**Baheej**	
	Score	**Level**	**Score**	**Level**	**Score**	**Level**
Economic Factors	0.54	Medium	0.13	Very low	0.24	low
Social and Cultural Factors	0.37	Low	0.22	Low	0.49	Medium
Environmental Factors	0.61	high	0.41	Medium	0.27	low
Institutional and Policy Factors	0.25	Low	0.43	Medium	0.45	Medium
Technological Factors	0.29	Low	0.29	Low	0.41	Medium
Total Rural Livelihood Resilience Score	0.41		0.30		0.37	
Total Rural Livelihood Resilience Level	Medium		Low		Low	

Source: calculated from the study data.

Table 4. Total Rural Livelihood Resilience Factors Score in the study area

Rural Livelihood Resilience Factors	Score	Level
Economic Factors	0.30	Low
Social and Cultural Factors	0.36	Low
Environmental Factors	0.43	Medium
Institutional and Policy Factors	0.38	Low
Technological Factors	0.33	Low
Total Score	0.36	
Total Level	Low	

Source: calculated from the study data.

According to the socio-economic and demographic characteristics for the study sample it seems that most of the respondents are in the age group (30:40) years old with approximately 66% of the study sample, 33% in the group of (40:50) years old and about 10% are in the group (20:30) years old. The household have a medium size with (5:7) person in the household with 53% of the total number of respondents and 38% of the households have more than 7 persons in the households but 9% of the total number of the studied households have less than 5 persons.

A bout 30% of the sample represents an average education degree. On the other hand, approximately 23% of the sample know only how to read and write, the set of respondents who have university degrees are 18% of the total sample, and about 16% illiterate, but 17% of respondents holds above average educational degree as it seen in Table (4). Moreover, about 55% of respondents are farmers with 45% occupying nonagricultural occupations.

According to Table (4) about 37% of respondents have been stayed in their villages 30 years ago to 14% stayed more than 30 years ago but, 31 % stayed in their villages about 20 years ago and 19% of the total number of people who included in the study sample stayed in their villages about 10 years ago.

Table 4. Primary Data of the study Sample

Variables	Frequencies	%
Age		
(20: 30)	21	10.24
(30: 40)	116	56.59
(40: 50)	68	33.17
Total	205	100.00
Education level		
Illiterate	33	16.08
Read and write	47	22.92
Average Academic Degree	61	29.74
Above Average Educational Degree	35	17.06
High Educational Degree	29	17.96
Total	205	100.00
Occupation		
Agriculture	112	54.63
Non-Agriculture	93	45.37
Total	205	100.00
Household size		
Less than 5	19	9.27
(5:7)	109	53.17
More than 7	77	37.56
Total	205	100.00
Stay Period in the village		
10 years	39	19.02
20 years	63	30.74
30 years	75	36.59
More than 30 years	28	13.65
Total	205	100.00

Source: calculated from the study data.

Table 5.Bivariate correlation results between Independent Variables and Rural Livelihood Resilience Measurement factors in the study villages

