SHOUHARDO III Longitudinal Study (RMS) Report

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care

Acknowledgements

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Acronyms

ANC	Antenatal care
BDHS	Bangladesh Demographic and Health Survey
CFW	Cash for work
DRR	Disaster Risk Reduction
EKATA	Empowering Knowledge and Transformative Action
FFBS	Farmer Field Business School
FFP	(USAID office of) Food for Peace
FFW	Food for Work
FLAIRb	Fostering Learning and Adaptation in Resilience building
FSN	Formal safety net
GBF	Grameen Bikash Foundation
GOB	Government of Bangladesh
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HH	Household
HHS	Household Hunger Scale
HoH	Head of household
IGA	Income generating activities
ISN	Informal safety net
LCS	Labor contracting society
NGO	Non-governmental organization
ODK	Open Data Kit
PEP	Poor and Extreme Poor
PLW	Pregnant and lactating women
PNGO	Partner Non-governmental Organization
RMS	Recurrent monitoring survey
SFDC	Supplemental food distribution committee
SHOUHARDO	Strengthening Household Ability to Respond to Development Opportunities
UDMC	Union Disaster Management Committee
UDV	Union Disaster Volunteer
UP	Union Parishad
USAID	United States Agency for International Development
USD	United States dollar ($)
VDC	Village Development Committee
VSLA	Village savings and loan association

Executive summary

Survey rounds data for the FLAIRb longitudinal study are collected in six months intervals during July/August and again in December/January. The six months recall period for the December/January data point is July to December and for the July/August data point, from January to June. Information is collected for these two data points for two different types of seasons with different natural calamities. Floods, flash floods, and excessive rain are very common in Bangladesh from July to December, which also includes the lean period during mid-August to mid-November (Bhadra, Asshin and Kartik Bengali months). The data collection period January to June includes very hot temperatures with tropical storms (*Kalboishakhi*). Disease prevalence is comparatively higher during that time, both for humans and livestock. Usually, during July to December, people often have less access to income generating activities, such as structured construction/rehabilitation (cash-for-work), and agriculture/non-agriculture seasonal labor, etc. Seasonal effects that occur during these two time intervals of survey rounds are prevalent in most of the indicators from Round 1 to Round 3. For example, Table 3 and Table 4 show that nearly all households were exposed to excessive rains/flood in Round 2, while 80 percent of households were exposed in both Round 1 and Round 3. Also, disease prevalence for livestock/crops was comparatively higher in Round 1 and Round 3. Loss of labor is 50 percent higher in Round 2 than in Round 1 and Round 3. This assumption should be validated in the next two rounds (Round 4 and Round 5) of data collection.

The economic shocks, especially, the percentage of project participants exposed to sharp increases in food price dramatically increased from 7.2 percent in Round 1 to 68.0 percent in Round 2 and 52.2 percent in Round 3 (Table 3). This rapid jump is consistent with the increase in Consumer Price Index (CPI) for Bangladesh for the time period of Round 1 and Round 2[1]. Significant increase in per capita income was found after Round 1 both in Taka and US Dollars, which is consistent with Bangladesh national statistics (Table 9). Per capita income increased by 13 percent from Round 1 to Round 2 and two percent from Round 2 to Round 3. Round 1 income data[2] was collected when the sampled program participants were first registered in the program. Hence, a 13 percent increase in per capita income from Round 1 to Round 2 might be due to the SHOUHARDO program's income generating activities. This assumption will need to be validated in the Round 4 and Round 5 panel data collection.

The Kurigram district is one of the most vulnerable districts in the Rangpur division for food security, livelihood, and health and nutrition security among children under the age of five. The

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[1] CPI was 236.61 for July 2017, 248.16 for January 2018 and 249.65 for July 2018. TRADINGECONOMICS.COM | Bangladesh Bureau of Statistics

[2] Annual income July 2016 to June 2017

Kurigram district was excluded from the Round 1 survey due to severe flooding that made the sample communities inaccessible to the data collection team. The Kurigram district was, however, added in during the later rounds. Therefore, some of the results from Round 2 and Round 3 are affected due to inclusion of Kurigram from Round 2 onwards. Table 47 shows that the underweight (weight-for-age) prevalence among children under two and children under five went up from Round 1 to Round 2 and continued at the same level until Round 3. This might be due to including the Kurigram district starting in Round 2. The *terre des homes* nutritional survey in Kurigram and the Demographic Health Survey (DHS) also found similar prevalence rates for the Kurigram district and Rangpur division[3].

Women's participation in any project promoted group increased significantly from 64 percent in Round 1 to 89 percent in Round 3, over the period of 18 months (Table 30). The highest percentages of participations were observed in three important groups: FFBS, VSLA and the Women's group, which helped increase the mean women decision making index from 2.2 in Round 1 to 2.4 in Round 2 and up to 2.7 in Round 3 (Table 24 and Table 25). All three resilience capacities are found to be comparatively higher among the participants who are involved in two or more groups, with steady increases in all three resilience capacities from Round 1 to Round 3 (Figure 3, and Figure 4).

 The level of shock recovery depends on the length of the term of the shocks. Recovery from the excessive rain/flood is higher than the recovery from sharp food price increase. Selling of livestock is slightly higher among shock impacted households than those that were not impacted, but distress sale is the main reason cited in both cases (Figure 1).

All three livelihood strategies for agricultural production and sales, livestock production and sales and agricultural labor have been increased over the period time (Table 18). Indicating that participants are adopting project promoted livelihood strategies. There are significant improvements on project promoted improved production technologies and management practices both for crops and livestock (Table 38). Although no improvements were found on the production of project promoted crop varieties. Besides the project promoted crop production, other crop production increased significantly from Round 1 and Round 3 (Table 38). Chilli is the only project promoted variety that has an increase of average selling from 304kg in Round 1 to 504kg in Round 3.

Program participants are found to have increased access to reproductive health and child health services from the community-based facilities, such as, satellite/EPI outreach, community clinic and NGO field workers (Table 41). The percentage of mothers who had at least one antenatal care (ANC) visit has increased from 68 percent in Round 1 to 96 percent in Round 3, while

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[3] Underweight among children U5 30.8%, Maternal and Child Health & Nutrition Survey in Kurigram District, Bangladesh, *Terre des homes*, December 2014; 36.8% in Rangpur District, Bangladesh Demographic Health Survey 2014.

slow improvements were observed for four or more ANC visits. More food intake and more day time rest during pregnancy increased significantly from Round 1 to Round 3 (Table 42). Intake of iron-folic acid during pregnancy and post-partum vitamin-A also had significant increases.

There were some improvements in hygienic practices for safe disposal of children's and animal's waste and hand washing practices. The practice of throwing children's waste outside decreased significantly. However, in the case of throwing animal's waste outside, the percentages remain the same (Table 43). Hand washing practices increased significantly for the critical times before feeding child, after cleaning baby's defecation, before food preparation, and after cleaning animal/birds feces, while soap use increased only before eating or before feeding children. Nearly all participants use soap after defecation (Table 44).

Child feeding practices have improved significantly for the minimum acceptable diet (MDD) and early initiations of breast milk (Table 45). Prevalence of diarrhea decreased over the survey rounds for both children under-two and children under-five (Table 46). Table 47 shows the percentage of children underweight increased from Round 1 to Round 2 and then decreased from Round 2 to Round 3. The reason for this increase from Round 1 to Round 2 was likely due to the addition of data from the Kurigram district in Round 2 (see the explanation in the third paragraph above). The actual prevalence of underweight children will be assessed after the remaining two rounds of data collection are complete.

1. Introduction

Study area

CARE's Strengthening Household Ability to Respond to Development Opportunities (SHOUHARDO) III program is designed to address food security and nutrition challenges among the poor and extreme poor communities in Bangladesh. The program is funded by United States Agency for International Development (USAID) for a five-year period between 2015 to 2020. SHOUHARDO III is implemented in partnership with six local Partner Non-Governmental Organizations (PNGOs) who bring technical expertise and experience in improving food security and resilience in the targeted districts. Additionally, CARE is partnering with international organizations and private sector actors in the areas of finance, agricultural marketing, and production. The program also works closely with the Government of Bangladesh (GoB) to enhance ownership and facilitate implementation, and align closely with national and local level policies and programs. SHOURHARDO III serves the most vulnerable and marginalized people including "extremely poor" households — those without even a small piece of land on which to grow food. The program is implemented in the Haor and Char areas of Northern Bangladesh, both of which experience frequent and damaging floods due to

seasonal monsoon rains, and reaches eight districts (Sirajganj, Kurigram, Gaibandha, Jamalpur, Kishoreganj, Netrokona, Habiganj and Sunamganj), 23 *upazilas*, and 115 unions.

SHOUHARDO III delivers a wide range of services and goods including: distribution of food rations; cash for work programs; infrastructure development and maintenance; increased opportunities for women and a push towards gender equity in communal socio-economic affairs; farmer training and support for agricultural inputs; non-farm income generation skills training and building up of productive assets; savings promotion and access to loans; nutritional supplement promotion; linkages to health care service providers; training on nutrition health and sanitation; mobilization of local resources for economic gains and hazard preparedness; inclusive local planning, early storm and flood warning; preparation of community and regional disaster response plans; and creating both demand and supply of improved service provision to communities.

The overarching program goal is to improve gender equitable food and nutrition security and resilience of the vulnerable people living in the Char and Haor regions in Bangladesh by 2020. To achieve its goal, SHOUHARDO III focuses on three principal purposes and two cross-cutting purposes: 1) Increased equitable access to income for both women and men, and nutritious food for men, women, boys, and girls; 2); Improved nutritional status of children under five years-of-age, pregnant and lactating women, and adolescent girls; 3) Strengthened gender equitable ability of people, households, communities and systems to mitigate, adapt to and recover from man-made and natural shocks; 4) Increased women's empowerment and gender equity at both the family and community levels; and 5) Increased provision and utilization of public services (e.g., local elected bodies and nation building departments) for communities, especially for poor and extremely poor women. Within its program areas of agriculture and livelihoods; health, hygiene, and nutrition; and disaster and climate risk management, the project delivers an integrated set of services – a holistic framework with an emphasis on women's empowerment, gender issues, and good governance.

Project profile

The core research objectives are:

1. To measure the longitudinal effects of the project interventions on increased agricultural production and better nutritional status by adopting agriculture, livelihood, and nutrition practices.
2. To increase understanding of which resilience capacities, in what form and where, have the greatest ability to help households mitigate shocks and stresses and achieve greater food security.
3. To determine if project interventions are effectively contributing to the resilience capacities of households, and inform program decisions on how to adjust interventions accordingly.

4. To provide evidence that allows the program to test and review its theory of change, and make adaptive management decisions within the project.

Multiple regression analysis was used to investigate the following questions:

- How did the severity of exposure to the shock affect households' ability to recover from the shock?
- Did household resilience capacities, before the onset of the shock, help protect them from its negative impacts and do the relevant capacities vary by shock type?

Household resilience outcomes are poverty–-measured by monthly household income in Taka, households' reported recovery from floods, and the Household Food Insecurity Index Score (HFIAS) as a measure of household food security.

The multiple regression analyses control for households' exposure to shocks, so the results indicate the extent to which households with higher levels of resilience capacities are more likely to recover from shocks and are able to achieve higher levels of food security when exposed to a particular level of shock.

2. Sample design

This section briefly outlines the methodology used to collect the longitudinal survey rounds (FLAIRb) data and how the quantitative data were analyzed.

The purpose of the longitudinal surveys is to obtain benchmark information in Round 1 and then progress in subsequent rounds about the household characteristics, practices, resilience capacities, and resilience outcomes, which are tracked throughout the remainder of the project in follow-up rounds. This method tracks household responses to shocks, stresses and other changes, and the effects of those changes on well-being. The survey round module is based, as much as possible, on the resilience module of the SHOUHARDO III project baseline survey, to ensure that the resilience capacities are measured consistently with other FFP surveys. This report provides findings from the Round 1, Round 2 and Round 3 surveys conducted in July-August 2017, December 2017-January 2018, and July-August 2018 respectively.

Sampling frame: The panel sample of beneficiaries was selected from the three major sampling frames of registered project participants: (i) Agriculture and Livestock beneficiaries, (ii) Pregnant and lactating women (nutrition program beneficiaries) (PLW), and (iii) Other beneficiaries. The total sample for the study was drawn from these three strata, with the target number of respondents per stratum computed as described in the following section. The same households that were selected for the first survey round were interviewed in all following rounds.

Sample size:

$$n = DEFF \left(\frac{Z_{\square}\sqrt{p_{\text{disc}}} \;+\; Z_{(1-\square)}\sqrt{p_{\text{disc}} - p^2_{\text{diff}}}}{p_{\text{diff}}} \right)^2$$

where

    n = Required minimum sample size per survey round or comparison group (strata)

    p_{disc} = The proportion of households that have changed indicators from the first round to last round.

    p_{diff} = The proportion of households with changes (positive/negative) from the first round to last round.

    Z_{α} = Z-score corresponding to the degree of confidence with which it is desired to be able to conclude that an observed change in the proportion would not have occurred by chance (α – the level of statistical significance for one-tailed test), at 95% confidence level.

    Z_{β} = Z-score corresponding to the degree of confidence with which it is desired to be certain of detecting a change in the proportion if one actually occurred (β - statistical power), 80%

    DEFF = Design effect

Using these values in the formula, the computed minimum sample size per stratum is:

Ag/Livestock	188 ≈ **200**
Pregnant and Lactating Women (PLW)	243 ≈ **280**
Other	119 ≈ **200**

Following this sampling strategy, the target and actual size of the survey broken down by project intervention category and round are provided in Table 1. A smaller than targeted sample size means that differences need to be larger

Table 1: Targeted and actual sample size by program area, across rounds

	Target	Round 1	Round 2	Round 3	Total
Ag/livestock	200	172	179	184	535
PLW	280	234	248	256	738
Other	200	175	180	182	537
Total	680	581	607	622	1,810

A total of 40 villages from the project implementation areas were selected in Round 1. The list of villages is provided in Appendix C. The number of households selected in each village is proportional to the number of beneficiaries registered in each village. Note that the total number of households actually interviewed in several villages is less than the target, with seven villages (Baliamari, Hakimer Moth, Dakshin Indragar, Damalgram, Khochabari, Purba Phulmati, and Islampur) in the Kurigram district, where no interviews were conducted in Round 1. This was due to the extreme flooding and heavy rain at the time of the fieldwork made these villages inaccessible. As a result, the initial round 1 sample was 516 households, 76 percent of the desired target of 680 households. Retrospective information was collected from 65 households during Round 2 to provide Round 1 information. While this reduced sample size reduces the precision of population estimates, the achieved sample is determined to be still sufficient for acceptably representative population estimates.

