**Pastoralist Areas Resilience Improvement and Market Expansion (PRIME)
Recurrent Monitoring Survey 2014-15 Deep Dive:
Uncovering the pathways to resilience**

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1. Background and objective

Over the one-year period between March 2014 and March 2015, households in the two areas in Ethiopia chosen as sites of the PRIME project's impact evaluation, Borena and Jijiga, experienced unusually severe drought conditions. The drought unfolded in two waves. In wave 1, the first rains (*Ganna* or *Diraa*) failed in both areas, leading to abnormal precipitous drops in soil moisture and vegetation coverage. In wave 2, the second rains (*Hagaya*) failed in Borena, which thus experienced successive below-average rainy seasons.

TANGO employed data collected before the drought occurred (with a baseline survey in December 2013) and after, the latter from a panel of 414 households included in the 2014-2015 Recurrent Monitoring Survey (RMS).[1] The RMS was administered in six monthly rounds between October 2014 and March 2015, the period of the second drought wave.

Following on initial analysis of the RMS data,[2] this analysis seeks to undertake a deeper investigation to understand which resilience capacities enabled households to recover from the drought in order to provide future programming recommendations for the PRIME project. The research questions are:

(1) Which resilience capacities enabled households to recover from the drought?;

(2) What were the coping strategies that the capacities enabled (or helped prevent?);

(3) Which resilience capacities should be bolstered to increase households' resilience to drought in the PRIME project's operational area?

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[1] This survey was previously referred to as the 2014-2015 Interim Monitoring Survey (IMS).
[2] Frankenberger, Timothy and Lisa C. Smith. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation Report of the Interim Monitoring Survey 2014-2015. November 2015. Prepared for the Feed the Future FEEDBACK project of the United States Agency for International Development.

2. Methods

To answer these questions, four sets of methods were employed:

1. *Growth regressions*.   The change in food security over each drought wave, a direct measure of households' resilience, was regressed on a variety of indicators of household and community resilience capacity while also controlling for the degree of shock exposure, initial food security, and household characteristics. The measure of food security used throughout the analysis is an index calculated as the inverse of the Household Food Insecurity Access Scale (HFIAS). Three measures of shock exposure are employed, all from African Flood and Drought Monitor satellite remote sensing data: cumulative rainfall deficit, cumulative soil moisture deficit, and cumulative vegetation deficit. Note that the data for measuring the resilience capacities were collected during the PRIME baseline survey, which was administered 10 months before the first round of the RMS data collection.[3]

2. *Positive-deviant (PD) analysis*. A group of households that fared far better than average over the course of the drought waves was first identified using the change in food security as the marker of how households fared. Next, a descriptive analysis of the differences in resilience capacities and coping strategies of the PDs from the non-PDs was undertaken. Both "unadjusted" differences were calculated as well as adjusted differences, the latter which account for factors that households and project managers have no control over (at least in the short run), including the degree of drought exposure, pre-drought food security, and household characteristics. Finally, probit regressions were run to give further insight into which resilience capacities distinguish the PDs from the non-PDs.

3. *Descriptive and regression analyses of households' coping strategies*. To analyze which resilience capacities enabled or prevented the use of various coping strategies, simple graphs of the trajectories of coping strategies used by the positive-deviants and non-positive deviants were first examined. Following, a regression analysis examining the association of 12 coping strategies with 22 indicators of household and community resilience capacity was undertaken.

4. *Cluster analysis.*   A hierarchical agglomerative cluster analysis was undertaken to identify groups of households with specific combinations of resilience capacities in order to determine which groups of capacities worked together best to support households' resilience.   Since the technique does not allow the control of shock exposure and baseline food security, it produced groups that gave no insight into the research question of interest (#1 above).[4] Thus the cluster analysis results are not reported here.

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[3] Thus the growth regressions examine the association between households' baseline resilience capacities and their eventual resilience to the drought waves. Given that data were not collected on resilience capacities in the RMS, it is not possible to determine whether they changed over the course of this 10-month period and how any such changes may have affected their food security.

[4] For example, for the first drought wave, four groups were identified. The group with the greatest increase in food security over the wave had the *least* resilience capacity as measured using almost all of the resilience capacity indicators. This unintuitive result occurred because of the inability to control for the fact that the initial food

All descriptive statistics, including test statistics, are calculated using sampling weights and taking into account other features of the sampling design—stratification and primary sampling units. For the analyses involving regressions, the regressions are run both with and without taking into account the sampling design. In most cases the regression coefficients and significance statistics are similar across the approaches, however in the context of a small sample size (which we have here), employing sampling weights does often reduce statistical significance because of the mechanics of the calculation.[5]

Analysis for drought wave 1:
Since both project areas were hit by this drought wave, both are included in the analysis (N=414). Growth regressions and positive-deviant analysis are employed. The PDs are defined as those households whose food security index increased by 3 or more points over the course of the drought wave, 98 (24%) of the panel households. Since data were not collected on coping strategies until after the drought wave was over, coping strategies analysis is not undertaken for this wave.

Analysis for drought wave 2:
Only Borena was hit by this drought wave, and thus only Borena households are included in the drought wave 2 analysis (N=212). Given such a small sample size, the growth regressions are undertaken using a stacked data set of changes in food security between RMS rounds as the dependent variable, yielding 1,060 observations. For the positive-deviant analysis, two sets of PDs are identified. The first is households who were able to maintain a reasonable steadiness in their food security throughout the 6-month period and end up having near the same or better food security at the end than the beginning. Specifically, the PDs are identified as the households whose food security index did not drop more than 2 points over the course of the six months, and for whom any drop in the index between consecutive rounds was no more than 5 points. The number of positive deviants is 58 out of 212 (27%). The second set of PDs is identified using the larger, stacked data set for between-round analysis. Here they are defined as those household-round observations for which the food security index increased by at least 4 points between rounds, 213 out of 1,060 observations (21%).

Coping strategies data referring to the previous month were collected in every round of RMS 2014-15. For the coping strategies analysis, comparison of differences across the first set of wave 2 PDs in the use of 13 coping strategies was undertaken, again adjusting for any differences in initial (round 1) food security, shock exposure, etc. Following, the trajectories over time in the use of the strategies for the PDs versus the non-PDs are examined graphically.

security of this group was lowest of all (the group with the lowest food security to start with will have members with the greatest ability to increase their food security over time simply because "up" is the only way to go; Further, the group with the highest food security to start with–near the maximum of the index—cannot increase their food security by very much).

[5] The following two articles discuss the advantages, disadvantages and circumstances under which it is appropriate to use sampling weights in regression analysis: Friedman, Jed. Tools of the trade: when to use those sample weights. 2013. Development Impact: News, views, methods, and insights from the world of impact evaluation. The World Bank, Washington, D.C. and Winship, Christopher and Larry Radbill. 1994. Sampling weights and regression analysis. *Sociological Methods & Research* 23: 230-257.

Lastly, in order to address Research Question #2 above, the stacked data set is used to run 264 (12*22) regressions looking at the associations between each resilience capacity and each coping strategy.

3. Results: Which resilience capacities enabled households to recover from the drought?

Growth regressions

Table 1 summarizes the results of the analyses examining this question, that is, growth regressions and positive-deviant analysis, using the data from both drought waves. For the growth regressions (columns A and D), it indicates which resilience capacities were found to have positive and statistically significant (at least at the 5% level) associations with the change in households' food security over the time period in question. The red-highlighted boxes indicate the strongest evidence of a positive association, with criteria based on statistical significance, consistency regardless of whether sampling weights are applied and, for drought wave 1, consistency across the three measures of shock exposure.[6]

Drought Wave 1:
For drought wave 1, it was necessary to single out the results by region (using an interaction term), because no resilience capacities were found to have statistically significant coefficients for the sample as a whole and for Jijiga. This result is most likely due to the fact that Jijiga households' capacities were so low to start with. For Borena, the following six capacities were found to have enabled households to recover from the drought: Bonding social capital, access to informal safety nets, asset ownership, human capital, access to markets, and access to communal natural resources (grazing areas, water, and woodlands) (see Appendix Table A1 for details of the results).

Drought Wave 2:
Four of these capacities—bonding social capital, access to informal safety nets, asset ownership, and access to communal natural resources—were found to have continued to enable Borena households to recover when they were hit by the second drought wave (see Table A5). Availability of hazard insurance, bridging social capital, access to financial resources (credit and savings services), and the availability of formal safety nets also played a role. Note that aspirations/confidence to adapt, a psycho-social capability, was found to have a marginally significant coefficient (at the 10% level) in the wave 2 growth regressions and thus may have also supported households' resilience to this shock.

