



EXPLORATION OF A SIMPLIFIED INDEX FOR MEASURING HOUSEHOLD RESILIENCE CAPACITY

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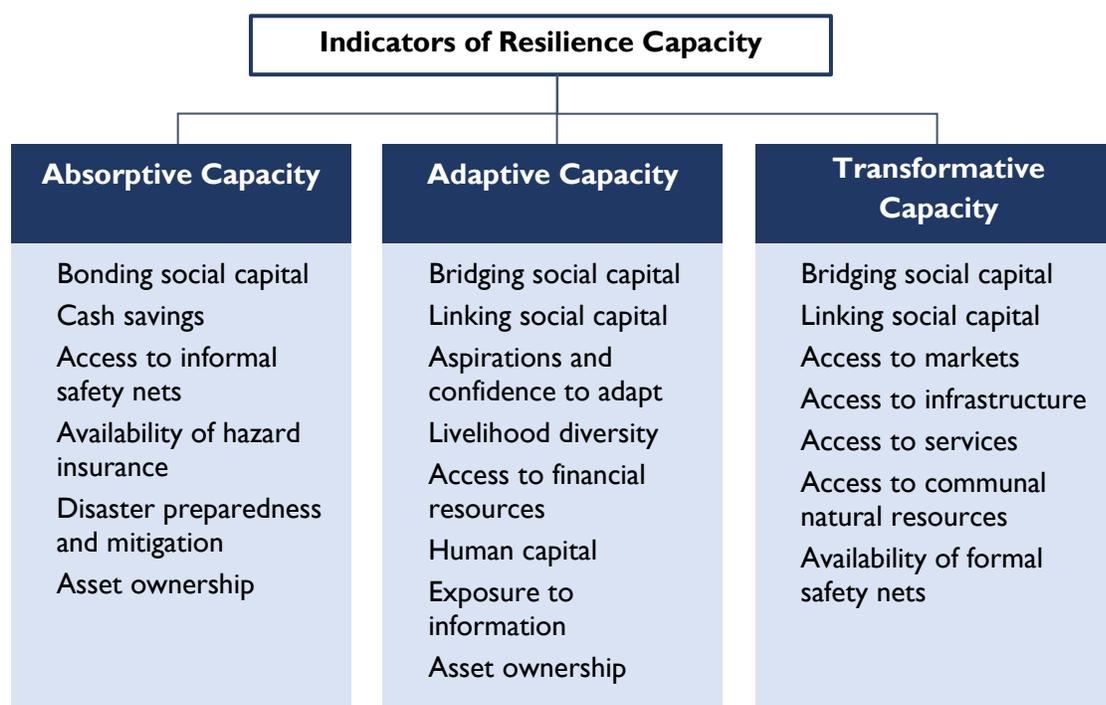


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I. Introduction

To date TANGO has been measuring resilience capacity using a core set of 18 indicators in a two-step process.¹ The first step is to use factor analysis to calculate indexes of the three dimensions of resilience capacity: absorptive capacity, adaptive capacity and transformative capacity. The second is to use factor analysis to calculate an overall index of resilience capacity based on those three sub-indexes. The 18 indicators are listed in Figure 1.

Figure 1: Eighteen core indicators of resilience capacity



The indexes and indicators are used for a variety of purposes, including:

- Comparing the resilience capacity of population groups;
- Tracking changes in resilience capacity over time;
- Determining whether program interventions have a positive impact on resilience capacity; and
- Understanding which specific capacities (the actionable programming and policy levers for enhancing resilience) have the greatest impact on resilience.

The purpose of this note is to explore the possibility of calculating a simplified index of resilience capacity to reduce the time and financial costs of administering surveys.

¹ In some analyses additional indicators are employed, for example, indicators of support for conflict mitigation and local government responsiveness.

2. Criteria and Data Used

Index calculation can be simplified by either reducing the number of indicators and/or reducing the number of survey questions required to measure them.

To determine which indicators could be potentially excluded without compromising the validity of the resulting index, we considered four criteria. These are:

1. How important each indicator is in determining households' resilience to shocks.
2. How much statistical influence each indicator has on the overall index of resilience capacity and indexes of absorptive, adaptive and transformative capacity.
3. Survey burden: How many questions are asked to measure each indicator.
4. Maintenance of a set of key core indicators central to the conceptualization of resilience.

Criteria 1, 2, and 3 are judged by analyzing the data collected in subsets of the four surveys listed in Table 1.

