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Market System Resilience Index (MSRI) in Mozambique

Nampula and Cabo Delgado provinces

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Abstract: The Market System Resilience Index (MSRI) has been developed both to guide development practitioners in the process of conducting resilience assessments and to promote the inclusion of all relevant actors within a market system (Choptiany et al., 2021). The market actors defined in this approach are input suppliers, retailers, output markets, and households. These actors will interact with each other and feed the market system. The analysis is performed based on a scoring process between 0 and 5. The present study focuses on the provinces of Cabo Delgado and Nampula and involves farmers and enterprises within the same sector. The results show that the MSRI is 2.61 for households and 2.75 for market actors. These results establish a baseline index, which is not enough to infer whether that is good or bad. It is just the stage of market system resilience in Nampula and Cabo Delgado for the farmers. For households, in terms of provinces, Cabo Delgado performed better than Nampula (2.68 against 2.47). In terms of gender, males had an MSRI of 2.68, while the MSRI for females was 2.51. These differences are statistically significant. For market actors, Nampula scored better than Cabo Delgado (2.93 against 2.60). These results can give us an overview of the MSRI for the farmers enrolled in iDE projects, particularly in Nampula and Cabo Delgado. Although not representative at the regional level (north of Mozambique), they serve as a starting point.
Keywords: resilience, northern Mozambique provinces, agricultural market systems, internally displaced people, iDE's interventions
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1 Introduction

According to Choptiany et al. (2021), resilience is defined by the United Nations Office for Disaster Risk Reduction as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of the hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions".

The concept of resilience helps answer questions such as why one household might be unable to recover from a shock, while their neighbour was able to cope, or how robust a community's social safety net may be in the face of increasingly severe natural hazards (Choptiany et al., 2021).

The primary objective of the Market System Resilience Index (MSRI) is to examine how robust market systems can affect resilience at both the systems and household levels and to provide more detailed information regarding future programme scale-up and expansion (Parker, 2020). By using the MSRI to measure the resilience of the market system at two or more points in time, projects can identify needed adjustments after the first round of measurement and test whether the adjusted activities led to changes in the market system. The tool bridges a specific gap in literature and practice, and in so doing may ease some of the tension in the development field between balancing short-term gains of project activities, long-term development goals, and the sustainability of projects in the age of anthropogenic climate change (International Development Enterprises, 2021).

The concept of market system resilience is a relatively new one; however, it provides comprehensive evidence to project managers to inform future decisions related to project implementation while also providing the project team and USAID with evidence related to the impacts the project has on resilience (Parker, 2020). Moving forward, the MSRI may aid in the development field's goal of reducing chronic vulnerability and promoting inclusive growth within the bounds of socio-ecological systems (International Development Enterprises, 2021).

In a more local context, the primary goal for using the MSRI in Nampula and Cabo Delgado provinces is to examine how market system factors affect resilience at both the systems level and household level to inform future programme improvements and policy decisions.

The key objectives are to:

1. analyse market system resilience across various sectors and subgroups for potential strengthening of distribution networks necessary to provide inputs to farmers in rural markets;
2. understand the impact of climate shocks and other stressors on market system resilience along with regular climate disasters faced by the project;
3. understand the resilience among internally displaced households and the hosts in the North; and
4. adapt and implement the MSRI as a quantitative resilience assessment tool.

Looking in greater detail at each of the MRSI objectives listed above, the following should be noted:

1. The MSRI will help address market actors' resilience. By reading the results, it will be possible to understand the main issues pointed out by the households, and based on that the interventions can be better targeted (within and between groups) so that their impact can be increased as much as possible.

2. The main aim is to understand the climate shocks and stressors that affected both sides of the agriculture market, how both sides are dealing with these effects (with positive results for some shocks and negative results for others), and how the climate effects can be mitigated based on the results of the surveys.

3. The survey results provide a descriptive analysis, but the main aim is to visualize how internally displaced people (IDPs) are dealing with shocks and stressors since they are not home, especially given the fact that they have no land on which to produce.

4. Transforming the respondents' answers into a quantitative metric helps understand the results in a way that makes it possible to quantify the problem so that, in turn, the solutions/interventions can be quantified and budgeted.

In this paper, the authors will give an overview of the resilience of market actors (demand and supply side) in Nampula and Cabo Delgado provinces.

The study is divided into six sections. The first section contains an introduction to the theme of market system resilience. The second section presents the existing literature on market resilience and its context for Mozambique. The third section refers to the methodology applied to obtain the index. The fourth and fifth sections showcase the results and discussion, respectively. The final section shares the conclusions and recommendations drawn from the results obtained.

2 Literature review

As stated by Bahadur et al. (2013), resilience comes from a very diverse background of disciplines. Due to that, there is a variety of tools to measure resilience, such as Mercy Corps' STRESS – Strategic Resilience Assessment, which provides a workflow process to follow with guiding steps and questions to frame decision-making; and GOAL, which aims to bring a resilience-informed approach to development and humanitarian interventions (Choptiany et al., 2021). The difference between these two is that STRESS only includes workflow steps, while GOAL's toolkit provides worksheets, specific determinants, and example risk matrices (GOAL, 2019). Between then and now, many more tools were created and developed, until the creation of the Market System Resilience Index (MSRI). Put simply, according to iDE (International Development Enterprises, n.d.), the MSRI is a user-friendly composite index drawn from academic literature and iDE's experience in market system strengthening.

There has been recognition that market-based approaches help promote household resilience through increased income, improved food security and nutritional status, promotion of both farm and off-farm activities promoting differentiation, and increased employment opportunities (Ambrosino et al., 2018). However, for the market-based approaches to be sustainable, the market system itself needs to be able to withstand, react, and transform in the face of climate change, conflict, and other shocks and stresses.

According to Irwin and Campbell (2015), the MSRI enables measurement of resilience of the wider market system, specifically in the rural context, which helps implementers better understand and adapt the market creation approach to local contexts.

The index was piloted in Bangladesh in 2018, in an area impacted by flooding and climate change, where it provided a score indicating how resilient local markets were to heavy rains and flash floods (International Development Enterprises, n.d.). Measurement activities were tied to the Suchana: Ending the Cycle of Undernutrition in Bangladesh programme, which aimed to reduce undernutrition leading to stunting in children under two years old (Parker, 2020). Leveraging the previously designed Systemic Change Tracker, the Suchana monitoring team designed a mechanism to measure system-wide resilience: the MSRI (Parker, 2020). Because of undernutrition interventions, the MSRI score improved by 15 points during the first phase of the nutrition-enhancing programme (International Development Enterprises, n.d.).

In Mozambique, two rounds of MSRI analysis were conducted for the same provinces (Sofala and Manica), and the results showed that the level of resilience of all actors slightly decreased from 2020 to 2021 (International Development Enterprises, 2022). Additionally, households continue to be the least resilient among the market actors and input suppliers had the largest drop in resilience scores.

2.1 The MSRI conceptual framework

The MSRI is a holistic approach to measuring the resilience of the market at multiple levels and accounts for various exogenous factors (e.g., the ecological environment), in contrast to similar tools available (Choptiany et al., 2021). The current evolution of the MSRI, MSRI 2.0, brings together core elements of resilience to measure and evaluate the effectiveness of any market system to anticipate, withstand, and adjust to external and internal shocks and stresses (Choptiany et al., 2021).

While the initial version of the MSRI tool was innovative and useful for project management and adaptation, iDE and others working in the market system resilience space recognized that it lacked a household-level resilience component. The MSRI was modelled after the Self-evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP), a tool developed by the UN's Food and Agriculture Organization (FAO). SHARP addresses the need to better understand and incorporate situations, concerns, and interests of farmers and pastoralists relating to climate resilience and agriculture at the household level (International Development Enterprises, 2022). The SHARP tool was integrated into the MSRI 1.0. Hence, the MSRI 2.0 has built upon experiences gained from previous resilience measurement tools and frameworks, including earlier piloted versions of the MSRI.