Survey rounds: The survey rounds were conducted in six-month intervals. First in July/August 2017 for Round 1, then Round 2 in December-2017/January 2018, and then Round 3 in July/August 2018. The survey rounds captured information to measure all dimensions of household resilience capacities – absorptive, adaptive, and transformative.

To measure absorptive capacity to manage shocks and stresses, the survey collected information on the ability of households, communities, and systems to manage shocks and stresses in the short term through cash savings, informal safety nets, disaster risk reduction and climate change adaptation strategies, and reliance on bonding social capital.

To measure adaptive capacity, data were gathered on access to information, livelihood activities, reliance on bridging and linking social capital, asset accumulation, access to financial services, and investment in human capital for better access to skills and improved nutrition and health status.

To measure transformative capacity, data were collected on access to formal safety nets, markets, basic services, agricultural services, infrastructure, and several dimensions of women's empowerment. Data were also gathered to understand the extent to which households and communities rely on bridging and linking social capital.

The survey rounds, tailored to the Bangladesh context and the FLAIRb research questions included the following modules:

- Demographic information, including education of household members
- Housing characteristics
- Assets
- Shocks and recovery
- Social capital (including bonding, bridging, and linking)
- Remittances, savings, and credit
- Access to information
- Livelihoods

- Access to financial services
- Women's empowerment
  - Decision-making
  - Mobility
  - Participation in community groups
- Attitudes toward domestic violence and family life
- Community information
- Household dietary diversity
- Household hunger

The detailed questionnaire for the survey rounds is provided in Appendix B.

Data collection and management: Grameen Bikash Foundation (GBF), a local third-party firm has been contracted to organize, manage, and implement data collection activities associated with the FLAIRb study. Quantitative data were collected on tablets using Open Data Kit (ODK) software and uploaded daily to a cloud server. The data were reviewed regularly as a quality control measure. The ODK dataset (XML format) was converted into Stata SE 13.1 database for data management and analysis. Validated data were accumulated in the main Stata database.

Data analysis: TANGO cleaned and analyzed the quantitative data collected by the local survey firm. The data analysis was conducted in STATA SE version 13.1 using both descriptive and multivariate techniques.

The analysis tested for statistically significant differences in indicators between the three survey rounds at the 0.05 significance level.

Representativeness of the SHOUHARDO III project area was maintained by using survey sampling weights. Some important variables of interest, namely the three resilience capacities and one of the measures of shock exposure, are composite measures based on multiple indicators. Multiple regression analysis was used to investigate the following questions:

- How did the severity of exposure to the shock affect households' ability to recover from the shock?
- Did household resilience capacities, before the onset of the shock, help protect them from its negative impacts and do the relevant capacities vary by shock type?

Household resilience outcomes are measured using households' reported recovery from shocks and two measures of household food security Household Food Access Insecurity Score (HFIAS) and the and Household Hunger Score (HHS). The multiple regression analysis controls for households' exposure to shocks, so the results indicate the extent to which households with higher levels of resilience capacities are more likely to recover from shocks and are able to achieve higher levels of food security when exposed to a particular level of shock.

3. Descriptive Statistics

This section provides bi-variate descriptive statistics covering household demographics, shock exposure, recovery from shocks, household hunger and food security outcomes, coping strategies, and program interventions; as well as nutrition outcomes and program interventions for children and women. Data cover all programs combined. Means or proportions, as appropriate, are compared across survey rounds. Tables for each program are included in Appendix A.

The graphs and tables illustrate means or percentages over three survey rounds. Superscript letters are used in tables to show the results of pair-wise comparisons. Values with the same superscript are significantly different from each other (p<0.05). Values with no superscript are not different from the others. Comparisons are across rows (between survey rounds).

This section first presents program level, geographic, and household demographic statistics. Then it presents information about shock exposure and resilience outcomes. This is followed by information about resilience capacity elements. Presenting shock information early in the section provides context for the remainder.

Household demographics and housing characteristics

Table 2 shows household demographics and housing characteristics[4]. The table shows that household demographics did not change significantly over the survey rounds. The percentage of households with improved sanitation increased in Round 3, to more than 3 out of 4, compared to about 69 percent in earlier rounds.

Table 2: Demographics and housing characteristics over survey rounds

	Round 1	Round 2	Round 3
Demographics			
HH size (mean)	4.4	4.5	4.4
Married couple HH (%HH)	87.6	87.7	88.4
Female headed HH (%HH)	12.4	13.2	12.6
Age HoH (mean)	42.2	42.8	43.4
Literate HoH (%HH)	51.6	46.1	51.0

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[4] Household heads are coded as literate if they have ever attended school.
Education level is a scale ranging from 0 to 8
0 No education or pre-school only
1 Primary incomplete (less than class 5)
2 Primary complete (class 5 passed)
3 Secondary school certificate/equivalent incomplete
4 Secondary school certificate/equivalent complete
5 Higher secondary school certificate/equivalent incomplete
6 Higher secondary school certificate/equivalent complete
7 Graduate/equivalent
8 Masters/equivalent/higher

Table 2: Demographics and housing characteristics over survey rounds

	Round 1	Round 2	Round 3
Education level HoH (mean)	0.9	0.7	0.7
Housing characteristics			
Improved drinking water source	99.9	99.9	99.9
Improved sanitation	69.8 [a]	68.5 [b]	77.2 [ab]
Improved house	98.8	99.4	99.2
Rooms in house	1.5	1.4	1.4
n	*581*	*607*	*622*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Shocks

Households provided information about shock exposure and the impact of shocks during the six months prior to the survey. This provides comprehensive coverage from Round 1 through Round 3. Table 3 shows 27 shocks grouped into four types: climate shocks and natural disasters, conflict shocks, economic shocks, and man-made shocks. The bottom of the table shows the percentage of households reporting exposure to any of the 27 shocks and total shocks, which is the mean number of shocks per household. Most or all of the shocks in Bangladesh are seasonal or localized. Data were collected in two different seasons.

The table shows that nearly all households were exposed to floods in Round 2, but by Round 3 the percentage returned to Round 1 levels. Heavy rains, floods and flash floods in Bangladesh usually happen at the end of June and become severe from July to September. Nearly all households (98.9 percent) experienced heavy rain/flood/flash flood which in Round 2.

The percentage of households reporting exposure to storms and crop or livestock disease was lower in Round 2 than in Round 1 or Round 3. The percentage of households reporting huge or unusual medical expenses increased between survey Rounds 2 and 3 from 6.8 to 12.4 percent, which was slightly higher than the initial 10 percent reported during Round 1. March to June is the peak summer and warmest time in Bangladesh. Seasonal storms (*Kal Boishakhi*) with rain is very common in the same time period. Also disease prevalence among both human and livestock increases during this time period which is consistent with the higher rates of exposure to storms and crops/livestock disease found in Round 1 and Round 3.

Exposure to sharp increases in food prices jumped in Round 2 from 7.2 percent of households in Round 1 to 68.0 percent in Round 2. The percentage dropped in Round 3 to 52.2 percent, but was still much higher than Round 1. Food price increases were driven, at least in part, by

failed rice harvests due to flooding[5]. Another reason might be due to the exclusion of the entire Kurigram district in Round 1 due to extreme flooding during the data collection period in July 2017. Krigram is a highly food insecure district and sharp food price increases translate differently for this district. Prices rose by five percent over the six months from (CPI)[6] from 237 in July 2017 to 245 in December 2017 and again to 250 in Bangladesh might be another reason for the higher percentage of food price increase shock.

Total shock exposure increased over the three survey rounds. The rise from Round 2 to Round 3 indicates that secondary, or downstream shocks due to the flood, were still prevalent. This provides important context for the remainder of the report: Findings are preliminary in the sense that households were still reporting high levels of shock exposure, because the shock period had not ended.

Table 3: Shock exposure, by survey round

	Round 1		Round 2		Round 3	
Climate shocks and natural disasters						
Excessive rains/flood	80.9	a	98.9	ab	79.8	b
Too little rain/drought	0.9		0.4		0.4	
Livestock/crop disease	8.3	a	5.0	a	7.8	
Poor harvest	6.2		4.8		4.8	
Landslides/erosion	2.3		0.6		3.3	
Storm	20.9	a	0.3	ab	24.3	b
Cold wave	0.2		0.0		0.6	
Earthquake	1.0		1.1		0.0	
Conflict shocks						
Theft of money	1.0		0.6		0.3	
Theft of crops	0.0		0.4		0.0	
Theft or destruction of assets	0.3		0.2		0.1	
Theft of livestock	0.1		0.1		0.1	
Destruction of house	0.1		0.1		0.3	
Conflict-lost land	0.1		0.1		0.4	
Violence against HH	1.2		0.0		0.7	
Family member injury	0.8		0.5		0.1	
Economic shocks						
Sharp food price increase	7.2	a	68.0	a	52.2	a
Unavailability of inputs	1.3		0.6		1.1	
No demand for products	0.0		0.4		0.9	

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[5] FAO. 2017. Global Information and Early Warning System (GIEWS) update: Bangladesh. https://reliefweb.int/sites/reliefweb.int/files/resources/a-i7876e_0.pdf
[6] TRADINGECONOMICS.COM| Bangladesh Bureau of Statistics

Table 3: Shock exposure, by survey round

	Round 1		Round 2		Round 3	
Increased input prices	1.4		0.1		4.5	
Drop in product prices	0.1		0.6		1.2	
Death of HH member	0.6		1.2		1.1	
Livestock death	10.2		9.1		12.2	
Huge medical expense	10.0		6.8	[a]	12.4	[a]
Man-made shocks						
Exploitation	0.5		0.1		0.1	
Fire hazard	0.0		0.1		0.1	
Accident	0.1		0.1		0.2	
Others	0.0		0.1		0.1	
Any shock	86.8	[ab]	99.4	[a]	95.8	[b]
Total shocks	1.6	[a]	2.0	[a]	2.1	[a]
n	517		607		622	

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

The next series of tables presents information about the impacts of flooding and the sharp increase in food prices. Table 4 includes all households reporting that they were exposed to flooding. Impacts are ranked highest to lowest by the percentage of households in Round 2. Infrastructure damage, inability to buy household basics, losses of labor, homes, livestock, drinking water, lower crop production, household displacement, and diseases peaked in Round 2. All were lower in Round 3. Household member migration and loss of assets declined across the survey rounds.

Table 4: Impacts of heavy rainfall/flooding, by survey round

	Round 1		Round 2		Round 3	
Impacts						
Infrastructure damage	67.3	[a]	80.0	[a]	40.8	[a]
Unable to buy basics	10.8	[a]	71.9	[a]	36.1	[ab]
Loss of labor	40.4	[a]	61.4	[ab]	36.9	[b]
Loss of home	8.4	[a]	25.5	[a]	3.1	[a]
Loss of livestock	5.3	[a]	17.5	[ab]	5.4	[b]
Loss of drinking water	1.3	[a]	16.5	[ab]	0.4	[b]
Lower crop production	7.6	[a]	14.6	[ab]	5.6	[b]
Loss of crops	20.5		14.2		10.0	
Loss of agricultural land	9.8		12.9		7.1	
HH was displaced	0.6	[a]	11.2	[ab]	0.4	[b]
Diseases	0.1	[a]	10.1	[a]	7.6	
Lower livestock production	2.3		5.2		2.8	
Loss of community forest	0.3		2.3		2.0	
HH member migrated	2.0	[a]	1.2	[b]	0.0	[ab]
Loss of fishing waters	0.9		1.1		0.2	
Loss of HH assets	1.1		0.9	[a]	0.0	[a]

Table 4: Impacts of heavy rainfall/flooding, by survey round

	Round 1	Round 2	Round 3
Loss of life	0.5	0.0	0.0
Others	0.0	0.3	0.0
No impact	14.1 [a]	4.9 [a]	31.1 [a]
N	*420*	*600*	*485*

Shocks also impacted household food consumption and income. The next table shows results for households exposed to flooding and sharp food price increases, the two main shocks. Response codes range from 1 to 3: 1 for 'remained the same', 2 for 'slight decrease' and 3 for 'severe decrease'. The table presents the mean values. Impacts of flooding on food consumption and income peaked in Round 2 at 1.8 but declined to levels that were slightly lower than Round 1 by Round 3. The impact of increased food prices on food consumption decreased between Round 2 and Round 3.

Table 5: Shock impacts on food consumption and income, by survey round

	Round 1	Round 2	Round 3
Flooding			
Impact on food consumption (mean, 1-3)	1.4 [a]	1.8 [ab]	1.3 [b]
Impact on income (mean, 1-3)	1.5 [a]	1.8 [a]	1.4 [a]
N	*420*	*600*	*485*
Increased food prices			
Impact on food consumption (mean, 1-3)	1.7	1.8 [a]	1.4 [a]
Impact on income (mean, 1-3)	1.5	1.4	1.5
N	*52*	*380*	*252*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 6 shows households' reported recovery from flooding and sharp increases in food prices. Response options for this survey question are:

1) *Not recovered at all;*
2) *Recovered but worse off than before the shock;*
3) *Recovered to the same level as before the shock;* and
4) *Recovered and better off than before the shock.*

For purposes of this analysis, households were considered recovered if they reported (3), *Recovered to the same level as before the shock,* or (4) *Recovered and better off than before the shock.* The table shows that for flooding and sharp food price increases, the percentage of households reporting recovery approximately doubled in Round 3 to around 58 percent. Recovery from flooding is one of the outcome variables used in multi-variate analysis.

Table 6: Recovery from floods and food price shocks, by survey round

	Round 1	Round 2	Round 3
Flooding	36.7 [a]	29.6 [b]	58.9 [ab]
n	*420*	*577*	*485*
Sharp food price increase	25.1 [a]	23.3 [b]	58.2 [ab]
n	*52*	*380*	*330*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

The sample beneficiaries for this panel data collection have been involved in the program for more than two years. Beneficiaries are in the stage of maturity with multiple program interventions.

Coping strategies

Coping strategies are household actions to reduce the impact of shocks. Households' choice of coping strategies depends in large part on their resilience capacities. It is worth noting that data from other studies[7] indicate that to cope with shocks, households progressively draw down resources, beginning with savings, then household and productive assets, then small livestock, then large livestock. Households without savings or assets to sell, cope by reducing food consumption, removing children from school, or sending children to work. These are considered to be negative coping strategies because they have both short- and long-term negative impacts on well-being, especially for children.

