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Access to special support grants and relative impact of resilience pillars on households' resilience capacity in the Eastern Cape, South Africa: Application of FAO's Shiny RIMA tool

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Abstract

The endowments of resources, institutional management and a household's capacity to handle challenges and unexpected events all contribute to their resilience and well-being. Unfortunately, many people in developing countries are vulnerable to episodes of shock and trapped in a vicious cycle of deprivations that hinder their ability to recover from shocks. This study examined how households' resilience capability was affected by different resilience pillars and indicators, the pattern of resilience heterogeneity and the relative impact of those pillars on households' resilience capability in the Eastern Cape Province of South Africa. A data set from the 2021 South African General Household Survey comprising 1499 households was used. The data were analyzed with the FAO's Shiny RIMA tool and structural equation modeling technique. Findings revealed an estimated general household resilience capacity index of 44.88 which appeared low. The results also indicated that adaptive capability or stability is weakly related to and the least significant pillar in terms of its contribution to households' resilience capacity while the social safety net pillar is highly linked to and the most important pillar contributing to households' resilience capacity. The contributions of the access to basic services and asset endowments pillars were shown to be crucial in reducing inequality in households' resilience capacity. There was also clear evidence of heterogeneity in households' resilience capacity. SEM analysis revealed that access to basic services, the social safety net and households' attributes had a significant impact on households' resilience capacity. Policy target actions are needed in areas where capacities are lacking or insufficient while the pillars that performed well should also be prioritized for building sustained households' resilience capacity.

Keywords: Eastern cape, Resilience capacity, SEM, Shiny RIMA, Social grant, South Africa.

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1. Introduction

The occurrence of adverse events across the African continent is affecting its economy due to the sensitivity, fragility and vulnerability of agri-food ecosystems especially agricultural livelihoods. According to Okon, et al. [1] farmers become susceptible as a result of these situations Okon, et al. [1]. The vulnerability of the system provides a dynamic concept and combined interactions of shocks and stressful situations, individual situations and actions. This vulnerability is defined by the combination of many factors such as the characteristics of the shock and the individual's capacity to adapt to that shock [2]. The response to shocks is therefore expressed as adaptive capacity and resilience building which could be driven or supported by government interventions. For instance, the South African government's COVID-19 relief initiative is an attempt to increase households' resilience and adaptability [3]. The concepts of adaptive capacity and resilience building are interwoven and can be helpful in revealing people's exposure to shocks or stresses which resultantly leads to a significant decline in the well-being of individuals below a given socially acceptable threshold [1, 4].

Hahn, et al. [5] also noted that infectious disease is one of the numerous shocks that will have a considerable influence on the African economy. The COVID-19 epidemic causes economic instability in both developed and developing countries and is harming people in every aspect of life. The impact on developing economies such as South Africa and other global south nations with dependency on agriculture and importantly, the livestock sub-sector presents critical challenges in terms of food and nutrition insecurity, civil conflicts and social unrest due to the insufficient buffers for adaptation and mitigation. A critical evaluation of the institutional assistance offered by the South African government under the title of the COVID-19 disaster relief package or intervention is required in order to reduce the difficulties. This will help to better understand the pandemic's broad-spectrum effects on human societies, social hierarchies, adaptive capability and resilience. South Africa must ensure a stable future for food systems for all people since decisions made today affect people's futures, and changes in food and agricultural systems indicate changes in people's futures, sustenance and welfare. This research used the theory of resilience [6] to explain the relative impact of the resilience pillars on the households' resilience capacity because of its theoretical strength to promote a more defined conceptualization of resilience for development. This theory highlights people's well-being and the non-linear and uncertain time path associated with living standards leading to vulnerability or non-vulnerability conditions. It also explains the appalling consequences of shocks and risks which can perhaps induce the transition of people from good to bad and from bad to worse conditions. In essence, the theory underscores the "stochastic dynamics of human well-being and the stochastic poverty trap" [7]. According to Barrett and Constas [6], the theory of resilience development posits that unexpected occurrences can diminish a household's well-being and consequently lead to a lack of capabilities [8].

In order to supply pertinent policy statements and the necessary baseline for the evaluation of the special assistance grant on families' resilience capability in the Eastern Cape Province of South Africa, this research:

- Examined the general contributions of the resilience pillars and indicators to households' resilience capacity in the study area.
- Investigated the resilience heterogeneity in the study area in terms of the performance of households' resilience pillars differentiated by gender, involvement in livestock farming, locations and population group dynamics.
- Assessed the contributions of resilience indicators to the resilience pillars in terms of gender, involvement in livestock farming, location and population group dimensions.
- Estimated the relative impact of the resilience pillars on the households' resilience capacity in the study area.

1.1. Description of the Study Area

The Eastern Cape Province of South Africa is the study area. The province is the second-largest of all the provinces and it covers an area of approximately 169,966 km² constituting about 13.9% of the total land area [9]. The population of the province is more than 6.7 million people who are mostly of the IsiXhosa speaking group followed by English and Afrikaans [10]. Agriculture is the predominant livelihood activity in the study area while some people also engage in a few other off-farm and non-farm activities [9]. Moreover, livestock farming enterprises are highly concentrated in the study area [11].

2. Methodological Approach

2.1. Data and Estimation Strategy

This research used the latest dataset from the 2021 South African General Household Survey (GHS) conducted by Statistics South Africa (Stats-SA) and the data are freely available and accessible on Stats-SA's website or the data portal managed by Data First. On the sampling process, secondary stratification was carried out based on some specific attributes in terms of population and geographical (urban, tribal and farm) dynamics in the selection of samples from the provinces across South Africa during the survey with the help of the country's population census data. In specific terms stratified random proportionate to size and systematic sampling techniques were applied simultaneously in two stages: to select the primary sampling units and dwelling units which also trickle down to individuals [12].

The GHS is a yearly survey designed to gauge South Africans (individuals and households) living conditions and circumstances. The scope of the GHS covers both household (*all de jure household members*) and individual levels. The household level dataset was used in this research and was cleaned to address all possible outliers before analyzing the dataset. The datasets captured the following: "personal and socio-demographic characteristics: relationship to household head, marital status, language, literacy status, employment, food security information, agricultural practices, household assets, housing conditions dwelling type, dwelling ownership and access to basic services and functionality of the facilities

in terms of health conditions access to health care, safe water, sanitation, fertility, mortality, disability as well as social developments, access to social grants, including the special support grant" [12].

2.2. Methods of Data Analysis and Modeling Procedure

The data was analyzed through chats and path diagrams of the Shiny Resilience Index Measurement and Analysis (RIMA) tool [13]. This tool provides the means through which the farmers' resilience capacity was investigated. The data focused on relevant indicators associated with the major pillars of resilience (access to basic services, productive and non-productive assets, social safety net, adaptive capacity, and food security) [14] as well as some households' attributes. Furthermore, structural equation modeling (SEM) analysis was applied to estimate the relative impact of the resilience pillars on households' resilience capacity in the Eastern Cape Province of South Africa.

2.3. Resilience Index Measurement and Analysis Using FAO's Shiny RIMA Tool

Resilience Index Measurement and Analysis is a model for measuring the resilience capacity and effectiveness of resilience-oriented programs in a defined geographical location [15, 16]. RIMA is largely based on household-level data. One of the most appealing features of this resilience approach is that it tries to identify how the combined effects of shocks and stresses, economic forces and social conditions of the system have increased the frequency and severity of risk exposure among the vulnerable household population. In addition, the shiny RIMA tool is an innovative tool developed by the FAO-RIMA team for unified resilience measurement and analysis without compromising the scientific rigor of the RIMA. This tool makes RIMA analyses more accessible thus contributing to evidence-based policymaking especially for users to rapidly generate some analyses and graphs for reporting purposes. According to the Food and Agriculture Organization (FAO) [14], the resilience analysis provides a framework for understanding the most effective combination of short- and long-term strategies for lifting families out of poverty and hunger.

This research captured the relevant resilience fundamental pillars (including their associated indicators) which are: access to basic services and quality of access (ABSQ), households' asset endowments (A), adaptive capacity and stability (AC), households' access to the social safety net (SSN) and food security (FS) in the survey datasets, based on theoretical understanding and statistical evidence of relationships and in line with the guidelines by the Food and Agriculture Organization [13, 14]. The pillar of food security is typically used in the system analysis of the RIMA tool to generate the constructs of other resilience pillars. Since resilience as a variable is a latent concept, observed variables (indicators) were used to form a construct for each of the resilience pillars and these pillars' constructs were used to estimate measure and derive the households' resilience capacity index (RCI) with the aid of the shiny RIMA tool. The RCI generated and the pillars (constructs) were further subjected to another analysis to examine and predict the relative impact of the resilience pillars on households' resilience capacity in the study area. It is important to note that the indicators in the dataset used for the pillar-constructs were checked for any potential outliers or missing values. Applicable indicators were also normalized to ensure a balanced dataset, as required before the shiny RIMA tool can be used for the resilience analyses [13].

2.4. Structural Equation Modeling (SEM)

The SEM approach to households' resilience capacity is based on the assumption that households' well-being is primarily dependent on their resource options at a given time period [17]. These resource options are: access to basic services or quality of access, asset endowments, adaptive capacity or stability, access to the social safety net and food security status. Therefore, these resources expressed in pillars and their corresponding indicators in this study are explicitly listed in Table 1.

Table 1. RIMA indicators and components.

Resilience pillars	Indicators/Components (Variables)
Access to basic services and quality of access (ABSQ)	Closeness to basic service (Inverse) Access to safe water Access to electricity Access to improved toilet Access to health facilities Access to solid waste management Access to communication facilities and public Wi-Fi
Asset endowments (A)	Non-productive (Normalized) Productive Assets (Normalized) Ownership of dwellings
Adaptive capacity and stability (AC)	Dependency ratio (Inverse) Crop diversity Income/livelihood diversity
Access to the social safety net (SSN)	Access to remittance or informal transfers Access to social grant or formal transfers Access to COVID-19 social grant or formal transfers Type of social grant Sales of agricultural produce
Food security (FS)	Food insecurity experience protocol covering Food availability, accessibility, affordability and nutrient utilization

Source: Food and Agriculture Organization (FAO) [14].

The resilience capacity index for i^{th} household is implicitly expressed as:

$$R_i = f(ABSQ_I, A_i, AC_i, SSN_i, X_i, FS_i) \quad (1)$$

where:

R_i is the resilience capacity index.

$ABSQ_i$ = access to basic services and quality of services for i^{th} household.

A_i = asset endowments construct for i^{th} household.

AC_i = the adaptive capacity construct for i^{th} household.

SSN_i = social safety net construct for i^{th} household.

X_i = selected personal and socio-economic features of i^{th} household.

FS_i = food security status of i^{th} household.