The MSRI 2.0 has been applied to iDE projects in Mozambique, Bangladesh, Nepal, Cambodia, Ethiopia, Zambia, and Ghana and is poised for broader deployment. This work provides the international development sector with an opportunity to learn from an innovative measurement tool that improves adaptive management and guides systems change.

Table 1 shows how iDE has integrated the MSRI and SHARP tools, by mapping the 13 SHARP agroecosystem indicators[1] across the nine determinants of the MSRI 1.0, resulting in the second version of the MSRI. iDE has reviewed and updated the determinants for the MSRI 2.0, which now includes two additional ones (shaded grey) related to natural environmental and financial considerations based on previous deployments in Bangladesh and Mozambique.

[1] 13 agroecosystem indicators of resilience at the household level used in the FAO SHARP tool.

Table 1: Harmonized MSRI 2.0 tool including both market and household levels in the assessment of resilience

MSRI Principle	MSRI Determinant	MSRI Description	13 agroecosystem indicators from SHARP at the household level[2]	
1. Structure of the market	**1.1 Redundancy (R)**	Surplus of market actors performing the same functions in the market system	3: Appropriately connected	5: Optimally redundant
	1.2 Diversity (D)	Diversity in the value chains and the available market channels	6. Spatial and temporal heterogeneity	3: Appropriately connected
	1.3 Functionality (F)	The flow of goods and services in, out, and through market spaces	4. Functional and response diversity	
2. Connectivity of the market	**2.1 Inclusion (Ic)**	Participation of women and other systemic groups in the market system	9. Reflective and shared learning	11. Honors Legacy
	2.2 Integration (Ig)	Different groups' involvement in relevant processes	11. Honors legacy	3: Appropriately connected
	2.3 Collaboration (C)	Collaboration among actors of the market system	10. Globally autonomous and locally interdependent	3: Appropriately connected
3. Support of the market	**3.1 Feedback loops (FL)**	Ability to learn from experience through control mechanisms	9. Reflective and shared learning	7. Exposed to disturbance
	3.2 Enabling environment (EE)	Transparent market governance is in place	12. Builds human capital	1. Socially self-organized
	3.3 Preparedness (P)	The ability of the system to promptly react to disturbances	9. Reflective and shared learning	2. Ecologically self-regulated
4. Environment	**4.1 Physical Environment (PE)**	The environmental condition of the market area	8. Coupled with local natural capital	2. Ecologically self-regulated
5. Financial	**5.1 Financial viability of market actors (FV)**	Financial sustainability of market actors' activities	13. Reasonably profitable	
	5.2 Ability to access financial services (FA)	Access to financial services	10. Globally autonomous and locally interdependent	

Source: International Development Enterprises.

Understanding the determinants of the MSRI

- Redundancy – if the household/market actor has different options to buy/sell the same input/products within the market at nearly the same prices.
- Diversity – if there are different inputs/products from different suppliers available in the market; also, if there are different prices to respond to all levels of farmers when it comes to costs.
- Functionality – how the market works (market dynamics): products in, products out; if the market is stable; concurrent activities; improved activities, and so on.
- Inclusion – when the different groups (women, youth, elders) are involved in agriculture activities.

[2] Framework from Cabell and Oelofse, 2012.

- Integration – when the different groups are involved in the different phases of the agriculture value chain (from buying inputs to selling the products, including the decision-making).

- Collaboration – if households/market actors are working together (e.g., households working in groups to go to the nearest village/city and sell their products).

- Feedback loops – if there is a communication flow within the market (e.g., if the households have a green line to give feedback about seeds to the supplier).

- Enabling environment – if the laws/rules/social norms in place do not harm agriculture activities.

- Preparedness – how ready the households and other market actors are to respond to shocks and stressors.

- Physical Environment – if there are "tangible" conditions for production (e.g., land, water for irrigation).

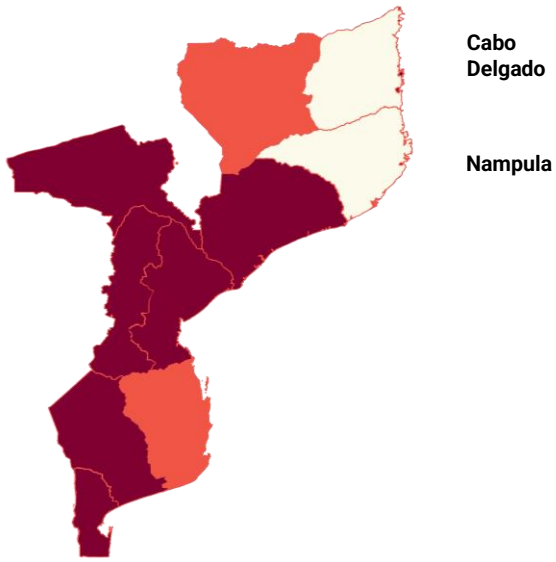
- Financial viability of market actors – if the market actor believes the business is sustainable.

- Ability to access financial services – how easy it is to access financial services.

2.2 The Mozambican context

Mozambique is a country covering approximately 799,380 km^2 total land area (CIAT & World Bank, 2017). The country faces an array of challenges to achieving sustained rural growth. A significant part of the population is exposed to frequent and recurrent shocks and stresses from climate change and other socio-economic and public health risks. Of the 28 million people estimated living in Mozambique (now around 30 million), 68% live in rural areas (CIAT & World Bank, 2017). The country faces high levels of poverty rates. Key factors driving poverty levels include small farm sizes, low productivity, high post-harvest losses, limited investment, and marginal growth share of cultivated land (CIAT & World Bank, 2017). Additionally, 99.6% are small-scale farms and 79% of people working in agriculture are employed in primary production of agriculture (CIAT & World Bank, 2017). Despite an abundance of fertile land, agricultural productivity remains relatively low (USAID, 2018). 62% of the total land area has agricultural potential, yet only 7% is being used. While the Government of Mozambique stresses the role of the private sector in market creation, Mozambique's many remote villages and poor road network prevent small and medium-scale farmers from accessing adequate input sellers and output buyers (Tschirley et al., 2021). As a result, farming families in Mozambique, especially women and youth, face a wide range of challenges: a lack of input retailers and extension agents; limited access to credit; insecure markets; and few dependable buyers (International Development Enterprises, 2021). These are some of the barriers preventing smallholder farmers from investing in agriculture as a business. After being piloted in Bangladesh, the MSRI was modified for use in Mozambique's agricultural portfolio (Parker, 2020). For now, it has been implemented three times: twice in the Beira corridor (Sofala and Manica provinces) and once in the North (Nampula and Cabo Delgado provinces).

Figure 1: Provinces where iDE operates (iDE does not operate in Inhambane or Niassa)



Source: Authors' illustration.

3 Methodology

To assess resilience in nine districts of Nampula and Cabo Delgado provinces, the Market System Resilience Index (MSRI) was implemented. Data were collected from households and the other actors to identify areas of improvement across the key dimensions linked to systems resilience (Downing et al., 2018).

Survey questions were then mapped to the MSRI 2.0 indicators, determinants, and principles. Questions were developed using the existing MSRI 1.0 set of questions, questions from SHARP, and adaptations through previous iterations of deployment. Subsequently, a scoring process was designed, where the index goes from 0 to 5.

3.1 Sampling

The 2022 MSRI assessment was built on the information collected from Nampula and Cabo Delgado provinces. The goal of the MSRI sampling strategy was to obtain representative samples of the agricultural market system actors in these provinces.

Four main actors were identified that represent fundamental pillars of the market system. The demand side consists of households, while the supply side consists of input suppliers, retailers, and output market actors. Table 2 offers more detail on the role of each market actor.

