Evaluation of household resilience capacity index to food insecurity. Case study: Hosein Abad Rekhneh Gol village - Iran

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DOI: 10.30682/nm2301h
JEL codes: P25, Q1, R2

Abstract

The present study estimates households' resilience against food insecurity in a selected village of Qalandar Abad district in Iran. The Resilience Index Measurement and Analysis (RIMA) of the Food and Agriculture Organization of the United Nations (FAO) was used for the first time in Iran, to achieve this goal. The samples included 149 farmers randomly selected and the Data were collected through interviews. The factor analysis method was used to estimate the components of resilience, and the MIMIC method was used to estimate the latent variable of resilience. The results showed that the components of asset and adaptive capacity had a significant role in increasing the resilience of rural households in the study area. Variables such as the land area, water availability, and the yield of crops had a significant positive role in improving the asset pillar. The households head and other members' education also had a significant positive effect in improving the adaptive capacity pillar. Therefore, due to time and budget constraints in the execution of macro-policies, adopting and implementing policies that increase the above components will improve the resilience of rural households.

Keywords*: Resilience, Rural farmers, Food insecurity, MIMIC model.*

1. Introduction

Given the growing global chronic hunger near 690 million people in recent years (Bedeau *et al.*, 2021; d'Errico *et al.*, 2021), creating and increasing resilience among disadvantaged and impoverished communities, emphasized in the 2030 Sustainable Development Agenda, is a significant concern to most countries (Sustainable Development Goals, 2019). The term resilience, generally considered as the capacity of a system to withstand various risks, was first examined in the general theory of systems and then in various studies such as ecology, psychology, epidemiology, engineering, etc. (d'Errico *et al.*, 2018). The introduction of the concept of resilience into the studies that examined the relationship between ecosystems and human societies (Folke *et al.*, 2002; Walker *et al.*, 2004) led this notion to be considered as a new concept

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of development by researchers and policymakers (Heijman *et al.*, 2019).

According to a report in the 2017 Sustainable Development Goals, about 80% of the world's poor live in rural areas (Guterres, 2017). In general, rural residents are more exposed to economic, environmental, and social challenges than urban dwellers in terms of lack of various facilities. Hanse, it is inevitable to pay attention to rural households' resilience and consider coping strategies in the face of different shocks. In Iran, about 24 million out of 85 million people live in rural when this ratio has decreased from 66.26% to 24.13% during the last 40 years (Statistical Center of Iran, 2021).

In addition to the development of cities during the mentioned years, various factors have led to the enhancement of migration rates from rural to urban areas, including reducing employment in agriculture and the development of industry and urban growth and development (Mahmoudian and Ghassemi, 2014). The depopulation of villages, the increase in marginalization, and economic and social challenges in cities are the severe consequences of such migration. So, comprehensive understanding and administration of rural households' resilience within the country's macro-policies will lead to migration reductions and efficient usage of Iran's financial resources by recognizing the strengths and weaknesses of each region.

Since resilience is a context-specific concept (d'Errico and Di Giuseppe, 2018), and cannot be measured directly, studies have provided various definitions of resilience to estimate this index to different shocks. For instance, food security as an essential shock could be influenced by various variables such as inflation, imports, and land under cereals in developing countries (Jeder *et al.*, 2020). Given that food insecurity is one of the most critical shocks to vulnerable communities, Table 1 summarizes some studies that calculated the resilience index to food insecurity through various criteria.

Various indices have been used to assess resilience against food insecurity, the most important of which is the index proposed by Alinovi *et al.* (2008) to measure the resilience capacity against food insecurity and evaluate the effectiveness of

Table 1- Studies on resilience -own elaboration based on Ansah *et al.* (2019).

Surveyed study	*Location*	*Resilience attributes assessed*
Alinovi *et al.*, 2010a	Palestine	Income and food access; Access to public services; Social safety nets; Agricultural assets; Non-agricultural assets; Agricultural practice and technology; Adaptive capacity; Stability
Keil *et al.*, 2008	Indonesia	Share of expenditures between normal and drought years; differences in monthly consumption frequencies between normal and drought years
Frankenberger *et al.*, 2012	Africa	Livelihood change over time
Vaitla *et al.*, 2012	Tigray, Ethiopia	Change over time of food security indicators
Browne *et al.*, 2014	Africa	Composite asset index
Kebede *et al.*, 2016	West Shoa, Ethiopia	Agricultural input and technology, social safety nets, access to basic services and food, income and adaptive capacity
Ambelu *et al.*, 2017	Borana communities, Southern Ethiopia	Wealth; Household food insecurity access prevalence; Social capital; Psychosocial distress; Livestock; Infrastructure and social services; Peace and security; Human capital; Environment
Smith and Frankenberger, 2018	Northern Bangladesh	Absorptive capacity; Adaptive capacity; Transformative capacity
d'Errico and Di Giuseppe, 2018	Uganda	Access to basic services; Social safety nets; Assets; Adaptive capacity
Dhraief *et al.*, 2019	Tunisia	Access to basic services; Social safety nets; Assets; Adaptive Capacity; Stability and Climate change