Independent Variables (Rural Livelihood Resilience measurement factors)	Independent Variables														
	Age			Education level			Occupation			Household size			Stay Period in the village		
	Abusir	Algharbanieat	Baheej	Abusir	Algharbanieat	Baheej	Abusir	Algharbanieat	Baheej	Abusir	Algharbanieat	Baheej	Abusir	Algharbanieat	Baheej
Economic Factors															
Income Diversification.	0.011	-0.34	-0.44**	0.15	-0.13	-0.15	-0.16	0.15	0.16	0.003	0.06	0.08	-0.02	0.11	0.13
Employment Rates.	-0.114	-0.11	-0.18*	0.04	-0.04	-0.06	0.03	-0.14	-0.18*	0.015	-0.07	-0.09	0.09	-0.19*	-0.22*
Access to Financial Services.	-0.39**	-0.13	-0.17	0.07	0.39**	0.43**	-0.14	-0.12	-0.15	0.022	0.01	0.03	-0.08	-0.14	-0.18*
Market Access and connectivity.	-0.01	-0.11	-0.13	0.03	-0.10	-0.10	-0.01	0.01	0.02	0.164	0.02	0.01	0.18	0.03	0.04
Government economic support programs	0.12	-0.03	-0.04	0.05	0.05	0.08	0.14	0.10	0.13	0.046	0.04	0.05	0.24*	0.11	0.12
Social and Cultural Factors															
Education Levels.	0.09	0.23**	0.33	١	١	١	-0.16	0.13	0.16	0.003	-0.07	-0.09	-0.02	0.11	0.13
Access to Health Services.	0.39**	-0.04	-0.07	0.24*	-0.48	٠.27*	0.03	-0.15	-0.18*	0.015	0.05	0.08	0.09	-0.19*	-0.22*
Social networks and support systems.	0.43**	0.19	0.27*	٠.15	-0.41	-0.48	-0.14	-0.13	-0.15	0.022	0.01	0.03	-0.08	-0.14	-0.18*
Cultural beliefs and values.	0.01	-0.05	-0.07	١-0.15	-0.29	-0.37**	-0.01	0.02	0.02	0.16	0.01	0.01	0.18	0.03	0.04
Gender Equity.	-0.07	-0.06	-0.09	0.07	-0.07	-0.09	0.14	0.11	0.13	0.046	0.04	0.05	0.24*	0.11	0.12
Environmental Factors															
Agricultural Productivity.	-0.16	0.11	0.16	-0.02	0.11	0.13	0.12	0.29*	0.35**	0.18	0.29*	0.32**	-0.22*	0.39**	0.44
Adaptive Strategies to Climate Changes.	0.03	-0.15	-0.18*	0.09	-0.21	-0.22*	0.28	0.30	0.39**	0.10	0.21	0.28	-0.18*	0.22	0.28
Biodiversity Loss.	-0.14	-0.11	-0.15	-0.08	-0.15	-0.18*	0.33	-0.16	-0.19*	0.14	0.11	0.17	0.04	0.01	0.05
Deforestation and Land Degradation.	-0.01	0.01	0.02	0.18	0.02	0.04	0.29*	0.05	0.07	0.16	0.09	0.10	0.12	0.11	0.14

Water quality and availability	0.14	0.11	0.13	0.24	0.11	0.12	-0.03	0.02	0.05	0.18	0.17	0.12	0.23**	0.21	0.26
Institutional and Policy Factors															
Policy stability.	0.12	-0.02	-0.04	-0.15	0.02	0.02	-0,04	0.09	0.13	0.003	0.04	0.08	0.15	0.01	0.05
Access to Government Services.	0.05	0.05	0.08	0.07	-0.03	-0.06	0.12	0.10	0.14	0.02	-0.04	-0.09	0.14	-0.05	-0.08
Effective local governance.	0.04	0.03	0.05	-0.22*	0.13	0.17	0.08	0.02	0.05	0.02	0.02	0.03	0.18	0.02	0.04
Government Institutions and their Roles.	0.12	0.10	0.13	0.01	-0.05	-0.09	0.05	0.02	0.04	0.16	0.02	0.01	0.29*	0.09	0.12
Role of Non-Governmental Organizations (NGOs).	0.08	0.11	0.14	0.04	-0.04	-0.08	0.13	0.11	0.12	0.04	0.03	0.05	-0.23*	0.029	0.26
Technological Factors															
Access to information and communication technologies (ICT).	-0.43**	-0.44	-0.53**	0.07	0.13	0.17	-0.53**	0.39**	0.42**	-0.18*	-0.14	-0.22*	0.05	0.04	0.08
Agricultural innovations and Technology Adoption.	-0.29	-0.41	-0.39**	0.39**	0.36	0.35**	0. 29	0.34	0.39**	0.09	0.11	0.19	0.29*	0.12	0.19
Infrastructure development.	-0.15	-0.03	-0.06	0.17	0.11	0.09	0.11	-0.11	-0.18*	0.09	-0.09	-0.11	0.19	0.40	0.41
Disaster risk management technologies.	0.17	0.01	0.03	0.37**	0.36	0.37**	0.37**	0.41	0.47**	-0.11	0.22	0.29*	0.36	0.38	0.33
Strategies for technological skill development	0.45	0.02	0.01	0.42**	0.35**	0.39**	0.39**	-0.39**	-0.41	0.21	0.04	0.07	0.22	0.21	0.17

* Significant on 0.05. ** Significant on 0.01.