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[6] For drought wave 1, two criteria are used for identifying "strong evidence": the coefficient on the resilience capacity is statistically significant at the 5% level for at least two of the shock exposure measures (rainfall, soil moisture, or vegetation coverage), and significance is verified both when sampling weights are employed and when not. For drought wave 2, only one measure of drought exposure is employed, month-by-month rainfall compared to the norm (the Standard Precipitation Index) because only this measure of shock exposure had a statistically significant association with the dependent variable. The criteria identified for strong evidence is statistical significance at the 5% level both when sampling weights are applied and when not.

Table 1. Summary: Which resilience capacities enabled households to recover from the drought?

Resilence capacity indicator	Wave 1			Wave2		
	Growth regressions (N=414)	PD: Descriptive (N=414)	PD: Probit (N=414)	Growth regressions (N=1,050)	PD: Descriptive (N=212)	PD: Probit (N=1,050)
	(A)	(B)	('C)	(D)	('E)	(F)
Absorptive capacity						
Bonding social capital	green			red		red
Holdings of savings						
Access to informal safety nets	green		green	green		
Availability of hazard insurance mitigation		green	green	green		
Asset index	red		green	red		
Adaptive capacity						
Bridging social capital		green		green		
Linking social capital						
Aspirations/confidence to adapt						
Livelihood diversity						
Access to financial resources		green	red	red		red
Human capital	red					
Exposure to information						
Asset index	gray	gray	gray	gray	gray	gray
Transformative capacity						
Bridging social capital	gray	gray	gray	gray	gray	gray
Linking social capital	gray	gray	gray	gray	gray	gray
Access to markets	green					
Access to infrastructure						
Access to services						
Access to communal natural resources	green			red		red
Availability of formal safety nets				red		red
Community resilience capacity						
Natural resource management group			green			
Disaster risk reduction						
Social protection			red			
Civic group		green	red			
Access to communal natural resources	gray	gray	gray	gray	gray	gray

Notes: Shaded boxes indicate that the resilience capacity has a statistically significant, positive association with households' ability to recover from the drought. Red-highlighted boxes indicate strong evidence of a positive association, as explained in the text.

Positive-deviant analysis

The goal of positive-deviant analysis is to determine what led the deviating households to do so much better than their peers and thus learn from their innovative behavior.

Drought wave 1:
The baseline food security, shock exposure and demographic characteristics of the 98 drought wave 1 positive deviants compared to their counterparts were first examined (Table A2). The PDs differed in that they had lower baseline food security,[7] somewhat lower shock exposure, and a lower percent of female-adult-only households. Notably, the PDs were not better off economically: their wealth (asset ownership), per-capita expenditures, poverty, and depth of poverty did not differ from that of the non-PDs. It is important to take into account the factors that do differ in order to single out any differences associated with initial (baseline) resilience capacities. To do so, "adjusted" means of the capacities that assume the factors are equal across the two groups are compared across them. The resilience capacities that are higher for the positive deviants are: Availability of hazard insurance, bridging social capital, access to financial resources, and the presence of a civic ("improving community") group in PD households' villages (see Table A3).

When probit regression analysis is used to single out what led the positive deviants to differ from their peers, three of these capacities are confirmed to have made the PDs stand out: Availability of hazard insurance, access to financial resources, and the presence of a civic group (Table A4). Four additional capacities were identified to "predict" which households will be PDs: Asset ownership, access to informal safety nets, the degree of social protection in households' communities, and the number of natural resource management groups in communities.

Drought wave 2:
The 58 drought wave 2 PDs also differed from their peers in that they had lower food security to begin with (but shock exposure did not differ). Additionally, they had lower education levels and were more likely to be non-pastoralists (Tables A6 and A7). Adjusting for these factors, no resilience capacities were found to have been greater for the PDs than their peers (Table A8). We were thus not able to learn anything from the descriptive PD analysis, most likely because of the small sample size.

The probit regression analysis using the stacked data set revealed the following capacities as predicting whether or not a household will be a positive deviant (Table A9): Bonding social capital, access to financial resources, access to communal natural resources, and the availability of formal safety nets.

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[7] Having lower initial food security is inevitable when PDs are defined as those households who have increased their food security the most since households at the highest end of the food security scale are not able to increase their food security.

Triangulation of the results

Across all analyses, the capacity that is most consistently associated with households' ability to recover from the drought--and for which the strongest evidence exists from this analysis—is:
Access to financial resources.
This capacity is measured using the availability in communities of institutions providing credit and savings support.

Five other capacities also show up as having supported households' ability to recover across the shock waves and methods of analysis:
- **Bonding social capital** (bonds between community members);
- **Access to informal safety nets;**
- **Availability of hazard insurance;**
- **Asset ownership; and**
- **Access to communal natural resources.**

Bridging social capital (bonds between members of different communities), the **availability of formal safety nets**, such as food aid, food/cash-for-work, and provision of hazard insurance, and the **presence of a civic group** in households' communities may have also played a role in assisting households in their recovery.

Human capital and **social protection in households' communities** were not identified as enablers of households' resilience to the drought across the multiple analyses, but strong evidence exists that they may have assisted in households' recovery from drought wave 1.

4. Results: What are the coping strategies that the capacities enabled (or helped prevent)?

As background to answering this question, we first take a look at which coping strategies enabled the first set of drought wave 2 PD households (those who were able to keep their food security stable and mostly increasing across drought wave 2) to manage the drought so much better than the other households. The 13 coping strategies examined fall into five categories: Reduce food consumption, sell or consume productive assets, change labor patterns, financial strategies, and receive food or financial assistance. They are:[8]

Reduce food consumption
Sell or consume productive assets
    Sell or slaughter livestock
    Sell agricultural productive assets (e.g., plough)
    Consume seed stock held for the next season
Change labor patterns
    Take up new wage labor
    Take children out of school/send to work
    Participate in food-for-work or cash-for-work
Financial strategies
    Borrow money from friends or relatives
    Borrow money from a money lender
    Buy food on credit
    Draw down on savings
Receive food or financial assistance
    Receive food aid
    Receive money (incl. remittances) or food from family.

Adjusted-mean differences in the use of these coping strategies in any month over the six-month RMS period showed the following to be used with substantially greater frequency by PD households (Table A10):

- Participate in food-for-work or cash-for-work
- Receive food aid.

The PDs used the following strategies with lower frequency:

- Take children out of school/send them to work for money
- Borrow money from a money lender
- Draw down on savings.

Apparently the PD households were better able to maintain stability in their food security in the face of the drought by relying on formal sources of assistance: food aid and employment through food- and cash-for-work programs.   They also were more likely to avoid drawing down

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[8] Data were included for migration as a coping strategy, but it was not included in this analysis because of the lack of specificity as to permanency (short or long term?), destination (to take cattle to better pasture lands or to an urban location), and purpose (tend to cattle, engage in wage labor?), all of which are needed for understanding how the strategy ties into households' resilience capacities.   One other coping strategy was excluded because of uncertainty as to the quality of the data. This was borrowing money from a savings/credit association or Micro-finance Institution, which was a new question added to the RMS that differed from the baseline.

on their savings and engaging in two negative coping strategies that undermine their future resilience to shocks: diverting children from schooling into productive activities (that is, increasing the use of child labor) and borrowing money from money lenders, who often use exploitative practices.

Appendix Figure A1 shows how the percentage of households employing each of the 13 coping strategies evolved over the RMS period. The use of food-for-work/cash-for-work increased substantially over the rounds for the PDs, perhaps as these programs became more widely available in response to increasing dire drought conditions. Notably, the reliance on family for food and cash declined over the period, suggesting the formal assistance displaced more informal sources of assistance.

Turning to the main question at hand: Which resilience capacities enabled which coping strategies or prevented their use? Answering this question helps us understand *why* the capacities identified to have helped households recover from the second wave of the drought did so.

The results of the regression analysis examining the associations between the coping strategies and the resilience capacities are summarized in Table 2 (see Appendix Table A11 for details). Blue-highlighted boxes indicate a statistically significant (at least at the 5% level), positive association between a resilience capacity and coping strategy; Orange-highlighted boxes indicate a negative association. Starred boxes signal stronger evidence of an association (see Section 3).