Table 2: Description of demand-side and supply-side market actors

Market actor type		Description of market actor
Demand side	**Households**	Group of persons who make common provision of food, shelter, and other essentials for living.
Supply side	**Input suppliers**	Main international, national, or regional agricultural businesses that sell agricultural inputs
	Retailers	Smaller business that commercializes and distribute agricultural inputs to more remote and rural areas
	Output market	Businesses that buy and aggregate agricultural products from farmers and sell to consumers.

Source: International Development Enterprises.

Steps to further disaggregate these four groups based on their geographic district, income/business revenue, and number of employees (for supply-side market actors) were taken by the iDE global team involved in the construction of the MSRI index. After identifying the actors and their disaggregation into the type of market actor, four sets of questionnaires were designed for each type of actor. Then, these sets of questions were translated into Portuguese and coded.

For households, two focus districts were selected from Nampula and three from Cabo Delgado. The more focused data collection effort allowed the team to collect larger samples per district for a more effective statistical analysis of households at the district level. The supply-side market actors were also located in Nampula and Cabo Delgado provinces, with five districts in Cabo Delgado province and four districts in Nampula province. Actors were selected from iDE's current stakeholder database in the region and were confirmed to operate within the same regions.

According to Roglà (2022), the sampling followed six steps: (i) deciding on comparison groups (gender is one of the most important comparisons needed and others can also be included); (ii) making sure the sample is representative of these groups; (iii) randomizing the sample; (iv) calculating the sample size (to have statistically meaningful size, calculators can be used. Usually, margin of error: 5%; confidence interval: 95%; population size: number of households or market actors in the area of interest and a sample proportion of 50%); (v) accounting for attrition/non-response rate; and (vi) making sure it fits the budget.

Here are the steps taken for the sampling, in greater detail:

1. **Deciding on the comparison groups.** For MSRI purposes, comparisons based on factors such as gender, province, type of market actor, and internally displaced people (IDPs) vs hosts were needed to generate localized solutions aiming for bigger impacts than the ones generated until now.

2. **Randomizing the sample.** Using *stratified* and/or *cluster sampling* to make sure comparison groups are adequately included in the sample is best for MSRI data collection. Here *systematic sampling* is used, though making sure that the comparison groups are represented. Specifically, the data were collected at an input supplier fair, and the enumerators talked to every tenth person to enter the fair alternating between males and females, for households.
    - At the end of each day, we did check-ins with all the enumerators to determine where we were in terms of sample balance on populations of interest, and adjustments were made as needed for the next day.

3. **Calculating the sample size.** A sample size calculator[3] was used, using the following data points as reference:
    - Margin of error: 5% (sector standard)
    - Confidence level: 95% (sector standard)
    - Population size: number of households or market actors in the area of interest
        - The population was 17,000 households and 58 market actors.
    - Sample proportion: 50%

4. **Accounting for attrition/non-response rate.** Assuming there will be some people in the sample who will refuse the survey, it is important to estimate a sample that is at least 5–10% greater than the needed sample size to account for that attrition/non-response rate. This was the approach used for the data collection in this study.

5. **Making sure it fits the budget.** Regardless of what a sample size calculator might say, the final decision on sample size was contingent on the budget for data collection.

[3] https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/

Data were collected from the largest possible number of actors, within the existing budget, yet it was possible to maintain representativeness.

For the market actors (supply side), a list of 58 agriculture sector companies (small, medium, and large) was gathered. From this list, 29 companies could be reached, either in person or by phone.

Table 3 shows what the sample size was at the end.

Table 3: Sample size by type of actor

Market actor type	Cabo Delgado	Nampula	Total
Households	367	185	552
Input suppliers	4	0	4
Output markets	11	2	13
Retailers	5	7	12
Total	387	194	581

Source: Authors' compilation based on the data collected.

3.2 Data collection

Data collection was done using Taro Works, a mobile data platform for phones and tablets. Surveys were available in both English and Portuguese and administered by iDE-trained representatives. For the demand-side actors, household data collection took place at iDE-managed Input Trade and Technology Fairs (ITTFs). Supply-side actors were identified with a simple market assessment and then surveyed either at the ITTFs or in their offices or warehouses. To ensure responsible and ethical data collection procedures, informed consent was collected before the survey from all survey participants.

The data collection took place between October and December 2022. The collected data were then analysed using Stata, Excel, and R statistical software programs.

3.3 Methods

The eleven determinants are scored between 0 and 5 using a consensus method, agreed upon in an expertise meeting (Ambrosino et al., 2018).

Table 4: MSRI scores description

Resilience contributing score at determinant level	Description
5	The market shows these elements frequently
4	The market shows these elements often
3	The market shows these elements sometimes
2	The market shows these elements rarely
1	The market shows these elements never

Source: Adapted from Ambrosino et al. (2018).

The final MSRI score will be out of 5, through a summation of the eleven weighted determinants.

$$MSRI = SUM\ [(Det * w_{Det})/5]$$

Where: Det represents the determinant score and w_{Det} is the weight of the determinant in the MSRI.

The results at different levels are presented. They can be at the determinant level, principle level, and overall MSRI index level. If needed, results can be shown for indicators and questions too.

3.3 Study limitations

The main limitation of this study is that the data for the household analysis were collected at iDE-managed ITTFs and can therefore be biased. Participants in ITTFs are registered for iDE programming that includes technical assistance, ITTF spending vouchers, and support in access to inputs and supplies. This presents a selection bias that affects the generalizability of the analysis.

Additionally, as conflicts occur in the North, agricultural activities are not consistent due to the population having to move at any time. This situation prevents/reduces the presence of companies in the rural areas, and smallholder farmers are a bit concerned about working on their pieces of land under this level of uncertainty.

4 Results

4.1 Descriptive statistics

For this study, 552 households were interviewed: 367 in Cabo Delgado and 185 in Nampula. On the supplier side, we interviewed 16 market actors in Cabo Delgado and 13 in Nampula (divided into input suppliers, output markets, and retailers).

Table 5: Market actors by province

Market actor type	Cabo Delgado	Nampula	Total
Households	367	185	552
Market actors	16	13	29
Total	383	198	581

Source: Authors' compilation based on the data collected.

4.1.1 Households

Broken down by gender, 242 women and 310 men were interviewed. These respondents were also asked if they were household heads. Table 6 presents this disaggregation in detail.

Table 6: Household by gender and head of household

HH head	Female	Male	Female %	Male %
Non-Household Head (Respondents)	99	11	90	10
Household Head (Respondents)	143	299	32.35	67.65
Total	242	310	43.84	56.16

Source: Authors' compilation based on the data collected.

The sample was also disaggregated by household income-generating activities (one household could have more than one income-generating activity). As shown in Table 7, 99.64% of the respondents worked in agriculture, 25.91% had their own business, 16.85% were engaged in casual labour, and 13.59% worked in fishing.