interventions. This index plays a significant role in the resilience concept development and has been considered by researchers and policymakers due to its comprehensiveness. The FAO Resilience Index Measurement Analysis (RIMA) was first introduced by Alinovi *et al.* (2008) and changed and expanded in 2016 (FAO, 2016).

According to the available data from the Statistics Center of Iran census in 2016, Khorasan Razavi province has the highest rural population among all provinces. Within the cities in this province, Fariman, located in the east of Khorasan Razavi province, has a positive growth of rural population at a rate of 0.66 during 2006 to 2016, which includes 60% of the urban population and 40% of the rural population. The annual positive growth rate of 0.66 of rural population of Fariman in comparison with -0.26 and -0.63 for Khorasan Razavi and the whole country, respectively Statistical Center of Iran (2021), indicates that there are still rooms in Fariman to prevent rural migration to cities. To acknowledge the current potentials, it is vital to measure the resilience status of rural households to achieve a clear understanding of their living conditions and apply the results in policy-making procedures to reduce the depopulation of villages.

Therefore, considering that the resilience index against factors such as food insecurity has not been quantitatively studied in Iran so far, this study aims to estimate the resilience index (RIMA) for rural farming households in Hosein Abad Rekhneh Gol located in Fariman against food insecurity.

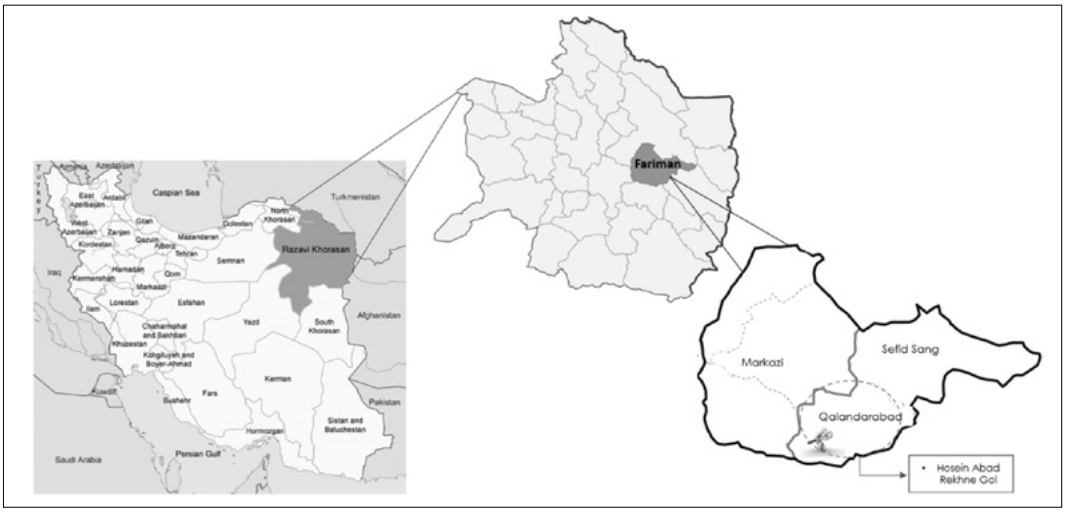
2. Materials and methods

2.1. *Study area*

Although understanding and awareness of villagers' resilience in a country requires a comprehensive study of rural households in that country, in the present study, Hosein Abad Rekhneh Gol located in Qalandar Abad rural area has been selected as a pilot project to estimate the resilience of rural farmers' households (Figure 1).

In Hosein Abad Rekhneh Gol, unlike other rural areas in Qalandar Abad, the primary source of revenue is agriculture since the villagers' have access to rented agricultural deep wells. Most agricultural deep wells in Qalandar Abad district are ruled by the landlords who live in the cities. At the same time, rural smallholders face critical challenges due to the lack of water or dehydration of many aqueducts in that area and have to work in other sectors for their livelihood. Therefore, according to the purpose of this study to investigate the resilience of rural farmers' households against food insecurity, Hosein Abad Rekhneh Gol has been selected as the study area.