A. Capacities that were shown to bolster household's resilience to the drought

In the last section, the following 11 resilience capacities were identified to have likely helped households recover from the drought:

- Bonding social capital (bonds between community members)
- Access to informal safety nets
- Availability of hazard insurance
- Asset ownership
- Bridging social capital
- Access to financial resources
- Human capital
- Access to communal natural resources
- Availability of formal safety nets
- Presence of a civic group
- Social protection.

Table 2. Summary: Which resilience capacities are associated with the coping strategies households used in response to the drought?

Legend: B = blue-highlighted (positive association); O = orange-highlighted (negative association); * = stronger evidence of an association.

Resilience capacity	Reduce food consump-tion	Sell/slaughter livestock	Consume seed stock	New wage labor	Increase child labor	Food/cash for work	Borrow: friends/relatives	Borrow: money lender	Buy food on credit	Draw down on savings	Food aid	Money/food from family
Absorptive capacity												
Bonding social capital					B					B	O*	B
Holdings of savings										B*		
Access to informal safety nets	O		O	O								
Availability of hazard insurance			O	O							B	
Disaster preparedness and mitigation								B			O*	
Asset index		B*		B*		O*			O	B	O	
Adaptive capacity												
Bridging social capital								O				B
Linking social capital	B*											B
Aspirations/confidence to adapt		O*				B*					B*	
Livelihood diversity				B*			B			B		
Access to financial resources	O			O								
Human capital		O*		B*			B				B*	
Exposure to information			O									
Asset index												
Transformative capacity												
Bridging social capital												
Linking social capital												
Access to markets		O	B			O*					O*	
Access to infrastructure			O	B*	B*	B*						O*
Access to services		B	O*								B*	
Access to communal natural resources	B*	B*		O*			B*					B
Availability of formal safety nets	O		O	O*							B	
Community resilience capacity												
Number natural resource managmt groups			O								B*	B
Disaster risk reduction index	B*	B*		O*			B**		O		O**	B*
Social protection index							B**				B	
Presence of a civic group												
Access to communal natural resources												

Notes: Shaded boxes indicate that the resilience capacity has a statistically significant association with the coping strategy. Blue-highlighted boxes indicate a positive association; Orange-highlighted boxes indicate a negative association. Stared boxes indicate stronger evidence of an association, as explained in the text.

We start here by looking at which coping strategies each of these capacities is associated with.

Bonding social capital
According to the coping strategies regression analysis, bonding social capital helped households recover by enabling them to receive money and/or food from family members while reducing their reliance on food aid. It also enabled them to draw down on their savings (presumably through allowing them to build up savings in the first place) and to engage their children in productive activities. While the latter leads to increased child labor, a negative coping strategy in the long run, it may have been a key means of protecting households' food security.

Access to informal safety nets
Access to informal safety nets served to increase households' resilience to the drought by reducing their need to consume seed stock and to engage in new wage labor. It appears to have lessened the likelihood that they reduced their food consumption to cope with the drought.

Availability of hazard insurance
Hazard insurance is measured as the availability in communities of institutions where people can receive assistance due to losses of livestock.   Like informal safety nets, it is associated with reducing households' need to consume seed stock and to engage in new wage labor. It is also associated with an increase in receipts of food aid, perhaps because the hazard assistance comes from formal sources of support such as NGOs or the government.

Asset ownership
Greater ownership of assets, an indicator of households' wealth, is associated with:
- Destocking of livestock (to be expected since livestock are a main form of wealth among Borena households);
- Drawing down on savings, again perhaps because assets allow more savings;
- Lowered engagement in new wage labor;
- Lowered purchasing of food on credit; and
- Less dependence on formal sources of assistance: food aid and food/cash-for-work.

Presumably households' assets made it possible for them to maintain their food security through selling off or slaughtering their livestock and drawing down on their savings while preventing them from relying on formal assistance, engaging in alternative sources of income generation, and putting their financial future into jeopardy by buying food on credit.

Bridging social capital
Having bonds with members of other communities increased households' resilience by enabling them to receive money or food from family members (who perhaps live in other communities), and by preventing them from borrowing money from money lenders.

Access to financial resources
Access to financial resources apparently helped to directly prevent households from reducing their food consumption, a particularly negative coping strategy and that most directly related to

their ability to recover as measured using food security as an indicator here. The analysis gives little clue as to how this capacity helped households to recover, only indicating that it may have decreased households' engagement in new wage labor.

Human capital
Household's human capital helped them in their recovery from the drought in multiple ways: allowing them to engage in new wage labor and food- or cash-for-work, preventing them from downsizing their livestock herds, increasing their ability to borrow money from friends and relatives, and increasing their receipts of food assistance.

Access to communal natural resources
Even though access to community-managed, shared natural resources was shown above to have led to increases in households' ability to recover (as measured using changes in food security over the drought period), the coping strategies analysis suggests that it increased their likelihood of reducing their food consumption in order to cope with the drought. Perhaps this strategy was employed temporarily to weather particularly difficult periods. Access to communal natural resources is associated with
- Increased selling/slaughtering of livestock;
- Increased borrowing of money from friends or relatives;
- Increased receiving money or food from family; and
- Reduced engagement in new wage labor.

Availability of formal safety nets
This capacity likely directly helped prevent households from reducing their food consumption as a coping strategy in response to the drought. As expected, it increased their reliance on food aid, but it also prevented them from consuming their seed stock and engaging in new wage labor.   It is associated with an increase in sells/slaughter of livestock, whether due to linked de-stocking programs or targeting of food aid towards geographical areas or households exhibiting distress destocking behaviors.

Presence of a civic group
This capacity was found to bolster households' resilience but it is not associated with any of the coping strategies examined here.

Social protection in communities
The social protection index is constructed using the availability of a variety of institutions in communities that may provide social protection (e.g. , women's groups, mutual help groups) in addition to aggregate, community-level measures of inter-household assistance in times of need.   According to the regression analysis, the capacity bolstered households' resilience to the drought by increasing their sales/slaughter of livestock, reducing their engagement in new wage labor, increasing their borrowing of money from friends and relatives, and increasing their use of food aid to meet their food needs.

B. Other capacities that influenced households' coping strategies

Beyond the capacities that were shown in the last section to have bolstered households' recovery from the drought, others appear to have played a role in influencing the strategies they employed to deal with the drought.

Holdings of savings
Households' holdings of savings at the time of the baseline survey (December 2013, 10 months prior to the drought) gave them the ability to draw down on their savings as a coping strategy.

Disaster preparedness and mitigation/disaster risk reduction
Besides helping to prevent reductions in food consumption, these capacities enabled households to engage in de-stocking of their livestock (perhaps in a planned manner) and reduce the need to engage in new wage labor. There is evidence that it reduced reliance on food aid and on buying food on credit, and that it increased reliance on friends and relatives for assistance. There is also evidence that it increased borrowing money from money lenders, however.

Aspirations and confidence to adapt
Households' psycho-social capabilities helped to prevent them from selling or consuming their productive assets (both livestock and seed stock) and helped them to seek out assistance in the form of food aid and food/cash-for-work. Note again that the aspirations index was found to be marginally significant in the drought wave 2 growth regressions (which indicate which capacities helped households recover from the drought) (see Table A5).

Livelihood diversity
The more diverse households' livelihoods were before the onset of the drought, the more likely they were to take advantage of new wage labor, to borrow money from friends and relatives, and to draw down on savings to cope with the drought.

Exposure to information
The analysis provides some evidence that households' exposure to information (measured using exposure to information on weather patterns, market prices, grazing conditions, conflict, and opportunities for borrowing money) helped to prevent them from consuming their seed stock.

Access to markets
Households with greater participation in markets may be able to buy and sell products more easily but are more vulnerable to market price fluctuations, the latter which were quite strong during the drought period. Access to markets is associated with reductions in the selling/slaughtering of livestock (perhaps because of sharp reductions in livestock prices), increased consumption of seed stock (perhaps due to sharp increases in staple food prices), and with increases in the reliance on food aid and food/cash-for-work as coping strategies.

<u>Access to infrastructure</u>
Access to infrastructure (piped water, electricity, paved roads and phone services) is associated with reduced selling/slaughtering of livestock, increased reliance on food aid, and associated decreased reliance on assistance from family. The availability of existing infrastructure may have also induced these changes in the use of household labor to cope with the drought: increased engagement in new wage labor and food/cash-for-work, and increased use of child labor.

<u>Access to basic services</u>
The more basic services a household's community had access to (including schools, health centers, veterinary facilities, extension services, institutions where people can borrow money, and security services), the more it appears to have used the following coping strategies: sell/slaughter livestock, engage in food/cash-for-work, and receive food aid; the less it appears to have consumed seed stock saved for the next season.