Table 7: Household income-generating activities

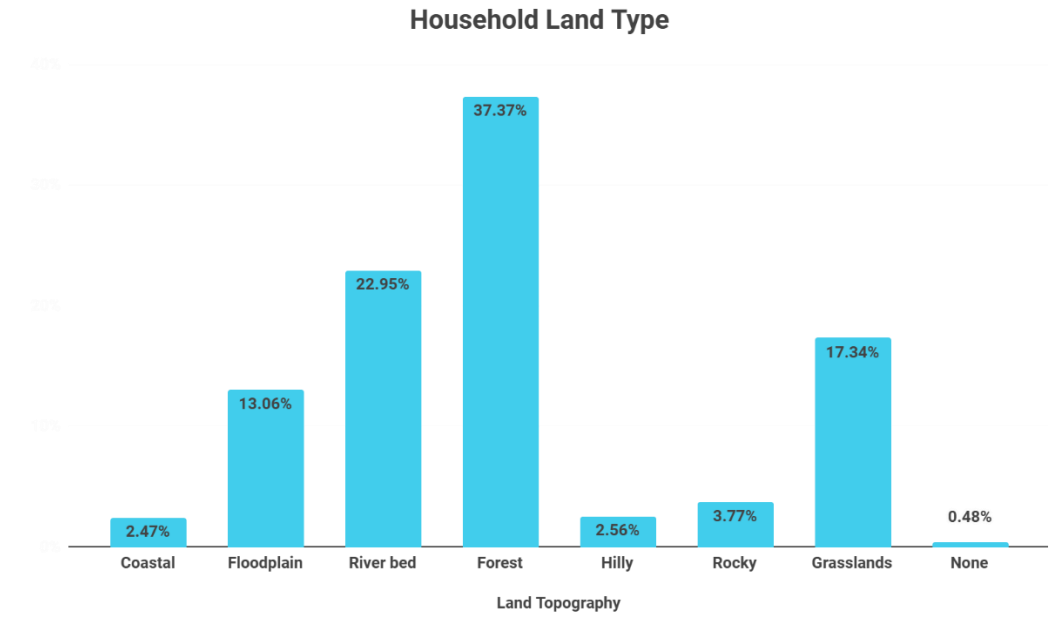
Activity	N	Frequency (%)
Crop production	550	99.64

Livestock	57	10.33
Aquaculture/Pisciculture	1	0.18
Fishing	75	13.59
Casual labour	93	16.85
Migration to cities for work	2	0.36
Firewood collection	12	2.17
Charcoal seller	49	8.88
Own business	143	25.91
Other	117	21.2

Source: Authors' compilation based on the data collected.

Since this study looked at the agriculture sector, the respondents were asked about the type of land they were working on. Figure 2 shows the frequency for each land topography identified by the farmers from Nampula and Cabo Delgado.

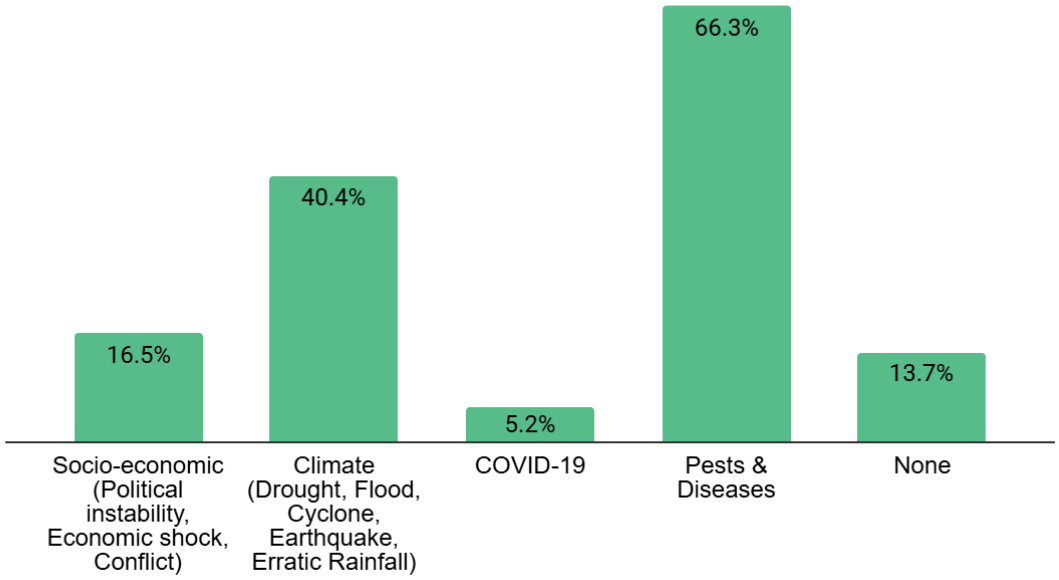
Figure 2: Land topography of the households



Source: Authors' illustration based on the data collected.

In terms of shocks, households were asked which type of shock, if any, they had faced in the 5 years preceding the survey. Figure 3 shows that the most frequent shock was pests and diseases (66.3%), followed by climate shocks (40.4%). Respondents were also asked about the time they took to recover from the shocks by which they were affected. The responses revealed that, for the shocks presented, most households took less than a month to recover; on the other hand, the second most common response was that households had not recovered at the time they were interviewed.

Figure 3: Frequency of shocks experienced by households in the 5 years preceding the survey.



Source: Authors' illustration based on the data collected.

4.1.2 Market actors

In terms of shocks experienced by market actors in the 5 years preceding the survey, COVID-19 was the shock that mostly affected them (79.3%). In terms of the time for recovery, 40% of the market actors said they had not recovered from public health shocks, while 29% said they had not recovered from socio-economic ones. As for climate shocks, 29% of the market actors took 1 to 3 months to recover from them.

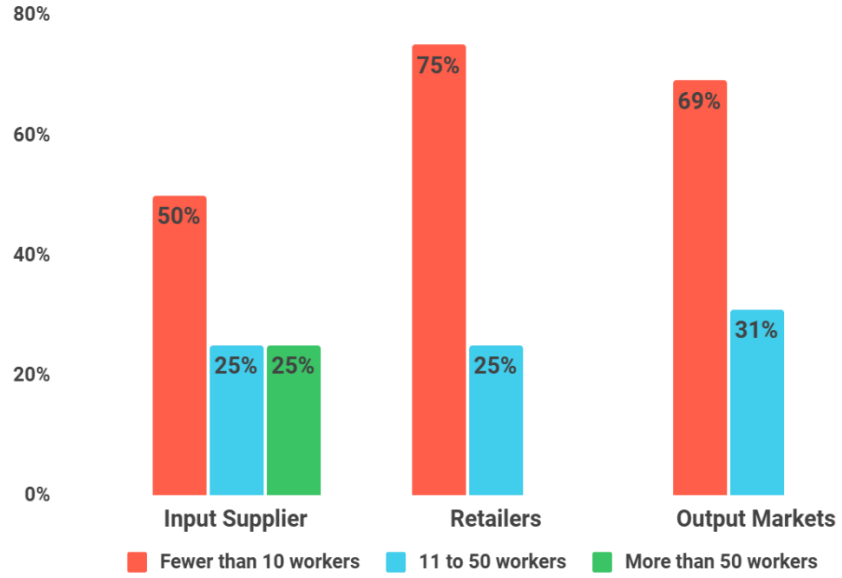
Table 8: Frequency of shocks experienced by market actors in the 5 years preceding the survey

Type of shocks	N	Per cent
Socio-economic (Political instability, Economic shock, Conflict)	16	55.2%
Climate (Drought, Flood, Cyclone, Earthquake, Erratic Rainfall)	16	55.2%
COVID-19	23	79.3%

Source: Authors' compilation based on the data collected.

Based on their size, the firms interviewed from the supplier side were divided into 3 groups: fewer than 10 workers, between 11 and 50 workers, and more than 50 workers. Results show that 25% of the input suppliers had more than 50 workers, 75% of the retailers had fewer than 10, and 69% of the output market also had fewer than 10 workers.

Figure 4: Frequency of firm size for the market actors

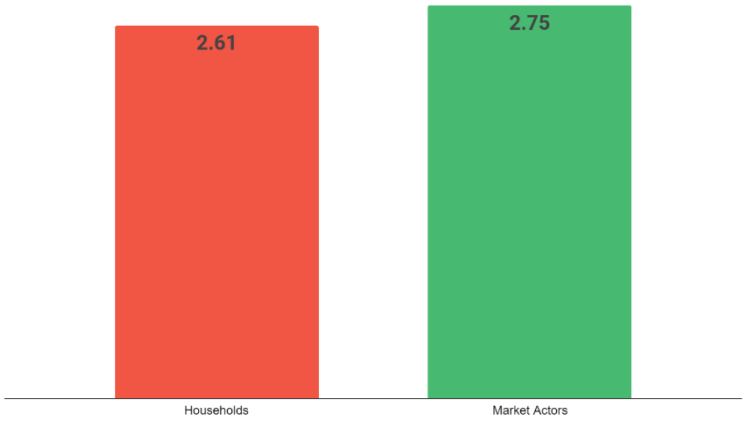


Source: Authors' illustration based on the data collected.