Figure 1 - Ghalandar Abad district position of Iran.



2.2. *Study population and data*

The study sample was selected by a simple random sampling method from the statistical population of farmers in Hosein Abad Rekhneh Gol. To achieve the above goal and consider the minimum required sample based on the Morgan table, 149 farmers participated in the present study through a table of random numbers. Household heads, who are the main decision-makers in the household, were considered as the respondents. The required data are collected through interviews with the household's head and filling out the FAO localized questionnaire (FAO, 2020), and the questionnaire was modified based on the pilot respondents in the pre-test level. The questionnaires were filled out in 2021.This data includes access to basic services such as health centers, schools, and taxi stations, available water, electricity and gas quality index, productive and non-productive assets, formal and informal cash transfers in the social safety nets of households, level of education, and variety of cultivation of household products as well as food security indices such as the household hunger scale and food consumption score of households.

2.3. *Empirical model*

The definition and development of models used in food security studies have led to the creation of resilient systems that consider households as components of this system. Therefore, considering households as a unit of analysis is one of the common references in the field of resilience and food insecurity studies (Dhraief *et al.*, 2019). RIMA is based on a definition of resilience, "the ability of households to return to previous living conditions – such as achieving food security – after a shock," and present how households cope with shocks and fluctuations through various econometric methods (FAO, 2016).

RIMA, which considers resilience as a latent variable, includes four main dimensions of access to basic services, assets, social safety nets, and adaptive capacity, estimated in two stages. In the first stage, estimating the components of resilience is obtained through observable variables of the questionnaire. In the second stage, the structural equation model (SEM) is used to estimate the latent variable of resilience capacity (FAO, 2016).

The main dimensions of the RIMA Resilience Capacity Index (RCI) are shown in Equation 1.

$$RCI = f(ABS, AST, SSN, AC) \quad (1)$$

In this regard, ABS is households' access to basic services, AST is household assets, SSN is social safety nets, and AC is households' capacity to adapt to various shocks. All of them are a function of the RCI index of resilience capacity and will be estimated using the factor analysis method through observable variables obtained from the questionnaire. Figure 2 shows the analytical framework of the present study.

As is shown from equation one and the analytical

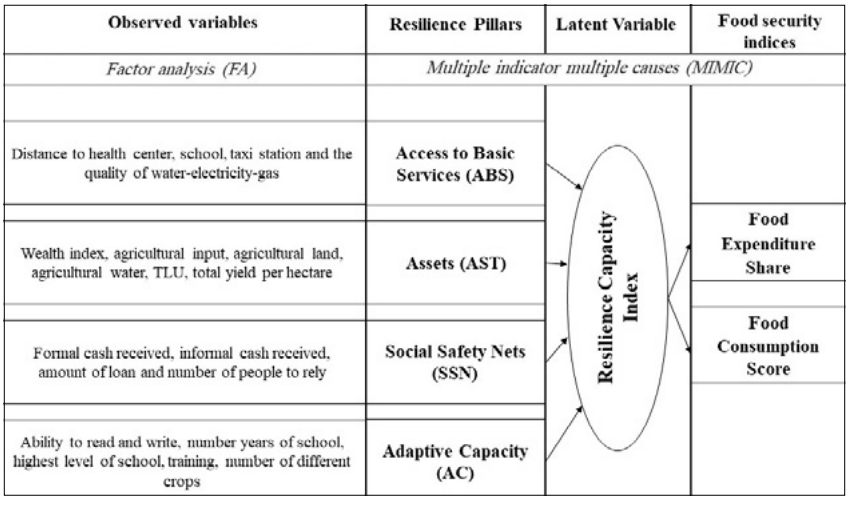


Figure 2 - Analytical framework for the study. Own elaboration based on FAO (2016).

framework of the study in Figure 2, to achieve the latent variable of resilience, the main components must first be estimated through the data collected in the questionnaire by using factor analysis.

Access to basic services (ABS), including improving the effectiveness of access to assets, is considered as one of the key factors in increasing household resilience. Therefore, access to public services affects the ability of households to cope with various shocks (Alinovi *et al.*, 2010b). Factors that makeup access to public services include the distance from the family to health centers, schools, local markets, and public transportation. The quality of services available to households such as drinking water, electricity, and gas are also considered as a variable of the ABS pillar (FAO, 2016).