<u>Number of natural resource management groups</u>
The natural resource management groups included are: communal grazing land management groups, communal water management groups, and communal groups deciding who can gather wood and how much from communal land. The more of these groups that exist in a household's community, the less likely it was to consume seed stock, engage in new wage labor, and receive food aid.

5. Which resilience capacities should be bolstered to increase households' resilience to drought in the PRIME project's operational area?

Based on the empirical analysis presented above, in this section we identify which resilience capacities should be the focus of future efforts to build households' resilience to drought in the project area.   Three criteria are brought to bear in identifying these capacities: (1) those that reduce reliance on food aid; (2) those that are associated with positive coping strategies for which households rely on their own means (rather than external assistance); and (3) those that prevent the use of negative coping strategies that undermine long-term resilience.

With regard to the first criteria, one behavior that made the drought wave 2 PDs stand out from their counterparts was their reliance on formal sources of assistance—food aid and food/cash-for-work—for coping with the drought.   Further, the growth regressions identified the availability of formal safety nets as one of the capacities that helped households recover from drought wave 2. It is encouraging that these emergency safety nets came into play at a critical time—when Borena households had experienced severe conditions of back-to-back droughts—and successfully assisted households in their recovery as intended. Such life-saving assistance will likely continue to be needed in the future. However, if the PRIME project's long-term goal is to enable households to become more resilient to future droughts in a self-reliant manner, then it would aim to build up the resilience capacities that enabled households to recover from the drought through their own means and that of the communities they live in.   The six

resilience capacities that are associated with less reliance on food aid and/or food/cash-for-work during the drought are (from Table 2):

- Bonding social capital;
- Disaster preparedness and mitigation;
- Asset ownership;
- Access to markets;
- Natural resource management groups; and
- Disaster risk reduction in communities.

Keeping in mind that we were not able to include "borrowing from a savings and credit association" in the analysis, capacities that are associated with positive coping strategies for which households rely on their own means rather than external assistance (criterion #2 above)—that is, borrowing money from friends and relatives, drawing down on savings, receiving money or food from family, and engaging in new wage labor—are:

- Bonding social capital;
- Bridging social capital;
- Linking social capital;
- Human capital;
- Asset ownership;
- Holdings of savings;
- Livelihood diversity;
- Access to communal natural resources;
- Access to infrastructure;
- Disaster risk reduction;
- Social protection in communities; and
- Natural resource management groups.

The PRIME project would also aim to discourage the use of negative coping strategies that undermine households' long-term resilience (criterion #3).   In addition to reducing food consumption, these are: selling or slaughtering livestock, consuming seed stock, employing the labor of children, borrowing from money lenders, and buying food on credit. The resilience capacities that are associated with reductions in these behaviors are:

- Access to informal safety nets;
- Access to financial resources;
- Aspirations and confidence to adapt;
- Human capital;
- Exposure to information;
- Access to services;
- Natural resource management groups;
- Bridging social capital;
- Asset ownership;
- Disaster risk reduction;
- Access to infrastructure; and
- Access to markets.

Summary of priority resilience capacities for building households' resilience to drought:

Eight of the capacities listed above were shown in Section 3 to have enabled households to recover from either drought wave 1 or drought wave 2, that is, to have increased their resilience to drought. They were also shown here to have likely reduced households' reliance on humanitarian assistance, encouraged the use of positive, self-reliant coping strategies, and/or reduced the use of negative coping strategies. We thus recommend that they be priority areas for building households' resilience to future droughts in the PRIME project's operational area.

They are:
1. Bonding social capital
2. Access to informal safety nets
3. Asset ownership
4. Bridging social capital
5. Access to financial resources
6. Human capital
7. Access to communal natural resources, and
8. Social protection in communities.

Building up the other capacities listed above also will likely help to bolster households' resilience to future droughts:
- Holdings of savings
- Disaster preparedness and mitigation;
- Linking social capital
- Aspirations and confidence to adapt
- Livelihood diversity
- Exposure to information
- Access to markets
- Access to infrastructure
- Access to services
- Natural resource management groups
- Disaster risk reduction.

The following caveats should be noted:
1. Bonding social capital may be associated with increased use of children's labor.
2. Access to markets is likely associated with increased reliance on markets for food and thus exposure to price shocks. A case in point: This analysis found it to be associated with increased consumption of seed stock as a coping strategy, possibly due to drought-induced food prices increases.

3. Access to infrastructure is associated with increased use of children's labor, most likely simply because it affords labor opportunities in general (e.g., through paved roads and telecommunications infrastructure).

4. Disaster preparedness and mitigation is associated with increased borrowing from money lenders (for unknown reasons).

Two final points should be kept in mind. First, most of the results presented here apply to Borena households. Future analysis of data collected in the PRIME project's operational area will hopefully determine whether the recommendations apply more broadly. Second, in the empirical analyses many of the capacities examined did not have statistically significant associations with households' ability to recover from drought despite solid theory in support of their role. In future analyses we will continue to explore possible measurement and data collection issues. Meanwhile, we note that the ability to detect results with sufficient statistical significance was compromised by the small sample size of the RMS data set. Future data collection efforts should prioritize a larger sample size (at least 1,000 households) while maintaining the panel nature of the data

Appendix: Tables and figures with detailed results of the analyses

Table A1. Drought wave 1 growth regressions: Which resilience capacities helped households recover from the drought?   (Results from Borena interaction effects only, N=414)

Resilence capacity indicator	Cumulative rainfall deficit			Cumulative soil moisture deficit			Cumulative vegetation deficit		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
Absorptive capacity									
Bonding social capital	0.0340	2.13	**	0.033	2.05	**	0.035	2.18	**
Holdings of savings	-1.770	-0.85		-1.74	-0.84		-1.86	-0.91	
Access to informal safety nets	1.520	2.15	**	1.57	2.22	**	1.65	2.35	**
Availability of hazard insurance a/	0.004	0.01		0.546	0.65		0.471	0.54	
Availability of disaster preparedness and	1.740	1.36		1.97	1.59		1.99	1.62	
Asset index	0.156	2.22	**	0.157	2.22	**	0.158	2.25	**
Adaptive capacity									
Bridging social capital	0.017	1.00		0.016	0.95		0.015	0.89	
Linking social capital	0.002	0.05		0.002	0.06		0.019	0.51	
Aspirations/confidence to adapt	0.011	0.28		0.012	0.31		0.006	0.15	
Livelihood diversity	0.958	1.05		0.913	1.01		0.948	1.05	
Access to financial resources /a	0.519	1.09		0.713	1.47		0.754	1.50	
Human capital	3.950	2.36	**	3.9	2.29	**	3.950	2.36	**
Exposure to information	-0.05	-0.3		-0.054	-0.37		-0.020	-0.14	
Asset index	0.156	2.22	**	0.157	2.22	**	0.158	2.25	**
Transformative capacity									
Bridging social capital	0.017	1.00		0.016	0.95		0.015	0.89	
Linking social capital	0.002	0.05		0.002	0.06		0.019	0.51	
Access to markets	1.060	2.28	**	1.120	2.44	**	1.060	2.21	**
Access to infrastructure	0.160	0.13		0.509	0.40		-0.018	-0.01	
Access to services	-1.150	-1.46		-1.18	-1.49		-1.06	-1.27	
Access to communal natural resources	1.640	2.03	**	1.17	1.46		1.96	2.37	**
Availability of formal safety nets	0.931	1.03		1.080	1.20		0.972	1.04	
Community resilience capacity									
Number natural resource managmt groups	0.341	0.44		0.343	0.44		1.19	1.38	
Disaster risk reduction index	-12.800	-1.61		-14.9	-1.93	*	-9.6	-1.10	
Social protection index	10.500	1.37		14.1	1.82	*	13.2	1.57	
Presence of a civic group	-0.170	-0.22		0.132	0.17		0.227	0.28	
Access to communal natural resources	1.640	2.03	**	1.17	1.46		1.96	2.37	**

Note: Reported coefficients are calculated from a full regression using the data for both Borena and Jijiga, with an interaction term for project area included. Shaded coefficients are significant at least at the 5% level when sampling weights are applied.

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

a/ These variables have zero values for Jijiga and are the result of a regression only including Borena households (N=212).