3. Discussion and Findings

This section presented the outcomes of the resilience index measurement and analysis (RIMA) carried out with the newly developed RIMA instrument from the FAO (chats and path diagrams in the Annexes). The findings are explained in light of the study's goals.

3.1. General Contributions of the Resilience Pillars to Overall Households' Resilience Capacity

The results in Figures 1 and 2 (Annex 1) revealed an average households' resilience capacity index (RCI) and the contributions of each of the resilience pillars (access to basic services and quality of access, asset endowments, adaptive capacity and stability, as well as access to the social safety net) to the general households resilience capacity. The findings indicated a general households' average resilience capacity index of 44.88 which is low. The results also revealed that the social safety net is the most important pillar contributing to households' resilience capacity followed by access to basic services and households' asset endowments. The contributions of access to functional basic infrastructural services, asset endowments and in particular the social safety net suggest that these pillars are very relevant and highly linked to boosting resilience capacity especially in the least resilient areas. According to the Food and Agriculture Organisation (FAO), these pillars are also essential for reducing family resilience capacity disparities [15].

Meanwhile, the result also revealed that adaptive capacity or stability is the least important pillar in terms of its contribution to households' resilience capacity. According to the data, this pillar is not irrelevant but seems to be less important and weakly related to resilience ability. The observed least contribution of the adaptive capacity pillar is not surprising because the majority of the households in the study area appear vulnerable, given the metrics released by Statistics South Africa (Stats-SA) [12], and may have little or no buffer against shocks and stressors. The result also corroborated the findings of Statistics South Africa (Stats-SA) [18] which noted that the major source of income for most households in the study area (Eastern Cape Province) is social grants and this may not be sustainable enough to absorb, adapt to and recover from shocks.

3.2. Resilience Heterogeneity: Contributions of the Resilience Pillars to Households' Resilience Capacity Differentiated by Gender, Involvement in Livestock Farming, Location and Population Group

Considering the gender of households' heads, the results in Figure 7 (Annex 2) revealed an average resilience capacity index of 45.36 for female-headed households, while an average resilience capacity index of 44.32 was recorded for male-headed households. The result suggests that female-headed households had greater resilience capacity compared to male-headed households. Similarly, the results (see Figure 8) (Annex 2) also indicated that male-headed households outperformed than female-headed households in terms of contributions of access to basic services and social safety net pillars to households' resilience capacity while female-headed households performed better than male-headed households in terms of contributions of asset endowment and adaptive capacity/stability pillars to households' resilience capacity. In accordance with Dedehouanou and McPeak [19, 20], this result suggests that female headed households probably engage more in crop and livelihood diversification which strengthens their adaptive capacity and accumulation of assets.

In terms of households' involvement in livestock farming (see Figure 13 (Annex 3)), those that are involved in livestock farming have an average resilience capacity index of 48.84 while households who are not involved in livestock farming have an average resilience capacity index of 43.76. This implies that households who are involved in livestock farming appear to be more resilient than households that are not involved in livestock farming. According to Figure 14 (Annex 3), households who are involved in livestock farming performed excellently well in terms of the contributions of access to basic services, the social safety net and adaptive capacity or stability pillars to households' resilience capacity while households who are not involved in livestock farming outperformed those involved in livestock farming in terms of the contributions of only the asset endowment pillar to household resilience capacity. The result also suggests that non-agro pastoral households seemed to be more resilient than agro-pastoral households.

Figure 19 (Annex 4) shows that the non-metropolitan households have an average resilience capacity index of 46.27 while the metropolitan households have an average resilience capacity index of 41.32 indicating that the non-metropolitan households are more resilient than the metropolitan ones in terms of household location. Furthermore, households who live in non-metro locations performed better than those in metro locations in terms of the social safety net and adaptive capacity/stability pillars' contributions to households' resilience capacity (see Figure 20 (Annex 4)).

Considering the population group dynamics (see Figure 25 (Annex 5)), households with African or black population group origins have an average resilience capacity index of 45.52 while households with colored, Indian or Asian and white population group origins have average resilience capacity indexes of 39.46, 37.3 and 37.5 respectively. This suggests that

the African or black population group is more resilient than any other population group in the study area. Similarly, the results shown in Figure 26 (Annex 5) indicated that households with white population group origin are more resilient in terms of the access to basic services pillar's contribution to households' resilience capacity compared to other population groups; this is followed by households with colored, Indian or Asian, African or black population group origins respectively.

In terms of the asset endowments pillar's contribution to households' resilience capacity, the findings also indicated that households of Indian or Asian population group origin are more resilient than other population groups. This is followed by households with colored, African or black and white population groups respectively. Given the contribution of the social safety net to households' resilience capacity, the findings indicated that households of Indian or Asian population group origin are more resilient than other population groups. Similarly, the African or the black population group also performed better (more resilient) than the other two population groups in terms of the contribution of social safety net pillar to households' resilience capacity; suggesting that the black population group predominantly accessed social grants.

Similarly, the result also revealed that households with white colored population groups outperformed (more resilient) the other two population groups in terms of adaptive capacity or the stability pillar's contributions to households' resilience capacity. The finding suggests that white colored groups can absorb, adapt to and recover from shocks and other unexpected events relatively more easily than other population groups.

3.3. Relative Performance of Resilience Indicators on Each of the Resilience Pillars Differentiated by Gender, Involvement in Livestock Farming, Locations and Population Group Dynamics

The results shown in Figure 3 (Annex 1) indicated that of all the indicators of the access to basic services pillar of households' resilience, closeness (proximity) to basic services and access to electricity supply performed significantly better than the other fitted indicators while access to safe water and health facilities also had fairly good performance in terms of their contributions to the access to basic services pillar of resilience. On the other hand, access to improved toilets, communication facilities or public internet supply and solid waste management performed poorly in terms of their contributions to the access to basic services pillar of households' resilience. The result suggested that the poorly performed indicators are significantly lacking in the study area.

With respect to the indicators of access to basic services pillar of resilience and given the gender perspective (Figure 9, Annex 2), households involvement in livestock farming (Figure 15, Annex 3), household's location (Figure 21, Annex 4), and population group dynamics (Figure 27, Annex 5) respectively, female-headed households were better than male-headed households while those who are involved in livestock farming were also fairly better than those who are not involved in livestock farming across many of the indicators discussed.

Considering the indicators of the asset endowments pillar of households' resilience as shown in Figure 4 (Annex 1), the results revealed that non-productive asset endowments performed better than the other indicators (productive or agricultural assets and ownership of dwellings). In particular, the ownership of dwellings indicator performed fairly well perhaps due to the reconstruction development programme (RDP) or state-subsidized dwelling programme by the South African government. This was later transformed into a comprehensive new plan for the development of sustainable human settlements aimed at providing housing to low-income households. On the other hand, productive asset endowment had worse performance given its contribution to the asset endowment pillar of households' resilience.

With respect to the indicators of the asset endowment pillar of resilience and given the gender perspective (Figure 10, Annex 2), households' involvement in livestock farming (Figure 16, Annex 3), household's location (Figure 22, Annex 4), and population group dynamics (Figure 28, Annex 5), female-headed households also slightly edged out male-headed households across two of the three mentioned indicators. However, households that are not involved in livestock farming also performed fairly well compared to their counterparts who are involved in livestock farming. As far as the indicators of the social safety net pillar of households' resilience are concerned (Figure 5, Annex 1), sales of agricultural produce and informal transfer or remittance had the best performances in terms of their contributions to the social safety net pillar of resilience. Similarly, other formal transfers and grants such as the COVID-19 social grant and others also performed fairly.

From the findings, one can infer that the evaluation of social grants as a sustainable indicator of the social safety net pillar for households is extremely challenging due to their poor performance. This result predicts the unsustainable sustainability of social grants in the long run if other resilience pillars and indicators that are lacking are not given proper attention.

Similarly, considering the gender perspective and the indicators of the social safety net pillar of resilience (Figure 11, Annex 2), households' involvement in livestock farming (Figure 17, Annex 3), household's location (Figure 23, Annex 4), and population group dynamics (Figure 29, Annex 5) respectively, female-headed households also performed slightly better than male-headed households across two of the highlighted indicators of the social safety net pillar while those who are involved in livestock farming fairly performed better in three of the fitted indicators than those who are not involved in livestock farming. In three of the indicators of the safety net pillar, households who are domiciled in non-metro locations were fairly better than their counterparts in metro locations while Africans or black population groups edged out other population groups in about 4 of the 5 indicators of the safety net pillar of resilience.

Given the indicators of the adaptive capacity or stability pillar of households' resilience, the results shown in Figure 6 (Annex 5) revealed that the best performance in terms of contribution to the adaptive capacity pillar of households' resilience was recorded for the crop diversity indicator while the dependency ratio indicator was found to perform and contribute poorly to households' adaptive capacity pillar. Meanwhile, income diversity among the households had the

worst contribution to the adaptive capacity pillar of resilience in the study area. The findings imply that dependency ratio is somewhat high and livelihood diversification seems to be lacking in the study area.

With respect to the indicators of the adaptive capacity pillar of resilience and given the gender perspective (Figure 12, Annex 2), households' involvement in livestock farming (Figure 18, Annex 3), household's location (Figure 24, Annex 4), and population group dynamics (Figure 30, Annex 5) both male and female-headed households as well as those who are involved in livestock farming and those who are not involved appeared to edge out each other in at least one indicator out of the three indicators of the adaptive capacity pillar of resilience.

3.4. Relative Impact of the Resilience Pillars on Households' Resilience Capacity

The relative impact of resilience pillars and the selected households' personal and demographic characteristics on households' resilience capacity was empirically estimated using the maximum likelihood procedure of structural equation modeling (see Table 2). The results revealed that households' asset endowments, adaptive capacity or stability, access to the social safety net ($p<0.05$), and population group dynamics ($p<0.01$) have a direct relationship with households' resilience capacity in the study area. On the other hand, access to basic services and quality of access ($p<0.1$), gender and age of households' heads have an inverse relationship with households' resilience capacity. The implication of the finding is that resilience capacity increases with an increase in household asset endowments (both productive and non-productive assets as well as ownership of dwellings). Possession of assets is expected to exert a positive influence on households' resilience capacity because assets can serve as buffers in emergency situations [21]. Similarly, adaptive capacity or stability was found to be associated with an increase in households' resilience capacity, suggesting that reduced dependency, an increase in crop diversity and livelihood diversification are important gateways to mitigate the impact of shocks on households' well-being [22].

Moreover, an increase in access to social safety net programs (remittance or informal transfer, social grant and COVID-19 grant or formal transfer, and sales of agricultural produce) induced a positive and significant relationship with the resilience capacity of households. This finding agrees with Babatunde and Olagunju [23] who reported the effectiveness of the social safety net for households during the COVID-19 pandemic through the delivery of targeted transfers and livelihood supports to extremely poor and vulnerable households. In addition, population group dynamics among the households were also found to have a positive and significant relationship with households' resilience capacity. This is an indication that households of African or black population group origin are more resilient than other population groups.