Assets (AST) in the RIMA method include two groups of productive and non-productive assets. The productive group effectively provides goods and services in terms of household income, and the non-productive group can also be put up for sale if needed. In general, the component of assets, including productive and non-productive, can be considered one of the most important criteria for measuring people's living standards. Since the main occupation of many villagers is agriculture, variables such as wealth index, agricultural inputs, land and water availability for agriculture, tropical livestock unit, and total yield can be considered for building up the AST pillar (FAO, 2016).

Social safety nets (SSN), including direct (cash) or indirect transfers, are considered among the most important forms of support for social safety and reducing household poverty in many developing countries. The variables that make up the SSN pillar generally include the amount of formal and informal cash transferred, formal and informal in-kind transferred, and the amount of money received via bank loans over a period of time, as well as the number of people that each household can rely on their help if needed (FAO, 2016).

Adaptive capacity (AC) is a multidimensional concept and means the ability of households to adapt to environmental changes, crises, and shocks influenced by factors such as learning and acquiring various technical skills. For instance, higher literacy rates as a measure of knowledge, awareness, and skills lead to higher adaptation capacity. In contrast, higher dependency ratio in households, minimum literacy levels, limited sources of income, etc., make households vulnerable to crisis. Variables such as the household's head literacy, the household's members attending school years, various agricultural and technical training, household dependency ratio, and the number of crops grown during a year are considered variables that form the AC (d'Errico and Di Giuseppe, 2018; FAO, 2016).

Table 2 - Household hunger based on Ballard *et al.* (2011).

Household Hunger Categories	*Household Hunger Score*
Little to no hunger in the household	0-1
Moderate hunger in the household	2-3
Severe hunger in the household	4-6

According to the purpose of the study on estimating the resilience of rural households against food insecurity with the MIMIC method, at least two food security indicators at the household level, as multiple indicators of resilience, are required (Alinovi *et al.*, 2010b; FAO, 2016).

The food security indices used in the calculations of this study include the Household Hunger Scale Index and the household Food Consumption Score.

The Household Hunger Scale Index is a simple scale for measuring household hunger in vulnerable areas, obtained by answering questions based on the occurrence and frequency of household hunger in a given period of time. The calculated numbers for each household are divided into three different groups according to Table 2 (Ballard *et al.*, 2011).

As can be seen from Table 2, the more scores of household hunger, the less food security in households will be.

The Food Consumption Score Index is aggregated and weighted based on the diversity and repetition of different food groups and their relative nutritional value, with three acceptable, average, and weak thresholds (INNDEX Project, 2018).

After estimating the resilience pillars through the factor analysis method and calculating the mentioned food security indicators, the MIMIC model

was used based on the FAO method to estimate the latent variable of resilience to food insecurity. The MIMIC model, which belongs to the structural equation model (SEM) group, was developed by Zellner in 1970 based on the statistical theory of latent variables, which is currently one of the most common methods for measuring latent variables (FAO, 2016; Motallebi *et al.*, 2020).

This model includes one latent, variable (resilience), several causal variables as the causes of the latent variable (resilient pillars) and several indicators representing resilience (food security indicators). Therefore, it is assumed in these equations, the latent variable of resilience is related to its causes on the one hand and has effects on food security on the other hand. The MIMIC model, which consists of two components of the structural equation and the measurement equation, explains the relationship between the latent variable and the observed variables (including causes of latent variable and its indices) by minimizing the distance between the sample covariance matrix and matrix predicted by the model (FAO, 2016, 2018).

3. Results

3.1. *Resilience pillars*

In the first stage, each of the pillars of resilience, including access to public services, assets, social safety nets, and adaptive capacity, which are considered latent variables, are estimated through observed variables of the questionnaire by factor analysis. Based on the analytical framework of the study in Figure 2,

- The access to basic services pillar includes variables such as the distance from the household accommodation to the nearest health center, school, and taxi station[1] and the quality of available water, electricity, and gas.[2]
- The asset pillar contains variables such as the calculated wealth index (FAO, 2019), inputs (total numbers), land (total owned and leased land per hectare), and water available to agriculture (dummy variable), the tropical livestock unit index (FAO, 2019), and the total yield obtained in one year (kg per hectare).
- The amount of formal and informal cash transferred and the amount of household loans received (in Rials per year), as well as the number of people each household can rely on if needed, are considered in the calculation of the social safety nets pillar.
- Variables such as the ability of the household's head to read and write, years of attending the school, the highest level of literacy among household members, various agricultural and technical training, and also the number of crops grown during a year are considered to create the adaptive capacity pillar.