Table A2. Drought wave 1 positive deviant analysis: Comparison of food security, household characteristics, and shock exposure of positive deviants and non-PDs (N=414)

Measure	Positive deviants	Non-deviants	Difference	
Food security				
At baseline	12.3	22.7	-10.4	***
At the time of IMS Round 1 (R1)	21.2	16.1	5.1	***
Change from baseline to Round 1	9.0	-6.6	15.6	***
Demographic characteristics				
Household size (mean)	6.3	5.7	0.7	**
Household age-sex composition (percent)				
Females 0-16	24.3	25.2	-0.9	
Females 16-30	10.1	11.0	-0.9	
Females 30 plus	14.0	14.2	-0.2	
Males 0-16	26.8	26.2	0.6	
Males 16-30	8.6	9.3	-0.8	
Males 30 plus	16.2	14.0	2.2	*
Female adult-only household (percent)	3.5	11.6	-8.1	**
Education (percent)				
None	42.2	39.7	2.6	
Primary	48.0	51.1	-3.1	
Secondary	9.7	9.2	0.5	
Pastoralist Status (percent)				
Pastoralist	27.5	35.8	-8.2	
Agro-pastoralist	44.3	42.3	2.0	
Non-pastoralist	28.1	21.9	6.2	
Economic status				
Asset index (mean)	48.9	49.7	-0.8	
Consumption assets	1.1	1.3	-0.2	
Agricultural productive assts	8.3	8.7	-0.4	
Animals (Tropical Livestock Units)	5.9	6.6	-0.7	
Per capita expenditures (daily birr)	14.4	16.2	-1.8	
Poverty (percent)	61.2	58.1	3.1	
Depth of poverty (poverty gap)	23.2	22.4	0.8	
Project area and remoteness				
Borena	58.5	72.5	-14.0	
Jijiga	41.5	27.5	14.0	
Distance from zonal capital (km)	63.4	53.2	10.2	
Shock exposure experienced between baseline				
Cumulative rainfall deficit	4.9	5.1	-0.2	**
Cumulative soil moisture deficit	110.9	140.6	-29.7	*
Cumulative vegetation deficit	94.7	106.9	-12.2	

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Resilence capacity indicator	Unadjusted means			Adjusted means (without sample weights)			Adjusted means (with sample weights)			pct diff w/o	pct diff with
	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference		
Absorptive capacity											
Bonding social capital	54.6	65.8	-11.2 *	59.6	57.5	2.1	64.7	63.1	1.6	3.7	2.5
Holdings of savings	8.6	16.0	-7.4	12.0	13.8	-1.8	10.6	15.5	-4.9	-13.0	-31.6
Access to informal safety nets	3.28	3.60	-0.32	3.16	3.10	0.1	3.72	3.48	0.2	1.9	6.9
Availability of hazard insurance	34.5	40.9	-6.40	31.8	25.6	6.2	46.3	37.8	8.5	24.2	22.5
Disaster preparedness and mitigation	46.0	51.4	-5.4	41.8	43.9	-2.1	50.3	50.3	0.0	-4.8	0.1
Asset index /a	48.9	49.7	-0.8	--	--		--	--			
Index of absorptive capacity	52.4	60.6	-8.2 **	54.7	53.3	1.4	59.9	58.2	1.7	2.6	2.9
Adaptive capacity											
Bridging social capital	40.7	51.2	-10.5 *	48.2	40.8	7.4	52.1	47.5	4.6	18.1	9.7
Linking social capital	45.5	49.0	-3.5	42.5	41.2	1.3	49.1	47.7	1.4	3.2	2.9
Aspirations/confidence to adapt	24.9	28.0	-3.1	27.8	28.1	-0.3	27.3	27.3	0.0	-1.1	0.0
Livelihood diversity	2.104	2.064	0.04	1.92	1.97	-0.1	1.67	2.86	-1.2	-2.5	-41.6
Access to financial resources	0.838	0.981	-0.14	0.87	0.77	0.10	1.09	0.91	0.19	13.0	20.4
Human capital	0.443	0.465	-0.02	0.373	0.408	-0.04	0.462	0.454	0.01	-8.6	1.8
Exposure to information	5.12	5.67	-0.6	4.37	4.57	-0.20	5.56	5.48	0.08	-4.4	1.5
Asset index a/	48.9	49.7	-0.8	--	--		--	--			
Index of adaptive capacity	44.9	51.0	-6.2 *	45.2	42.6	2.6	51.3	49.1	2.2	6.1	4.5
Transformative capacity											
Bridging social capital	39.7	50.8	-11.1 *	48.2	40.8	7.4	52.1	47.5	4.6	18.1	9.7
Linking social capital	45.1	48.8	-3.7	42.5	41.2	1.3	49.1	47.7	1.4	3.2	2.9
Access to markets	1.61	1.83	-0.2	1.14	1.20	-0.06	1.74	1.96	-0.22	-5.0	-11.2
Access to infrastructure	1.35	1.30	0.1	1.36	1.38	-0.02	1.30	1.31	-0.01	-1.4	-0.8
Access to services	4.49	4.65	-0.2	4.33	4.42	-0.09	4.55	4.63	-0.08	-2.0	-1.7
Access to communal natural resources	2.01	2.44	-0.4 **	1.97	2.25	-0.28	2.23	2.38	-0.15	-12.4	-6.3
Availability of formal safety nets	0.89	1.31	-0.4	1.05	0.98	0.08	1.31	1.19	0.12	7.7	10.1
Index of transformative capacity	46.8	52.9	-6.1 *	46.5	44.4	2.10	53.0	51.2	1.75	4.7	3.4
Community resilience capacity											
No. natural resource managmt groups	1.45	1.69	-0.24 ***	1.27	1.30	-0.03	1.64	1.63	0.01	-2.3	0.6
Disaster risk reduction index	0.41	0.49	-0.08	0.39	0.38	0.01	0.47	0.47	0.00	1.3	-0.4
Social protection index	0.62	0.68	-0.06 *	0.63	0.60	0.03	0.70	0.66	0.04	5.7	6.5
Presence of a civic group	0.33	0.28	0.06	0.27	0.20	0.08	0.37	0.27	0.10	38.1	38.3
Access to communal natural resources	2.01	2.44	-0.4 ***	1.97	2.25	-0.28	2.23	2.38	-0.15	-12.4	-6.3

Table A3. Drought wave 1 positive deviant analysis: Comparison of pre-shock resilience capacities of positive deviants and non-deviants

Note: Means are adjusted for the demographic characteristics listed in the previous table, pastoralist status, the asset index, project area, shock exposure, and baseline food security.

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

a/ Adjusted means are not reported for this variable because it is one of the variables that are adjusted for.

Table A4. Drought wave 1 positive deviance analysis: Probit regression results

Resilence capacity indicator	Cumulative rainfall deficit			Cumulative soil moisture deficit			Cumulative vegetation deficit		
	Coeff-icient	t-stat		Coeff-icient	t-stat		Coeff-icient	t-stat	
Absorptive capacity									
Bonding social capital	-0.001	-0.27		-0.0005	-0.15		-0.002	-0.50	
Holdings of savings	-0.031	-0.09		-0.05	-0.14		-0.108	-0.31	
Access to informal safety nets	0.09	1.16		0.076	1.02		0.022	0.28	
Availability of hazard insurance	0.460	1.70	*	0.356	1.26		0.174	0.58	
Availability of disaster preparedness and	0.223	0.93		0.244	1.02		0.028	0.12	
Asset index	0.043	2.03	**	0.044	2.08	**	0.046	2.16	**
Adaptive capacity									
Bridging social capital	0.005	1.56		0.005	1.62		0.005	1.39	
Linking social capital	0.007	1.15		0.008	1.28		0.004	0.73	
Aspirations/confidence to adapt	0.001	0.10		0.0004	0.05		0.002	0.24	
Livelihood diversity	-0.037	-0.21		-0.013	-0.07		-0.0014	-0.01	
Access to financial resources	0.362	2.23	**	0.337	2.06	**	0.231	1.31	
Human capital	-0.139	-0.40		-0.08	-0.22		-0.178	-0.50	
Exposure to information	0.007	0.27		0.011	0.39		0.000	0.00	
Asset index	-0.043	2.03	**	0.044	2.08	**	0.046	2.16	**
Transformative capacity									
Bridging social capital	0.005	1.56		0.005	1.62		0.005	1.39	
Linking social capital	0.007	1.15		0.008	1.28		0.004	0.73	
Access to markets	-0.033	-0.35		0.011	0.12		0.009	0.09	
Access to infrastructure	0.210	0.81		0.019	0.08		0.205	0.84	
Access to services	0.049	0.34		-0.014	-0.10		-0.077	-0.49	
Access to communal natural resources	-0.210	-1.85	*	-0.251	-2.02	**	-0.21	-1.92	*
Availability of formal safety nets	0.14	1.21		0.071	0.62		0.047	0.40	
Community resilience capacity									
No. natural resource managmt groups	0.119	0.91		0.147	1.12		-0.008	-0.06	
Disaster risk reduction index	0.853	0.70		1.23	1.02		-0.527	-0.33	
Social protection index	2.550	2.70	***	2.54	2.66	***	2.01	1.97	*
Presence of a civic group	0.638	2.33	**	0.583	2.08	**	0.413	1.39	
Access to communal natural resources	-0.210	-1.85	*	-0.251	-2.02	**	-0.21	-1.92	*