On the other hand, increased access to basic services or quality of access (proximity to basic services, access to: safe water, electricity supply, improved toilets, health facilities, solid waste management & sanitation, improved communication facilities and public Wi-Fi) was negatively and significantly associated with households' resilience capacity. This is contrary to expectations because the pillar through its indicators mentioned should contribute positively to improved food systems, reduce food poverty and build households' resilience capacity against unexpected events and shocks [24]. Similarly, the gender of the households' head was revealed to have a negative relationship with households' resilience capacity, and this suggests that female-headed households are more resilient than their male counterparts. The negative relationship between the age of the heads of the households suggests that an increase in the age of the heads of households induces a negative impact on the resilience capacity of households because of the life cycle hypothesis which posits that agility to engage in livelihood activities or diversify decreases with an increase in the age of individuals [22].

Table 2. Relative impact of the resilience pillars on households' resilience capacity (n=1499)

Resilience capacity	**Satorra- bentler**			
	Coefficient	**Std. error**	***Z***	***p>|z|***
Access to basic services and quality of access	-0.011	0.006	-1.83***	0.071
Assets endowments	0.013	0.010	1.30	0.191
Adaptive capacity and stability	0.008	0.011	0.72	0.474
Access to the social safety net	0.019	0.009	2.11**	0.046
Gender	-0.007	0.006	-1.16	0.251
Age	-0.009	0.197	-0.05	0.964
Population group	0.015	0.002	7.5*	0.000
Mean (Resilience)	7.36E-10	0.558	0.00	1.000
var(e.abs)	0.377	0.031	-	-
var(e.ast)	0.578	0.018		
var(e.ac)	0.658	0.093		
var(e.ssn)	0.493	0.022		
var(e.head_gender)	0.249	0.003		
var(e.head_age)	253.834	7.556		
var(e.head_popgrp)	0.083	0.005		
var(res)	4.661	0.261		

Note: LR test of model vs. saturated: $chi^2(21) = 483.92$, $Prob > chi^2 = 0.0000$
Satorra- bentler scaled test: $chi^2(21) = 439.29$, $Prob > chi^2 = 0.0000$
***, **, * - $p<0.1$, $p<0.05$ and $p<0.01$ respectively.
Source: Data analysis, 2023.

This study has revealed that age and demographic characteristics as well as the notable resilience pillars contribute to households' resilience capacity. In addition, the study has also revealed clear evidence of heterogeneity in resilience pillars

in the study area and areas where capacities are lacking or insufficient for households. Therefore, it is critical to focus on these areas in order to increase households' potential for resilience against shocks and unexpected events.

3.5. Post-Estimation Analysis (Goodness of Fit Tests)

The goal of estimating goodness-of-fit test statistics is to determine the suitability and appropriateness of the fitted model. The cut-off caveats of many of the fit statistics seem to be arbitrary in nature and there is a likelihood of having conflicting conclusion given different t-test statistics obtained from their computation [25]. Regardless, the results in Table 3 revealed the likelihood ratio test. The caveat is that any value of the t-statistic greater than $p<0.05$ may suggest that the model is not significantly different from the saturated model in explaining the dataset. In explaining the dataset, the findings indicated that the estimated t-statistic is less than $p<0.05$ implying that the fitted model is significantly different from the saturated model. Similarly, given that the population error, lower bound is somewhat greater than $p<0.05$ and the upper bound is not above $p<0.1$, it can be inferred that the model's fit is not too close [25]. Furthermore, the 'absolute values' of AIC and BIC are small, suggesting a good fitted model. The values of the CFI and non-normed fit index (TLI) are far from unity which may perhaps be an indication of poor model performance. In terms of SRMR, a small value (0.096) implies a better model fit [25]. Since the majority of the t-test statistic parameters indicated a good model fit based on the information supplied on the various goodness of fit tests, it can be concluded that the model is valid.

Table 3. Fit-test statistics

Fit statistic	Value	Description
Likelihood ratio		
chi^2_ms (21)	483.921	Model vs. saturated
p>chi^2	0.000	
chi2_bs (28)	515.234	Baseline vs. saturated
p>chi^2	0.000	
Population error		
RMSEA	0.121	Root mean square error of approximation
90% CI, lower bound	0.112	
Upper bound	0.131	
*P*close	0.000	Probability RMSEA <= 0.05
Information criteria		
AIC	34890.856	Akaike's information criteria
BIC	35013.045	Swartz's Bayesian information criterion
Baseline comparison		
CFI	0.050	Comparative fit index
TLI	-0.267	Tucker-Lewis's index

Source: Data analysis, 2023

4. Conclusion and Policy Recommendations

This research investigated the relative impact of resilience pillars on households' resilience capacity using the dataset from the 2021 South African General Household Survey (GHS). The resilience capacity of the households was analyzed using the shiny RIMA tool and the SEM approach. The study found low households' resilience capacity and clear evidence of heterogeneity in resilience capacity and in some indicators and pillars among male and female genders which appeared to favor female-headed households in most cases, households involved in livestock farming, households living in metro geographical locations as well as households of the black population group. The study also highlighted the contributions of social safety net and access to basic services as these pillars significantly contributed to and were highly linked to households' resilience capacity.

In spite of these findings, policy initiatives should concentrate on how to help households become more resilient by improving the elements that are severely insufficient (for example, adaptive ability). Similarly, emphasis should be placed on social investment program among households and especially vulnerable populations. Future research should investigate the dynamics of resilience capacity over time using panel or longitudinal data.

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Annex 1. Contributions of the resilience pillars to overall households' resilience capacity.

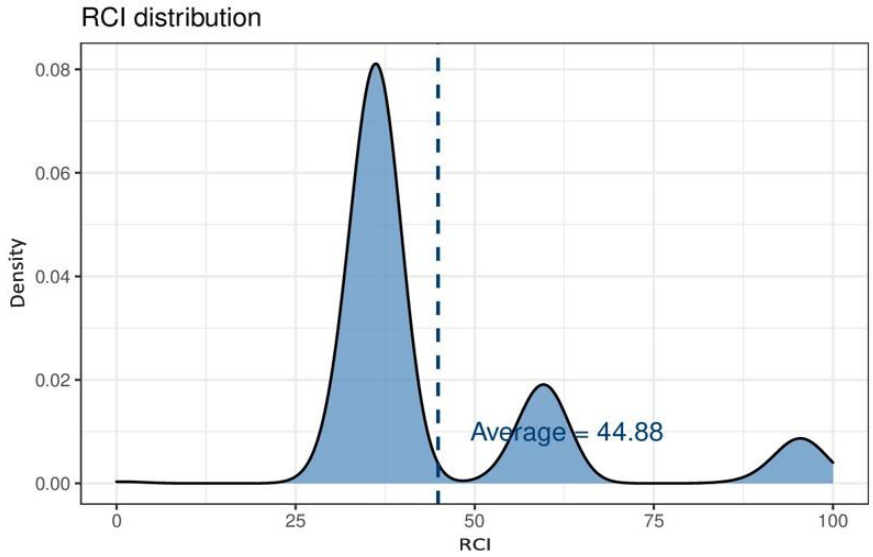

Figure 1.
Resilience capacity index distribution.

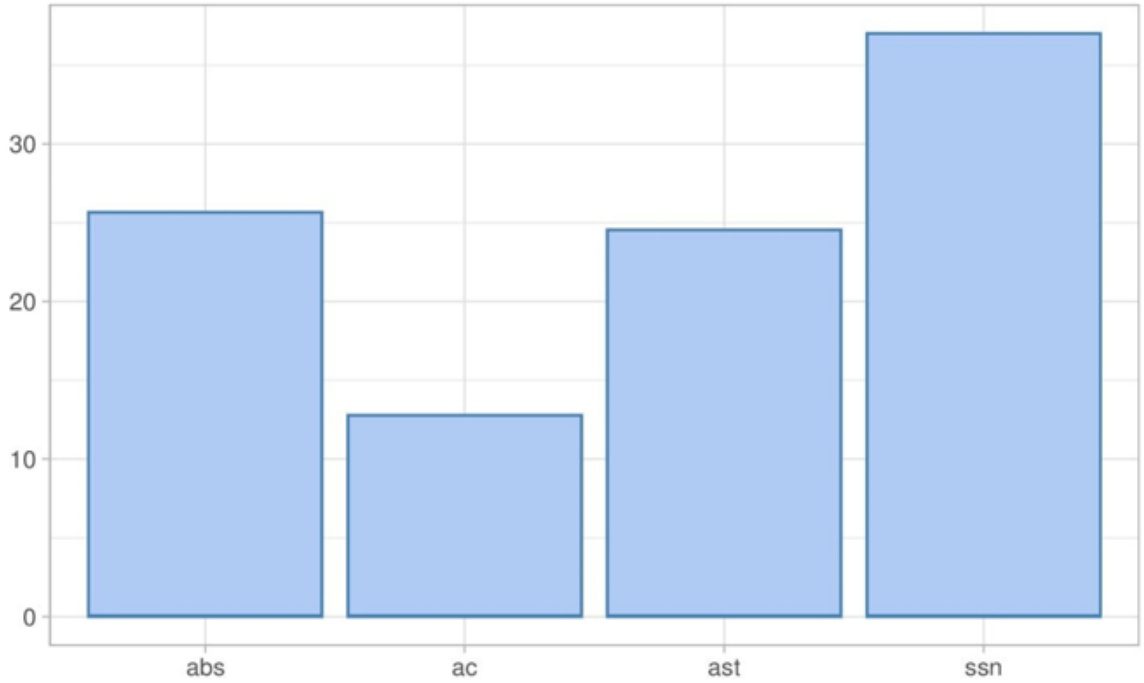

Figure 2.
Resilience structure matrix.

General performance of the resilience indicators on each of the resilience pillars

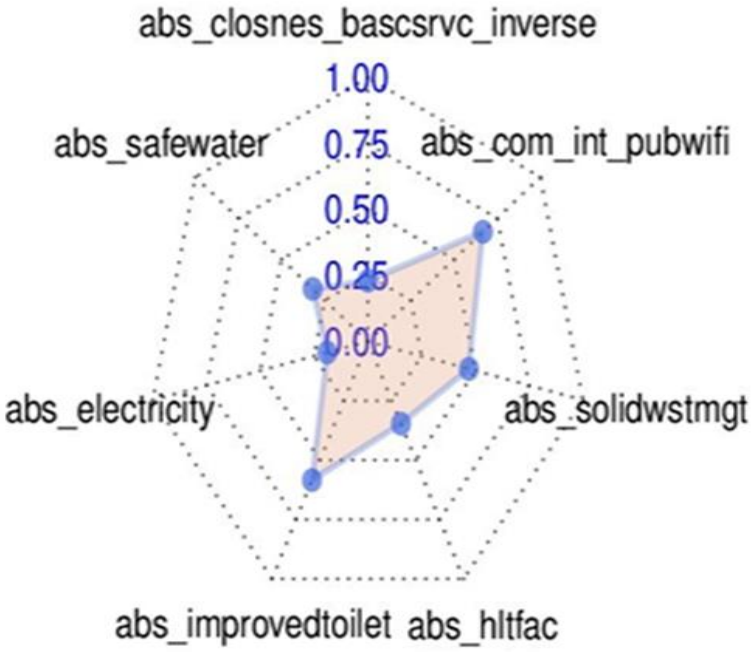

Figure 3.
Correlations of sub-variables with the ABS pillar.