Table (5) shows the results of the correlation between independent variables and indicators for the rural Livelihood Resilience measurement. The results show a significant correlation relationship between respondent's age and income diversification in Baheej, respondent's education level and Access to financial services in Algharbanieat and Baheej, respondent's age and Access to financial services in Abusir on the significance level 0.05. On the other hand, there are a significant correlation relationship between respondent's age and employment rate in Baheej, respondent's occupation and employment rate in Baheej, respondent's staying period and employment rate in Baheej and Algharbanieat, respondent's staying period and Access to financial services in Baheej, respondent's staying period and government economic support programs in Abusir on the significance level 0.01.

Moreover, there are a significant correlation relationship between respondent's age and education level in Algharbanieat, respondent's age and access to health services in Abusir, respondent's age and social network and support system in Abusir, respondent's education level and cultural beliefs Baheej on the significance level 0.05. On the other hand, there are a significant correlation relationship between

respondent's education level and access to health services in Abusir, respondent's education level and access to health services in Baheej, respondent's occupation and access to health services in Baheej, respondent's staying period and access to health services in Baheej and Algharbanieat, respondent's age and social networks and support systems in Baheej, respondent's staying period and social networks and support systems in Baheej, respondent's staying period and gender equity in Abusir on the significance level 0.01.

Table (5) also show a significant correlation relationship between respondent's occupation and agricultural productivity in Baheej, respondent's household size and agricultural productivity in Baheej, respondent's staying period and agricultural productivity in Algharbanieat, respondent's occupation and adaptive strategies to climate changes in Baheej, respondent's staying period and water quality and availability in Abusir on the significance level 0.05. On the other hand, there are a significant correlation relationship between respondent's occupation and agricultural productivity in Algharbanieat, respondent's household size and agricultural productivity in Algharbanieat, respondent's staying period and agricultural productivity in Abusir, respondent's age and respondent's education level and adaptive strategies to climate changes in Baheej, respondent's staying period and adaptive strategies to climate changes in Abusir, respondent's education level and occupation and biodiversity loss in Baheej, respondent's occupation and deforestation and land degradation in Abusir on the significance level 0.01.

In addition to that the study finds a significant correlation relationship between respondent's education level and effective local governance in Abusir, respondent's staying period and government institution and their role in Abusir, respondent's staying period and non-governmental organization and their role in Abusir on the significance level 0.05. On the other hand, there are a significant correlation relationship between respondent's age and access to information and communication technologies in Abusir, respondent's age and access to information and communication technologies in Baheej, respondent's occupation and access to information and communication technologies in all villages (Baheej, Algharbanieat and Abusir), respondent's age and agricultural innovations and technology adoption in Baheej, respondent's education level and agricultural innovations and technology adoption in Abusir and Baheej, respondent's occupation and agricultural innovations and technology adoption in Baheej, respondent's education level and disaster risk management technologies in Baheej and Abusir, respondent's occupation and disaster risk management technologies in Baheej Abusir, respondent's education level and strategies for technological skill development in the three studied villages (Baheej, Algharbanieat and Abusir), respondent's occupation and strategies for technological skill development in Algharbanieat and Abusir on the significance level 0.05. On the other hand, there are a significant correlation relationship between household's size and access to information and communication technologies in Abusir and Baheej, respondent's staying period and agricultural innovations and technology adoption in Abusir, respondent's occupation and infrastructure in Baheej, household's size and disaster risk management technologies in Baheej on the significance level 0.01.