Note: Shaded coefficients are significant at least at the 5% level when sampling weights are applied.
Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A5. Drought wave 2 six-round growth regressions: Which resilience capacities helped households recover from the drought? (Borena only, N=1,060)

Resilence capacity indicator	Basic growth regression			Regression including interaction with shock exposure a/ (Without sample weights)			Regression including interaction with shock exposure a/ (with sample weights)		
	Coeff-icient	t-stat		Coeff-icient	t-stat		Coeff-icient	t-stat	
Absorptive capacity									
Bonding social capital	0.008	1.68	*	0.011	2.25	**	0.015	3.53	***
Holdings of savings	0.608	1.66	*						
Access to informal safety nets	0.141	2.02	**						
Availability of hazard insurance	0.576	2.05	**						
Availability of disaster preparedness and	-0.389	-1.18							
Asset index	0.097	3.37	***						
Adaptive capacity									
Bridging social capital	-0.001	-0.18		0.008	1.73	*	0.017	2.86	**
Linking social capital	-0.012	-1.19							
Aspirations/confidence to adapt	0.014	1.33		0.022	1.84	*	0.031	1.92	*
Livelihood diversity	-0.053	-0.23							
Access to financial resources	0.440	2.79	***						
Human capital	-0.499	-1.16					0.415	2.11	*
Exposure to information	-0.03	-0.8							
Asset index	0.10	3.37	***						
Transformative capacity									
Bridging social capital	-0.001	-0.18		0.008	1.73	*	0.017	2.86	**
Linking social capital	-0.012	-1.19							
Access to markets	-0.048	-0.42							
Access to infrastructure	-0.635	-2.17	**	0.575	1.67	*			
Access to services	0.084	0.38							
Access to communal natural resources	0.492	2.02	**				-0.449	-3.16	***
Availability of formal safety nets	0.288	2.33	**						
Community resilience capacity									
No. natural resource managmt groups	0.344	1.74	*						
Disaster risk reduction index	0.014	0.01							
Social protection index	1.570	1.43							
Presence of a civic group	-0.168	-0.58							
Access to communal natural resources	0.492	2.02	**						

Note: The measure of shock exposure employed is the 1-month Standard Precipation Index.

Shaded coefficients are significant at least at the 5% level when sampling weights are applied.

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

a/ Only the coefficients of statistically significant interaction terms are reported.

Table A6. Shock wave 2 positive deviant analysis for Borena: Comparison of food security and household characteristics of positive deviants and non-PDs

Measure	Positive deviants	Non-deviants	Difference	
Food security				
Round 1	12.29	17.55	-5.26	***
Round 2	12.50	17.92	-5.42	***
Round 3	12.74	15.51	-2.77	**
Round 4	13.48	12.79	0.69	
Round 5	13.71	15.83	-2.12	**
Round 6	15.13	14.39	0.74	
Demographic characteristics				
Household size (mean)	5.52	5.93	-0.41	
Household age-sex composition (percent)				
Females 0-16	25.9	27.2	-1.3	
Females 16-30	9.2	10.8	-1.6	
Females 30 plus	16.4	12.9	3.4	
Males 0-16	27.4	26.3	1.1	
Males 16-30	9.3	8.6	0.7	
Males 30 plus	11.8	14.1	-2.3	***
Female adult-only household (percent)	13.1	10.7	2.3	
Education (percent)				
None	49.7	25.9	23.8	*
Primary	41.2	61.3	-20.0	*
Secondary	9.0	12.8	-3.8	
Pastoralist Status (percent)				
Pastoralist	45.0	40.3	4.6	
Agro-pastoralist	29.4	49.3	-19.9	**
Non-pastoralist	25.6	10.4	15.2	
Distance from zonal capital	54.7	47.3	7.4	
Economic status				
Asset index (mean)	49.48	50.75	-1.27	
Per capita expenditures (daily birr)	11.137	11.631	-0.495	
Poverty (percent)	75.4	73.1	2.2	
Depth of poverty (poverty gap)	33.8	27.7	6.1	

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A7. Shock wave 2 positive deviance analysis for Borena: Comparison of shock exposure of positive deviants and non-deviants

Measure	Positive deviants	Non-deviants	Difference
1-month rainfall deviation from norm			
Round 1	-1.14	-1.21	0.06
Round 2	0.39	0.37	0.02
Round 3	-2.07	-2.02	-0.04
Round 4	-1.28	-1.23	-0.05
Round 5	-0.80	-0.78	-0.02
Round 6	-0.33	-0.35	0.02
Cumulative 6-month rainfall deficit	5.62	5.59	0.03
1-month soil moisture deficit			
Round 1	35.6	36.4	-0.85
Round 2	42.2	41.2	0.93
Round 3	33.7	33.5	0.25
Round 4	30.8	30.9	-0.16
Round 5	19.8	19.7	0.10
Round 6	19.2	19.6	-0.39
Cumulative 6-month soil moisture deficit	118.8	118.7	0.11
1-month vegetation deficit			
Round 1	65.5	65.7	-0.22
Round 2	--	--	
Round 3	36.4	36.1	0.23
Round 4	26.3	26.8	-0.51
Round 5	16.8	17.5	-0.64 *
Round 6	34.6	34.9	-0.24
Cumulative 6-month vegetation deficit	69.53	68.14	1.40
Perceptions-based shock exposure index			
Round 1	16.9	14.6	2.32 *
Round 2	12.3	11.0	1.31
Round 3	8.7	10.8	-2.14 **
Round 4	6.8	8.1	-1.38 **
Round 5	6.3	11.1	-4.73 ***
Round 6	9.9	10.1	-0.18
Mean across rounds	10.2	11.0	-0.80
Wave 1 shock exposure			
Cumulative rainfall deficit	5.00	5.10	-0.10
Cumulative soil moisture deficit	177.60	177.70	-0.10
Cumulative vegetation deficit	123.9	126.4	-2.50