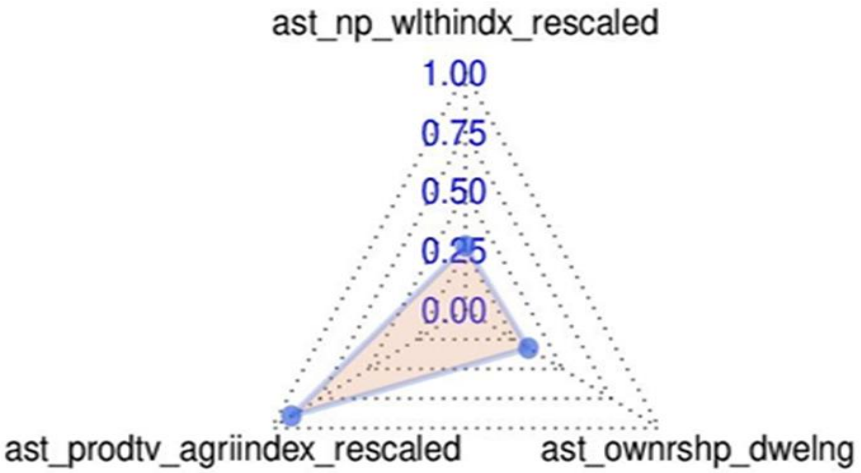

Figure 4.
Correlations of sub-variables with the AST pillar.

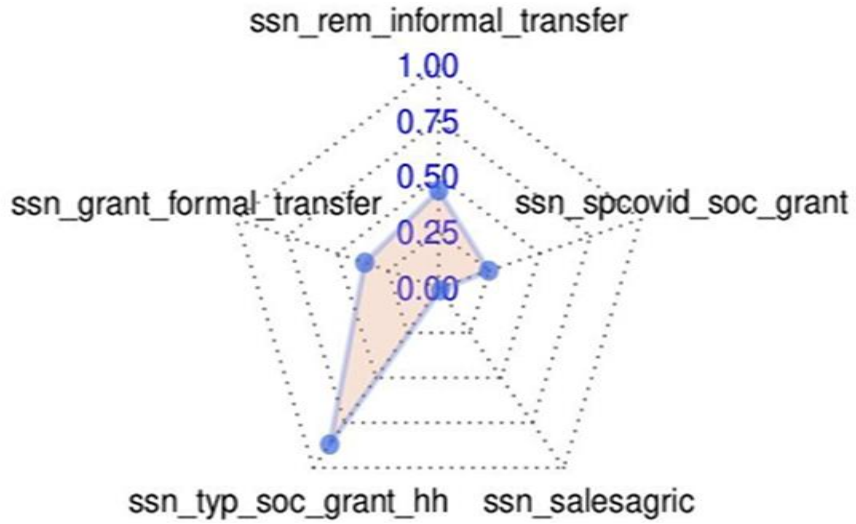

Figure 5.
Correlations of sub-variables with the SSN pillar.

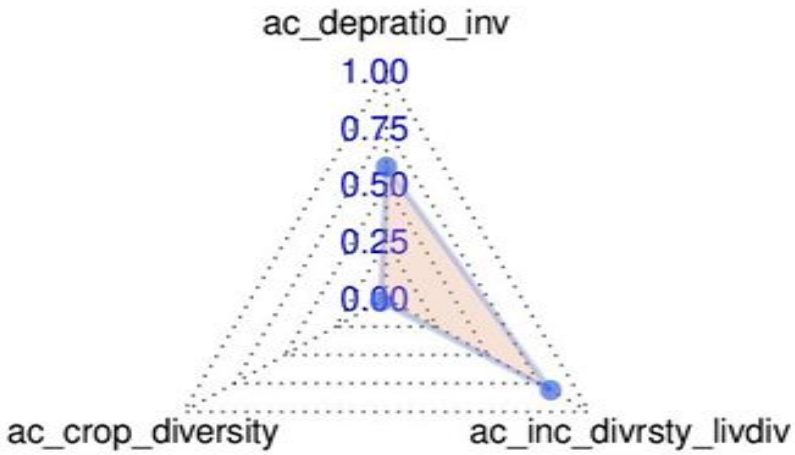

Figure 6.
Correlations of sub-variables with the AC pillar.

Annex 2: Contributions of the resilience pillars to overall households' resilience capacity (Differentiated by gender).

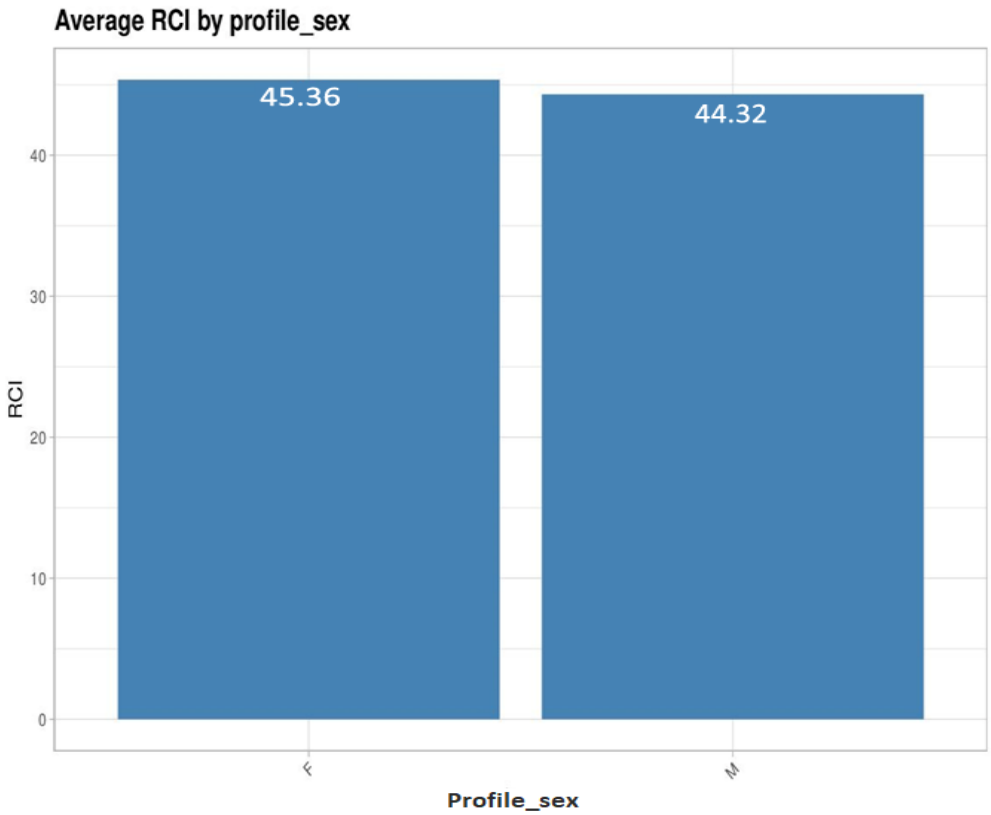

Figure 7.
Average resilience capacity index by gender.

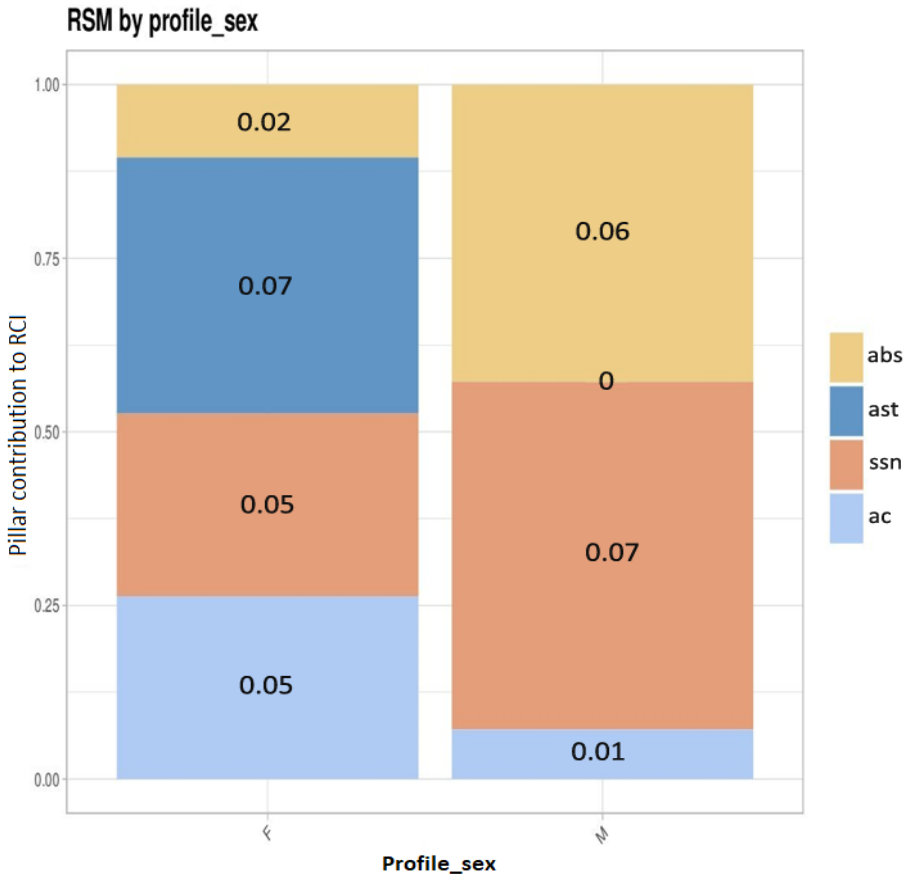

Figure 8.
Resilience structure matrix by gender.

Relative performance of the resilience indicators on each of the resilience pillars (Differentiated by gender).