The study also, conducted stepwise regression which is a method used to build a regression model by iteratively adding or removing variables. The goal is to create a model that is both accurate and parsimonious, meaning it uses the smallest number of variables necessary to explain the data. The study uses Forward Selection type of stepwise regression which starts with an empty model and adds variables one by one, selecting the variable that improves the model the most at each step (Miller *et al*., 2022).

As it shown in Table (6) these factors vary in the degree of their impact on the rural livelihood resilience which is clear from β values which is equal 0.575 for economic factors while 0.688 and 0.420 for economic and social and cultural factors, but it was equal 0.720, 0.437 and 0.285 with economic, social and cultural and environmental factors, and 0.319, 0.803, 0.426, and 0.458 with economic, social and cultural, environmental and Institutional and Policy factors, it was equal 0.433, 0.264, 0.626, 0.404, 0.374 with economic, social and cultural, environmental, Institutional and Policy and technological Factors. On the other hand R^2 values was 0.331, 0.495, 0.575, 0.642, 0.726 and significance level 0.000, 0.001, 003, 0.015, 0.013, which is mean that the factors (Economic factors, Social and Cultural factors, Environmental factors, Institutional and Policy factors, Technological Factors) have a gradual effect on the rural livelihood resilience on the study areas.

Table 6. Multiple Regression Results between Rural Livelihood Resilience Measurement and its factors

Factors	R^2	F	β	Significance level
Economic Factors	0.331	18.803	0.575	0.000
Economic+Social and	0.495	18.120	0.688	0.003
Cultural Factors			0.420	0.000
Economic+Social and	0.575	16.228	0.720	0.000
Cultural			0.437	0.001
Factors+Environmental			0.285	0.000
Factors				
Economic+Social and	0.642	15.691	0.319	0.001
Cultural+Environmental			0.803	0.015
+Institutional and Policy			0.426	0.000
Factors			0.458	0.013
Economic+Social and	0.726	15.67	0.433	0.013
Cultural+Environmental			0.264	0.001
+Institutional and			0.726	0.000
Policy+Technological			0.404	0.015
Factors			0.374	0.000

Conclusions and Recommendations:

The concept of livelihood resilience has garnered significant attention in the field of rural development, particularly in regions experiencing rapid socio-economic, technological, policy, institutional and environmental changes. In the context of Egypt, where rural communities form the backbone of agricultural production and local economies, understanding and enhancing livelihood resilience is imperative. This study focuses on the rural areas of the Alexandria Governorate, a region that exemplifies the diverse challenges and opportunities faced by rural populations in Egypt.

Rural livelihoods in Alexandria are influenced by a myriad of factors, including Economic Factors, Social and Cultural Factors, Environmental Factors, Institutional and Policy Factors and Technological Factors. These factors collectively shape the rural livelihood resilience context within which rural households operate, impacting their ability to sustain and improve their livelihoods. As such, examining the resilience of these livelihoods necessitates a comprehensive analysis of the strategies and adaptation mechanisms employed by rural communities to navigate and mitigate risks.

Moreover, an assessment of these interventions provides valuable insights into their impact and highlights areas for improvement. This study also delves into the inherent challenges faced by rural households in building and maintaining resilience.

Ultimately, the findings of this study finds that the total rural livelihood resilience score in the three villages of study area don't show a significant gab. The villages of (Algharbanieat and Baheej) less resilient village compared with the village of (Abusir) which is consider more resilient village. On the other hand, the Environmental Factors have medium score on the measurement but all other factors (Economic Factors, Social and Cultural Factors, Institutional and Policy Factors, Technological Factors) have low score on the same measurement. This study recommends to working on raise the level of livelihood resilience in the study area by improving the factors effected on livelihood resilience level by integration all items for every factor to get more resilient rural communities and goes hand in hand with Sustainable development goals.