Table 7 shows coping strategies used by households exposed to flooding. Strategies are ranked by the percentage of households using them in Round 2. The table shows that reducing food consumption more than tripled from Round 1 to Round 2, rising from 17.2 percent of households to 57.1 percent, remaining high in Round 3. Although the percentages are small, temporary migration of the whole family increased sharply in Round 2 when flooding was at its worst.

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7 TANGO International, 2016, Zimbabwe Resilience Research Initiative (ZRRI) Final report. Oct 31. (https://www.fsnnetwork.org/sites/default/files/zrri_endline_report_2017.pdf)

Table 7: Coping strategies for flooding, by survey round

Coping Strategy	Round 1	Round 2	Round 3
Reduce food consumption	17.2 ab	57.1 a	47.0 b
Savings	18.8	30.4	23.2
Temp migration (whole family)	1.2 a	7.3 ab	0.9 b
Loan-friends or relatives	7.4	6.9	5.3
Loan-NGO, savings gp	5.9	4.3	2.5
Loan-money lender	7.3	3.9	4.8
FFW or CFW-govt	1.3	3.4	0.8
New wage labor	2.6	3.0	2.8
Children out of school	0.6	2.9	0.9
Money or food-family local	2.3	2.9	3.7
Sell livestock	5.8	2.6	3.5
Less expensive housing	0.2	2.4	0.6
Slaughter livestock	0.3	1.8	1.5
Temp migration (some family)	2.1 ab	1.5 a	0.0 b
Livestock to pasture	0.4	1.1	1.0
FFW or CFW-NGO	0.5	1.0	0.0
Remittance	0.5 a	1.0 b	0.0 ab
Loan-bank	0.4	0.3	0.5
Sell HH items	0.0	0.3	0.4
Send boys to other HH	0.5	0.2	0.0
Permanent migration (some)	0.2	0.1	0.0
Other	0.4	0.1	0.4
Lease out land	0.0	0.1	0.2
Send girls to other HH	0.0	0.0	0.0
Children to work	0.2	0.0	0.0
Help from local org	0.2	0.0	0.1
No coping strategies	36.7 ab	9.1 a	15.1 b
n	420	600	485

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Income

Besides recovery from floods, other resilience outcome variables include income, household hunger, and household dietary diversity.

Table 8: Household and per capita income, by survey round

	Round 1	Round 2	Round 3
Household monthly income Taka	9,984 ab	11,895 a	12,758 b
Household monthly income USD	126 a	146	154 a
Per capita daily income Taka[8]	74 a	88 b	94 ab
Per capita daily income USD[9]	0.93	1.08	1.16
n	581	607	622

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

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[8] HH size for round 1 and round 2 is 4.5 and round 3 is 4.4.

[9] Average conversion rates for USD and BDT is 79.53750 for July 2016 to June 2017, 81.46583 for Jan-Dec 2017 and 83.07583 for July 2017 to June 2018

Household monthly income and per capita daily income are reported in Table 8[10]. The table shows that both increased in nominal terms over the survey rounds. Average monthly income increased from USD126 to USD146 from Round 1 to Round 2 with little increase from Round 2 to Round 3. In real terms, that is consistent with the Bangladesh national statistics[11].

Food security

This study collected data for three food security measures: HFIAS; moderate to severe household hunger, using the Household Hunger Scale (HHS): and Household Dietary Diversity Score (HDDS). Computation of all three measures follows USAID guidelines.[12]

The HFIAS is based on household access to food and responses to shortages in access to food over a 30-day recall period. This indicator is based on the household's: (1) perceptions of uncertainty over food access in the past 30 days; (2) perceptions of insufficiency in quantity and quality of food over the past 30 days; (3) reported reductions in food intake; and (4) reported consequences of reductions in food intake. To tabulate the HFIAS score, a HFIAS score variable is calculated for each household by summing the codes for each frequency-of-occurrence question (see Table 9).

Table 9: HFIAS frequency-of-occurrence questions

In the past 30 days how often did you or were you:
1) …worry that your household would not have enough food
2) …not able to eat the kinds of foods you preferred
3) …eat a limited variety of foods
4) …eat some foods that you really did not want to eat
5) …have to eat a smaller meal than needed
6) …eat fewer meals in a day
7) …have no food to eat of any kind in your household
8) …go to sleep at night hungry
9) …go a whole day and night without eating anything

Table 10: Household dietary diversity, by survey round

	Round 1	Round 2	Round 3
Food groups (%HH)			
Breads, rice, pasta	100.0	100.0	100.0
Potatoes, Irish potatoes, manioc, cassava	86.3 [a]	92.9 [ab]	88.7 [b]
Leafy green vegetables	89.4 [a]	97.9	96.7 [a]
Fruits and juices	18.0 [a]	10.3 [b]	31.5 [ab]
Meat	9.1	8.3	10.4
Eggs	21.1	27.9	27.6
Fish	65.7	69.0	62.9
Beans, legumes	31.1 [a]	39.8 [b]	19.7 [ab]
Milk products	19.7	21.3	23.9
Oils and fats	96.3	98.7	97.5
Sugar, honey	31.6 [a]	35.3 [b]	18.1 [ab]
Condiments (tea, coffee)	44.8	38.7	31.2
HDDS (mean, 0-12)	6.1	6.4 [a]	6.1 [a]
n	517	607	622

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[10] A 12 month recall period provides a moving average.

[11] In Bangladesh, average monthly income for 2017 was TK13,258 and projection for 2018 is TK.13,500 (Source: TRADINGECONOMICS.COM| Bangladesh Bureau of Statistics).

12 Coates, J., A. Swindaleand P. Bilinsky. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of household food access: Indicator guide (v. 3). Washington, D.C. https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf

Households missing data on any component were coded as missing for HFIAS. The maximum score for a household is 27 (this happens when the household response to all nine frequency-of-occurrence questions is 'often,' coded with a response code of 3). The minimum score is 0 (this happens when the household responds 'no' to all occurrence questions or when frequency-of-occurrence questions were skipped by the interviewer; these are coded as 0). The highest score (27) corresponds to the highest level of food insecurity (access); the lowest score (0) corresponds to the lowest level.

Households are classified into different food security categories using information from the HFIAS: food secure, mildly food insecure, moderately food insecure, and severely food insecure. The last three of the nine questions (see Table 9) used for the HFIAS provide data to compute the Household Hunger Score (HHS) and the percentage of households experiencing moderate to severe household hunger.[13]

Household Dietary Diversity Score (HDDS)[14] is a count of the number of different food categories (out of 12) the household consumed in the seven days prior to the survey. The HDDS provides a proxy measure of household food access, defined as the ability to acquire a sufficient quality and quantity of food to meet all household members' nutritional requirements for productive lives. A higher HDDS generally represents a more diverse diet, which is empirically highly correlated with a household's income level and access to food. However, a household can maintain its HDDS by substituting less-nutritious foods.

Table 10 shows household consumption of 12 food groups and the mean HDDS score over the three survey rounds. The table shows that despite increased percentages of households reporting exposure and adverse impacts of floods (Table 3 and Table 4), households were able to increase their dietary diversity in Round 2. Consumption of starches and legumes increased in Round 2. Lower fruit and juice consumption during this survey period probably reflects their seasonal availability.

Table 11 shows that nearly all households report little to no hunger. This remained unchanged across all three survey rounds. The proportion of households reporting moderate or severe hunger was too small to allow for analysis.

Table 11: Household hunger categories, by survey round

	Round 1	Round 2	Round 3
Little to no hunger	96.0	95.4	98.1
Moderate hunger	3.7	3.7	1.8
Severe hunger	0.3	0.9	0.1
N	581	607	622

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

13 Ballard, T., J. Coates, A. Swindale, and M. Deitchler. *Household Hunger Scale: Indicator Definition and Measurement Guide.* Washington, DC: Food and Nutrition Technical Assistance II Project, FHI 360. https://www.fantaproject.org/monitoring-and-evaluation/household-hunger-scale-hhs

14 Swindale, A. and P. Bilinsky. 2006. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2). Washington, D.C.: FHI 360/FANTA.

Of the food security measures, only HFIAS increased during Round 2, rising from 3.8 in Round 1 to 5.2 in Round 2. By Round 3, HFIAS returned to Round 1 levels.

Table 12: HFIAS by program and survey round

	Round 1		Round 2		Round 3	
HFIAS categories (%HH)						
Food secure	32.9	a	17.3	ab	34.9	b
Mildly food insecure	23.0		26.7		27.3	
Moderately food insecure	33.4		42.4		34.3	
Severely food insecure	10.6	a	13.6	b	3.6	ab
HFIAS (mean, 0-27)	3.8	a	5.2	ab	3.3	b
	581		607		622	

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

4. Resilience capacity indices components

This section provides descriptions of variables and indices that make up absorptive, adaptive, and transformative resilience capacities. It also discusses the method employed to calculate the three resilience capacities and reports their scores over the three survey rounds.

Assets

Assets are a component of absorptive and adaptive resilience capacity indices. Surveys collected data to measure household, productive and livestock assets. Households reported the number of each type of asset they owned[15]. Indices equal the sum of asset counts multiplied by their values (Taka). The first set of tables shows the percentage of households owning each type of assets followed by the mean number of assets owned over the three survey rounds. In Table 13 assets are ranked by the percentage of households owning each in Round 1. The table shows that nearly everyone owns furniture and fixtures. The percentage of households owning kitchen appliances increased in Round 3 to 3.2, up from 1 in Round 1 and Round 2. Nine out of ten households own a mobile phone, which remained same from Round 1 to Round 2 with a slight increase in Round 3. The mean number of household assets remained at about 3 in all survey rounds.

Table 13: Household consumption assets ownership, by survey round (%HH)

	Round 1	Round 2	Round 3
Asset type			
Furniture & fixtures	99.3	99.1	99.1
Mobile phone	87.3	87.3	89.9
Electric fan	41.5	40.0	42.1
Solar panel	20.4	24.4	24.5
Bicycle	18.0	19.3	18.4

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[15] Assets information are at the household level; ownership was not collected for the individuals in a household.

	Round 1	Round 2	Round 3
Clock	8.5	8.1	6.9
Television	6.5	6.3	7.2
Sewing machine	3.1	1.2	2.7
Motorcycle	1.0	1.9	1.0
Kitchen appliances	1.0 [a]	0.8 [b]	3.2 [a]
CD player, radio	0.9	1.3	1.5
Car	0.6	0.0	0.6
Iron	0.3	0.3	0.3
Washing machine	0.0	0.0	0.0
Computer	0.0	0.2	0.3
Consumption assets (mean, 0-15)	2.9	2.9	3.0
n	581	607	622

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 14 shows productive asset ownership, ranked from most to least commonly owned assets in Round 1. The table shows that the percentage of households owning hand tools dropped between Round 2 and Round 3 from 92.4 to 85.1, but there is slight increase in ownership of motorized vehicles. Overall mean levels of productive assets remained between 1.1 and 1.2 over the three survey rounds.

Table 15 shows livestock ownership in each survey round. Shared ownership of bulls, ownership of goats, and poultry all dropped after Round 2. Shared ownership of bulls decreased by about half from over 6 percent of households in Round 1 and Round 2 to 3.1 percent in R 3. Goat ownership dropped by almost 10 percentage points from around 46 percent of

Table 14: Productive asset ownership, by survey round (%HH)

	Round 1	Round 2	Round 3
Asset type			
Hand tools	88.9	92.4 [a]	85.1 [a]
Motorized vehicle	5.2	4.8	6.9
Plow	4.3	6.9	7.0
Sewing machine	3.3	4.0	3.3
Wheelbarrow	2.6	3.1	2.4
Knapsack chemical sprayer	2.4	3.1	3.7
Animal cart or boat	2.1	2.7	3.8
Mechanical water pump	1.4	1.5	0.3
Motorized water pump	1.3	1.5	1.9
Small tractor	0.6	0.3	0.1
Hand-held motorized tiller	0.5	0.3	0.1
Motorized grain mill	0.3	0.4	0.4
Stone grain mill	0.1	0.3	1.5
Productive assets (mean, 0-13)	1.1	1.2	1.2
n	581	607	622

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

households to 36 percent between Rounds 2 and 3. In addition, the percentage of households owning poultry dropped from 65.1 to 56.9 in Round 1 and Round 3, respectively. However, ownership of cows increased from Round 1 to Round 3, rising from 16.7 percent to 22.5

Table 15: Livestock ownership, by survey round (%HH

	Round 1	Round 2	Round 3
Oxen-own	1.4	1.3	0.4
Oxen-shared	1.2	0.9	2.5

percent. This indicates more interest among project participants in owning bulls rather than sharing.

Livestock sales is slightly higher among those who are impacted from shocks in the past six months (Figure 1). In round 1, nearly all sales were because of urgent needs. That decreased significantly in Round 2 and Round 3, irrespective of being impacted or not impacted. This might be the case that the program participants are raising livestock and selling to earn income regularly (Table 17).

Table 16 shows asset indices, in nominal Taka and nominal USD. The table shows that asset holdings remained steady over survey rounds. It does not appear that households significantly depleted assets to cope with the flood in Round 2.

Bulls-own	11.6	9.7	11.1
Bulls-shared	6.1 [a]	6.6 [b]	3.1 [ab]
Cows-own	16.7 [a]	19.6	22.5 [a]
Cows-shared	6.5	6.5	7.9
Calves-own	13.7	15.7	18.3
Calves-shared	4.3	4.3	4.6
Sheep-own	2.5	1.7	2.6
Sheep-shared	0.5	1.2	0.4
Goats-own	47.4 [a]	44.5 [b]	36.6 [ab]
Goats-shared	4.7	2.6	4.2
Donkeys-own	0.1	0.0	0.1
Horses-own	0.3	0.4	0.5
Poultry-own	65.1 [a]	64.4 [b]	56.9 [ab]
Quail-own	0.0	0.3	0.1
Pigeon-own	3.5	3.1	3.7
n	*581*	*607*	*622*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Figure 1 Livestock sales and reason for sales by impact of shocks and survey round
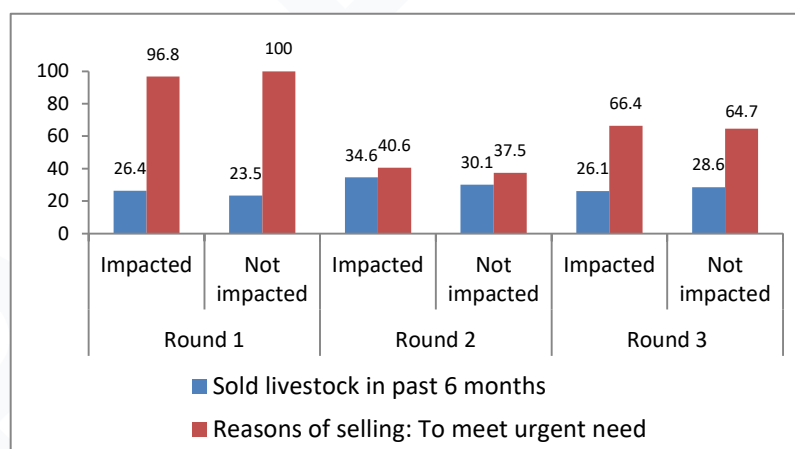
Table 16: Asset values, by survey round

	Round 1	Round 2	Round 3
Taka ('000)			
Consumption assets	17.1	17.4	18.7
Productive assets	4.4	4.2	5.2
Livestock assets	32.2	33.0	33.6
Asset indices value	53.8	54.6	57.5
USD			
Consumption assets	215	214	227
Productive assets	55	52	63
Livestock assets	405	405	407
Asset indices value	675	671	697
n	*581*	*607*	*622*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Livelihoods

Table 17 shows the different livelihood activities that households engaged in. It also shows the mean number, out of 13, of these livelihood activities that the households participated in. There were more households producing and selling livestock in Round 2 compared to Round 1 that remains same in Round 3. Agricultural daily wage labor increased across the survey rounds from 49.9 percent in Round 1 to 58.4 percent in Round 3. Despite the initial decrease in non-agricultural self-employment between rounds 1 and 2, this was followed by an increase of about 6 percent between Rounds 2 and 3. On average, households had about 2 livelihood activities, which only increased slightly from 2.1 in rounds 1 and 2 to 2.3 in Round 3.