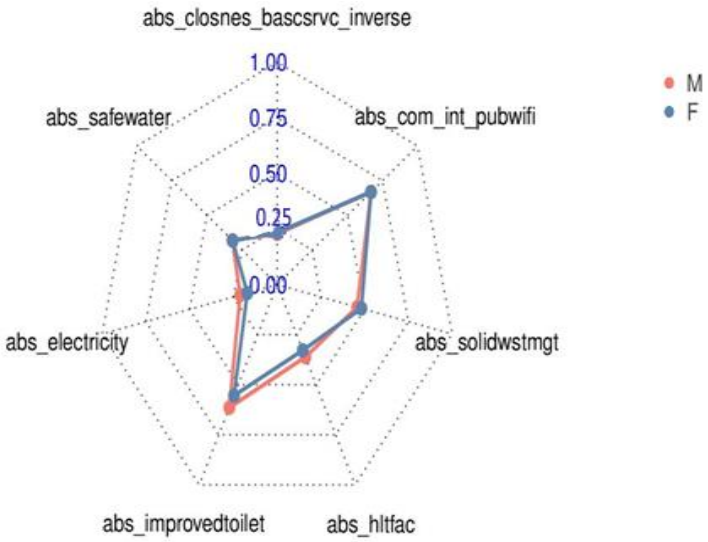

Figure 9.
Correlations of sub-variables with the ABS pillar by gender.

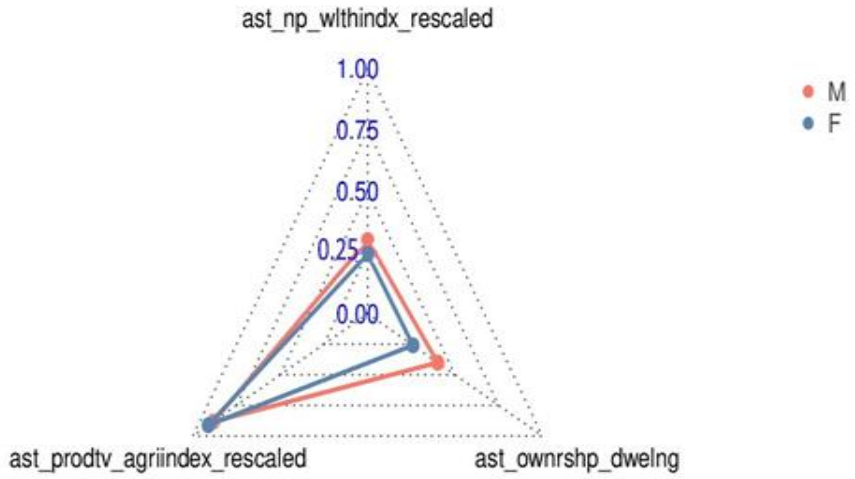

Figure 10.
Correlations of sub-variables with the AST pillar by gender.

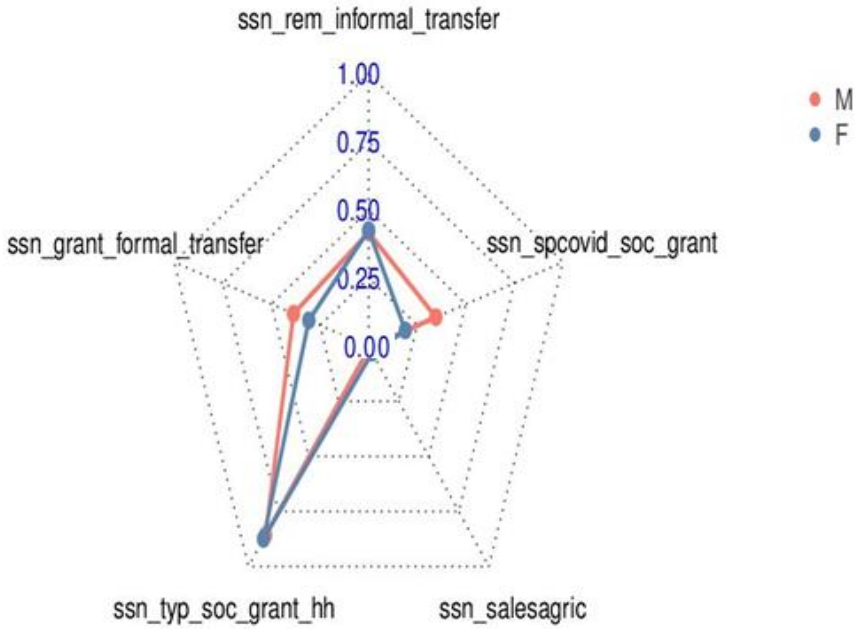

Figure 11.
Correlations of sub-variables with the SSN pillar by gender.

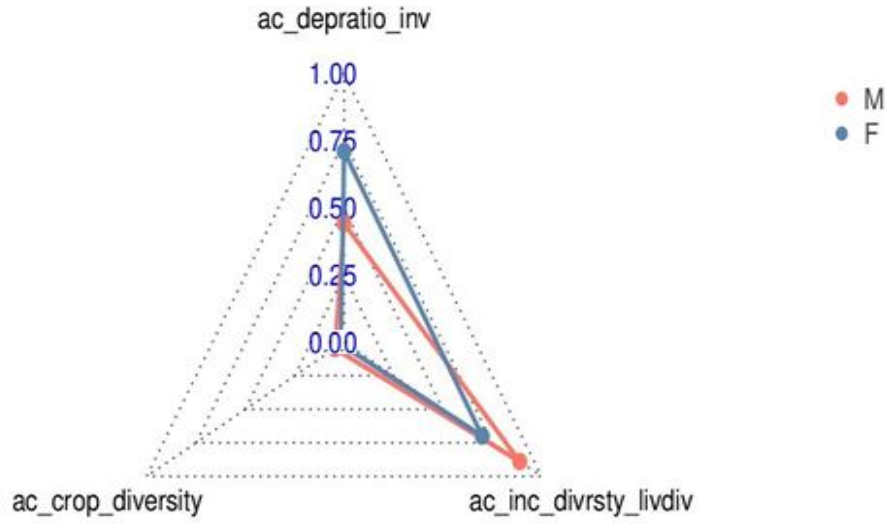

Figure 12.
Correlations of sub-variables with the AC pillar by gender.

Annex 3: Contributions of the resilience pillars to overall households' resilience capacity (Differentiated by involvement in livestock farming).

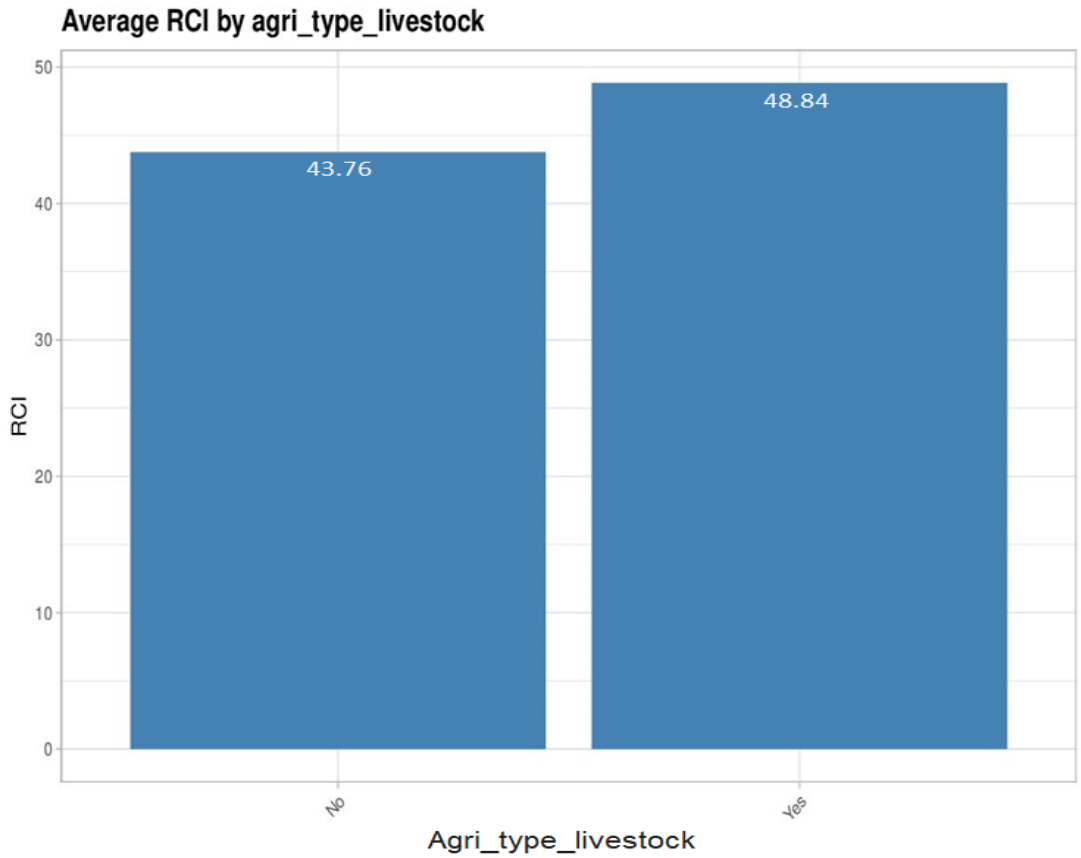

Figure 13.
Average resilience capacity index by involvement in livestock farming.