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A8. Shock wave 2 positive deviance analysis (Borena): Comparison of pre-shock resilience capacities of positive deviants and non-PDs (N=212)										
	Unadjusted means			Adjusted means (without sample weights)			Adjusted means (with sample weights)			pct diff w/o	pct diff with
Resilence capacity indicator	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference		
Absorptive capacity											
Bonding social capital	66.7	76.4	-9.7	69.8	77.1	-7.3	69.0	75.4	-6.4	-9.5	-8.5
Holdings of savings	0.171	0.206	-0.03	0.21	0.23	-0.02	0.18	0.20	-0.03	-8.7	-14.2
Access to informal safety nets	4.05	4.43	-0.38	4.45	4.45	0.00	4.17	4.37	-0.20	0.0	-4.6
Availability of hazard insurance	0.515	0.572	-0.057	0.524	0.501	0.023	0.540	0.560	-0.020	4.6	-3.6
mitigation	0.583	0.690	-0.107	0.724	0.712	0.012	0.628	0.671	-0.043	1.7	-6.4
Asset index a/	49.5	50.7	-1.2	--	--		--	--			
Index of absorptive capacity	62.6	70.0	-7.4	66.2	70.4	-4.2	64.8	69.1	-4.3	-6.0	-6.2
Adaptive capacity											
Bridging social capital	52.4	61.4	-9.0 *	51.8	60.0	-8.2	53.9	59.6	-5.7	-13.7	-9.6
Linking social capital	57.9	55.6	2.3	54.0	52.0	2.0	56.8	55.7	1.1	3.8	2.0
Aspirations/confidence to adapt	26.2	26.9	-0.67	26.8	27.4	-0.60	26.4	26.9	-0.50	-2.2	-1.9
Livelihood diversity	2.11	2.31	-0.20	2.19	2.26	-0.07	2.19	2.27	-0.08	-3.1	-3.5
Access to financial resources	1.21	1.41	-0.20	1.44	1.54	-0.10	1.23	1.39	-0.16	-6.5	-11.5
Human capital	0.41	0.60	-0.20 **	0.478	0.558	-0.08	0.477	0.570	-0.09	-14.3	-16.3
Exposure to information	6.80	7.02	-0.21	6.34	6.82	-0.48	6.34	7.12	-0.78	-7.0	-11.0
Asset index a/	49.7	50.7	-1.05	--	--		--	--			
Index of adaptive capacity	56.7	59.3	-2.7	55.1	57.1	-2.0	57.1	59.0	-1.9	-3.5	-3.1
Transformative capacity											
Bridging social capital	51.1	60.7	-9.6 *	51.8	60.0	-8.2	53.9	59.6	-5.7	-13.7	-9.6
Linking social capital	57.5	55.4	2.1	54.0	52.0	2.0	56.8	55.7	1.1	3.8	2.0
Access to markets	2.34	2.41	-0.07	1.95	1.90	0.05	2.39	2.38	0.01	2.6	0.4
Access to infrastructure	1.40	1.39	0.01	1.54	1.64	-0.10	1.35	1.41	-0.06	-6.1	-4.3
Access to services	5.08	4.97	0.11 *	5.11	4.98	0.13	5.08	4.98	0.10	2.6	2.0
Access to communal natural resources	2.60	2.75	-0.15	2.80	2.80	0.00	2.66	2.72	-0.06	0.0	-2.2
Availability of formal safety nets	1.63	1.67	-0.04	1.82	1.69	0.13	1.69	1.64	0.05	7.7	3.0
Index of transformative capacity	60.2	60.9	-0.74	58.2	58.3	-0.10	60.4	60.8	-0.40	-0.2	-0.7
Community resilience capacity											
No. natural resource managmt groups	1.97	2.10	-0.13	1.95	1.88	0.07	2.05	2.07	-0.02	3.7	-1.0
Disaster risk reduction index	0.60	0.61	-0.01	0.60	0.59	0.01	0.61	0.61	0.00	1.4	0.0
Social protection index	0.75	0.81	-0.05 **	0.79	0.82	-0.03	0.76	0.80	-0.04	-3.8	-4.7
Presence of a civic group	0.31	0.44	-0.13	0.39	0.42	-0.03	0.35	0.43	-0.08	-8.1	-19.1
Access to communal natural resources	2.60	2.75	-0.15	2.80	2.80	0.00	2.66	2.72	-0.06	0.0	-2.2

Note: Means are adjusted for demographic characteristics, pastoralist status, the asset index, shock exposure, and Round 1 food security.

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

a/ Adjusted means are not reported for this variable because it is one of the variables that are adjusted for.

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Table A9. Drought wave 2 positive deviance analysis: Probit regression results (N=1,060)

Resilence capacity indicator	Cumulative rainfall deficit		
	Coeff-icient	t-stat	
Absorptive capacity			
Bonding social capital	0.005	2.99	***
Holdings of savings	0.218	1.86	*
Access to informal safety nets	0.03	1.31	
Availability of hazard insurance	0.034	0.35	
Availability of disaster preparedness and	-0.111	-1.01	
Asset index	0.019	1.71	*
Adaptive capacity			
Bridging social capital	0.003	1.80	*
Linking social capital	-0.002	-0.62	
Aspirations/confidence to adapt	0.002	0.59	
Livelihood diversity	0.042	0.53	
Access to financial resources	0.167	2.66	***
Human capital	-0.027	-0.18	
Exposure to information	0.009	0.74	
Asset index	0.019	1.71	*
Transformative capacity			
Bridging social capital	0.003	1.80	*
Linking social capital	-0.002	-0.62	
Access to markets	-0.011	-0.27	
Access to infrastructure	-0.150	-1.46	
Access to services	-0.094	-1.23	
Access to communal natural resources	0.219	2.34	**
Availability of formal safety nets	0.04	1.71	*
Community resilience capacity			
No. natural resource managmt groups	0.078	1.14	
Disaster risk reduction index	0.092	0.21	
Social protection index	0.797	1.93	*
Presence of a civic group	-0.198	-1.96	**
Access to communal natural resources	0.219	2.34	**

Note: Shaded coefficients are significant at least at the 5% level when sampling weights are applied.

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

| Table A10. Shock wave 2 positive deviance analysis: Comparison of coping strategies employed by positive deviants and non-PDs (N=212)												
	Unadjusted means				**Adjusted means** a/ (without sample weights)			**Adjusted means** a/ (with sample weights)			pct diff w/o	pct diff with
Coping strategy	All	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference	Positive deviants	Non-deviants	Difference		
Reduce food consumption	99.3	100.0	98.9	1.1	99.6	99.5	0.1	99.2	99.3	-0.1	0.1	-0.1
Sell or consume productive assets												
Sell or slaughter livestock	95.3	96.7	94.7	2.0	97.9	96.3	1.6	97.4	94.5	2.9	1.7	3.1
Sell agricultural productive assets (e.g., plough)	1.9	0.8	2.4	-1.7	0.1	2.3	-2.2	0.0	2.7	-2.7	-96.3	-99.9
Consume seed stock held for the next season	68.0	75.6	64.8	10.8	65.6	69.4	-3.8	67.1	68.4	-1.3	-5.5	-1.9
Change labor patterns												
Take up new wage labor	64.6	59.3	66.8	-7.5	66.0	70.0	-4.0	62.1	65.7	-3.6	-5.7	-5.5
Take children out of school/send to work	30.4	22.4	33.8	-11.4	29.4	37.0	-7.6	18.6	35.4	-16.8	-20.5	-47.5
Participate in food-for-work or cash-for-work	36.8	47.2	32.5	14.8 **	47.3	36.7	10.6	45.8	33.1	12.7	28.9	38.4
Financial strategies												
Borrow money from friends or relatives	96.1	91.7	97.9	-6.2 **	92.4	99.0	-6.6	90.6	98.3	-7.7	-6.7	-7.8
Borrow money from a money lender	17.5	14.1	18.9	-4.8	12.1	20.8	-8.7	12.9	19.4	-6.5	-41.8	-33.5
Buy food on credit	80.6	76.4	82.4	-6.0	82.4	78.7	3.7	82.5	79.8	2.7	4.7	3.4
Draw down on savings	40.2	37.2	41.5	-4.3	39.6	43.5	-3.9	35.3	42.3	-7.0	-9.0	-16.5
Borrow from a savings/credit association or MFI b/	--	--	--	--	--	--	--	--	--	--		
Receive food or financial assistance												
Receive food aid	41.1	53.3	36.0	17.3	44.8	44.2	0.6	44.6	39.6	5.0	1.4	12.6
Receive money (incl. remittances) or food from family	93.8	95.2	93.2	2.0	89.5	94.9	-5.4	91.0	94.9	-3.9	-5.7	-4.1

Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

a/ Means are adjusted for demographic characteristics, pastoralist status, the asset index, shock exposure, and Round 1 (initial) food security.
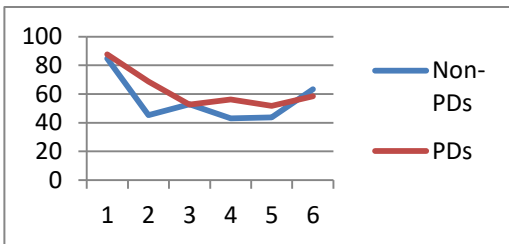
b/ Not included in analysis due to uncertainty about the quality of the data.

