December 2016
Issue no. 6

BRACED aims to build the resilience of more than 5 million vulnerable people against climate extremes and disasters. It does so through 15 NGO-consortia working across 13 countries in East Africa, the Sahel and Asia.

www.braced.org
@bebraced

RESILIENCE INTEL

Reality of Resilience: perspectives of the 2015–16 drought in Ethiopia

Roop Singh, Mulugeta Worku, Solomon Bogale, Adrian Cullis, Alebachew Adem, Ben Irwin, Sheri Lim, Lorenzo Bosi, and Courtenay Cabot Venton

This report highlights lessons from the 2015–16 drought in Ethiopia, including how and why different communities were impacted, effective approaches to resilience-building and challenges faced.

KEY MESSAGES

- The timing and spatial distribution of rainfall, beyond total deficits, impacted livelihood activities such as agriculture and pastoralism during the 2015–16 drought in Ethiopia.
- Early response costs less and results in better outcomes. Mechanisms that trigger early funding based on pre-agreed indicators are critical to overcome some of the political, institutional and media effects that have kept the humanitarian system in a state of crisis response.
- Flexible funding and adaptive programming is needed for humanitarian and development organisations implementing projects. This will pivot funds, depending on need, and help stimulate more timely action.
- There is increasing evidence that financial services such as index-based insurance are an important part of building resilience. These services need to be accessible to the most vulnerable people.

BRACED KNOWLEDGE MANAGER

A drought crisis in Ethiopia, triggered by erratic and severely depressed rainfall in early 2015, has affected 9.7 million Ethiopians. The Government of Ethiopia (GoE) and international humanitarian community have mobilised to meet emergency needs, including water, sanitation and hygiene (WASH), food and nutrition. This has taken place through a $1.62 billion appeal, which has only been partially met to date (2016 Ethiopia HRD). In response to the current drought, the GoE has allocated more than $700 million of its own resources mainly to address needs not included in the appeal, including by reprogramming infrastructure programmes (UNOCHA).

The BRACED Knowledge Manager's (KM) Reality of Resilience initiative has been monitoring rainfall deficits in Ethiopia since April 2015 when the first rainy season failed. The delay of the subsequent June to September rains prompted the BRACED KM to examine the extreme event and contact thematic experts and organisations implementing resilience interventions aimed towards understanding the effects of the drought and the impact of interventions.

This report is intended to provide snapshots of the Ethiopia drought from the ground through a series of case studies. It begins with an overview of the climatic variables that contributed to the drought. This is followed by case studies from non-governmental organisations (NGOs), humanitarian organisations and thematic experts, centering on what they have learned about building resilience to climate shocks and stresses through their work during the 2015–16 drought. Five case studies were written independently, using methodologies such as surveys, key informant interviews, focus group discussions, and Value for Money (VfM) analysis to inform conclusions. The case studies are brought together in this report to illustrate different points of view and lessons across Ethiopia during the drought, including from pastoralist and farming communities and from the household level up to the humanitarian system.

Incorporated are two case studies highlighting how households were impacted during the drought, including reasons for increased debt and lessons from the adaptation decisions some farmers are now taking. This is followed by two case studies highlighting the benefits and lessons learned from initiatives that integrated climate and weather information to prompt early action for pastoralists and also absorb drought impacts on farmers through index-based insurance. Finally, we emphasise the role of the humanitarian system through a case study that illustrates the cost savings from an appropriately timed response to the drought crisis. Through these case studies, this report provides lessons for climate and development practitioners on how and why different households were impacted by the drought, initiatives that worked to reduce this and recommendations for strengthening resilience ahead of future extreme events. While this report uses the drought in Ethiopia to draw lessons, many of the recommendations are applicable to other areas facing climate extremes and disasters.

ETHIOPIA AND CLIMATE

Ethiopia is both topographically and climatically complex, with vastly different rainfall regimes across the country. The majority of the population resides in the highlands and engages in a mix of agriculture and livestock production, while pastoralists dominate the lowlands.