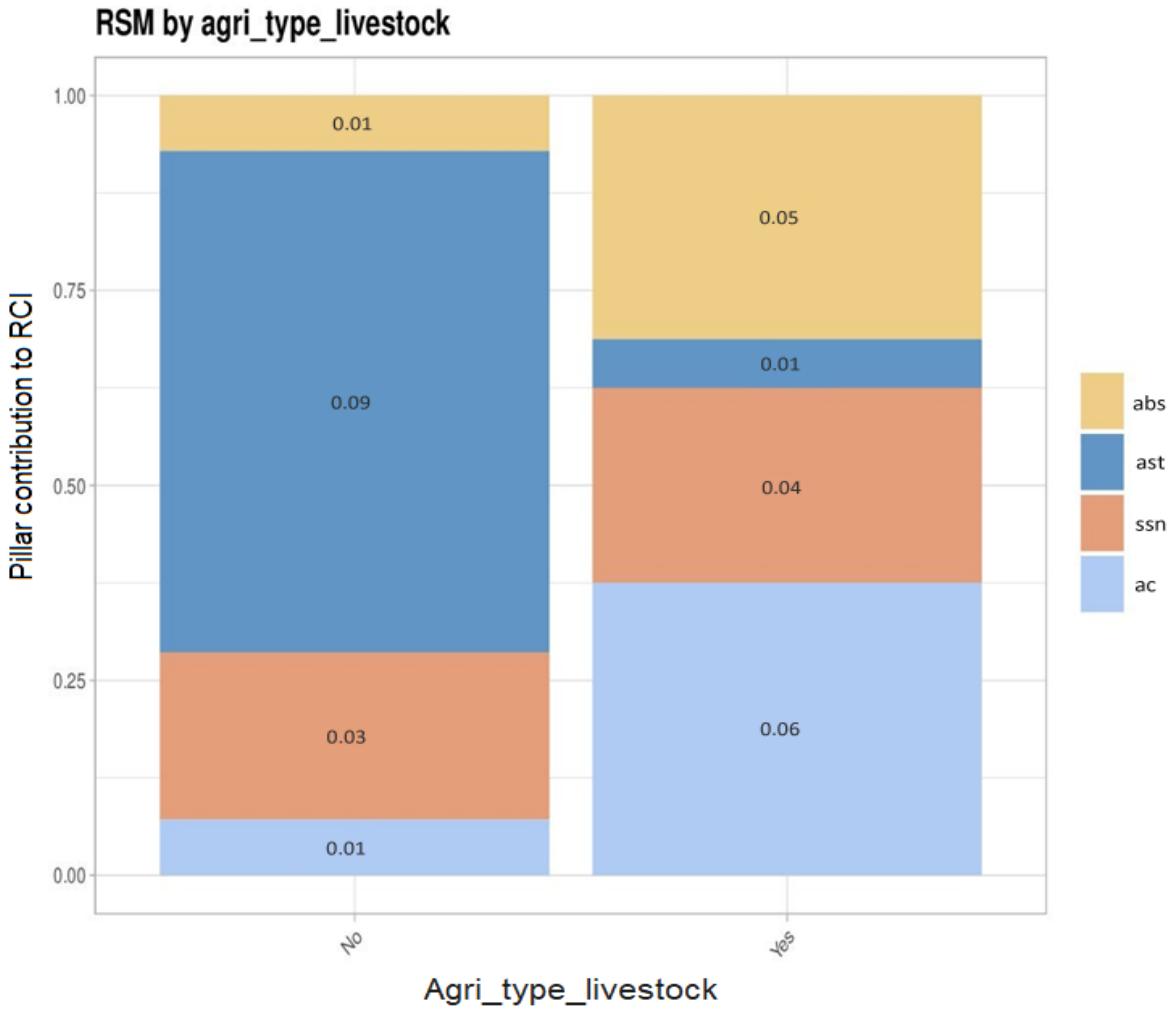

Figure 14.
Resilience structure matrix by involvement in livestock farming.

Relative performance of the resilience indicators on each of the resilience pillars (differentiated by involvement in livestock farming)

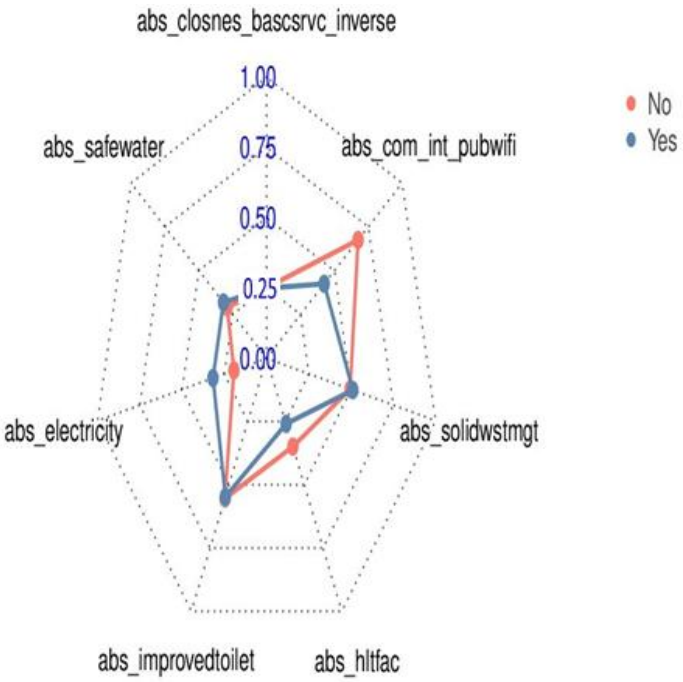

Figure 15. Correlations of sub-variables with the ABS pillar by involvement in livestock farming.

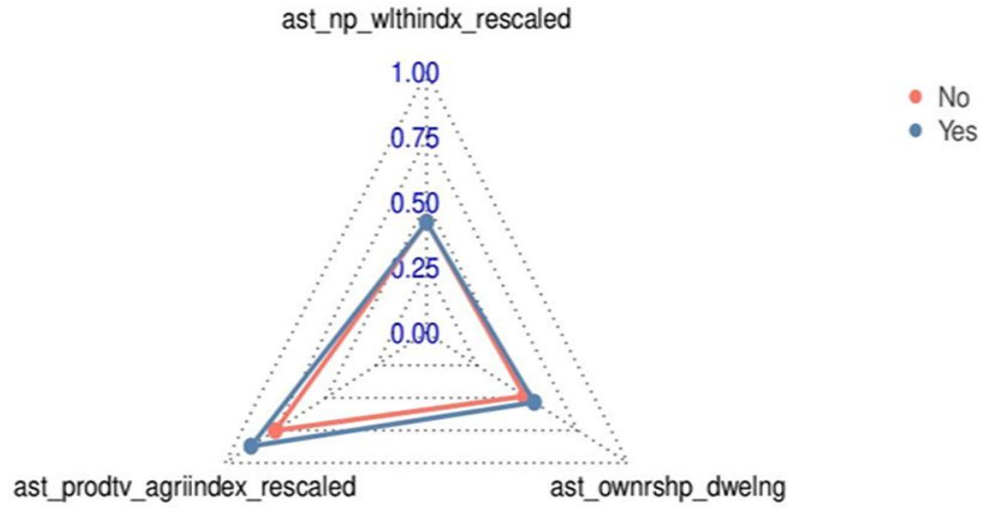

Figure 16.
Correlations of sub-variables with the AST pillar by involvement in livestock farming.

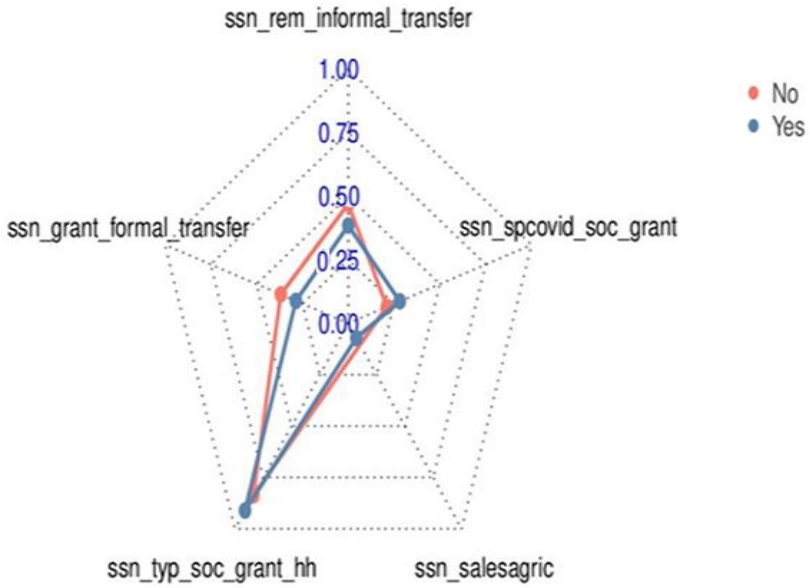

Figure 17.
Correlations of sub-variables with the SSN pillar by involvement in livestock farming.

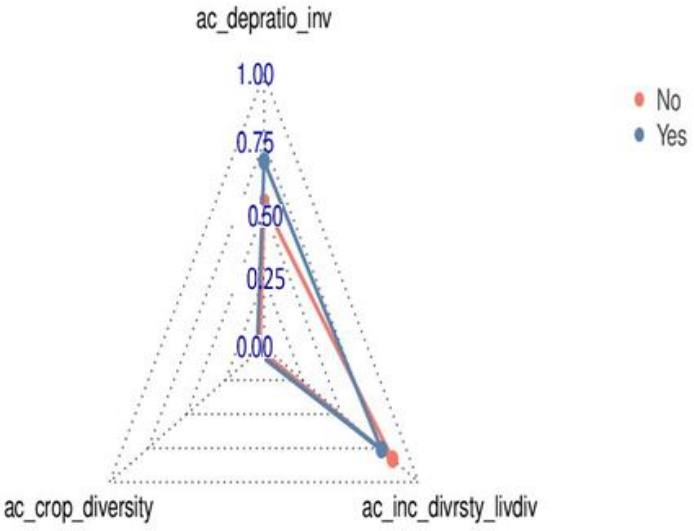

Figure 18.
Correlations of sub-variables with the AC pillar by involvement in livestock farming.

Annex 4: Contributions of the resilience pillars to overall households' resilience capacity (Differentiated by location).

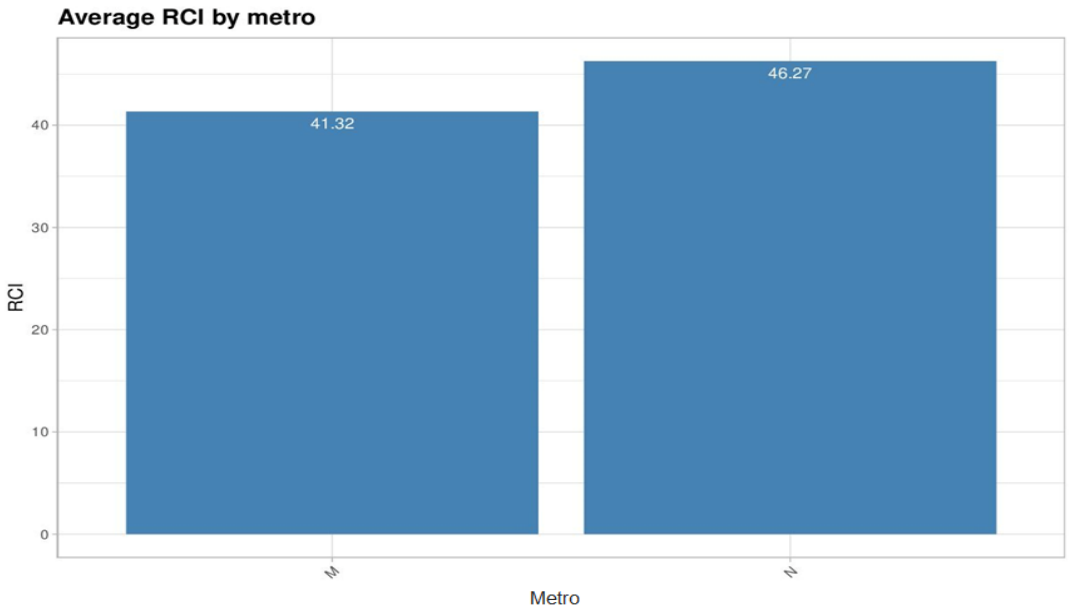

Figure 19.
Average resilience capacity index by metropolitan status.