Table 17: Livelihoods, by program and survey round

	Round 1	Round 2	Round 3
Livelihood (%HH)			
Ag prod & sales	25.8	22.3	27.8
Livestock prod & sales	28.5 [a]	37.9 [a]	37.5
Wage labor ag	49.9 [a]	52.4	58.4 [a]
Wage labor non-ag	55.4	56.9	55.7
Salary ag	0.3	0.7	0.5
Salary non-ag	7.7	9.0	7.8
Self-employ ag	3.3	3.8	2.2
Self-employ non-ag	29.7	22.4 [a]	30.7 [a]
Wild products	0.0	0.0	0.4
Handicrafts	5.2	3.2	3.7
Domestic (paid)	1.0	0.0	1.0
Fishing	8.0	8.9	11.0
Begging	1.4	1.3	1.5
Livelihood diversification (mean, 0-13)	2.1	2.1 [a]	2.3 [a]
n	581	607	622

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Social capital

Social capital is the bonds between and across community members. It involves principles and norms such as trust, reciprocity, and cooperation, and is often drawn on in the disaster context, when survivors work closely to help each other to cope and recover.[16] Within the resilience framework, household-level social capital has two primary forms: bonding and bridging social capital. Horizontal links between people within more proximate geographies are part of bonding social capital; more-dispersed horizontal links with those in less-proximate geographies are bridging social capital.

The bonding social capital score is based on responses to two questions: one asking whether the household would be able to *receive* help from various categories of people in their

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[16] Frankenberger, T., Mueller, M., Spangler, T., and Alexander S. (2013). Community resilience: Conceptual framework and measurement Feed the Future learning agenda. Rockville, MD: Westat.. (https://www.fsnnetwork.org/community-resilience-conceptual-framework-and-measurement-feed-future-learning-agenda)

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community if they need it, and one asking whether the household would be able to *give* help to people in need in their community. The possible responses are *relatives, non-relatives within my ethnic/caste group, non-relatives of other ethnic/caste groups,* or *no one;* the range is from 0 to 6.

The bridging social capital score is based on responses to two similar questions; however, instead of asking about help that can be received or given among members of the respondent household's community, the questions are asked in reference to members outside the community. The bridging social capital score also ranges from 0 to 6.

Table 18: Social capital, by survey round

	Round 1	Round 2	Round 3
Bonding social capital (% HH)			
Give to relatives	45.9 a	64.1 a	51.8
Give to non-relatives, same ethnicity/caste	29.8 ab	56.4 a	51.1 b
Give to non-relatives, other ethnicity/caste	1.8	0.6 a	6.1 a
Receive from relatives	77.6	81.1	82.4
Receive from non-relatives, same ethnic/caste group	55.3 ab	75.9 a	74.4 b
Receive from non-relatives, other ethnic/caste group	0.9 a	1.6 b	14.2 ab
Bonding social capital indices (mean, 0-6)	**2.1 ab**	**2.8 a**	**2.8 b**
Bridging social capital (% HH)			
Give to relatives	29.6 a	48.6 a	36.3
Give to non-relatives, same ethnic/caste group	9.0 a	24.2 a	16.9
Give to non-relatives, other ethnic/caste group	1.0	0.3	4.3
Receive from relatives	43.4 ab	63.7 a	62.8 b
Receive from non-relatives, same ethnic/caste group	15.6 ab	34.5 a	29.7 b
Receive from non-relatives, other ethnic/caste group	1.8 a	2.1 b	11.7 ab
Bridging social capital indices (mean, 0-6)	**1.0 ab**	**1.7 a**	**1.6 b**
Linking social capital indices (mean, 0-6)	2.7 ab	3.4 a	3.6 b
n	*517*	*607*	*622*

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 18 shows that there was a peak in households giving or receiving help from relatives or non-relatives of the same different caste/ethnic groups in Rounds 2 and 3, compared to Round 1. The mean score of the bonding social capital indices rose from 2.1 in Round 1 to 2.8 in Rounds 2 and 3. The bridging social capital indices mean score peaked in Round 2 to 1.7 from 1.0 in Round 1 and then dropped slightly to 1.6 in Round 3. The mean linking social capital indices increased in Rounds 2 and 3 to 3.4 and 3.6, respectively from 2.7 in Round 1. The rise in bridging,

Table 19: Type of assistance, by survey round (%HH)

	Round 1	Round 2	Round 3
Type of assistance			
Food	11.2 a	41.3 ab	14.0 b
Cash gift	15.8 a	30.9 a	21.8
Cash loan	2.6 a	7.2 a	5.2
Clothing	0.0	3.0	1.0
Shelter	1.2	2.1 a	0.4 a
Transporting HH items to safety	0.1	1.6	0.5
Seed	0.0	1.1	0.1
Household items	0.0	1.0	0.0
Other	0.0	0.5	0.3
Labor to rebuild structures	0.0	0.1	0.4
Agricultural labor	0.0	0.1	0.1
Childcare	0.3	0.0	0.0
Land parcel	0.0	0.0	0.0
n	*581*	*607*	*622*

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

linking and bonding social capital indices in Rounds 2 and 3 may be reflective of households drawing on social capital to recover from shocks that occurred around the same period.

Table 19 shows the types of assistance received by households. The percentage of households receiving food assistance, cash gifts, cash loans, and shelter peaked in Round 2. Food assistance increased from 11.2 percent in Round 1 to 41.3 percent in Round 2, but by Round 3 it dropped to 14 percent. Cash gift assistance doubled between Rounds 1 and 2 from 15.8 percent to 30.9 percent. Cash loan assistance more than doubled between Rounds 1 and 2 from 2.6 percent in Round 1 to 7.2 percent in Round 2.

Table 20: Sources of assistance after flooding, by survey round (% HH)

	Round 1	Round 2	Round 3
Relatives	13.6 [a]	31.8 [ab]	16.9 [b]
Community group	2.0	1.7	1.2
Non-relatives same ethnic/caste group	3.1 [a]	11.3 [a]	11.1
Non-relatives other ethnic/caste groups	0.0 [a]	1.3 [a]	2.4
NGO	3.7	7.2	3.8
Government	7.1 [a]	25.4 [ab]	1.7 [b]
My employer	0.0	0.0	0.0
My wholesaler	0.2	0.0	0.0
Landowner	0.0	0.0	0.0
Other	0.5	0.0	0.0
No assistance	58.7	47.6	50.9
n	*420*	*600*	*485*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 20 shows that assistance from government, relatives, as well as non-relatives within or outside ethnic/caste groups peaked in Round 2. The Round 2 information was collected for the time period of July-December 2017 that includes the time of flood/flash flood. This might be the reason why receiving assistance from relatives and government is higher in Round 2. All but assistance from non-relatives belonging to other ethic/caste groups declined by Round 3.

Exposure to information

Exposure to information, is a count (range: 0-15) of whether a household received information about any of the following topics:

1. Early hazard warning
2. Threats to crop health
3. Threats to animal health
4. Rainfall coming growing season
5. Long-term weather
6. Disease prevention
7. Safe migration opportunities
8. Improved crop production
9. Improved animal health
10. Business opportunities
11. Opportunities to borrow money
12. Nearby government services
13. Natural resource management
14. Equal rights for ethnic groups

15. Gender equality or gender violence

Table 21 shows the percentage of households reporting that they had access to information and the mean of the total over the three survey rounds. For all kinds of information, except early hazard warning, the percentage of households reporting access was highest in Round 3. The total number of sources almost doubled between Round 1 and Round 2, then again between Round 2 and Round 3.

Table 21: Access to information, by survey round

	Round 1	Round 2	Round 3
Information type (%HH)			
Early hazard warning	37.6 [a]	77.2 [a]	65.0 [a]
Threats to crop health	4.1 [a]	5.9 [b]	38.5 [ab]
Threats to animal health	4.0 [a]	7.0 [b]	41.0 [ab]
Rainfall coming growing season	2.7 [a]	5.0 [b]	21.3 [ab]
Long-term weather	5.0 [a]	10.2 [b]	32.7 [ab]
Disease prevention	5.2 [a]	8.8 [b]	43.4 [ab]
Safe migration opportunities	6.2 [a]	24.0 [a]	43.1 [ab]
Improve crop production	5.0 [a]	14.2 [a]	45.7 [a]
Improved animal health	17.0 [a]	29.6 [a]	58.7 [a]
Business opportunities	3.6 [a]	6.3	10.5 [a]
Opportunities to borrow money	37.7 [a]	63.5 [a]	83.7 [a]
Nearby government services	41.7 [a]	73.9 [a]	94.6 [a]
Natural resource management	0.7 [a]	1.5	3.0 [a]
Equal rights for ethnic groups	4.7 [a]	12.1 [a]	64.9 [a]
Gender equality, gender violence	19.1 [a]	29.0 [b]	73.0 [ab]
Total information types	1.9 [a]	3.7 [a]	7.2 [a]
n	*517*	*607*	*622*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 22 shows the percentage of households reporting remittances, savings and borrowing by survey round. Levels of savings, remittances and borrowing were all higher in Round 2 than Round 1. Households receiving remittances increased from 20.2 percent in Round 1 to 29.2 percent in Round 2. Households with savings increased from 72.1 percent in Round 1 to 83.5 percent in Round 2. Households borrowing money increased from 49.7 percent in Round 1 to 57.8 percent in

Table 22: Remittances, savings and borrowing, by survey round

	Round 1		Round 2		Round 3	
	% HH	*n*	% HH	*n*	% HH	*n*
Remittances	20.2 [a]	*517*	29.2 [a]	*607*	24.3	*622*
Savings	72.1 [a]	*581*	83.5 [a]	*607*	77.2	*622*
Borrowing	49.7 [a]	*581*	57.8 [ab]	*607*	52.1 [b]	*622*

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Round 2, dropping to 52.1 percent in Round 3. Savings was the second most coping strategy for the impacts of flood/flash flood (Table 7). Round 2 data captured information during the flood/flash flood in July-December 2017. So households had higher percentages for all of these three indicators that they used for coping strategies during a shock period. This pattern could be more clearly explained after the next two rounds of data collection.

Women's empowerment and decision-making

The survey asked women about their involvement in 12 household decisions. Response codes are ordered by level of empowerment: 1 'Not involved in decision', 2 'Husband makes decision after discussion with wife', 3 'Woman decides with husband or other adult male family member' or 4 'Woman can decide alone.' Table 23 shows mean scores for each of the 12 decisions and the decision-making indices at the bottom of the table, which is the overall mean score. The table shows that in Round 3 women's involvement in decisions and the decision-making indices was highest that increased gradually from Round 1 to Round 2 and Round 3. All of the components of decision making indices increased from Round 1 through Round 3 that may have a link to the increase in women's participation in community groups over the period of time (Table 29).

Table 23: Women's decision-making, by survey round

	Round 1		Round 2		Round 3	
	Mean	n	Mean	n	Mean	n
Types of decisions						
Buy small food items, toiletries	3.0 [a]	458	3.3 [a]	557	3.7 [a]	570
Buy clothing for yourself & children	2.2 [a]	453	2.4 [a]	555	3.1 [a]	569
Spend money you earned	2.2 [a]	240	2.6 [a]	314	3.2 [a]	310
Buy or sell land, livestock, crops	2.0 [ab]	455	2.3 [a]	551	2.4 [b]	564
Buy or sell jewelry	2.1 [a]	448	2.2	512	2.4 [a]	563
Use of loans or savings	2.0 [a]	447	2.3 [a]	548	2.5 [a]	562
Spend on children's education	2.4 [a]	371	2.3 [b]	458	2.8 [ab]	465
Spend on children's marriage	2.3 [a]	250	2.4 [b]	272	2.5 [ab]	226
Medical expenses for you or children	2.4 [a]	455	2.3 [b]	552	2.9 [ab]	564
Expenses for family planning	2.3 [a]	427	2.2 [b]	539	2.5 [ab]	549
Move to shelter during disaster	2.0 [ab]	412	2.3 [a]	522	2.5 [b]	533
Active in arbitration (Salish)	1.2 [a]	221	1.2 [a]	284	1.8 [a]	424
Decision-making indices	2.2 [a]	458	2.4 [a]	556	2.7 [a]	570

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 24 shows increases in the percentage of households with women who have cash income between survey rounds 2 and 3. Among those, the increase in the percentage of women who report that they, alone, make decisions about how to spend the money they earn, rose significantly from 22.9 percent in Round 1 to 76.3 percent in Round 3.

Table 24: Women with cash earnings

	Round 1		Round 2		Round 3	
	% HH	n	% HH	n	% HH	n
Cash earnings	14.9	459	10.7 [a]	557	25.1 [a]	570
Decides alone how to spend earnings	22.9 [ab]	74	57.6 [a]	56	76.3 [b]	125

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 25 measures women's freedom to visit nearby locations, and within that group, whether the woman is allowed to go by herself. Women's freedom of movements to local markets and health centers increased over the survey rounds. Of these, the percentage of women that were free to travel alone significantly increased by the third round of the survey. More women were

free to go by themselves to nearby religious centers by Round 3. Most women, 95.3 percent, had the freedom to visit friends/parents in the neighborhood in Round 1 and this increased to 99.3 percent by Round 3.