Table 3 shows the descriptive statistics of the included variables to create the resilience pillars.

The results regarding the correlation between variables and pillars of access to public services, adaptation capacity, assets and social safety nets can be seen in Figures 3 to 6. The higher correlation between the variables and the calculated pillars indicates the greater importance of that variable in each of the resilience components.

According to the results, among the variables that constitute the pillar of access to basic services, "the distance from the household to the health center" variable has a higher correlation with this pillar, which indicates its high importance. In addition, the "attending school years" is one of the most important variables in forming and creating the adaptive capacity of a household to the crises ahead. Both the agricultural water availability and the total yield during a year play an important role in creating the asset pillar. Regarding creating the social safety nets pillar, as we expected, the governmental cash transfers, through monthly subsidies, the Imam Khomeini Relief Foundation, and the State Welfare Organization of Iran, is the most crucial variable.

[1] According to the Short Rima Manual (FAO, 2019), for distance to main services, we calculated the inverse (1/variable) which provides a proxy measurement of the distance to particular service.

[2] According to FAO (2016, 2020) to calculate the service quality index, the head of the household was asked about (water, electricity, and gas quality) and the answer was recorded as ordinal variables from 1 to 5. Then, the aggregated quality variable for each household was scaled through the Min-Max Scaling method.

Table 3 - Descriptive statistics of the variables.

Variables		*Descriptive Statistics*			
		Mean	*Standard Deviation*	*Minimum*	*Maximum*
ABS's variables	Distance to taxi	0.17	0.13	0.03	1
	Distance to school	0.15	0.15	0.03	1
	Distance to health center	0.13	0.10	0.03	1
	Quality index	0.66	0.14	0.00	1
AST's variables	Wealth index	0.41	0.19	0.00	1
	Agricultural inputs	0.22	0.72	0.00	3
	Agricultural land	7.84	6.82	1.00	52
	Having agricultural water or not	0.64	0.48	0.00	1
	TLU	1.59	2.29	0.00	13
	Total yield (kg per hectare)	2695.97	2541.72	0.00	9500
SSN's variables	Formal received (in Rials)	33469798.66	14824973.02	0.00	71000000
	Informal received (in Rials)	64899328.86	114606361.84	0.00	700000000
	Amount of loans (in Rials)	110402684.56	352333685.50	0.00	3000000000
	Numbers for rely	1.58	1.94	0.00	11
AC's variables	Ability for read and write	0.81	0.40	0.00	1
	Years of school(head-HH)	5.60	3.59	0.00	16
	Highest level school (HH)	7.40	3.27	0.00	16
	Training	0.20	0.40	0.00	1
	Numbers of crops	2.02	0.99	1.00	4

Figure 3 - Variables correlation with the ABS pillar.

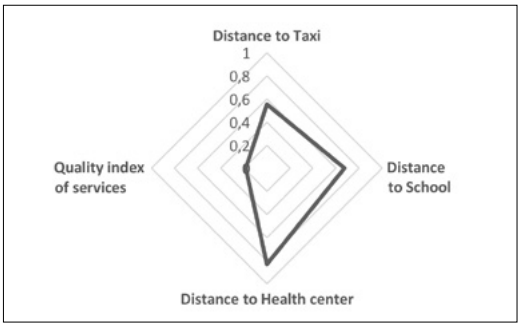


Figure 4 - Variables correlation with the AST pillar.

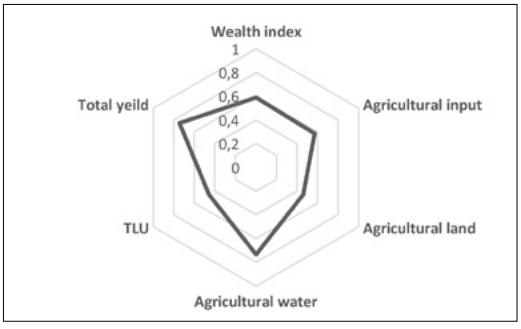


Figure 5 - Variables correlation with the SSN pillar.