To do that efforts must be directed to raising the rural livelihood resilience levels in Egypt. Work should be directed to persons and households. So, the state should direct part of its development programs to rural areas. In addition to that it should try to increase the local people and households share in the community issues, encourage rural households to engage in several income-generating activities can lessen reliance on a single source of income, fostering small-scale companies. Improve agricultural practices. Introducing sustainable farming techniques, making agriculture more robust to climate change. Access to education and training. Education and vocational training assist rural populations in developing new skills and information, allowing them to adjust to changing economic conditions and possibilities. Develop a strategy to address biodiversity loss while also promoting sustainable land-use practices, water quality, soil fertility, pest control, and lowering vulnerability to climate change and other environmental challenges, Developing infrastructure and basic services to boost market access and increase economic stability in remote

communities, Encouraging the establishment of cooperatives and social networks can increase collective bargaining power, improve access to resources, and provide a support system during crisis. Enhance government financial support initiatives. Increased access to microfinance, savings, and insurance services can assist rural households in managing risks and investing in productive activities. Improving information and communication technologies (ICT) to offer farmers with timely information on weather forecasts, market prices, and best agricultural practices. This assists them in making educated decisions, lowering risks and enhancing production, so creating Cultural beliefs and values that promote gender equity and empowerment should be consolidated, and both governmental and non-governmental institutions and organizations should develop and implement rural development policies, such as subsidies for sustainable practices, investment in rural infrastructure, and social protection programs. By combining these techniques, rural communities can increase their resilience, assuring sustainable livelihoods and a higher quality of life. Other constraints to rural livelihood resilience in Egypt require additional research.

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الملخص العربي

تقييم مرونة الحياة الريفية فى مصر

بسمة حسن سعد

في ظل سعي الدول نحو التنمية المستدامة، أصبح فهم ديناميات سبل العيش الريفية أمرًا بالغ الأهمية، لا سيما في المناطق التي تتجلى فيها الهشاشة الاقتصادية بشكل واضح. تقدم محافظة الإسكندرية، بما تتميز به من مشهد اجتماعي واقتصادي فريد، حالة مثيرة للاهتمام لاستكشاف سبل العيش الريفية بشكل عميق، مع التركيز على العوامل التي تسهم في تعزيز القدرة على الصمود في ظل التحديات المستمرة مثل الفقر، وتدهور البيئة، وعدم الاستقرار الاجتماعي. تبحث هذه الدراسة في تحديد وتحليل الأبعاد المتعددة التي تؤثر على المرونة بين المجتمعات الريفية. بينما اعترفت الأدبيات الحالية بهذه التحديات، هناك فجوة ملحوظة تتعلق بالتقييمات المحلية التي تأخذ في الاعتبار الخصائص الفريدة للسكان الريفيين في الإسكندرية وتفاعل الضغوط الخارجية، مثل تغير المناخ وتقلبات السوق. معالجة هذه الفجوة أمر حيوي ليس فقط للنقاش الأكاديمي ولكن أيضًا لإبلاغ صانعي السياسات والمساهمين في صياغة تدخلات فعالة تعزز من مرونة سبل العيش في المناطق الريفية في مصر.

تظهر هذه الدراسة أن درجة مرونة سبل العيش الريفية الإجمالية في القرى الثلاثة في منطقة الدراسة لا تُظهر فجوة كبيرة. قرى (الغربانيات) و(بهج) أقل مرونة مقارنة بقرية (أبو صير) التي تعتبر قرية أكثر مرونة. تتمتع العوامل البيئية بتقييم متوسط في القياس، بينما تسجل جميع العوامل الأخرى (العوامل الاقتصادية، العوامل الاجتماعية والثقافية، العوامل المؤسسية والسياسية، العوامل التكنولوجية) درجات منخفضة. توصي هذه الدراسة بالعمل على رفع مستوى مرونة سبل العيش في منطقة الدراسة من خلال تحسين العوامل المؤثرة على مستوى مرونة سبل العيش، من خلال دمج جميع العناصر لكل عامل للحصول على مجتمعات ريفية أكثر مرونة.

الكلمات المفتاحية: مرونة المجتمع، الضعف الاجتماعي، مرونة سبل العيش، إدارة الكوارث المجتمعية، التنمية الريفية.