Table 25: Women's freedom of movement

	Round 1		Round 2		Round 3	
	% HH	n	% HH	n	% HH	n
Local market to buy things	60.7 [a]	459	81.7 [a]	557	89.0 [a]	570
To visit local market alone	48.1 [ab]	262	77.2 [a]	441	82.3 [b]	504
Local health center or doctor	83.2 [ab]	459	97.0 [a]	557	98.0 [b]	570
To visit health center/doctor alone	52.0 [a]	381	74.4 [a]	536	90.8 [a]	557
Friends/ parent's in neighborhood	95.3 [ab]	459	99.5 [a]	557	99.3 [b]	570
To meet friends/parents alone	86.2	437	87.8	554	91.2	565
Nearby religious institutions	14.9 [a]	459	6.8 [b]	557	55.6 [ab]	570
To visit religious institutions alone	41.7 [a]	77	40.5 [b]	44	85.8 [ab]	320

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

The survey included a series of questions about gender roles in family life. Women were read a series of statements and asked if they agree or disagree. Table 26 shows that the percentage of women agreeing to the statement that "important family decisions should be made only by men of the family" decrease from 53.7 percent in Round 1 to 27.6 percent in Round 3. Similarly, there were fewer women, 3.2 percent, agreeing to the statement that "it is better to send a

Table 26: Women's agreement with statements about gender roles, by survey round

	Round 1		Round 2		Round 3	
More patriarchal statements	% HH	n	% HH	n	% HH	n
a. Important family decisions should be made only by men of the family	53.7 [ab]	452	38.4 [a]	552	27.6 [b]	569
b. A wife should tolerate being beaten by her husband to keep the family together	88.3	451	88.0	555	83.7	570
c. It is better to send a son to school than a daughter	19.3 [ab]	449	7.0 [a]	556	3.2 [b]	570
Less patriarchal statements						
a. If the wife is working outside the home, her husband should help with chores	67.7	436	69.9	549	80.8	569
b. A married woman should be allowed to work outside the home to earn money if she wants to.	46.0	424	66.0	550	77.0	570
c. The wife has a right to express her opinion even when she disagrees with her husband	58.8	439	70.0	551	87.3 [ab]	567

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

son to school than a daughter" in Round 3, compared to 19.3 percent in Round 1.

Table 27 shows beliefs about domestic violence. Although there was an increase in the percentage of households that believed a wife deserved to be hit or physically abused by the husband in situations such as when a wife goes out without telling her husband or refuses to have sex in Round 2, the percentage decreased to levels that were lower than those in Round 1 by Round 3 of the survey. The percentage of households agreeing that a wife deserves to be hit or physically abused by her husband if she burns food rose dramatically from 13.2 to 47, between Rounds 1 and 2, respectively.

Table 27: Beliefs about domestic violence (wife deserves to be hit), by survey round

	Round 1	Round 2	Round 3
Reasons wife deserves to be hit			
Goes out without telling him	66.1 [a]	76.4 [a]	49.1 [a]
Neglects the children	67.1	68.3	52.7
Argues with him	65.0	66.3	54.5
Refuses to have sex	21.0 [a]	23.1	11.6 [a]
Burns the food	13.2 [a]	23.6 [a]	14.1
Protests husband's mistreatment	41.8	47.0	36.2
Does not obey elders	87.5	92.5	79.1
n	457	556	570

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 28 shows types of domestic violence against women and the percentage of women seeking assistance. There was a rise in the percentage of women being yelled at or struck from 5.8 percent in Round 1 to 15 percent in Round 2. By Round 3, however, this number dropped to 2.7 percent.

Table 28: Domestic violence against women, by survey round

	Round 1	Round 2	Round 3
Yelled at or struck (% of HH)	5.8 [a]	15.0 [a]	2.7 [a]
n	433	537	569
Type of abuse (% of HH)			
Physical abuse	7.1	9.3	~
Verbal abuse	53.3	52.9	~
Both abuse	39.5	37.8	~
Frequency of abuse (% of HH)			
Abused once	34.5	24.9	~
Abused several times	58.4	74.1	~
Abused often	7.1	1.0	~
Sought assistance (% of HH)	7.1	7.4	~
n	26	76	17

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 29 shows the percentage of women who were members of groups, attended any of the groups, and the mean number of groups they were members of. It also shows that the women who are participating have positions (president, secretary etc.) in the groups. Increases in Round 3 show that more women were participating in more groups, but very few have a

position in those groups that remains steady from Round 1 through Round 3. Attendance at salish meetings increased in Round 3 from less than 1 percent to almost 6 percent.

This is evident that the women empowerment and women's ability to make household level decisions increased significantly with the increased participation in project promoted community groups and activities. This achievement will be further assessed in next two rounds data collection to validate this assumption.

Table 29; Women's group membership and in a responsible position, by survey round

	Round 1				Round 2			Round 3		
	Participate	Position			Participate	Position		Participate	Position	
Type of group (% HH)	%		%	n		%	n	%		%	n
VSLA	14.6 a		1.5	405	15.8 b	0.7	484	28.3 ab		0.8	411
FFBS	9.9 a		0.0	419	19.9 a	0.0	457	50.5 a		0.1	296
Mothers	41.3 a		0.3	254	41.9	0.0	298	53.1 a		0.1	244
Youth	0.5 a		0.2	456	1.5	0.4	551	2.9 a		0.4	554
Women's	21.3 a		0.8	370	20.6 b	1.8	460	39.5 ab		2.0	345
Special	0.1		0.0	458	0.0	0.0	557	0.1		0.0	569
Standing	0.0		0.0	459	0.0	0.0	557	0.3		0.0	569
Disaster	0.1		0.0	458	0.2	0.1	555	0.1		0.1	570
Other group	1.6		0.0	451	0.3	0.0	553	1.0		0.1	565
Any group (% HH)	64.1 a		2.1	459	68.0 b	2.0	557	88.6 ab		2.2	570
Total groups (mean, 0-9)	0.9 a		0.023	459	1.0 b	0.024	557	1.8 ab		0.024	570
Attended a Salish meeting	0.4 a		-	-	0.9 b	-	-	5.9 ab		-	
n	459		-	-	557	-	-	570		-	

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Community indicators

Table 30 presents mean values of indicators measuring household participation in, and access to community services. Minimum and maximum values for each indicator are given in parentheses; as detailed in the analysis below, higher values are desirable for all indicators presented.

Collective action is a count of household participation in nine activities:

1. Protect crops from floods
2. Protect structures from floods
3. Stop tree-cutting
4. Improve access to drinking water
5. Improve access to electricity
6. Improve access to health services
7. Improve roads
8. Form cooperatives
9. Promote tourism

The informal safety nets (ISN) indicator counts the categories of community organizations/ groups present in a given community. It ranges from 0 to 8 and uses the following group categories:

1. Agriculture, CHD, Fisheries group Farmer Filed Business School (FFBS)
2. Income Generating Activities (IGA) group
3. Village Development Committees (VDC)
4. Village Savings and Loans Management Committee (VSLA)
5. EKATA Group
6. Supplementary Food Distribution Committee (SDFC)
7. Labor Contracting Society (LCS)
8. Mother's Group

The financial services indices indicates whether a community has a savings institution and a lending institution. A 0 value indicates neither service is available; 1 indicates one is available, and 2 indicates that both are available.

The disaster preparedness and mitigation indices (0-1) measures the existence of one or more programs in a community to help households prepare for shocks and mitigate their effects

The **formal safety nets (FSN)** indices is (0-1) whether a community offers food assistance, non-food assistance, or both.

Access to markets reflects the extent of households' accessibility to four types of markets: livestock, agricultural products agricultural inputs and forest products. For each market type, communities receive a score of one point if the market is within 10 km (range 0-4).

The **access to infrastructure** indices is a count (range 0-4) of access to four types of infrastructure: electricity, cell phones, pay phone, and/or paved road access.

The **access to services** indices (range 0-3) measures the access to primary schools, access to and quality of health centers and access to piped water. Communities are scored 1 point for a primary school within 5 km. Health centers are scored 1 if they are within 5 km and do not have problems. Problems are no beds, no staff or the health center was destroyed. They receive 1 point if the household has piped water.

Table 30: Community indicators, by survey round

	Round 1	Round 2	Round 3
Collective action (0-9)	0.1	0.1	0.0
Financial services (0-2)	1.9 ab	2.0 a	2.0 b
ISN (0-8)	5.0 ab	6.6 a	7.0 b
FSN (0-1)	0.4 ab	0.7 a	0.7 b
Access to markets (0-4)	3.8 a	3.9 a	4.0 a
Access to infrastructure (0-4)	1.9	2.0	2.1
Access to services (0-3)	3.0	3.0	3.0
Ag extension services (0-1)	0.93 ab	0.99 a	1.00 b
Veterinary services (0-1)	0.97 a	1.00 a	0.99
Shock prep & mitig (0-1)	0.4 ab	0.7 a	0.7 b
n	517	607	622

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Access to veterinary services is scored 0 or 1, similar to health centers (veterinary center within 5 km, condition is good or very good, and no problems).

Access **to agricultural services** is also scored 0 or 1. One point is for having agricultural extension services with no problems. Problems are closed or destroyed centers or no workers.

Table 30 shows that mean values of access to financial services, markets, and agricultural services increased after the Round 1, reaching the maximum level by the third round of the survey. There

was also a rise in formal and informal safety nets, veterinary services, and shock preparedness & mitigation during this period.

Resilience capacity indices

The three capacity indices and their component indicators are as follows:

Absorptive capacity indices: Absorptive capacity is the ability to minimize exposure to shocks and stresses through preventative measures and appropriate coping strategies to avoid permanent, negative impacts. The absorptive capacity indices (range 1-100) was constructed from eight indicators, shown in Table 31. The SHO column indicates if this indicator is directly affected by SHOHARDO III program interventions.

Adaptive capacity indices: Adaptive capacity is the ability to make proactive and informed choices about alternative livelihood strategies based on an understanding of changing conditions. The indices (range 1-100) is constructed from eight indicators, shown in Table 31.

Transformative capacity indices: Transformative capacity involves services, infrastructure, community networks, and formal and informal social protection mechanisms that constitute the enabling environment for systemic change. This indices (range 1-100) is constructed from six indicators, shown in Table 31.

Table 31: Absorptive, adaptive and transformative capacity indices components

Absorptive		Adaptive		Transformative	
Indicator	**SHO**	**Indicator**	**SHO**	**Indicator**	**SHO**
1. Bonding social capital	Yes	1. Bridging social capital	Yes	1. Bridging social capital	Yes
2. Access to cash savings	Yes	2. Linking social capital	Yes	2. Linking social capital	Yes
3. Household assets	Yes	3. Education/training	Yes	3. Availability of/access to formal safety nets	Yes
4. Productive assets	Yes	4. Livelihood diversification	Yes	4. Availability of markets	Yes
5. Livestock assets	Yes	5. Exposure to information	Yes	5. Availability of/access to services	Yes
6. Informal safety nets (ISN)	Yes	6. Household assets	Yes	6. Access to livestock services	
7. Shock preparedness and mitigation	Yes	7. Productive assets	Yes	7. Access to agriculture extension services	
8. Access to financial institutions	Yes	8. Livestock assets	Yes	8. Availability of/access to infrastructure	
				9. Collective action	Yes
				10. Formal safety nets (FSN)	

Calculations of measures of resilience

Absorptive capacity indices

Absorptive capacity indices was constructed from the following eight indicators: access to informal safety nets, bonding social capital indices, percentage of households with cash savings,

shock preparedness and mitigation, access to financial services, and the value of three types of assets; consumption, productive, and livestock assets.

The first step in the construction of the absorptive indices was making sure that all observations of the indicators were standardized so that values of observations in a particular variable array take a range of values from 0 to 100. This was achieved by using the following transformation:

$$XS_j = (X_j - Min_j)/(Max_j - Min_j) * 100 \qquad (1)$$

Where XS_j is the value of the standardized observation of indicator j, X_j is the actual value of the same observation, and Min_j and Max_j are the minimum and maximum values of indicator j, respectively. Because the survey spans across three rounds, the standardization was done for each round separately. For unbounded components such as the value of productive assets, the Round 1 maximum value was used in order to ensure comparability across the three rounds. In addition, for cases were the sample values differed from the theoretical minimum and maximum values, the theoretical values were used. After standardizing the indicators, the absorptive capacity indices was computed by taking a simple average of the indicators[17]. The resulting indices takes values between 0 and 100, and higher values correspond to higher absorptive capacity. This method of computing the absorptive, adaptive, and transformative indices has been used instead of the factor analysis method described in the Round 1(baseline) report for two reasons. First, there is a clear, easily understandable logic of how the indices is related to the underlying components; it is simply the average of the individual components. Secondly, with this approach the indices values are directly comparable across survey rounds.

Table 32: Absorptive capacity indices and components, by survey round

Indicator	R1		R2		R3	
	Mean Score	Indices	Mean Score	Indices	Mean Score	Indices
Informal safety nets (range: 0-9)	5.0	55.4	6.6	73.6	7.0	77.7
Bonding social capital (range: 0-6)	1.8	30.3	2.8	46.6	2.8	46.7
Access to cash savings (range: 0-1)	0.7	72.1	0.8	83.5	0.8	77.2
Productive asset value (Taka)	4384	4.7	4231	4.5	5181	5.5
Livestock asset value (Taka)	32247	5.2	32976	5.3	33608	5.4
Household asset value (Taka)	17126	6.3	17387	6.4	18731	6.9
Shock preparedness and mitigation (range: 0-1)	0.4	43.3	0.7	65.9	0.7	68.0
Access to financial institutions (range: 0-4)	1.9	94.9	2.0	99.5	2.0	99.3
Absorptive Capacity (range: 0-100)		39.2		48.2		48.3

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[17] This method of measuring resilience capacity indices is adapted from Briguglio, L., Cordina, G., Farrugia, N., & Vella, S. (2009). Economic vulnerability and resilience: concepts and measurements. *Oxford development studies*, *37*(3), 229-247.

Adaptive capacity indices

The adaptive capacity indices was calculated by combining eight indicators. These indicators are hypothesized to contribute to a household's ability to make proactive and informed choices about alternative livelihood strategies based on an understanding of changing conditions. The indicators are: bridging social capital indices, linking social capital indices, number of household members aged 17 to 65 with more than primary education (human capital), livelihood diversification, exposure to information, and ownership of three types of assets, including livestock, consumptive, and productive assets. Like absorptive capacity indices, the adaptive capacity indices was calculated by taking a simple average of standardized indicators. Higher scores of the indices mean that a household has more adaptive capacity.