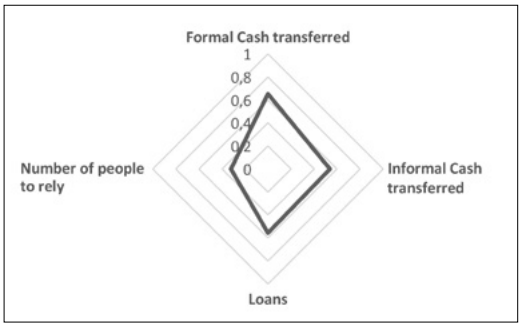
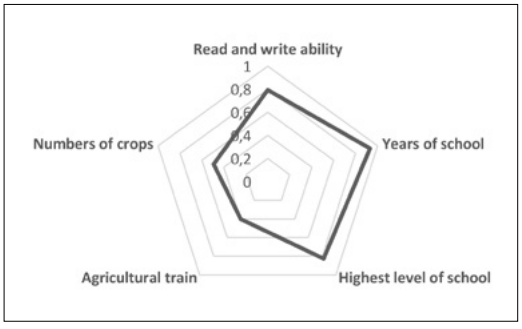


Figure 6 - Variables correlation with the AC pillar.



3.2. *Food security indices*

The Food Consumption Score Index consists of three thresholds: I) score from 0 to 21 in the Poor Food Security group, II) score of 21.5 to 35 at the borderline, and III) score of 35 and above called acceptable (INNDEX Project, 2018). The results obtained from the food consumption (FCS) score index showed that 117 out of 149 studied households are in the acceptable threshold, 28 households are on the borderline, and 4 households are in the poor food consumption situation. The Hunger Scale Index showed that out of 149 households, 62 households are on the little to no hunger threshold, while 81 households are on the moderate hunger and 6 households are on the severe hunger thresholds. Figures 7 and 8 are the scores of the studied households based on the food consumption index and hunger scale, respectively.

Figure 7 - Food consumption score result.

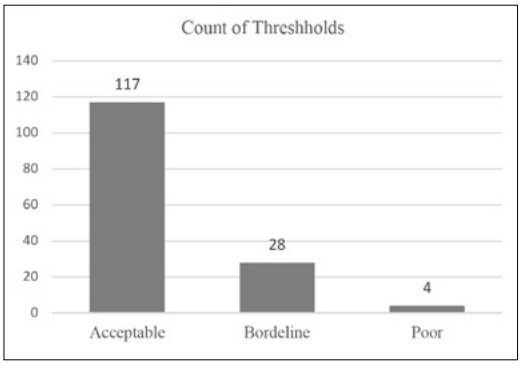
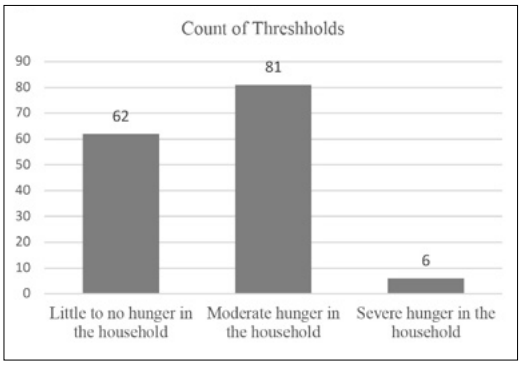


Figure 8 - Household's hunger score result.



3.3. *The MIMIC model results*

Table 4 summarizes the results of estimating the MIMIC model on the resilience capacity index (RCI). Access to basic services, assets, social safety nets, and adaptive capacity are the factors affecting resilience, and additionally, indicators of food security are affected by the resilience capacity index. According to our findings, among the calculated pillars, household assets is the most important one. The possession of critical inputs such as agricultural land and water in the AST pillar could increase farmers' income and improve their living conditions. So, it can play an essential role in increasing the resilience of rural households. The increase of one standard deviation unit in AST will increase 0.06 standard deviation units in the resilience capacity index.

Adaptive capacity and social safety nets pillars also play a significant role in creating resilience for rural households. Thus, increasing one standard deviation in the AC and SSN lead to an increase in the magnitude of the RCI by 0.04 and 0.03 standard deviation, respectively. Figure 9 shows the share of each of the components affecting the RCI.

These findings are in line with the studies such as Boukary *et al.* (2016), FAO (2016, 2018) and Innocenti Research Centre (2018) that state asset,

Table 4 - MIMIC regression results.

Covariates	*ML*
ABS	-0.005 (-0.03)
AST	0.063** (3.04)
SSN	0.036** (2.02)
AC	0.044** (2.13)
Measurement model	*ML*
Food consumption score	1
Household hunger scale	-1.87** (-2.71)
Statistics	*ML*
Observation	149
Chi-square	58.43
(P- value)	0.00
RMSEA	0.00
Probability RMSEA < 0.05	0.89
CFI	1.00
TLI	1.12

*Note: **: Significative at 95%*

Figure 9 - Pillar's share of the Resilience Capacity Index.