4.2 Market System Resilience Index (MSRI)

The MSRI was calculated both for the households and for the remaining market actors. The overall score is 2.61 for the households and 2.75 for market actors, which puts the actors on level 3 of resilience on a scale of 0 to 5. This works as a baseline for resilience in the provinces analysed. It is not sufficient to conclude whether the result is good or bad, yet it works as a starting point, and since the second round is being prepared, the difference in analysis will give a better picture of the situation and probably of the impact (or lack thereof) of iDE interventions.

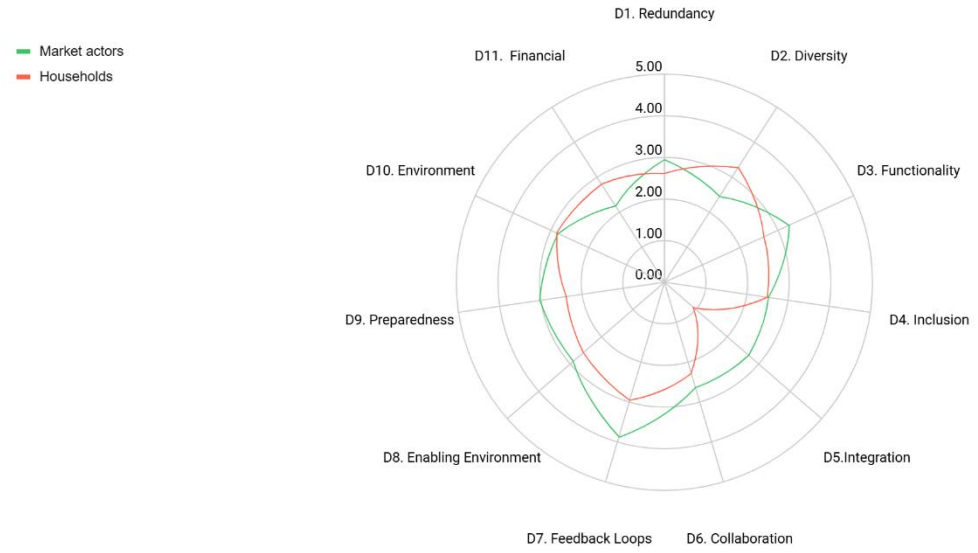
Figure 5: MSRI for households and market actors



Source: Authors' illustration based on the data collected.

The following results represent a comparison between market actors and households at the determinant level. In general, market actors scored higher, except for the financial, diversity, and environment determinants, where the households showed better results.

Figure 6: MSRI for households and market actors, at determinant level



Source: Authors' illustration based on the data collected.

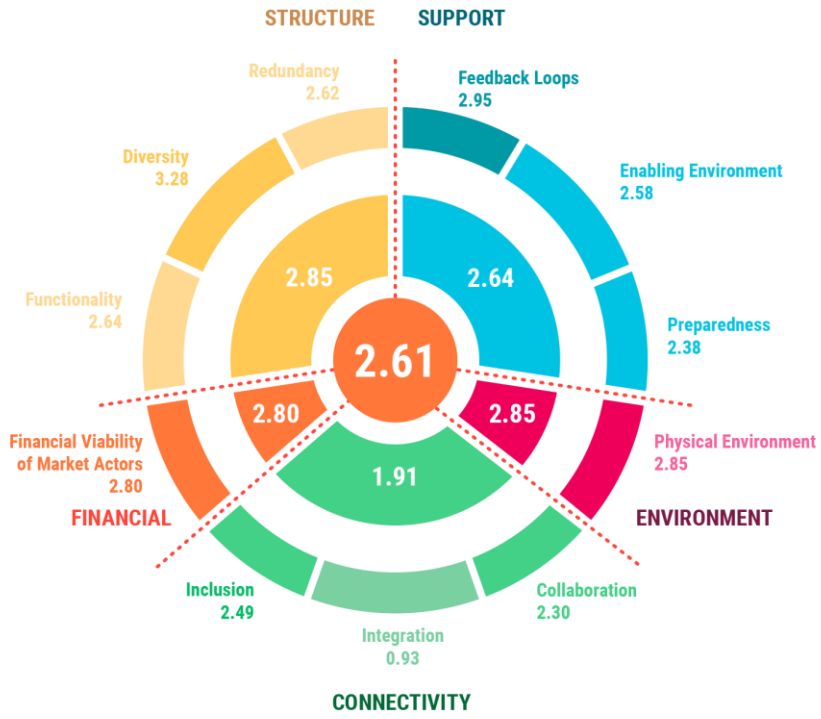
4.2.1 Households

The overall household score is 2.61 out of 5. This means that the households meet "sometimes" the MSRI criteria to be considered resilient, i.e., they are halfway to it. The main drivers of these results in terms of determinants are diversity, feedback loops, physical environment, and financial, with scores of 3.28, 2.95, 2.85, and 2.80, respectively. Diversity was the highest scoring determinant, which shows that households grow a diverse number of crops and the market provides many options where they can buy and sell inputs/products.

The connectivity of the market principle, which is composed of the inclusion, integration, and collaboration determinants, is the principle contributing the least to household resilience (score of 1.91). This suggests low participation of different groups in the market system, little involvement from different groups in relevant market processes (agriculture value chain), and limited evidence of collaboration among households.

Notably, integration is the lowest scoring determinant of the entire MSRI result, at 0.93.

Figure 7: MSRI for households (overall, principle, and determinant level)



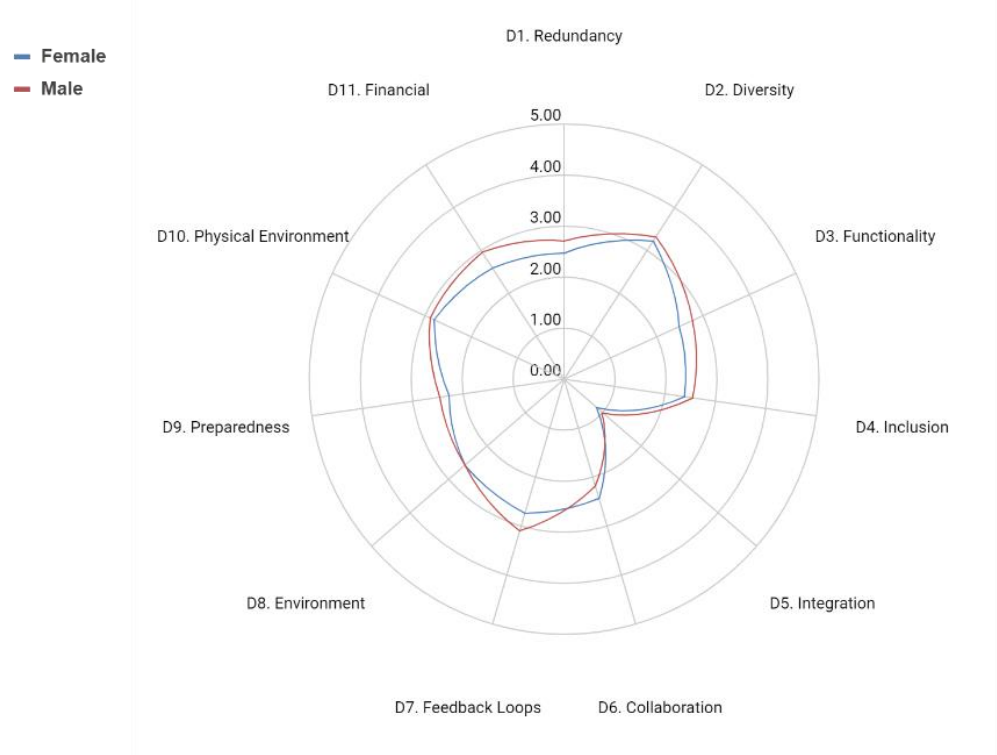
Source: Authors' illustration based on the data collected.