Table 1: Surveys employed to judge criteria

Survey	Full name	Dates of data collection	Number of households
PRIME (Ethiopia)	"Pastoralist Areas Resilience Improvement and Market Expansion" impact evaluation endline survey	December 2017	2,750
RISE (Burkina Faso and Niger)	"Resilience in the Sahel-Enhanced" impact evaluation midline survey	April/May 2017	2,492
PREG (Kenya)	"Partnership for Resilience and Economic Growth" Phase II impact evaluation baseline survey	September 2018	2,820
DFSA (Uganda)	Food for Peace "Development Food Security Activities (DFSA's) in Uganda" baseline report	June/July 2018	2,799

3. Assessment of the Criteria

Criterion #1. How Important Each Indicator is in Determining Households' Resilience to Shocks.

This information is obtained from prior regression analyses exploring the associations between each individual indicator and measures of resilience, while controlling for household shock exposure, socio-demographic characteristics, economic status, and location of residence.²

² The measures of resilience are either (1) "realized resilience", the change in food security over the course of a shock period, or (2) "perceived ability to recover", an index of households' ability to recover from shocks based on self-reports.

Table 2 reports on the number of data sets for which each indicator has a positive and statistically significant association with resilience. The indicators having the lowest number of data sets with positive associations are:

- Livelihood diversity (0)
- Linking social capital (1)
- Access to services (1)
- Access to infrastructure (1)
- Access to CNR (1).

The number of data sets is given in parentheses.

Table 2: Association between resilience capacity indicators and resilience to shocks

	Ethiopia PRIME	Burkina Faso/Niger (RISE)	Kenya PREG	Uganda (Evelyn)	Number of positive associations
Bonding social capital	1	1	0	0	2
Cash savings	0	1	1	1	3
Access to informal safety nets	1	1	0	0	2
Availability of hazard insurance	1	1	0	1	3
Disaster preparedness and mitigation	1	1	1		3
Asset ownership	1	1	1	1	4
Bridging social capital	1	1	0	0	2
Linking social capital	0	1	0	0	1
Aspirations and confidence to adapt	1	1	0	0	2
Livelihood diversity	0	0	0	0	0
Access to financial resources	1	1	0	0	2
Human capital	1	1	0	1	3
Exposure to information	1	1	0	1	3
Access to markets	1	1	0	1	3
Access to services	0	1	0	0	1
Access to infrastructure	0	1	0	0	1
Access to communal natural resources	1	0	0	0	1
Availability of formal safety nets	1	1	0	0	2

Note: Green boxes and the value of 1 indicate a positive, statistically significant association.

Criterion #2. How Much Statistical Influence Each Indicator has on the Overall Index of Resilience Capacity and Indexes of Absorptive, Adaptive and Transformative Capacity.

This criterion is judged based on these sub-criteria:

- a) How highly correlated each indicator is with the index (its factor analysis scoring coefficient) and how highly correlated it is with the other indicators (the mean of the correlation coefficients with all other indicators); and
- b) The difference in the index when each indicator is excluded from its calculation. This is judged based on (1) the correlation coefficient between the original index and an index with each indicator excluded; and (2) a Kolmogorov-Smirnov test for equality of these distributions.

The detailed results for this analysis are presented in Appendix I, Table Ia. They are summarized in Table 3. The table reports, for each of the four sub-criterion and each indicator, the number of data sets for which the sub-criterion is met. For example, in the case of bonding social capital one data set meets the first sub-criterion, one the second, three the third, and one the fourth. The mean number of data sets satisfying the criteria is 1.5.

Table 3: Statistical influence of each indicator on overall index of resilience capacity: Number of data sets

	Scoring coefficient criterion (≥ 0.1)	Mean correlation with other indicators criterion (≥ 0.15)	Correlation of 18-indicator index with index that excludes the indicator (≤ 0.995)	KS test of difference between 18-indicator index and index that excludes the indicator (p-value < 0.3)	Mean number of data sets satisfying criteria
Bonding social capital	1	1	3	1	1.50
Cash savings	2	1	2	0	1.25
Access to informal safety nets	4	4	4	1	3.25
Availability of hazard insurance	0	1	1	0	0.50
Disaster preparedness and mitigation	1	2	2	0	1.25
Asset ownership	2	1	2	0	1.25
Bridging social capital	1	1	2	1	1.25
Linking social capital	2	2	3	1	2.00
Aspirations and confidence to adapt	0	0	0	0	0.00
Livelihood diversity	0	1	2	0	0.75
Access to financial resources	3	2	4	4	3.25
Human capital	2	1	2	0	1.25