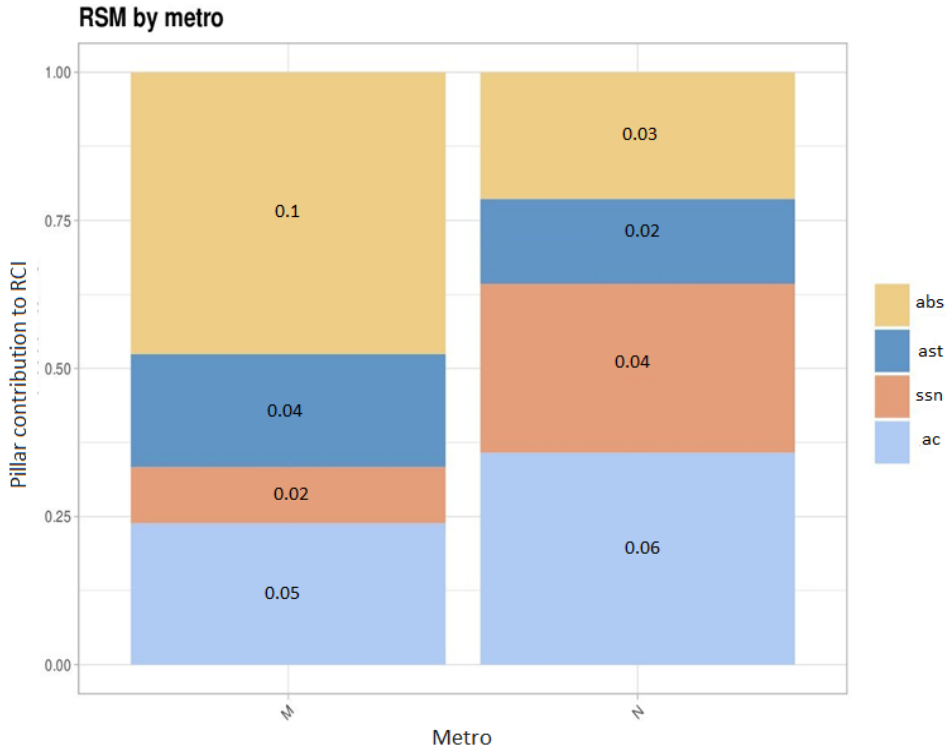

Figure 20.
Resilience structure matrix by metropolitan status.

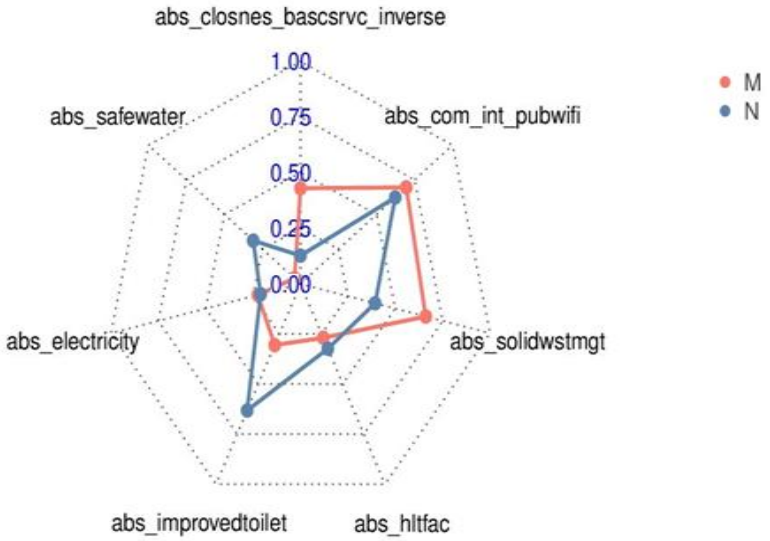

Figure 21.
Correlations of sub-variables with the ABS pillar by metropolitan status.

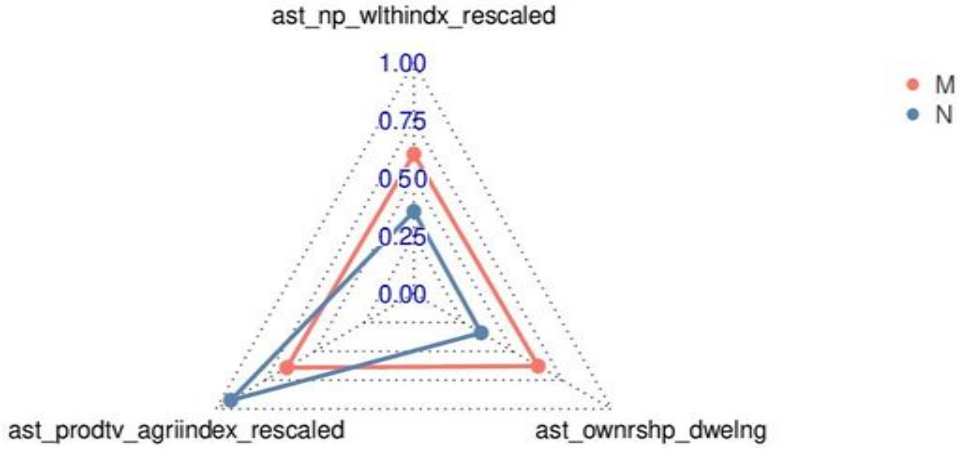

Figure 22.
Correlations of sub-variables with the AST pillar by metropolitan status.

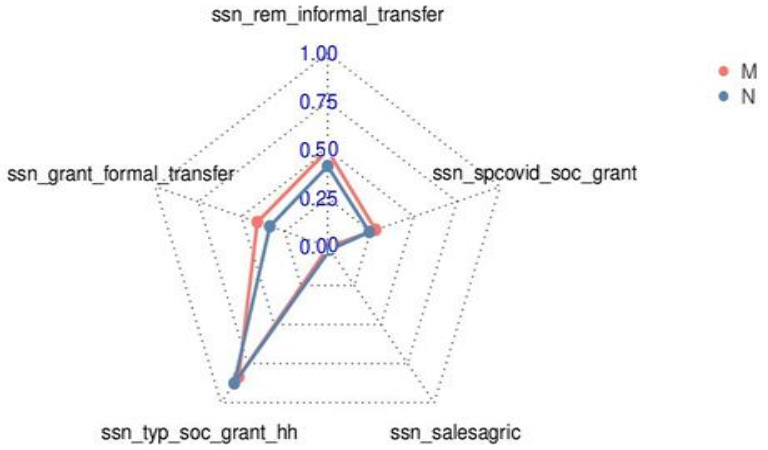

Figure 23.
Correlations of sub-variables with the SSN pillar by metropolitan status.

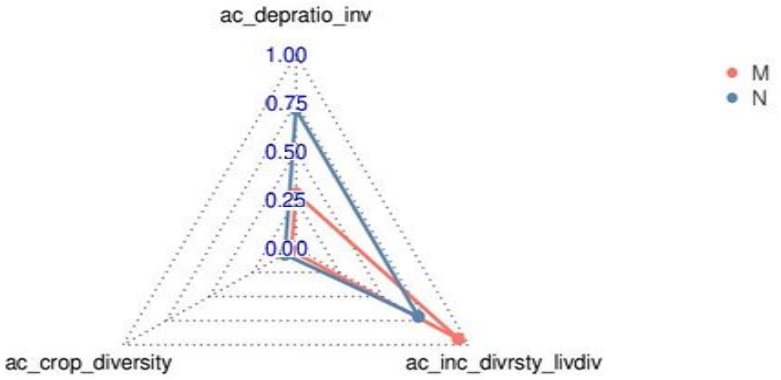

Figure 24.
Correlations of sub-variables with the AC pillar by metropolitan status.

Annex 5: Contributions of the resilience pillars to overall households' resilience capacity (Differentiated by population group dynamics).

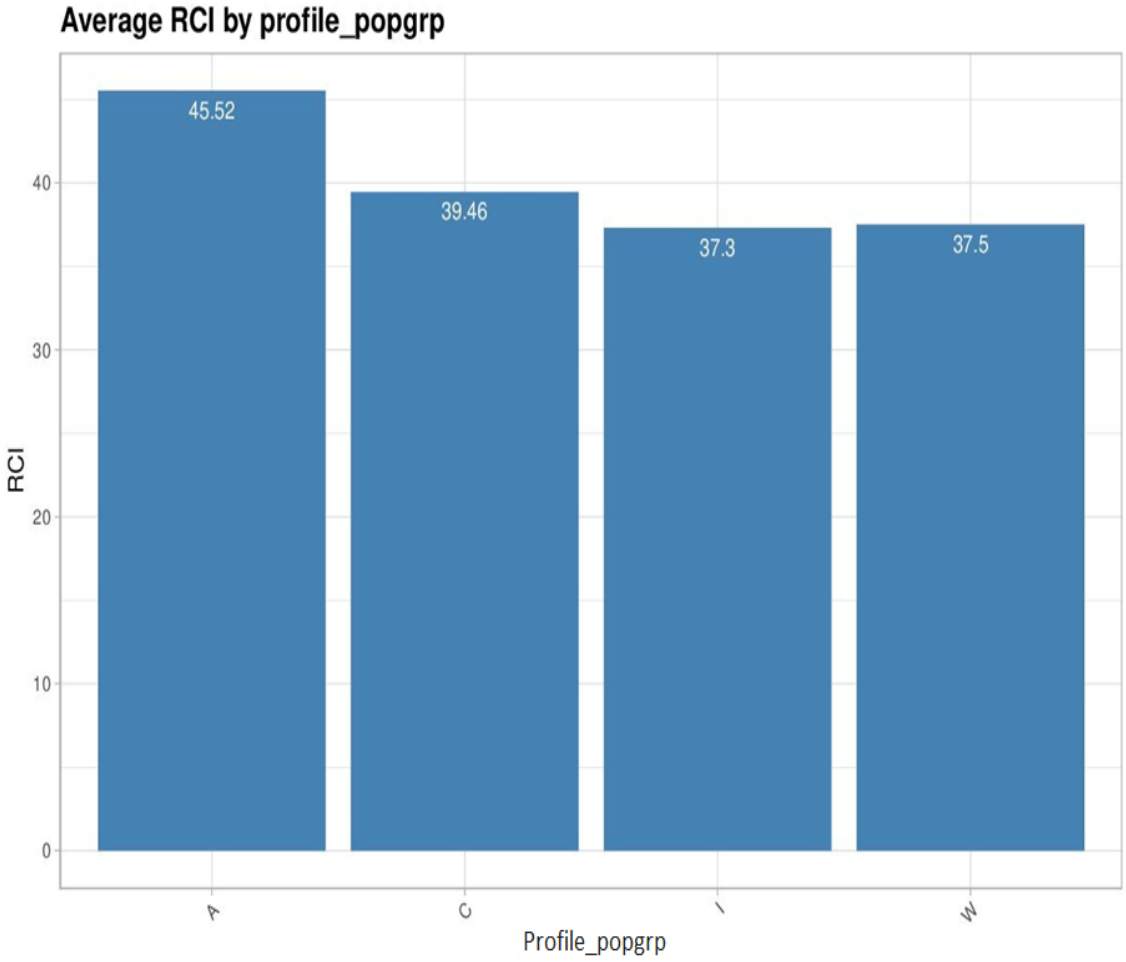

Figure 25.
Average Resilience Capacity Index by population group.