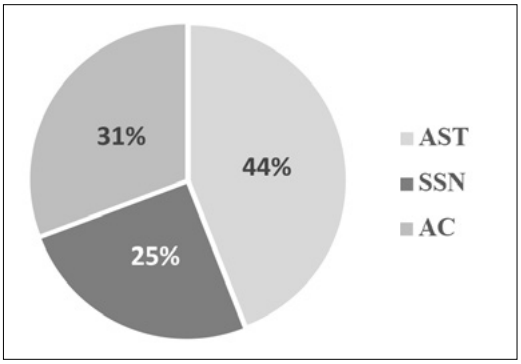
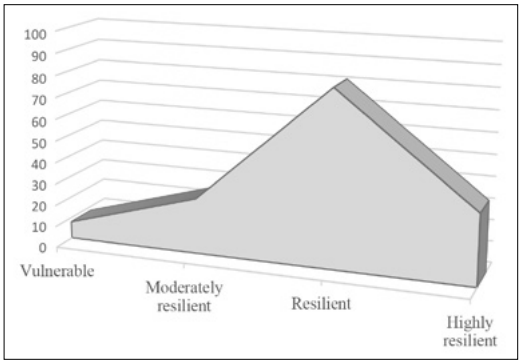


Figure 10 - Household resilience spectrum based on calculated RCI.



adaptive capacity, and social safety net pillars have a notable influence on households' resilience.

Turning to the Measurement model section, given the fixed positive coefficient of Food Consumption Score, the calculated coefficient of the Household Hunger Scale indicates that an increase in RCI of one standard deviation decreases HHS by 1.87. In other words, increasing the resilience of rural households effectively reduces food insecurity of the surveyed households.

Within the Statics section Table 4, the results' robustness test to various methods is displayed. The RMSEA, CFI, and TLI results are 0.00, 1.00, and 0.12, respectively. According to the FAO (2016) based on Bentler (1990) and Browne and Cudeck (1993), the RMSEA values smaller than 0.05 infer a good model fit, and the two fit indexes CFI and TLI, indicate a good model fit by values close to unit.

In addition to the above results, a min-max scaling is used to come up with a more straightforward interpretation (FAO, 2016; TANGO International, 2018). The higher the RCI score obtains, the more resilient households to food insecurity. The present study used the grouping method for four levels of resilience which are randomly proposed by Dhraief *et al.* (2019):

- Vulnerable (RCI < 10)
- Moderately resilient (10 ≤ RCI < 25)
- Resilient (25 ≤ RCI < 50)
- Highly resilient (RCI 50).

According to Figure 10, 55% of the participating households are resilient, 22% are highly resilient, 18% are moderately resilient, and 5% are vulnerable to food insecurity.

4. Discussion

One of the important goals of societies, especially underdeveloped and developing countries, is to eradicate poverty and achieve sustainable development. Since vulnerable people in different communities have increasingly faced various economic, environmental, and political challenges, managing ahead of crises by governments and policymakers is inevitable (d'Errico *et al.*, 2016; Guterres, 2017).

Generally speaking, unpredictable crises are considered significant causes of food insecurity in developing countries. Iran has a long record of shocks traced back to some main reasons such as political crises and economic forces, various sanctions, and droughts. Therefore, Iranian smallholder farmers are known to be vulnerable to environmental and economic changes such as climate change, rising prices of agricultural inputs, lack of land integration, and lack of use of financial and credit facilities (Harvey *et al.*, 2014; Kumar *et al.*, 2020). The adoption and implementation of policies that lead to a fair distribution of income in society are manifested by various governments in Iran.

In 2010, Iran's government launched a five-year Targeted Subsidies Program (TSP), whereby lump-sum cash transfers replaced energy subsidies. Today, after the various changes in the TSP made in recent years, the government has only removed the cash transfer from a tiny percentage of the wealthy population. In addition to creating a deficit in the government budget, direct cash subsidies have failed to fully achieve goals such

as fair income distribution due to the lack of transparency in household income deciles (Bande Ghraee *et al.*, 2019).

While providing direct cash subsidies to low-income households -based on income decile- is one of the most important measures taken to reduce poverty, the more targeted distribution plans may rise its effectiveness (Enami *et al*., 2019; Tabatabai, 2012). Creating awareness and transparency about the living conditions of vulnerable households by measuring the resilience index, provides comprehensive data to policymakers.