Indicator	R1		R2		R3	
	Mean Score	Indices	Mean Score	Indices	Mean Score	Indices
Bridging social capital (range: 0-6)	0.9	14.4	1.7	28.9	1.6	26.9
Linking social capital (range: 0-6)	2.7	45.3	3.4	56.9	3.6	59.9
Education/training	0.5	6.8	0.4	6.2	0.4	6.3
Livelihood diversification (range: 0-6)	2.1	35.2	2.1	35.1	2.3	38.1
Exposure to information (range: 0-15)	1.9	13.0	3.7	24.6	7.2	48.0
Livestock asset value (Taka)	32247	5.2	32976	5.3	33608	5.4
Household asset value (Taka)	17126	6.3	17387	6.4	18731	6.9
Productive asset value (Taka)	4384	4.7	4231	4.5	5181	5.5
Adaptive capacity (range: 0-100)		16.8		21.0		24.6

Table 33: Adaptive capacity indices and components, by survey round

Transformative capacity indices

The transformative capacity indices is constructed from the following nine indicators: access to formal safety nets, access to markets, access to basic services, access to infrastructure, access to agricultural services, access to livestock services, bridging social capital indices, linking social capital indices, and collective action. Like the absorptive and adaptive capacity indices, the transformative capacity indices was computed by taking a simple average of the nine standardized indicators used to build this indices.

Table 34: Transformative capacity indices and components, by survey round

Indicator	R1		R2		R3	
	Mean Score	Indices	Mean Score	Indices	Mean Score	Indices
Formal safety nets (range: 0-1)	0.4	43.3	0.7	65.9	0.7	68.0
Availability of markets (range: 0-4)	3.8	94.1	3.9	98.6	4.0	99.7
Access to services (range: 0-3)	3.0	98.9	3.0	99.1	3.0	99.7
Availability/ access to infrastructure (range: 0-4)	1.9	48.7	2.0	49.7	2.1	51.4
Access to agriculture extension services (range: 0-1)	0.9	93.3	1.0	99.4	1.0	99.9
Access to livestock services (range: 0-1)	1.0	97.1	1.0	99.7	1.0	98.9
Bridging social capital (range: 0-6)	0.9	14.4	1.7	28.9	1.6	26.9
Linking social capital (range: 0-6)	2.7	45.3	3.4	56.9	3.6	59.9
Collective action (range: 0-9)	0.1	0.6	0.1	0.8	0.0	0.5
Transformative capacity (range: 0-100)		59.8		66.5		67.2

By construction, changes in the absorptive, adaptive, and transformative capacity indices are driven by changes in the individual component indicators of each indices. Therefore, any significant increase in the individual indicators of each indices leads to a rise in the capacities. The converse is true for decreases in the indicators.

Table 35 shows resilience capacity indices across three survey rounds. There was a general increase in the absorptive, adaptive, and transformative capacities from the first to the third survey rounds. The absorptive capacity indices increased from 39.2 in Round 1 to 48.3 in Round 3. The increase in the indices appears to have been driven by informal safety nets, savings, shock preparedness and mitigation, and bonding social capital indices which increased in a similar pattern as the absorptive capacity indices across the survey rounds.

The adaptive capacity indices increased steadily across the successive survey rounds with 25 and 17 percentage increases occurring between Rounds 1 and 2, and between Rounds 2 and 3, respectively. This was driven by a rise in linking social capital, formal safety nets, livelihood diversification, and exposure to information.

Households have higher transformative capacities compared to absorptive and adaptive capacities. This is partly because of the indicators used to construct this capacity indices are community level services and most of the households have access to these services. The transformative capacity indices increased across the survey rounds from 58.9 in Round 1 to 67.2 in Round 3. This increase was driven by formal safety nets, bridging and linking social capital, access to markets, agricultural, and livestock services which rose during this period.

Table 35: Resilience capacities, by survey round

	Round 1	Round 2	Round 3
Absorptive capacity indices	39.2 ab	48.2 a	48.3 b
Adaptive capacity indices	16.8 a	21.0 a	24.6 a
Transformative capacity indices	59.8 ab	66.5 a	67.2 b
n	*517*	*607*	*622*

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Household participation in community groups

Figure 2: Absorptive capacity, by group participation and survey round that households that participation in more project groups shows greater relative increases in absorptive capacities over the three rounds. The second panel shows higher mean levels of absorptive capacity for households participating in all but LCS group in Round 2 compared to first round of the survey. By Round 3, the mean absorptive capacity was generally stabilizes in comparison with Round 2. The mean absorptive capacity for households in the LCS group initially decreased between Rounds 1 and 2, but later rose after Round 2 surpassing Round 1 levels by the third round of the survey. Note that the LCS groups do not receive any particular kind of systematic resilience programming support, so can be considered as a 'non-resilience program' control group. The changes in this group over the three rounds exhibit expected seasonal patterns. Figure 2 also shows that households participating in more groups have higher absorptive capacities across the survey rounds compared to those participating in fewer groups. Households with the highest absorptive capacities across the survey rounds are those that participate in two or more groups, while those with no participation in any group have the least absorptive capacity and declined from Round 1 to Round 3.

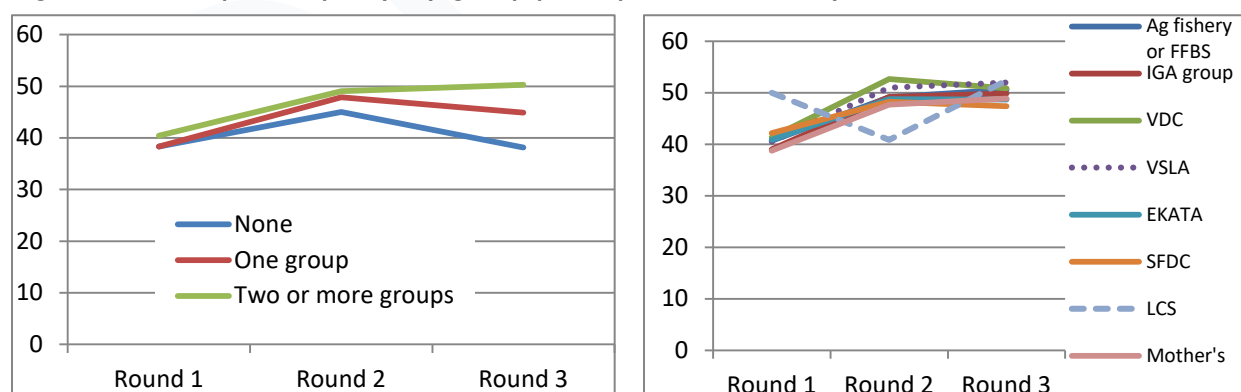Figure 2: Absorptive capacity, by group participation and survey round

Figure 3 shows an increase in adaptive capacities for households that participated in EKATA, SFDC, VSLA, VDC, IGA, mother's groups, and agricultural, fishery or FFBS groups across the survey rounds. However, there was a decrease in the mean adaptive capacity for households that

participated in LCS groups between Rounds 1 and 2 which was followed by an increase between Rounds 2 and 3 to higher absorptive capacity in Round 3 for households participating in this group. Figure 3 shows adaptive capacities of households by the number of groups they participate in. Although the absorptive capacities increased for all households regardless of the number of groups they were participating in between Rounds 1 and 2, after Round 2 the adaptive capacities of households not participating in any group declined. The absorptive capacities of households participating in two or more groups continued to increase even after Round 2, but it remained almost same after Round 2 for those who are participating in only one group.

Figure 3: Adaptive capacity, by group participation and survey round
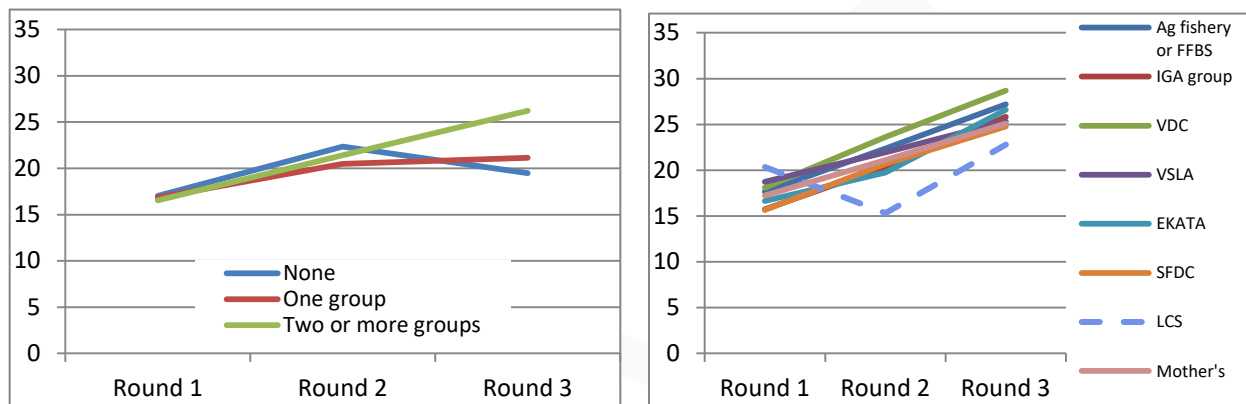
Figure 4 shows trends in household transformative capacity by group participation. There was an increase in transformative capacities of households that participated in all but LCS groups across the survey rounds. The increase between Rounds 1 and 2 was greater than the increase between Rounds 2 and 3. For households participating in LCS groups, their transformative capacity declined between Rounds 1 and 2 and then started to rise again after Round 2.

Figure 4: Transformative capacity, by group participation and survey round
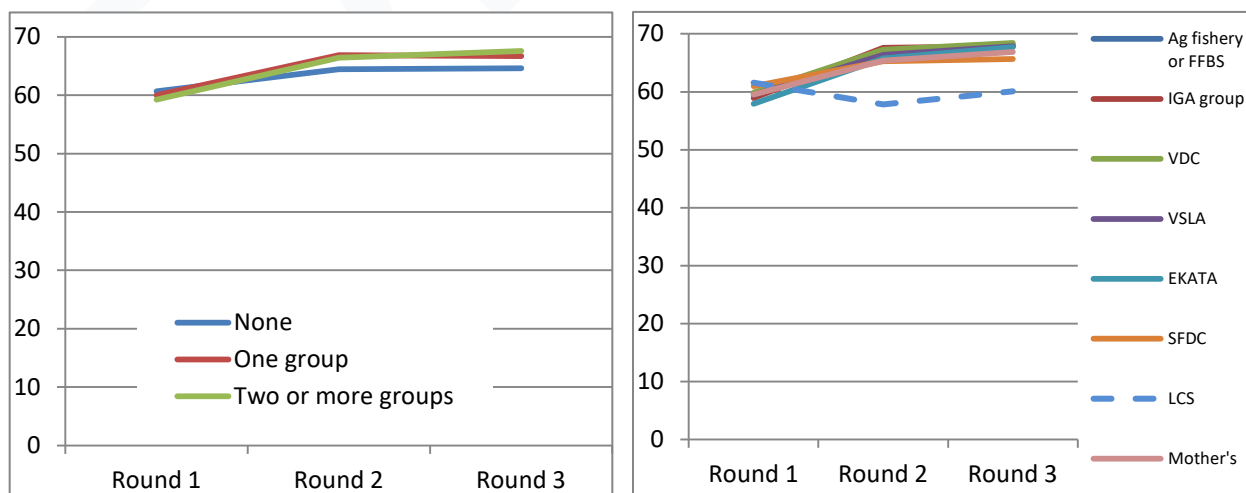
Households that did not participate in any groups had lower transformative capacities compared to those that participated in at least one group. The increase in transformative capacities was higher between Rounds 1 and 2 compared to Rounds 2 and 3 for all households regardless of the number of groups that they participated in.

Resilience outcomes

I. Household Monthly Income

Table 36 shows three resilience outcome measures across the three survey rounds. There was a significant increase in the average household monthly income across the three survey rounds. The highest increase in income occurred between Rounds 1 and 2, representing an increase of about 19 percent, compared to a 7 percent increase between Rounds 2 and 3.

II. Household Hunger Scale (HHS)

The HHS is a perception-based food deprivation scale. The percentage of households experiencing moderate to severe hunger significantly declined from the period when the first survey was conducted to the third round of the survey. This reduction was mainly driven by the reduction that occurred between survey Rounds 2 and 3.

III. Household Food Insecurity Access Scale (HFIAS)

The HFIAS, developed by Food and Nutrition Technical Assistance project (FANTA)[18], is an experiential indicator of food insecurity that is constructed from responses to nine questions ranging from worries about not having enough food to actual experiences of food deprivation associated with hunger 30 days prior to the survey. Because the HFIAS is a measure of food insecurity, a higher value means that households are more food insecure. Although there was a significant increase in the mean HFIAS score between survey Rounds 1 and 2, this was immediately followed by a reduction in the mean HFIAS score between survey Rounds 2 and 3. This reduction outweighed the initial increase, hence contributing to the overall decline in the mean HFIAS score across the three survey rounds. This trend is similar to the pattern shown by the HHS.

Table 36: Resilience outcomes, by survey round

	Round 1	Round 2	Round 3
Household monthly income Taka (mean)	9,984.4 [a]	11,894.6 [a]	12,757.8 [a]
HFIAS (0-27, mean)	3.8 [a]	5.2 [ab]	3.3 [b]
Moderate or severe hunger (%)	4.0 [a]	4.6 [b]	1.9 [ab]
n	581	607	622

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

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[18] Coates, Jennifer, Anne Swindale and Paula Bilinsky. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.: FHI 360/FANTA.

Table 37 shows that the percentage of households producing crops increased from 35.5 percent in Round 1 to 42.6 percent in Round 3. Households selling project promoted crops dropped from 28.1 percent in Round 1 to 19 percent in Round 3. The quantity as well as the value of maize sold dropped between Rounds 1 and 3.

Table 37: Crop production, by survey round

	Round 1		Round 2		Round 3	
		n		n		n
Any crop (% HH)	35.5 [a]	581	36.2	607	42.6 [a]	622
Project promoted crop (%HH)	36.1	198	24.6	206	27.2	252
Sold project promoted crop (%HH)	28.1 [a]	198	2.4 [ab]	206	19.0 [b]	252
Maize sold (kg)	1215.9 [a]	32	~	2	1010.3 [a]	29
Chili sold (kg)	303.9	57	320.9	29	504.0	69
Sweet gourd sold (kg)	~	17	~	2	~	10
Taka/kg maize	14.9 [a]	32	~	1	13.1 [a]	29
Taka/kg chili	~	13	~	1	~	14
Taka/kg gourd	~	17	~	2	~	10

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 38 shows the percentage of households adopting improved agricultural practices. More households were adopting different improved agricultural practices across the survey rounds. However, adoption of improved record keeping dropped from 8.2 percent in Round 1 to 3.2 in Round 3.