Figure 1: Ethiopia's topography

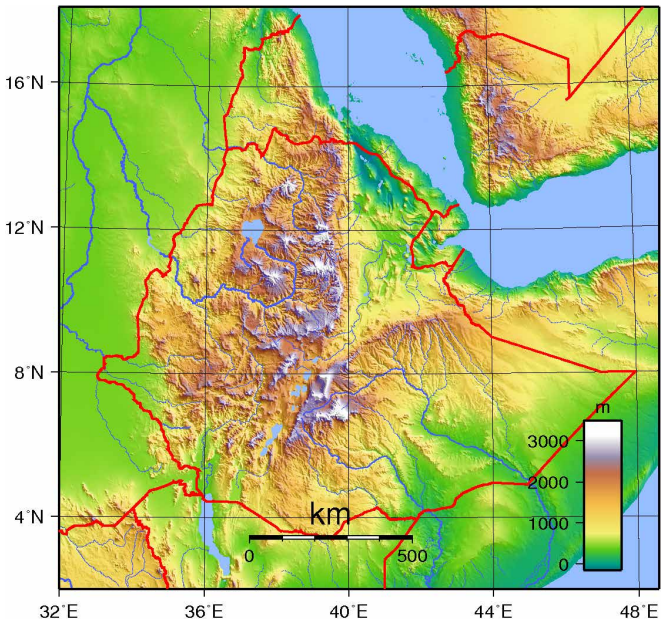
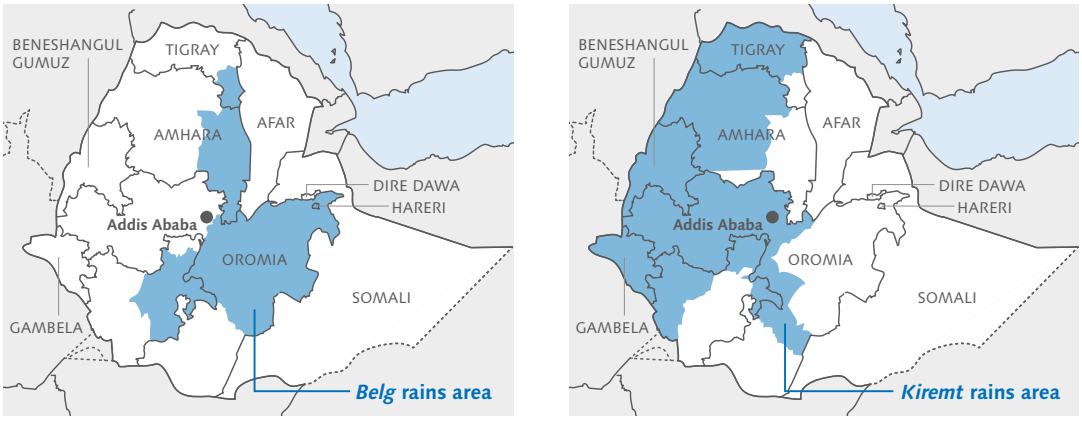


Figure 1. Located on the Horn of Africa, just north of the equator, Ethiopia contains a plateau comprising the highlands in the centre of the country and the Great African Rift valley. The incredible diversity of topography lends itself to equally diverse climate and microclimates.

To understand the impact this drought had on Ethiopians, climate scientists look at when it typically rains, who uses that rain, and for what livelihood activities.

Figure 2: *Belg*-dependent and *kiremt*-dependent agricultural areas



Belg-dependent agricultural areas (left), and *kiremt*-dependent agricultural areas (right).
Source: Adapted from EHCT (2015).

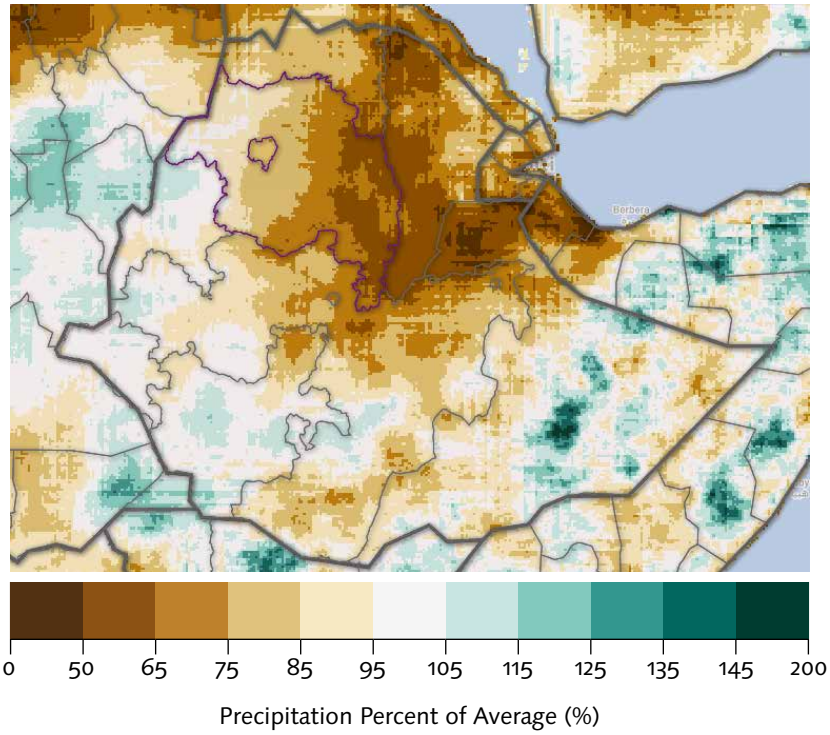
The *belg* season runs from February to May and provides rainfall for agriculture in the centre of Ethiopia (figure 2, left), as well as for pasture for livestock (Degefu, 1987; Gissila et al., 2004). About 10% of the Ethiopian population is entirely dependent on this rainy season. The *kiremt* rains are more reliable and run from June to mid-September, providing water mainly for agriculture in the western half of the country (Walker, 2016).