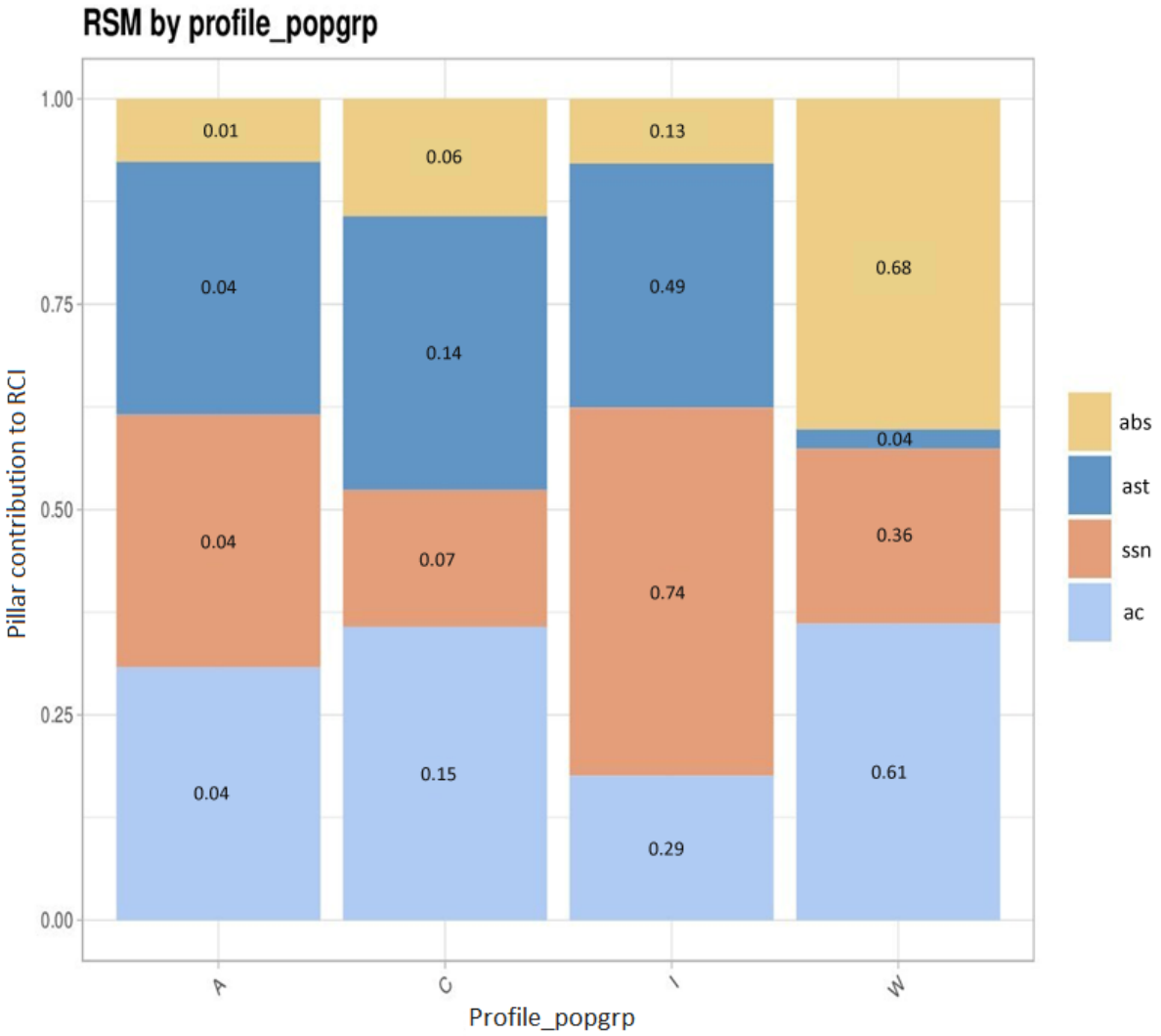

Figure 26.
Resilience structure matrix by population group.

Relative performance of the resilience indicators on each of the resilience pillars (Differentiated by population groups).

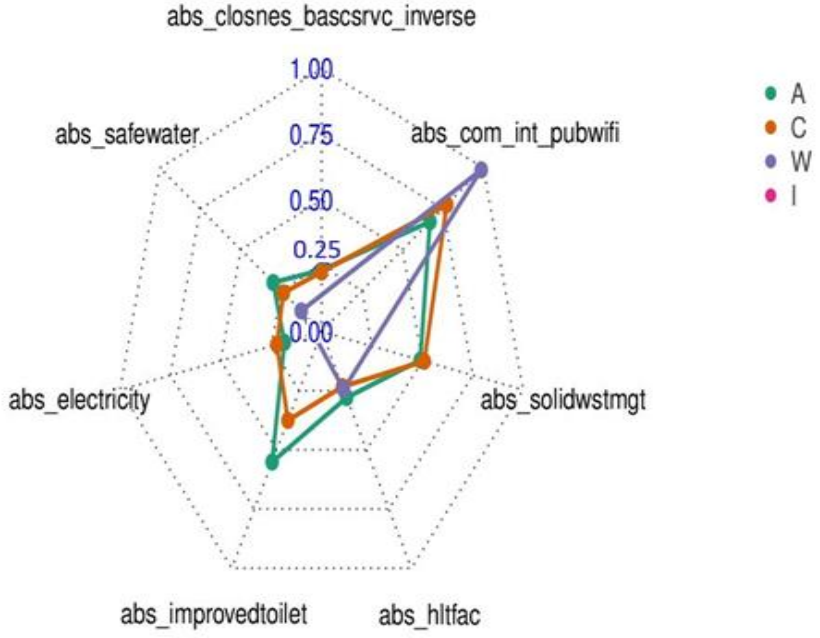

Figure 27.
Correlations of sub-variables with the ABS pillar by population group.

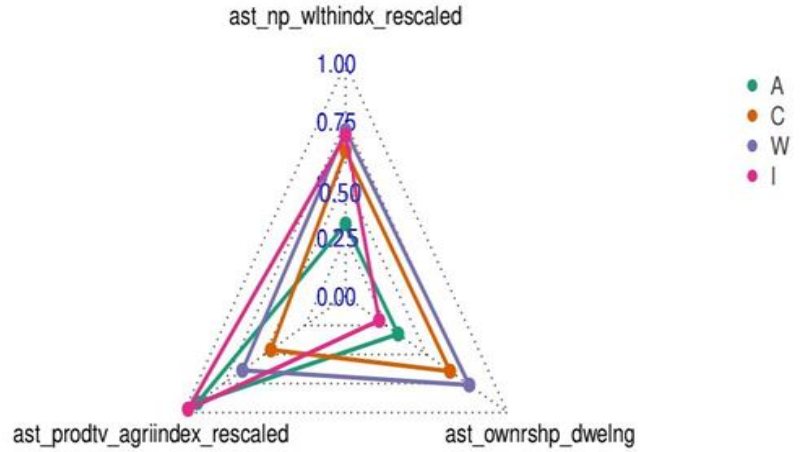

Figure 28.
Correlations of sub-variables with the AST pillar by population group.

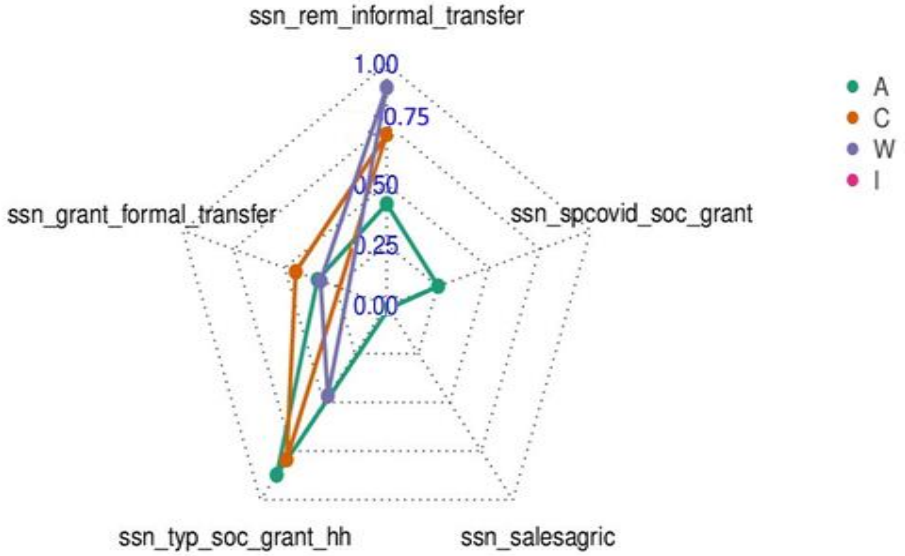

Figure 29.
Correlations of sub-variables with the SSN pillar by population group.

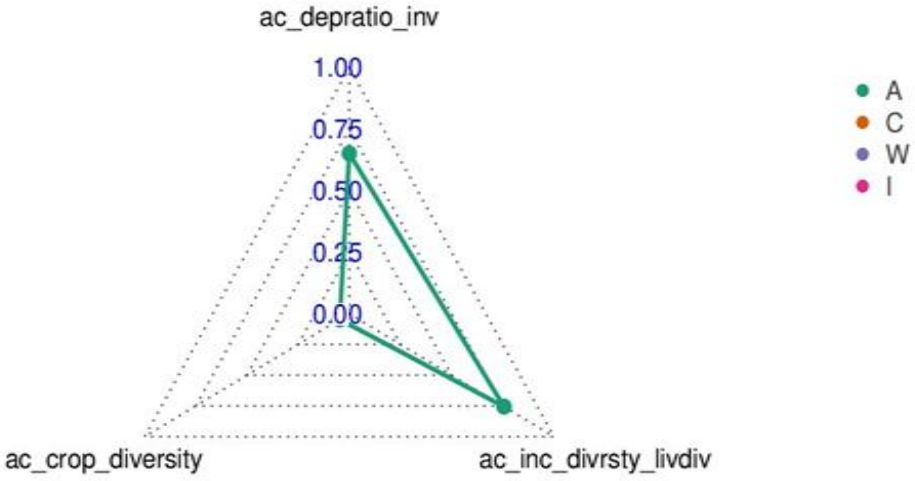

Figure 30.
Correlations of sub-variables with the AC pillar by population group.