Table 38: Improved agricultural practices, by program and survey round (% HH)

Practice	Round 1		Round 2		Round 3	
Improved/certified seed	65.3	a	76.8		84.2	a
Improved seedling production and transplantation	8.6	a	29.6	a	53.6	a
Planting density and moulding	25.0	a	28.9	b	63.1	ab
Micro-dosing	1.6	a	0.9	b	10.5	ab
Planting basins (bed system)	10.6		18.9		16.5	
Mulching	8.3		1.2		4.2	
Integrated pest management	0.7	a	8.0	a	24.4	a
Improved insecticides and pesticides	41.5	a	64.6	a	80.4	a
Integrated bio pesticides management	1.6	ab	7.5	a	13.3	b
Improved fungicides and appropriate application	17.7	ab	44.0	a	50.3	b
Integrated soil fertility management	13.2		6.6		6.5	
Soil amendments to increase fertilizer-use efficiency	3.7		6.4		5.8	
Improved fertilizer use practices	23.9	ab	85.6	a	92.3	b
Compost use	5.2		4.6	a	10.9	a
Land levelling	91.0		90.8		92.7	
Minimum tillage practice	18.9	a	21.3		34.0	a
Crop rotation	7.1	a	7.8	b	17.5	ab
Drought and flood resistant varieties	8.2		17.3		8.9	
Sustainable water use practices	16.8	a	47.3	a	74.4	a
Improved input purchase technologies and practices	14.5	a	42.2	a	78.9	a
Improved commodity sale technologies and practices	15.7		11.5		17.6	
Improved market info system technologies and practices	8.5		9.0		15.8	
Improved packing house technologies and practices	5.5		6.8		4.9	
Temperature and humidity control	19.7	a	33.7		50.7	a
Improved quality control technologies and practices	7.6	a	16.1	b	34.5	ab
Improved packaging practices	5.5		5.9		3.8	
Improved record keeping	8.2	a	4.5		3.2	a
n	169		206		252	

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Table 39 shows an increase in livestock programming participation over the survey period. There were more households taking part in routine vaccination of animals, making livestock feed using local products, using artificial insemination, and using services from animal health workers or para-vets. However, households using livestock feed supplied by stock-fed manufacturers dropped from 13.9 percent in Round 1 to 5.5 percent in Round 2 but by Round 3 it went up to 10.9 percent.

Table 39: Livestock program participation, by program and survey round (% HH)

	Round 1		Round 2		Round 3	
Program promoted livestock	100.0		99.1		99.5	
Programing						
Improved livestock varieties	16.7		27.4		29.2	
Improved goat shelter	16.2		22.5		18.3	
Routine vaccinations	35.7	ab	48.4	a	57.1	b
Castration	7.6		9.1		12.6	
Deworming	53.8		60.8		59.5	
Dehorning	0.4		0.2		0.7	
Make livestock feeds -local products	64.3	a	69.3	b	81.7	ab
Livestock feed – manufacturer	13.9	a	5.5	ab	10.9	b
Artificial insemination	6.9	a	11.8		14.5	a
Pen feeding	7.7		8.0		3.7	
Legumes for fodder or veld reinforcement	14.5		22.5		20.9	
Animal health workers or para-vets	63.5	a	64.2	b	76.9	ab
n	*425*		*513*		*497*	

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Maternal and children's nutrition, health and hygiene indicators

This section presents descriptive statistics for maternal and children's health, nutrition and hygiene. The analysis dataset includes pregnant and lactating women and their children under age five. Statistical comparisons are across survey rounds.

Table 40 shows an increase in the percentage of mothers receiving antenatal care over the survey period from 68.3 percent in Round 1 to 95.6 percent in Round 3. Mothers receiving antenatal services from satellite/EPI outreach centers increased from 2.9 percent in Round 1 to 15.9 percent in Round 3. There was also a rise in women receiving antenatal services from FWA to 8.8 percent in Round 3 from 0 percent in Round 1.

Table 40: Antenatal care, by survey round

	Round 1	Round 2	Round 3
	% mothers	% mothers	% mothers
Any antenatal care	68.3 a	77.2 b	95.6 ab
n	205	246	250
More than 4 antenatal visits	18.6	21.6	23.0
Accompanied by husband	98.6	96.8	97.5
Place ANC was received			
Hospital/medical college	5.7	4.2	2.1
Upazila health complex	15.0	16.8	24.3
Satellite/EPI outreach	2.9 a	2.1 b	15.9 ab
MCWC	0.7	0.0	2.1
FWC	9.3	5.8	14.2
FWV	10.0	5.8	7.5
FWA	0.0 a	3.2	8.8 a
Community Clinic (CC)	20.0	33.7	34.7
NGO static clinic	2.1	2.1	1.7
NGO satellite clinic	1.4	1.1	0.4
NGO field worker	29.3	31.1	33.1
NGO hospital	1.4	2.6	2.5
CHV	0.0	0.0	2.5
Clinic/hospital	13.6	8.9	10.5
MBBS doctor	5.7	11.1	2.5
Village doctor	0.7	10.5	3.3
Homeopathic doctor	0.0	0.5	0.4
Pharmacy	0.7	0.0	0.4
Friend/relative	1.4	0.0	0.8
Neighbor	0.0	0.0	0.4
Other	0.0	0.0	0.4
n	140	190	239

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Table 41 shows that there was an increase in the percentage of women eating food more often during pregnancy across the survey period, while the percentage of women that ate less or the same amount of food decreased. Similarly, the percentage of women taking more rest during pregnancy increased, while those that took less rest or the same amount of rest decreased during the survey period. More pregnant women were taking iron and folic acid during the survey period. There was also an increase in the percentage of women taking Vitamin A after child birth from 15.2 percent in Round 1 to 46.8 percent in Round 3. The percentage of women taking vitamin A within 45 days of giving birth rose from 14.7 percent to 35.9 percent between Round 1 and Round 2, respectively then it dropped to 0 percent in Round 3.

Table 41: Antenatal care and nutrition, by survey round

	Round 1		Round 2		Round 3	
	% mothers		% mothers		% mothers	
Food eaten during pregnancy						
More food	30.7	a	45.1		65.6	a
Less food	42.9	a	38.2		28.4	a
Same as usual	26.3	a	16.7		6.0	a
Daytime rest during pregnancy						
More rest	59.0	a	66.7		78.8	a
Less rest	32.2	a	31.3		20.8	a
Same as usual	8.8	a	2.0		0.4	a
N	205		246		250	
Iron and folic acid during pregnancy	59.9	ab	75.2	a	80.0	b
1-2 months	33.9		38.9		31.0	
3-4 months	43.8		37.8	a	53.0	a
5-6 months	20.7		22.2		12.0	
More than 6 months	1.7		1.1		4.0	
N	202		246		250	
Vitamin A after child's birth	15.2	ab	36.2	a	46.8	b
Vitamin A within 45 days of birth	14.7	ab	35.9	a	0.0	b
N	198		246		250	

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Table 42 shows that there was a decrease in percentage of households disposing children's waste in latrines and throwing outside between Rounds 1 and 3 while burying children's waste and burning and covering with ash increased over the same period.

Table 42: Hygiene, by survey round (% HH)

	Round 1		Round 2		Round 3	
Proper disposal of children's waste						
Latrine	21.5	ab	1.2	a	1.2	b
Throw outside	73.2	ab	25.5	a	14.4	b
Bury in dirt	0.5	ab	28.4	a	28.0	b
Burn & cover with ash	0.0	ab	42.8	a	55.6	b
Proper disposal of animal waste						
Separate pit cover	8.8		3.7		4.4	
Separate pit no cover	32.2		42.0		32.8	
Throw outside	41.5		39.1		42.4	
Keep in compost pit	1.0		0.0		0.4	
N	205		243		250	

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Table 43 shows household handwashing practices. Handwashing before food preparation rose from 33.7 percent in Round 1 to 58.8 percent in Round 3. The percentage of households washing hands before feeding children or breastfeeding increased from 22 percent in Round 1 to 40.3 percent in Round 2 and then finally to 66.4 percent in Round 3. There was an increase in handwashing practices after cleaning baby's defecation from 35.6 percent in Round 1 to 89.2 percent in Round 3. Handwashing after cleaning animal and bird feces also increased from 32.7 percent in Round 1 to 65.6 percent in Round 3. Furthermore, there was an increase in the percentage of households washing hands with soap, ash or sand before eating from 24.6 percent to 37.1 percent between Round 1 and Round 2, respectively. More than 90 percent of the households practiced handwashing with soap, ash, or sand after defecation and after cleaning baby's defecation, and this further increased across the survey rounds.

Table 43: Handwashing, by survey round (% HH)

	Round 1		Round 2		Round 3	
Handwashing						
Before food preparation	33.7 [ab]		53.5 [a]		58.8 [b]	
Before eating	91.2		92.2		96.8	
Before feeding children or breastfeeding	22.0 [a]		40.3 [a]		66.4 [a]	
After defecation/using latrine	95.1		98.8		100.0	
After cleaning baby's defecation	35.6 [ab]		77.0 [a]		89.2 [b]	
After cleaning animal and bird feces	32.7 [ab]		60.1 [a]		65.6 [b]	
N	*205*		*243*		*250*	
		n			N	
Handwashing with soap, ash or sand						
Before food prep	39.1	69	39.2	130	29.3	147
Before eating	24.6 [a]	187	37.1 [a]	224	31.4	242
Before feeding children	35.6	45	51.0	98	47.6	166
After defecation	95.9 [ab]	195	99.6 [a]	240	99.2 [b]	250
After cleaning baby's defecation	91.8 [a]	73	98.4 [a]	187	96.9	223

a,b Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns

Infants' and children's nutrition and health.

Early initiation of breastfeeding measures the proportion of children born in the last 24 months who were put to the breast within one hour of birth[19].Table 44 shows that there was an increase in early breastfeeding practices over the survey period. Early breastfeeding increased from 83 percent in Round 1 to 93.4 percent in Round 3. The minimum dietary diversity measures the proportion of children 6 to 23 months of age who receive foods from four or more food groups. The percentage of children meeting the minimum dietary diversity doubled between Round 1 and Round 3 from 14.8 to 31.6, respectively. Although the percentage of children 6 to 23 months of age who receive a minimum acceptable diet more than doubled between Rounds 1 and 3, about 80 percent of the children still do not meet the minimum adequate diet requirement.

Table 44: Infants and young children feeding practices, by survey round (% children)

	Round 1	Round 2	Round 3
Exclusive breast feeding, 0-6 months	62.5	72.7	76.0
N	48	55	25
Early breast feeding, 0 to 23 months	83.0 [ab]	90.7 [a]	93.4 [b]
N	229	247	196
Children ages 6 to 23 months			
Minimum dietary diversity (MDD)	14.8 [ab]	24.5 [a]	31.6 [b]
Minimum meal frequency (MMF)	42.0	42.2	47.4
Minimum adequate diet (MAD)	8.7 [ab]	16.7 [a]	19.3 [b]
N	183	192	171

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level.
Comparisons are across columns.

Table 45 shows a decrease between Rounds 1 and 2, followed by an increase between Round 2 and 3 in the percentage of children that had diarrhea 15 days prior to each survey. This is true for children less than two years old and those below the age of five. Children below the age of two that had diarrhea reduced from 10.6 percent in Round 1 to 4.1 percent in Round 2. However, this was followed by an increase to 8.7 percent in Round 3. Similarly, the percentage of children below the age of five that had diarrhea decreased from 10.2 in Round 1 to 4.5 in Round 2 and then increased to 7.5 in Round 3.

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[19] World Health Organization. (2008). Indicators for assessing infant and young child feeding practices: part 1: definitions: conclusions of a consensus meeting held 6-8 November 2007 in Washington DC, USA.

Table 45: Children with diarrhea in the past 15 days (% children), by survey round

	Round 1	Round 2	Round 3
Age less than two years	10.6 [a]	4.1 [ab]	8.7 [b]
N	208	197	161
Age less than five years	10.2 [a]	4.5 [ab]	7.5 [b]
N	255	313	308

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Table 46 shows the prevalence of undernutrition among children. There was an increase in underweight boys from 14.5 percent to 29 percent from Round 1 to Round 2, respectively among children aged between 0 to 23 months. However, among children between 0 to 59 months there was an increase in the percentage of girls who are underweight from 26.7 in Round 2 to 34.1 in Round 3. Consequently, underweight children (both boys and girls) increased from 23.6 percent in Round 1 to 32.3 in Round 3.

Kurigram district in Rangpur division is one of the most food insecure and disaster (flood/flash flood) prone district in Bangladesh with comparatively poor nutritional status[20]. Kurigram district was entirely excluded in Round 1 due to extreme flood. Nutritional data for this district is available from Round 2. Also childhood diseases are more prevalent and limited access to food is more common during April-Oct in Bangladesh. These might be the reasons of significant increase in percentage of children U5 with underweight from Round 1 to Round 2 that continued till Round 3. This assumption will be validated in next two rounds of data collection.

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[20] Underweight among children U5 30.8%, Maternal and Child Health & Nutrition Survey in Kurigram District, Bangladesh, *Terre des homes*, December 2014; 36.8% in Rangpur District, Bangladesh Demographic Health Survey 2014.

Table 46: Underweight and severely underweight (% children), by survey round

	Round 1		Round 2		Round 3	
Children 0 to 23 months						
Boys						
Underweight	14.5	[a]	29.0	[a]	18.2	
Severely underweight	1.3		6.5		2.6	
n	*76*		*93*		*77*	
Girls						
Underweight	18.3		17.3		26.0	
Severely underweight	6.1		5.1		8.2	
n	*82*		*98*		*73*	
All						
Underweight	16.5		23.0		22.0	
Severely underweight	3.8		5.8		5.3	
n	*158*		*191*		*150*	
Children 0 to 59 months						
Boys						
Underweight	24.3		31.8		30.6	
Severely underweight	5.8		6.6		5.4	
n	*103*		*151*		*147*	
Girls						
Underweight	23.0		26.7	[a]	34.1	[a]
Severely underweight	9.0		6.2		9.8	
n	*100*		*146*		*132*	
All						
Underweight	23.6	[a]	29.3		32.3	[a]
Severely underweight	7.4		6.4		7.5	
n	*203*		*297*		*279*	

[a,b] Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

5. Multivariate analyses

Table 47 shows regression results linking participation in various community groups to absorptive, adaptive, and transformative resilience capacities.