	Scoring coefficient criterion (≥ 0.1)	Mean correlation with other indicators criterion (≥ 0.15)	Correlation of 18-indicator index with index that excludes the indicator (≤ 0.995)	KS test of difference between 18-indicator index and index that excludes the indicator (p-value < 0.3)	Mean number of data sets satisfying criteria
Exposure to information	2	2	2	0	1.50
Access to markets	0	0	1	0	0.25
Access to services	3	2	4	2	2.75
Access to infrastructure	2	2	2	1	1.75
Access to communal natural resources	0	1	0	0	0.25
Availability of formal safety nets	3	1	3	1	2.00

Note: Table numbers are the number of data sets, out of four, that meet each criterion.

Five indicators showed the lowest statistical influence on the overall index of resilience capacity (with the mean number of data sets satisfying the criteria in parentheses):

- Aspirations (0)
- Access to markets (0.25)
- Access to CNR (0.25)
- Availability of hazard insurance (0.5)
- Livelihood diversity (0.75).

Note that we conducted additional analysis excluding these five indicators as a group from the index and found little difference from the original index of resilience capacity. However, we did find some differences in the indexes of the three dimensions of resilience capacity (see Appendix I, Table 1b). We considered the possibility of recommending that only one overall index be calculated directly from the indicators rather than creating separate indexes of the three dimensions first. However, we ruled this out because we felt that indexes of the three dimensions are important evidence for decision making--they are critical for making decisions regarding investment focus and balance.

The implication is that if USAID wants to be able to measure the three dimensions of resilience capacity it cannot drop any of these five indicators without compromising measurement accuracy.

Criterion #3. Survey Burden: How Many Questions are Asked to Measure Each Indicator.

The number of survey questions used to measure each indicator is fairly stable across data sets. Tables 4a and 4b list those for the PRIME and RISE data sets, respectively. Some indicators are measured using survey questions that are shared with other indicators, as indicated in the far- right columns.

Table 4a: Number of survey questions for each indicator, Ethiopia PRIME

	Number of survey questions	Number of solo questions	Number of shared questions	Shared with:
Bonding social capital	8	8	0	
Cash savings	1	1	0	
Access to informal safety nets	8	8	0	
Availability of hazard insurance	1	1	0	
Disaster preparedness and mitigation	6	5	1	Availability of formal safety nets
Asset ownership	68	68	0	
Bridging social capital	7	7	0	
Linking social capital	38	20	18	Exposure to information (13) Access to services (5)
Aspirations and confidence to adapt	14	14	0	
Livelihood diversity	10	10	0	
Access to financial resources	3	2	1	Access to services
Human capital	7	7	0	
Exposure to information	13	0	13	Linking social capital
Access to markets	3	3	0	
Access to infrastructure	6	6	0	
Access to services	9	3	6	Linking social capital (5) Access to financial services (1)
Access to communal natural resources	3	3	0	
Availability of formal safety nets	4	3	1	Disaster preparedness and mitigation

Note: The total number of survey questions takes into account shared questions (that is, there is no double counting).

Table 4b: Number of survey questions for each indicator, Burkina Faso/Niger RISE

	Number of survey questions	Number of solo questions	Number of shared questions	Shared with:
Bonding social capital	8	8	0	
Cash savings	1	1	0	
Access to informal safety nets	7	5	2	Access to services (1) Disaster preparedness and mitigation (1)
Availability of hazard insurance	1	1	0	
Disaster preparedness and mitigation	6	1	5	Availability of formal safety nets (4) Access to informal safety nets (1)
Asset ownership	80	80	0	
Bridging social capital	8	8	0	
Linking social capital	28	16	12	Exposure to information (7) Access to services (5)
Aspirations and confidence to adapt	11	11	0	
Livelihood diversity	18	18	0	
Access to financial resources	2	0	2	Access to services
Human capital	7	7	0	
Exposure to information	7	0	7	Linking social capital
Access to markets	3	3	0	
Access to infrastructure	6	6	0	
Access to services	17	9	8	Linking social capital (5) Access to financial services (2) Access to informal safety nets (1)
Access to communal natural resources	3	3	0	
Availability of formal safety nets	8	4	4	Disaster preparedness and mitigation

Note: The total number of survey questions takes into account shared questions (that is, there is no double counting).