Determinant scores across subgroups

1. Gender

In terms of gender disaggregation, males scored better in all determinants except collaboration, in which females scored higher, meaning that women work better as a group than men. For the male group, the highest score was in diversity (3.32) – they grow different types of crops – and the lowest was in integration (1.00) – which can mean that there is no involvement of different groups in relevant processes. For females, the pattern was the same: the highest performing determinant was diversity, with a score of 3.22, and the lowest was integration, with a score of 0.81.

Figure 8: MSRI for households, disaggregated by gender



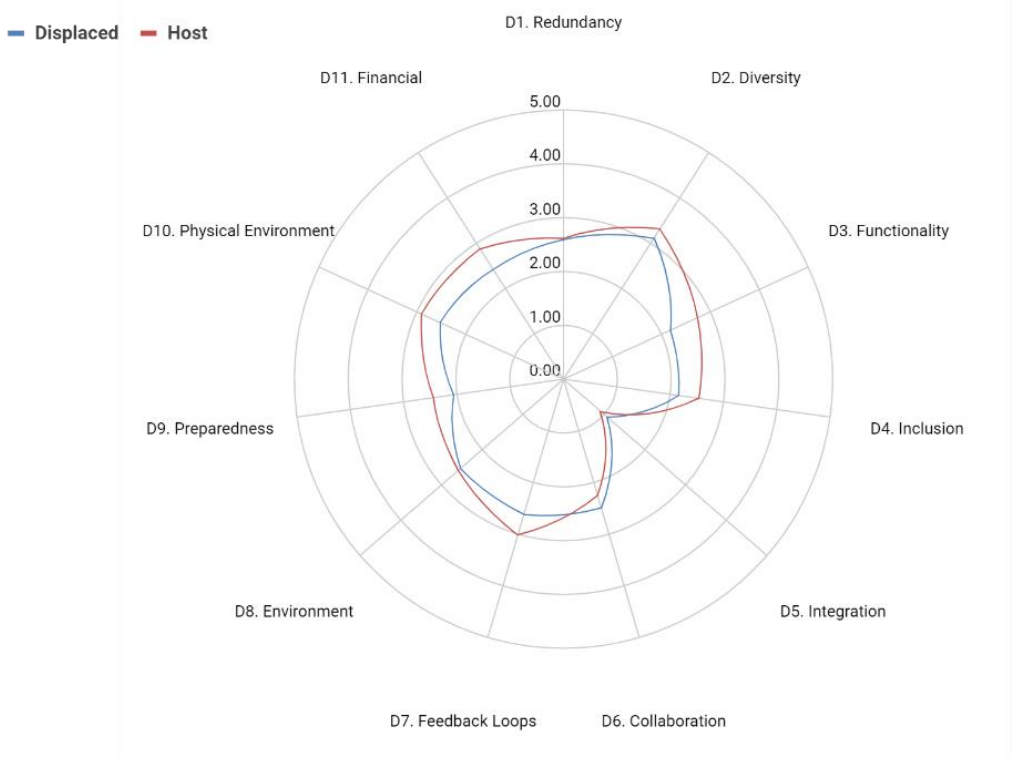
Source: Authors' illustration based on the data collected.

2. Hosts and internally displaced people

Host households scored, on average, higher than internally displaced households across all determinants except collaboration, meaning that collaboration is the only determinant in which displaced people scored better. This shows that internally displaced people (IDPs) are communicating better among themselves and organizing themselves in a way that allows them to work as a group, which is a good way of sharing land, knowledge, profits, and so on.

IDPs moved from their local small farms running from terrorism to neighbouring districts or provinces. As farmers, some of the IDPs borrowed/rented land to produce crops during the time they would be staying.

Figure 9: MSRI for households, disaggregated by status



Source: Authors' illustration based on the data collected.

Determinants by number and type of shocks

The type of shock the households were affected by can influence their resilience. Table 9 shows slight differences between the different types of shocks, with public disease (COVID-19) presenting the highest result (2.77) for the MSRI overall. In terms of the determinants, the households affected by public disease shocks showed only slightly better results, except in functionality.

Regarding the number of shocks, there are no clear patterns in the determinant results. Yet, from the overall MSRI results it can be seen that those households affected by 3 or 4 shocks are slightly more resilient. However, these results are not conclusive since the differences are too small.

Table 9: MSRI (overall and by determinants) by type of shock

	Redundancy	Diversity	Functionality	Inclusion	Integration	Collaboration	Feedback Loops	Enabling Environment	Preparedness	Physical Environment	Financial	MSRI
Socio-economic	2.37	3.13	2.43	2.86	1.09	1.58	2.93	2.57	2.03	2.79	2.77	2.51
Climate	2.59	3.28	2.78	2.62	0.93	2.12	2.89	2.69	2.26	2.85	2.90	2.63
Public disease	2.87	3.38	2.47	2.96	1.66	1.85	3.51	2.61	2.46	3.06	2.85	2.77
Pests and diseases	2.48	3.27	2.74	2.66	0.88	2.05	2.96	2.60	2.36	2.92	2.86	2.62
None	2.64	3.34	2.80	2.36	0.71	2.65	2.84	2.54	2.65	2.86	2.85	2.64

Source: Authors' compilation based on the data collected.

Table 10: MSRI (overall and by determinants) by number of shocks

# of disasters	Redundancy	Diversity	Functionality	Inclusion	Integration	Collaboration	Feedback Loops	Enabling Environment	Preparedness	Physical Environment	Financial	MSRI
0	2.66	3.33	2.80	2.35	0.72	2.65	2.85	2.54	2.66	2.85	2.84	2.64
1	2.82	3.29	2.47	2.22	1.03	2.65	3.03	2.51	2.41	2.82	2.68	2.59
2	2.27	3.24	2.85	2.85	0.83	1.71	2.79	2.72	2.24	2.86	2.96	2.60
3	1.97	3.26	2.79	3.18	0.82	1.50	2.94	2.71	2.00	3.11	3.15	2.66
4	2.85	3.21	2.99	3.76	1.39	0.79	3.51	2.65	2.22	3.26	3.01	2.81

Source: Authors' compilation based on the data collected.