One of the advantages of categorizing households based on their severity of resilience to food insecurity is to provide potential strategies for each specific group of people. According to the calculated RCI for the studied population, 55% of the participating households are resilient, 22% are highly resilient, 18% are moderately resilient, and 5% are vulnerable to food insecurity. Since the importance of contributed factors in RCI differs among the distinct regions, policies to increase rural resilience to food insecurity could vary. For instance, the results of studied respondents' households showed that assets, adaptive capacity, and social safety nets, respectively, improve the food security of rural households by creating resilience. However, access to basic services is statistically insignificant. This is highly aligned with the results of (FAO, 2018; Kebede *et al.*, 2016). The potential strategic actions based on the strengths and weaknesses of pillars for the highly resilient category can be an improvement for the preparedness to deal with future crises such as drought and food shortage by increasing their awareness of climatic challenges. Indeed, this group of rural farmers should develop sustainable agriculture as a pioneer in their area, given their less vulnerable. The resilient category needs to strengthen food production, reduce post-harvest losses, and increase post-harvest value addition.

Concerning the moderately and least resilient population, it is essential to imply strategies and policy instruments that can help create rural smallholders' capacity to absorb the shock effects, adapt capacity to evolving risk environment, and transform capacity if the current system is no longer sustainable. Therefore, comprehensive interventions for this population are needed to increase food stability through fostering the diversification of income sources of household heads.

Given the preeminent role played by productive agricultural assets in determining households' resilience to food insecurity, the primary recommendation for policymakers is to facilitate and enhance the rural smallholders' access to the essential farm inputs and equipment to empower them to cope with shocks and stressor. In other words, investments in resilience-focused policies and programs should be considered with the most critical factors in the asset pillar, such as land available to farmers, available water resources, and also the yield of crops. Therefore, providing state-owned agriculture wells to smallholders in possession and rent will enhance farmers' water and land availability, which will help them to increase their assets by better yields. The adaptive capacity factor is another significant component in increasing rural household resilience to food insecurity. For that reason, policymakers should invest in infrastructures that enhance the knowledge and awareness of vulnerable groups.

Altogether, the practical recommendation for highly resilient, resilient, moderately and least resilient categories, respectively can be as follow:

Creating encouragement to participate in the related training courses for accelerating the transition to sustainable agriculture.

Facilitating the use of the services of rural agricultural cooperatives such as agricultural insurance services and farming equipment, as well as monitoring the price determination in agricultural product markets.

Creating the required infrastructure to diversify the income sources of household heads in the rural region, such as expanding the pre and post-processing Agro-industries.

Increase the amount of formal cash transfers and improve food distribution programs to enhance rural population resilience to food insecurity as short-term policies.

5. Conclusion

Estimating the RIMA makes it possible to rank households based on their strengths, weaknesses, and current needs. Budget allo-

cation and policy's time duration are two limiting factors that may optimize by using the RIMA results. The present study examined the RIMA for the first time in Iran for a specific region. Since the ranking of households based on resilience requires awareness of all vulnerable households' situations, the definition of short-term and long-term projects in the future development plans is essential. To identify "the most vulnerable groups" and "the most important challenges and shocks", these scheduled projects are vital for budget allocation prioritization.

In Iran, a significant budget is allocated annually to direct cash subsidies granted by the government to low-income groups. In the structure of RIMA, such payments are also placed in social safety nets. The present study results showed the greater importance of assets and the adaptive capacity of households in increasing resilience. Thus, allocating a portion of that budget to support rural smallholders' agricultural activities and improving educational infrastructure in deprived areas can cause the growth and development of the rural regions. A fruitful avenue for further research would thus be

Carry out the RIMA assessment in a dynamic context that estimates before and after implementing a specific policy.

It comes as no surprise that the evaluation of RIMA should be conducted for non-farmers rural villagers in different societies.

6. Limitations

This study suffers from some limitations. First, the model does not include the anticipation capacity, given the time limitation. Second, due to many questions in the questionnaire and the unwillingness of the villagers to answer the questions, the effect of agricultural technologies on the rural households' resilience has not been considered. Finally, Resilience Capacity Index, as implemented by the RIMA-II (FAO, 2016) approach, has been based on a quantitative method while combining quantitative and qualitative approaches can achieve more comprehensive results in order to appropriate government policy implementation.

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