The indicators that can—if not limited to a maximum cap (see below)—put the strongest independent burden on the total number of survey questions (around 90 in total) are:

- Asset ownership
- Linking social capital
- Aspirations and confidence to adapt
- Livelihood diversity
- Exposure to information
- Access to services.

Criterion #4. Maintenance of a Set of Key Core Indicators Central to the Conceptualization of Resilience.

Here we used resilience theory to determine which indicators could be excluded without making conceptual compromises. None could be excluded based on this criterion.

4. Discussion and Recommendations

Of the indicators identified above for potential exclusion, three do poorly on both criterion #1 and criterion #3:

- Linking social capital
- Livelihood diversity
- Access to services.

The most viable candidate for exclusion from index calculation is linking social capital. This indicator is important conceptually, but as currently measured has not shown strong positive associations with resilience itself. Further, we feel that the method for measuring it (based on indirect indicators) is not optimal, and could do with some research and refinement. Dropping it would reduce survey burden by around 10 percent (the number of “solo” questions is around 16-20 of the near 190 total).

We feel that the other two indicators identified to have little association with resilience and/or little influence on the overall index of resilience capacity are well measured and do not have large enough data collection burdens to warrant complete exclusion.

This leaves us with one additional recommendation for reducing survey burden:

Cap the number of survey questions for some indicators.

The obvious first candidate for doing so is asset ownership, which takes up 35-40 percent of the resilience capacity survey questions. Asset indexes are constructed using four types of assets: consumption assets, productive assets, animals owned, and land ownership. We conducted analysis of the RISE data set to determine whether a substantial reduction in the number of assets makes any difference to the overall index.

We followed these guidelines in choosing the number of assets in each category, focusing on those assets having the highest percent ownership (information that can often be obtained from past surveys):

Consumption assets: 15

Productive assets: 10

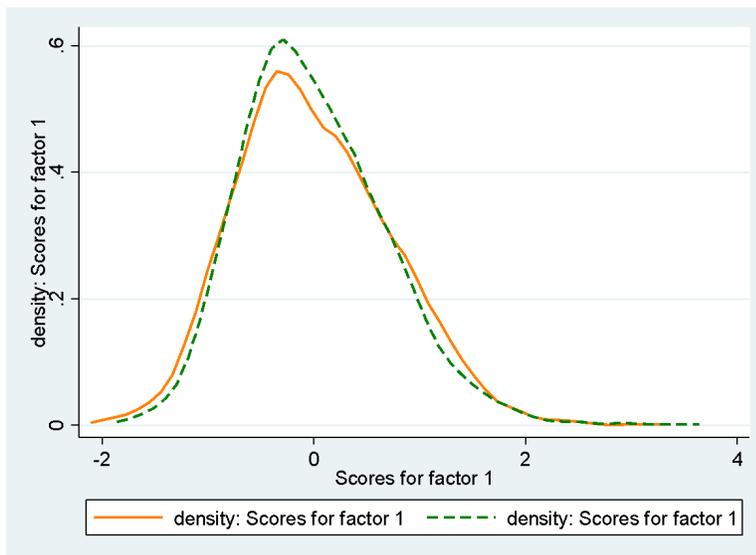
Animals: 8

Land:³ 1

For consumption assets, we took care to maintain some indicators in each of four categories: electronics, furniture/sleep items, vehicles, and luxury items. The specific consumption indicators for the RISE reduced index are listed in Appendix 2.

When we did so, we found that the original and reduced asset indexes differ little, being correlated at 0.98 ($p=0.000$). Their distributions are very close, as can be seen in Figure 2.

Figure 2: Distribution of full and reduced asset indexes, RISE data set



This analysis indicates that substantially reducing the number of assets for which data are collected may be a viable option for reducing the burden of data collection for measuring resilience capacity.⁴ Analysis of additional data sets will provide confirmation.

Three other candidates for capping the number of survey questions because they rely on component listing are (with suggested maximum number of questions in parentheses):

- Livelihood diversity (10)
- Exposure to information (10)
- Access to services (10).

³ In some surveys, respondents are asked to simply report the number of hectares of land they own. In others they are asked to give the hectareage of each plot enumerated separately, a lengthy process. Those wishing to reduce survey burdens can chose to use the former method under the understanding that there will be some loss in accuracy.

⁴ Asset indexes may also be used for measuring wealth and poverty. This analysis shows that the results for these would be essentially the same as well.