4.2.2 Market actors

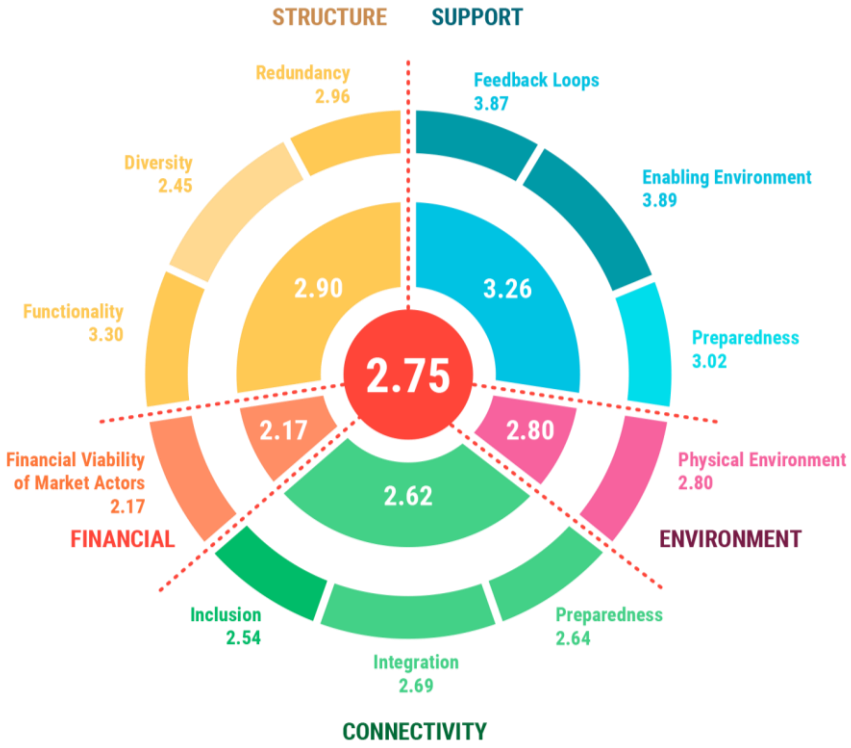
Market actors are composed of input suppliers, retailers, and output markets. The analysis presents aggregate results for market actors because the number of observations found on the field for each subgroup was smaller than expected.

Overall, market actors scored 2.75 out of 5, meaning that in the aspects of resilience being measured, market actors range between "The market shows these elements rarely" and "The market shows these elements sometimes". The ultimate goal is to score 5 out of 5 or as close as possible to it.

The main drivers of these results are feedback loops, enabling environment, and functionality (3.89, 3.87, and 3.30, respectively).

The financial principle is the one contributing the least to the market actors' resilience. This suggests that market actors have a difficult time accessing financial resources to run, invest, and grow their small businesses. These results show the necessity of interventions in the financial sector. Agriculture is a risky sector, and finance institutions have higher rates for this business sector, putting farmers in a position where it is not easy to get money to invest more in the business. Usually, farmers use informal microfinance or community-based solutions such as group savings.

Figure 10: MSRI for market actors (overall, principle, and determinant level)



Source: Authors' illustration based on the data collected.

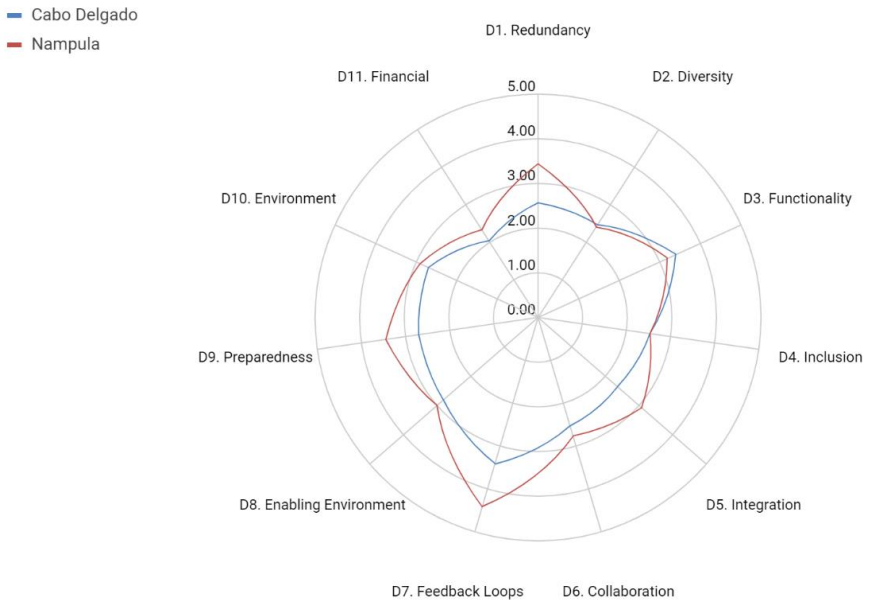
Determinant scores across subgroups – Provinces

In terms of disaggregation by province, Nampula had a score of 2.93 and Cabo Delgado had a score of 2.60.

Although both provinces follow a similar resilience pattern, market actors in Nampula, on average, scored better than market actors in Cabo Delgado across all MSRI determinants except diversity and functionality.

In contrast to the households, the supply side is less resilient in Cabo Delgado, and one of the reasons for this is the political instability in that province. Companies do not feel safe in some districts and therefore they are either closing there or reducing business staff. During the interviews, the business owners stated that due to terrorism fears, they had reduced the staff or even closed some shops in some districts in Cabo Delgado.

Figure 11: MSRI for households, disaggregated by province

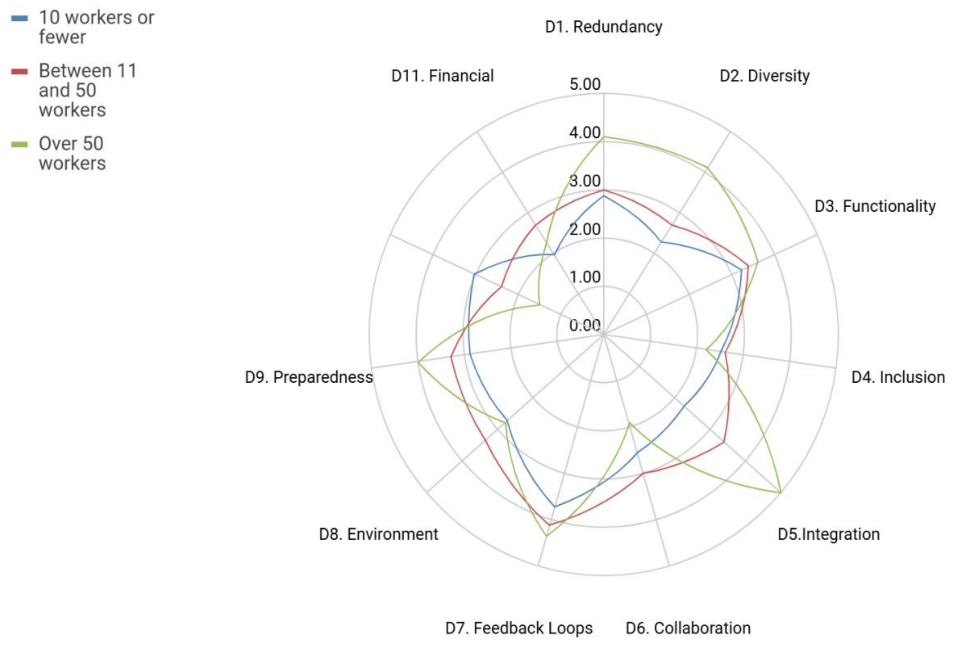


Source: Authors' illustration based on the data collected.

Determinant scores across subgroups – Firm size

For the first group (10 workers or fewer), which had the largest sample size, the determinant with the highest score was feedback loops (3.74) and the one with the lowest was financial (1.96), meaning that the companies are struggling to access financial services to maintain (or grow) their business, while, on the other hand, the communication between them and their customers is working well. Farmers are usually able to contact the supplier if they have a complaint about a specific product and, based on some interviews, the companies give feedback to the households/retailers too.

Figure 12: MSRI for households, disaggregated by firm size



Source: Authors' illustration based on the data collected.

5 Discussion

Market System Resilience Index (MSRI) analysis is a good tool to assess resilience within the area being studied and helpful in assessing the impact of project interventions.

In Mozambique, three rounds of MSRI were conducted, twice in the Beira Corridor (Manica and Sofala) and most recently in the north of the country, in Nampula and Cabo Delgado. As this is a new tool, not many MSRI studies have been published.

In Bangladesh, results showed that households score higher for redundancy and feedback loops, while the scores for integration, diversity, and collaboration were low (Choptiany et al., 2021). For market actors, the highest scores were in redundancy, diversity, and integration, while the lowest were in preparedness, collaboration, and inclusion (Choptiany et al., 2021).