Model 1 shows that the higher the capacities in Round 1, the higher it is going to be in Round 3. Participation in the Income Generating Activities (IGA) group is positively associated with absorptive, adaptive, and transformative capacities. Compared to households that do not participate in the IGA group, those that participate in the group increases absorptive, adaptive, and transformative capacities by 3.48, 2.65, and 2.74 respectively. Furthermore, participation in the Agriculture, CHD, Fisheries and Farmer Field Business School (FFBS) group is positively associated with absorptive and adaptive capacities. Households that participate in the Village

Savings and Loans Management Committee (VSLA) have higher absorptive capacities compared to households that do not participate in this group. Participation in Village Development Committees (VDC) increases adaptive capacity. Female headed households have lower absorptive capacities compared to male headed households. Households participating in the Supplementary Food Distribution Committee (SDFC) have lower transformative capacities compared to those that do not participate in this group.

Table 47: Predicting resilience capacities in round 3

Dependent variables resilience capacities OLS estimator	Model		
	(Absorptive)	(Adaptive)	(Transformative)
Absorptive capacity in round 1	0.10*		
Adaptive capacity in round 1		0.25***	
Transformative capacity in round 1			0.07*
Group participation			
Ag fishery or FFBS dummy	3.79***	4.45***	1.29
IGA group dummy	3.48***	2.65***	2.74***
VDC dummy	1.35	2.56*	1.27
VSLA dummy	3.78***	0.14	-0.01
EKATA dummy	-0.21	0.50	0.21
SFDC dummy	-1.82	-0.11	-2.10**
Mother's dummy	1.07	0.64	-0.02
Women decision making indices	1.30	-0.04	-0.85
Region dummy (base=Char)			
Haor	0.58	-1.53	2.49*
Age HoH	0.00	0.01	0.00
HH size	0.18	0.28	-0.22
Female household dummy	-7.40***	-1.73	-3.11
Education level of HoH	0.23		0.18
Constant	35.43***	14.46***	64.07***
Observations	442	442	442
R-squared	0.17	0.28	0.10

* p<0.05 ** p<0.01 *** p<0.001

The remainder of this section presents results of multivariate analyses examining the relationships between adoption of improved agricultural and livestock practices and earnings from agriculture and livestock over the past 12 months[21], HFIAS and recovery from floods.

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[21] These analyses use earnings from agricultural production or earnings from livestock production as outcome instead of monthly household income because they are more directly related to agriculture and livestock production.

Equations estimating the effects of adoption of agricultural practices include all households involved in crop production. Similarly, equations estimating the effects of adoption of improved livestock practices include livestock owning households. Dummy variables for Char and Haor provide geographic control variables in all equations. Other control variables are shock exposure and household characteristics: household size, female headed households, education of household head, household assets and livelihood risk category. Graphs in this section use results from estimation equations presented in Appendix E and compare results across survey rounds.

The first set of graphs describes the relationships between adoption of improved agricultural practices and earnings from agricultural production and HFIAS. Data did not indicate a statistically significant relationship between adoption of improved agricultural practices and recovery from floods. The horizontal axis in Figure 5 is a count of improved agricultural practices adopted by households. The figure shows that adoption of more agricultural practices increases earnings from agriculture.

Figure 5: Effects of adoption of improved agricultural practices on earnings from crop production
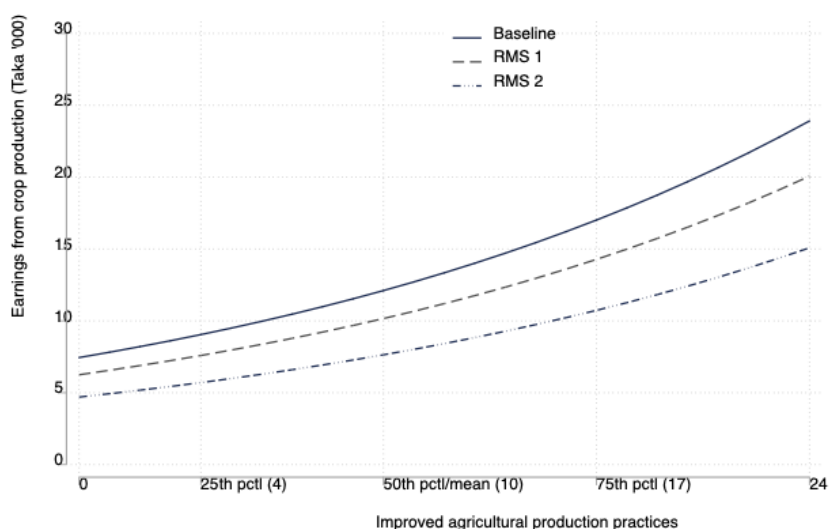

Figure 6 shows the effect of each of the ten improved agricultural practices on household earnings from agriculture. These were statistically significant in the estimation equations. Comparisons are between crop producing households adopting each practice and crop producing households that did not adopt the practice. Colors denote statistical significance. Gray bars are significant at >0.01 and <0.05. Navy blue bars are significant at <0.01. The figure does not allow for comparison among practices.

Figure 6: Effects of adoption of improved agricultural practices on earnings from agriculture, program detail

Increase in annual earnings from agricultural sales (Taka '000)
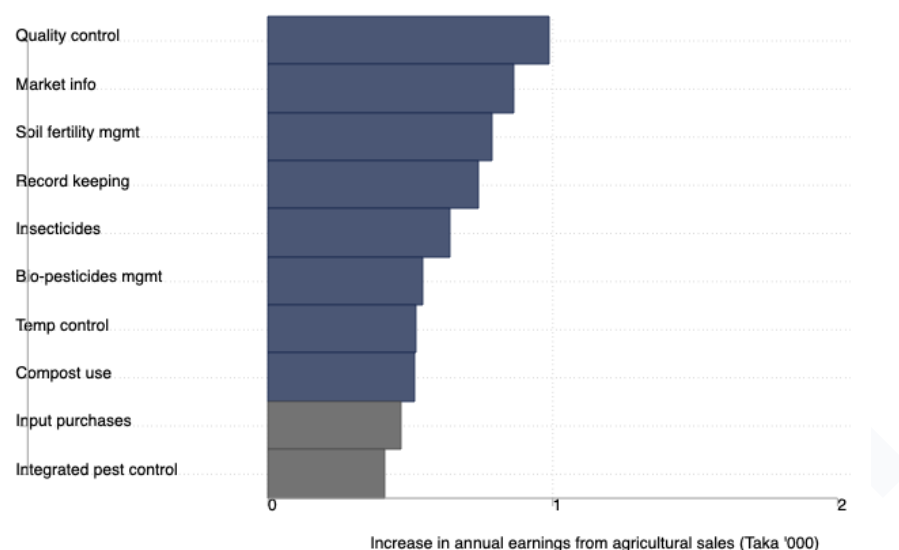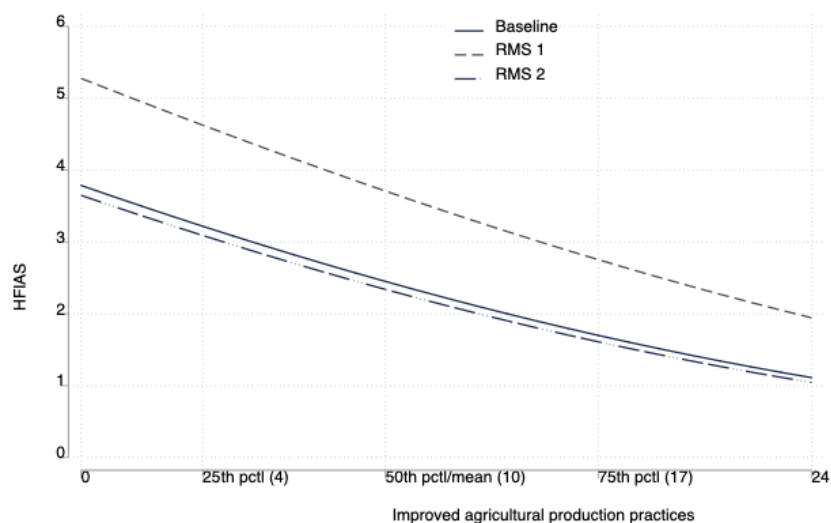
Figure 7 shows the effects of adoption of improved agricultural practices on HFIAS. The trend was the same in all survey rounds and shows that, for households producing crops, food security improves as the household adopts more practices.

Figure 7: Effect of adoption of improved agricultural practices on HFIAS

The next two graphs present results from equations estimating the effects of adoption of improved livestock practices on earnings from livestock, and detailed information about each the effect of each livestock practice on earnings. The effect of adoption of improved livestock practices on HFIAS was not statistically significant.

Figure 8 shows that adoption of at least four improved livestock practices increases household earnings from livestock. Moving from the 25th percentile (adopting two improved practices to the 75th percentile (adopting 5 practices) increased annual income in round 2 by about 5000 Taka.

Figure 8: Effects of adopting improved livestock practices on earnings from livestock production
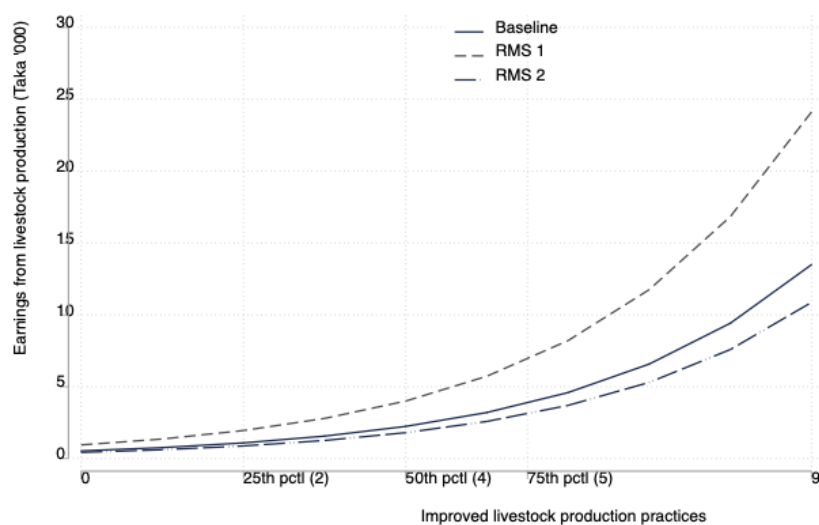

Figure 9 shows effects of eight of the improved livestock practices on earnings from livestock. All eight were statistically significant at <0.01.

Figure 9: Effects of adoption of improved livestock practices[22] on annual earnings from livestock, program detail
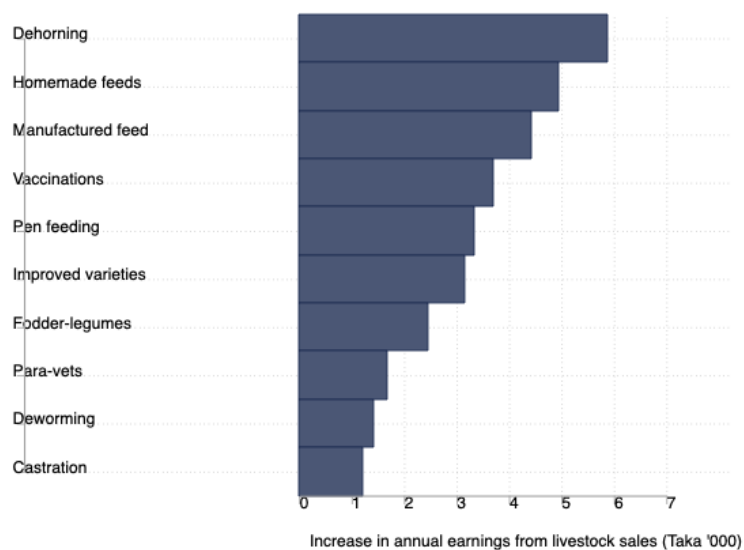
Figure 10 shows the effects of adoption of improved livestock practices on recovery from floods. Moving from the 25 percentile to the 75th increases the probability of recovery by about 0.08.

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[22] Goat shelters and artificial insemination are omitted. There was no statistically significant relationship in equations estimating earnings from livestock.

Figure 10: Effects of adoption of improved livestock practices on
recovery from floods
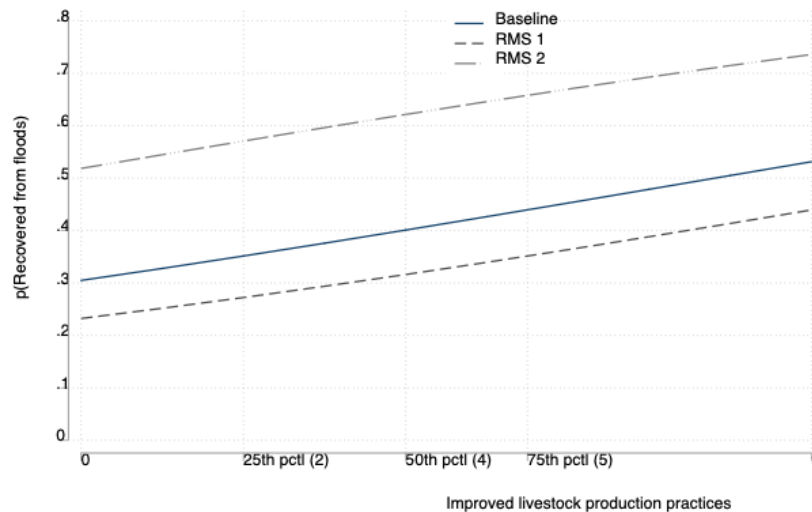
6. Conclusion

The research questions of the FLAIRb longitudinal study were developed to test the hypothesis by collecting panel data sets in six-month intervals, in five survey rounds for three years. This report covers the first three rounds (Round 1, Round 2, and Round 3) of panel data, where new respondents who were missed in Round 1 from the Kurigram district were added to Round 2 and onwards. Therefore, some of the information from Round 2 is not consistent with earlier rounds. Also, Round 1 and Round 3 data were collected for the same time period during similar seasons. However, Round 2 data was collected during a different time period and season. Thus, it is observed that some of the results from these three rounds have seasonal effects and are time bound. The FLAIRb study team realizes that data from Round 4 and Round 5 are essential in order to make valid conclusions on the research questions.

The results for the three rounds show significant changes in resilience capacities, women's participations in program groups, women's decision-making power and control over cash income, project promoted improved production technologies and management practices, recovery from shocks, and access to health and nutrition services at the community level. The study also found that there is a positive correlation with resilience capacities and program participation in more than one group with duration of program participation. While the positive effectiveness that the program interventions have on resilience capacities is visible, it will need to be validated in the next two rounds of data collection.