Streamlining survey questionnaires based on caps on the numbers of questions recommended here as rules of thumb should be done individually for each questionnaire as the particular questions included are context-specific.

If linking social capital were dropped and the number of questions used to measure asset ownership, livelihood diversity, exposure to information, and access to services were cut to the suggested numbers here, the total number of survey questions would be reduced substantially. For example, the number for PRIME would be reduced from 189 to 132, a 30 percent reduction. That for RISE would be reduced from 197 to 123, a 38 percent reduction.

5. A Note on Simplification of the Measurement of Household Shock Exposure

In addition to resilience capacity, resilience measurement includes measurement of households' exposure to shocks. TANGO has been using household survey data to measure this using an index of shock exposure that takes into account the total number of shocks households experienced as well as their perceived severity. Perceived severity is measured using answers to two questions: (1) "How severe was the impact on your income?" and (2) "How severe was the impact on your food consumption?"

After consultation with USAID staff, we recommend that streamlined questionnaires only include the second question regarding food consumption.

Appendix I

Table 1a: Statistics for judging how much statistical influence each indicator has on the overall index of resilience capacity

		Ethiopia PRIME				RISE			
		Scoring coefficient	Mean corr with others	Correlation with index if exclude	KS test with exclusion	Scoring coefficient	Mean corr with others	Correlation with index if exclude	KS test with exclusion
1	Bonding social capital	0.0840	0.225	0.9931	0.446	0.08557	0.1400	0.9933	0.920
2	Cash savings	0.0214	0.124	0.9997	1.000	0.04092	0.1154	0.9984	0.999
3	Access to informal safety nets	0.2955	0.360	0.9864	0.007	0.12779	0.2250	0.9929	0.532
4	Availability of hazard insurance	0.0235	0.212	0.9927	0.596	0.07308	0.1267	0.9956	0.999
5	Disaster mitigation and preparedness	0.0399	0.251	0.9983	0.933	0.08128	0.1050	0.9904	0.905
6	Asset ownership	0.0466	0.190	0.9986	0.999	0.05	0.1101	0.998	0.957
7	Bridging social capital	0.0766	0.182	0.9938	0.551	0.06092	0.1119	0.9952	0.986
8	Linking social capital	0.1102	0.235	0.993	0.112	0.13419	0.2349	0.9836	0.832
9	Aspirations/confidence to adapt	0.0163	0.071	0.9998	1.000	0.00957	0.0405	0.9999	1.000
10	Livelihood diversity	0.0332	0.157	0.9992	0.999	0.03059	0.0660	0.9994	0.998
11	Access to financial resources	0.1312	0.326	0.9921	0.027	0.16031	0.2332	0.9828	0.249
12	Human capital	0.0124	0.075	0.9999	1.000	0.04876	0.1263	0.9985	1.000
13	Exposure to information	0.0617	0.229	0.997	0.775	0.05614	0.0952	0.9982	0.905
14	Access to markets	-0.0210	-0.023	0.9998	1.000	-0.00029	0.0626	0.9997	1.000
15	Access to services	0.0912	0.249	0.9943	0.303	0.41812	0.2540	0.9479	0.579
16	Access to infrastructure	0.0270	0.149	0.9994	0.979	0.01627	0.0870	0.9985	1.000

		Ethiopia PRIME				RISE			
		Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion	Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion
17	Access to communal natural resources	0.0459	0.229	0.9985	0.335	-0.01261	0.0197	0.9998	1.000
18	Access to formal safety nets	0.2987	0.340	0.9829	0.258	0.16861	0.0689	0.981	0.811

Table 1a (Continued): Statistics for judging how much statistical influence each indicator has on the overall index of resilience capacity

		Kenya PREG				Uganda EVELYN			
		Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion	Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion
1	Bonding social capital	0.1446	0.1137	0.9726	0.0810	0.01687	0.04820588	0.999	1.000
2	Cash savings	0.1155	0.1300	0.9882	0.9970	0.14811	0.15667059	0.9873	0.862
3	Access to informal safety nets	0.1376	0.1585	0.9832	0.8650	0.17202	0.17656471	0.982	0.519
4	Availability of hazard insurance	0.0280	0.0592	0.9985	1.0000	0.0449	0.07052353	0.9982	1.000
5	Disaster mitigation and preparedness	0.0555	0.0922	0.9967	1.0000	0.14982	0.16047647	0.9808	0.541
6	Asset ownership	0.1125	0.1231	0.9869	0.9820	0.10426	0.12755294	0.9896	0.742
7	Bridging social capital	0.1067	0.1047	0.9755	0.1370	0.04866	0.07424118	0.9978	0.986
8	Linking social capital	0.0703	0.1152	0.9963	1.0000	0.09045	0.12379412	0.9942	0.967
9	Aspirations/confidence to adapt	0.0737	0.0959	0.9957	0.9960	0.07364	0.1018	0.9959	0.999
10	Livelihood diversity	0.0642	0.0950	0.9950	0.8820	0.08886	0.11562941	0.9911	0.959
11	Access to financial resources	0.0773	0.0750	0.9804	0.1740	0.15127	0.14919412	0.9773	0.161