In Nepal, the survey was conducted during the period of COVID-19 restrictions, which limited its range, with only 40 households and 17 market actors being interviewed (Choptiany et al., 2021). Results showed that COVID-19 was found to have a major impact on farmers relative to other shocks and stresses.

In terms of disaggregation, there were significant differences between males and females in the Bangladesh study (Choptiany et al., 2021)

The results for the Beira Corridor were, in the first round, 2.87 for households and 3.3 for market actors and, in the second round, 2.81 for households and 3.13 for market actors.

In MSRI 2020, for Mozambique, the key results for households were: (i) low levels of resilience, driven by poor market system connectivity, which translated into weak market inclusion,

integration, and collaboration; and (ii) relatively good scores in redundancy and diversity, which indicates that households have multiple options/places to buy/sell products (International Development Enterprises, 2021). In MSRI 2021, the highest scoring principle was environment (3.04), followed by structure (2.94) and support of the market (2.85); the lowest results were obtained in the financial (2.71) and connectivity (2.49) principles (International Development Enterprises, 2022).

As for market actors, they are typically more resilient than households, and specifically input suppliers have higher resilience than retailers and output market actors. The higher levels are driven by effective feedback loops and market diversity, and the lowest were for the inclusion and collaboration determinants (International Development Enterprises, 2021). In the second round, the high scores were in the structure principle (3.51), driven by the diversity determinant (4.14). The feedback loop determinant (4.06) also contributed positively to the overall MSRI score, and the lowest was the connectivity of the market (2.62), driven by the inclusion determinant. Finally, the enabling environment determinant contributed the least to the overall MSRI score (International Development Enterprises, 2022).

The MSRI tool is being implemented in more countries where iDE works and being refined each time it is used. For Mozambique, the assessment will continue, specifically for the same provinces presented in this study and sectors other than agriculture.

6 Conclusion and recommendations

The Market System Resilience Index (MSRI) is a useful tool to assess resilience in Mozambique whenever possible, and it helps measure the market actors' ability to overcome the shocks and stresses the country has faced in the last 10 years. This tool can help identify channels through which effective interventions can be adopted.

The study presented in this paper provides several insights related to resilience in the market system in Nampula and Cabo Delgado. The results for the various principles, determinants, and actors can guide project and policy implementation in moving towards a resilient market system that can recover from serious periods of shocks.

The households' overall MSRI score is 2.61, while for market actors the score is 2.75. In terms of provinces, Cabo Delgado scored better than Nampula, which was not expected. Market actors struggle to have access to financial resources and diverse markets.

For the households, it can be concluded that there is a need to prioritize the incorporation of strategies to support collaboration, integration, and preparedness into the current and future activities in the agriculture sector. For example: i) Collaboration – establishing or supporting production groups or collection centres; ii) Integration – encouraging the establishment of relationships between households and buyers, educating on the importance of contracts and how to develop business skills to negotiate for them; iii) Preparedness – connecting farmers to weather information and early warning systems; link to crop insurance providers. In addition, promoting regenerative agriculture can help boost adaptation and increase climate shock recovery times.

For the market actors, there is a lack of informal and village-level finance services as well as microfinance institutions. If market actors do not meet the requirements to access formal financial channels, they have no options. Programming that helps develop community-level finance networks and brings microfinance institutions to clients can help address this gap. To increase diversity, it is important to work on supply chain development and on introducing suppliers to various markets/collection centres to increase point-of-sale avenues.

Looking at the status groups, internally displaced people (IDPs) are generally more vulnerable than host households. Therefore, increasing preparedness through the above activities could boost resilience. In terms of collaboration, IDPs scored better than hosts, and looking closer

at why this happened might give contextualized insight into ways of boosting collaboration for hosts.

The MSRI may have its limitations, but it is a good starting point to evaluate resilience and assess measures in a targeted way to increase programme impact and draw powerful insights into the market system.

Improvements can always be made to refine it and make it as useful as possible, both for the population and for all those involved in strengthening the market system.

References

Ambrosino, C., Wellstein, J. M., Barua, B. K., & Ullah, M. (2018, November 12–15). *Introducing and operationalizing the Market System Resilience Index (MSRI)* [Conference paper]. Resilience Measurement, Evidence and Learning Conference, New Orleans, LA, USA. https://s3.amazonaws.com/www.ideglobal.org/files/public/RMEL_Conference-R_MSRI_FINAL.pdf

Bahadur, A. V., Ibrahim, M., & Tanner, T. (2013). Characterising resilience: Unpacking the concept for tackling climate change and development. *Climate and Development*, *5*(1), 55–65. https://doi.org/10.1080/17565529.2012.762334

Cabell, J. F., & Oelofse, M. (2012). An indicator framework for assessing agroecosystem resilience. *Ecology and Society*, *17*(1), Article 18. http://doi.org/10.5751/ES-04666-170118

Choptiany, J. M. H., Nicoletti, C. K., Beck, L., Seekman, V., Henao, L., Buchholz, N., Parker, T., Kothari, R., Ullah, M. H., & O'Hara, C. (2021). The Market Systems Resilience Index: A Multi-Dimensional Tool for Development Practitioners to Assess Resilience at Multiple Levels. *Sustainability, 13*(20), Article 11210. https://doi.org/10.3390/su132011210

CIAT, & World Bank. (2017). *Climate-smart agriculture in Mozambique* (CSA Country Profiles for Africa Series). https://climateknowledgeportal.worldbank.org/sites/default/files/2019-06/CSA-in-Mozambique.pdf

Downing, J., Field, M., Ripley, M., & Sebstad, J. (2018). *Market System Resilience: A Framework for Measurement.* USAID. https://www.marketlinks.org/sites/default/files/media/file/2020-09/Market-Systems-Resilience-Measurement-Framework-Report-Final_public-August-2019.pdf

GOAL. (2019). *Resilience for Social Systems: R4S Approach User Guidance Manual.* http://resiliencenexus.org/wp-content/uploads/2019/05/2019-R4S-ToolkitD01-1.pdf

International Development Enterprises. (n.d.). *Measuring Market Resilience: Using an index to understand the durability of markets.* iDE Global. Retrieved June 9, 2023, from https://www.ideglobal.org/story/climate-resilience-measurement

International Development Enterprises. (2021). *iDE's Market Systems Resilience Index: Assessing Market Systems in Mozambique: 2020*. Internal iDE report: unpublished.

International Development Enterprises. (2022). *Market System Resilience Index: Beira Corridor 2021. Results*. Internal iDE report: unpublished.

Irwin, B., & Campbell, R. (2015). *Market System for Resilience* (LEO Report #6). USAID. https://www.marketlinks.org/sites/default/files/resource/files/Market_Systems_for_Resilience.pdf

Parker, T. (2020). *MSRI Support to Global E&A.* Retrieved June 17, 2023, from https://docs.google.com/document/d/1iXdnKIYGk88M5a5_koYv2X934DRT8FUvFcs3kXQOIl4/edit?tab=t.0#heading=h.xik1fze4hkjj

Roglà, J. (2022). *Guide to Building a Research, Evaluation, and Sample Design*. Retrieved June 28, 2023, from https://docs.google.com/document/d/1wiuUnSYF4q742vI1XGptUhaN8OHhF0-jC60Xr6It9Ng/edit#heading=h.ynr0kck4kisz

Tschirley, D., Donovan, C., Mata, T., Chapoto, A., & Mather, D. (2021). *Analysis to guide USAID/Mozambique programmatic investments in agriculture and food nutrition security.* USAID. https://pdf.usaid.gov/pdf_docs/PA00XGR1.pdf

USAID. (2018). *Climate Risk Profile Mozambique*. https://www.climatelinks.org/sites/default/files/asset/document/2018_USAID-ATLAS-Project_Climate-Risk-Profile-Mozambique.pdf