Figure A1. Trends over the six RMS rounds in the percent of positive-deviant and non-positive-deviant households using coping strategies
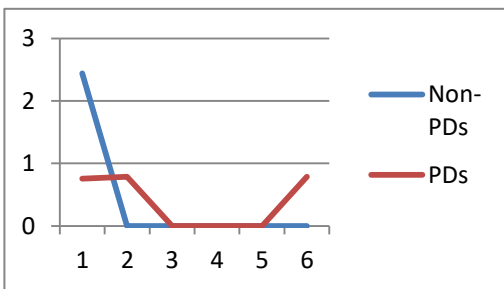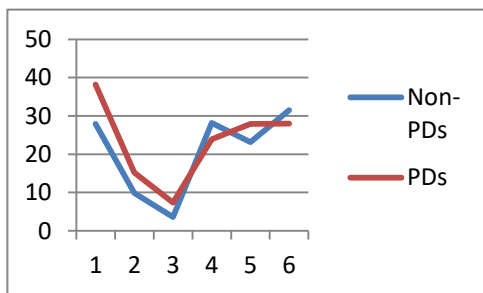
Reduce food consumption
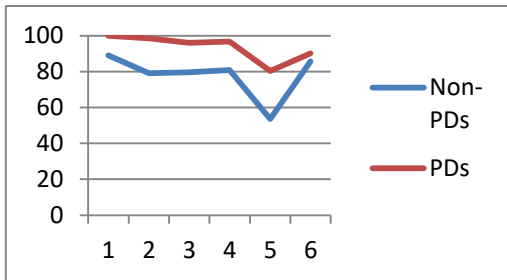
Sell or consume productive assets

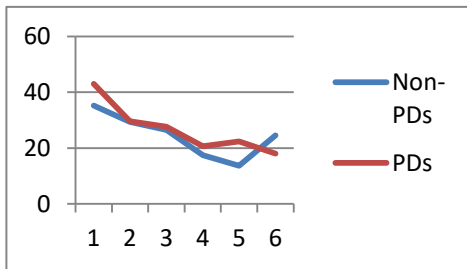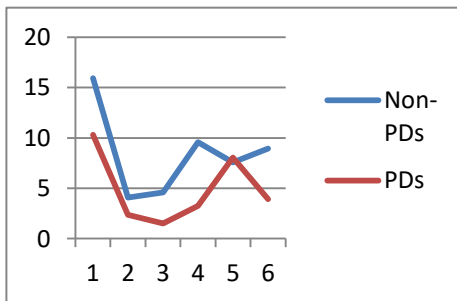Sell or slaughter livestock

Sell agricultural assets
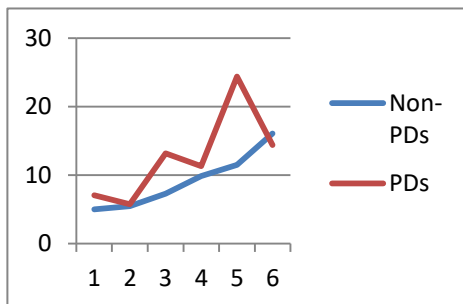

Consume seed stock held for next season
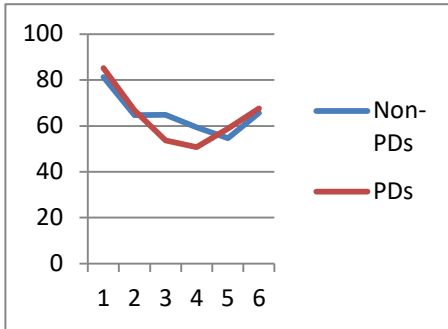
Change labor patterns

Take up new wage labor

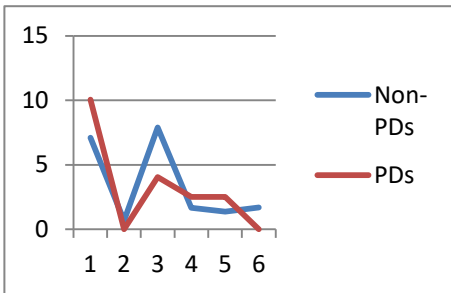Take children out of school/send to work for money

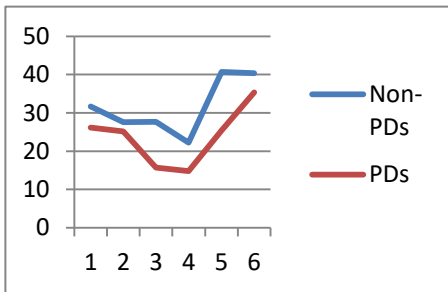Participate in food-for-work or cash-for-work
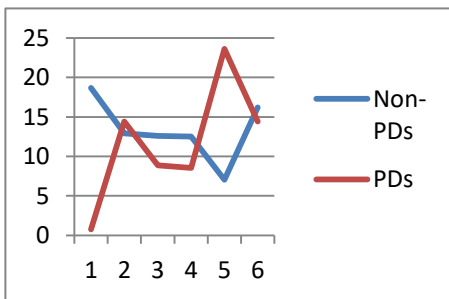
Financial strategies

Borrow money from friends or relatives
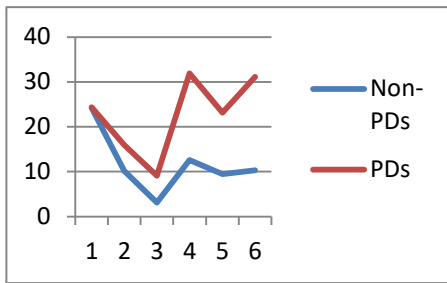

Borrow money from a money lender
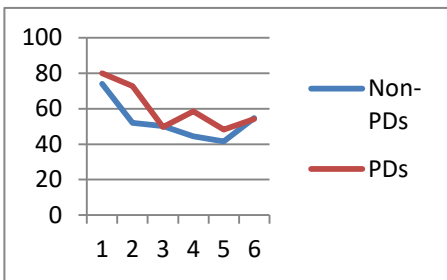

Buy food on credit

Draw down on savings

Receive food or financial assistance

Receive food aid

Receive money or food from family

Table A11. Shock wave 2 six-round coping strategy regressions (N=1,250)

Coping strategy	Reduce food consumption	Sell or consume productive assets			Change labor patterns		
		Sell/slaughter livestock	Sell agric. productive assets a/	Consume seed stock	New wage labor	Increase child labor	Food- or cash-for-work
Absorptive capacity							
Bonding social capital	***		--			**	
Holdings of savings		*	--				
Access to informal safety nets			--	***	**		
Availability of hazard insurance		*	--	***	***		*
Disaster preparedness and mitigation		**	--		*		
Asset index		***	--		***		**
Adaptive capacity							
Bridging social capital			--				
Linking social capital	***		--		*	*	
Aspirations/confidence to adapt		***	--	***			***
Livelihood diversity			--		**		
Access to financial resources	**		--		***		
Human capital		***	--		**		**
Exposure to information			--	**			
Asset index		***	--		***		**
Transformative capacity							
Bridging social capital			--				
Linking social capital	***		--		*	*	
Access to markets		***	--	***			***
Access to infrastructure		**	--		***	***	***
Access to services		**	--	***			***
Access to communal natural resources	+	***	--		***		
Availability of formal safety nets	**	***	--	***	***		*
Community resilience capacity							
Number natural resource managmt groups		*	--	**	***		
Disaster risk reduction index	***	***	--		***	*	
Social protection index		***	--		***		
Presence of a civic group		*	--				*
Access to communal natural resources	+	***	--		***		

Note: The measure of shock exposure employed is the 1-month Standard Precipation Index.
Red-colored stars signify a negative coefficient; Blue-colored stars signify a positive coefficient.
Green shading indicates that coefficients are significant at least at the 5% level when sampling weights are applied.

a/ Not enough households used this coping strategy for analysis (6 household-round observations).

Table A11 (cont). Shock wave 2 six-round coping strategy regressions (N=1,250)

Coping strategy	Financial strategies				Receive food or financial assistance	
	Borrow from friends/ relatives	Borrow from a money lender	Buy food on credit	Draw down on savings	Food aid	Money/food from family (incl. remits)
Absorptive capacity						
Bonding social capital				+	**	**
Holdings of savings			**		*	
Access to informal safety nets					*	
Availability of hazard insurance					***	
Disaster preparedness and mitigation		***			**	
Asset index		*	**	***	**	
Adaptive capacity						
Bridging social capital		-				**
Linking social capital						**
Aspirations/confidence to adapt					**	
Livelihood diversity	**		*	***		*
Access to financial resources						
Human capital	**	*			**	
Exposure to information						
Asset index		*	**	***	**	
Transformative capacity						
Bridging social capital		-				**
Linking social capital						**
Access to markets				*	***	
Access to infrastructure	*			*	***	***
Access to services	*				***	
Access to communal natural resources	***					*
Availability of formal safety nets					***	
Community resilience capacity						
Number natural resource managmt groups					**	**
Disaster risk reduction index	***		**		***	***
Social protection index	***				**	
Presence of a civic group						
Access to communal natural resources	***					*

Note: The measure of shock exposure employed is the 1-month Standard Precipation Index.

Red-colored stars signify a negative coefficient; Blue-colored stars signify a positive coefficient.

Green shading indicates that coefficients are significant at least at the 5% level when sampling weights are applied.