		Kenya PREG				Uganda EVELYN			
		Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion	Scoring coefficient	Mean corr with others	Correlati on with index if exclude	KS test with exclusion
12	Human capital	0.1598	0.1830	0.9831	0.9500	0.18749	0.18241176	0.9811	0.437
13	Exposure to information	0.1163	0.1614	0.9862	0.8090	0.17212	0.1695	0.9713	0.805
14	Access to markets	0.0548	0.0509	0.9965	0.8820	0.07895	0.08692353	0.9906	0.862
15	Access to services	0.2553	0.1478	0.9343	0.1060	0.12505	0.12092941	0.9825	0.519
16	Access to infrastructure	0.1968	0.1767	0.9530	0.1450	0.12923	0.12727647	0.9806	0.720
17	Access to communal natural resources	-0.0211	-0.0287	0.9992	0.9900	0.01626	0.02147647	0.9996	1.000
18	Access to formal safety nets	0.1322	0.1394	0.9841	0.7020	0.01396	0.03660588	0.9998	1.000

Table 1b. Statistics for judging how much statistical influence each indicator has on the indexes of absorptive, adaptive and transformative capacity

	Ethiopia PRIME		Burkina Faso/Niger RISE		Kenya PREG		Uganda EVELYN	
	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)
Absorptive capacity								
Bonding social capital	Meets Criteria (MC)	MC	MC	MC		MC		
Cash savings	MC		MC	MC	MC	MC	MC	MC
Access to informal safety nets	MC	MC	MC	MC	MC	MC	MC	MC
Availability of hazard insurance	MC	MC	MC	MC			MC	MC
Disaster preparedness and mitigation	MC	MC	MC	MC	MC	MC	MC	MC
Asset ownership	MC	MC	MC	MC	MC	MC	MC	MC
Adaptive capacity								
Bridging social capital	MC	MC	MC	MC	MC	MC		
Linking social capital	MC	MC	MC	MC	MC	MC	MC	MC
Aspirations and confidence to adapt	MC		MC	MC	MC	MC	MC	MC
Livelihood diversity	MC	MC	MC	MC	MC	MC	MC	MC
Access to financial resources	MC	MC	MC	MC			MC	MC

	Ethiopia PRIME		Burkina Faso/Niger RISE		Kenya PREG		Uganda EVELYN	
	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)	Scoring coefficient (> 0.1)	Correlation of full index with index that excludes the indicator (<=0.995)
Human capital	MC		MC	MC	MC	MC	MC	MC
Exposure to information	MC	MC	MC	MC	MC	MC	MC	MC
Asset ownership	MC	MC	MC	MC	MC	MC	MC	MC
Transformative capacity								
Bridging social capital	MC							
Linking social capital	MC	MC	MC	MC	MC	MC	MC	
Access to markets	MC		MC		MC	MC	MC	MC
Access to services	MC	MC	MC	MC	MC	MC	MC	MC
Access to infrastructure	MC	MC	MC	MC	MC	MC	MC	MC
Access to communal natural resources	MC	MC				MC	MC	MC
Availability of formal safety nets	MC	MC	MC	MC	MC	MC		

Note: Green boxes with MC indicate that indicator meets criteria.

Appendix 2: List of Consumption Assets for the RISE Survey Analysis

- **Electronics**
 - Radio
 - Telephone set/cellular phone
- **Furniture/sleep items**
 - Chair
 - Wooden bed
 - Metal bed
 - Table
 - Mat
 - Portable handheld lighting
 - Blanket
 - Mosquito net
- **Vehicles**
 - Bicycle
 - Cart (animal drawn)
 - Motorcycle/moped
- **Non-necessities**
 - Jewelry: Silver
 - Watch