WHAT HAPPENED TO THE RAINS IN 2015–16?

On 4 June 2015, Ethiopia's National Meteorological Agency (NMA) declared that the spring *belg* rains had failed. Soon after, the *kiremt* rains were severely delayed and erratic.

From February through September 2015 the north, central and eastern parts of the country received only 50 to 75% of the rainfall normally expected over this time period (figure 3). However, this departure from 'normal' only tells part of the story. In the following sections, we introduce other ways of looking at the drought, including its severity, spatial extent and how well we can predict these types of events.

Figure 3: Precipitation during *Belg* and *Kiremt* seasons



Total precipitation from 1 February to 15 September 2015 (*belg* and *kiremt* seasons) as a percentage of the long-term average.

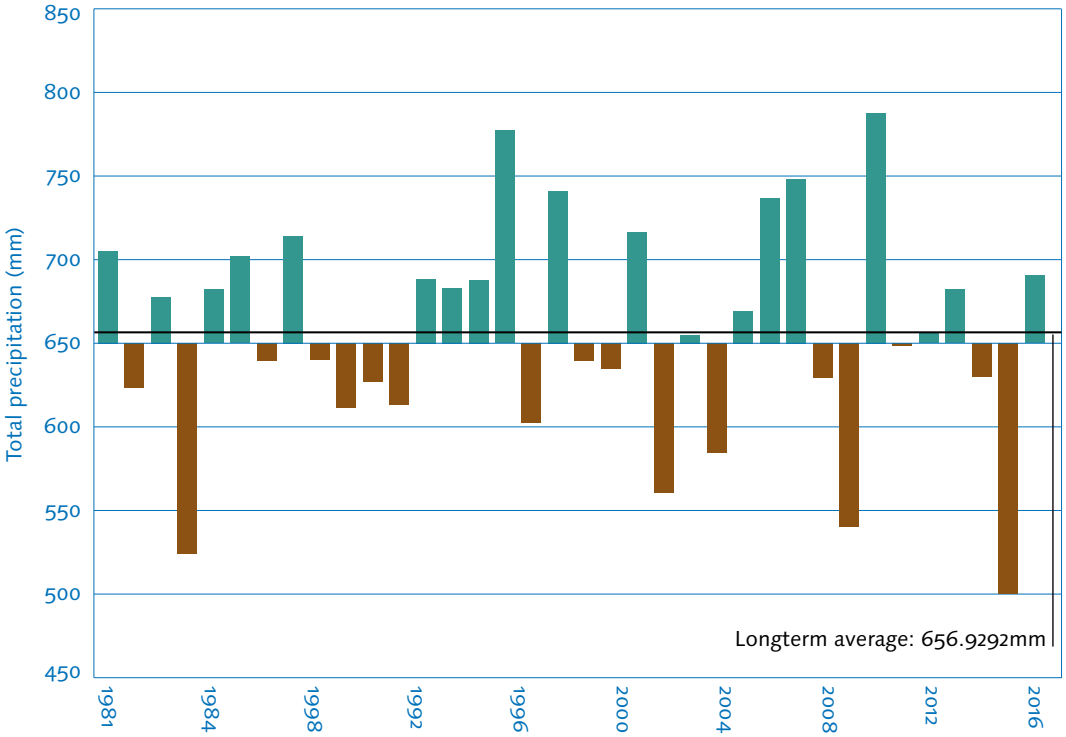
Data Source: CHIRPS 4.8-km (1/20-deg) precipitation dataset (UCSB/CHG). Target Period: 2015–02–01 to 2015–09–02. Historical Period: 1981–2014.

HOW EXTREME WAS THE DROUGHT?

Many media headlines read 'worst drought in 50 years,' as a way to show the severity and exceptional nature of this extreme event (Davison, 2015). Return times like this represent the average amount of time between events with similar severity.

Using one definition of the 2015 drought, the return time is greater than at least 30 years (Figure 4). However, return times depend on the area and time period used to define the drought event and, in many cases, the dataset used. For this reason, analyses like these can lead to false comparisons. For example, some have concluded that this drought is as severe or worse than that of 1984. However, the 1984 drought occurred over a different and far larger area, and thus impacted a larger proportion of the population. Also of note for the most recent drought is that it continued to be dry in parts of 2016, during which the February and March rains were below average, likely further impacting people (Figure 5). Therefore, it is important to delve past the newspaper headlines if we are to understand the actual severity and impact of the drought.

Figure 4: Total departure from average precipitation from 1 February to 1 September over the affected drought area.



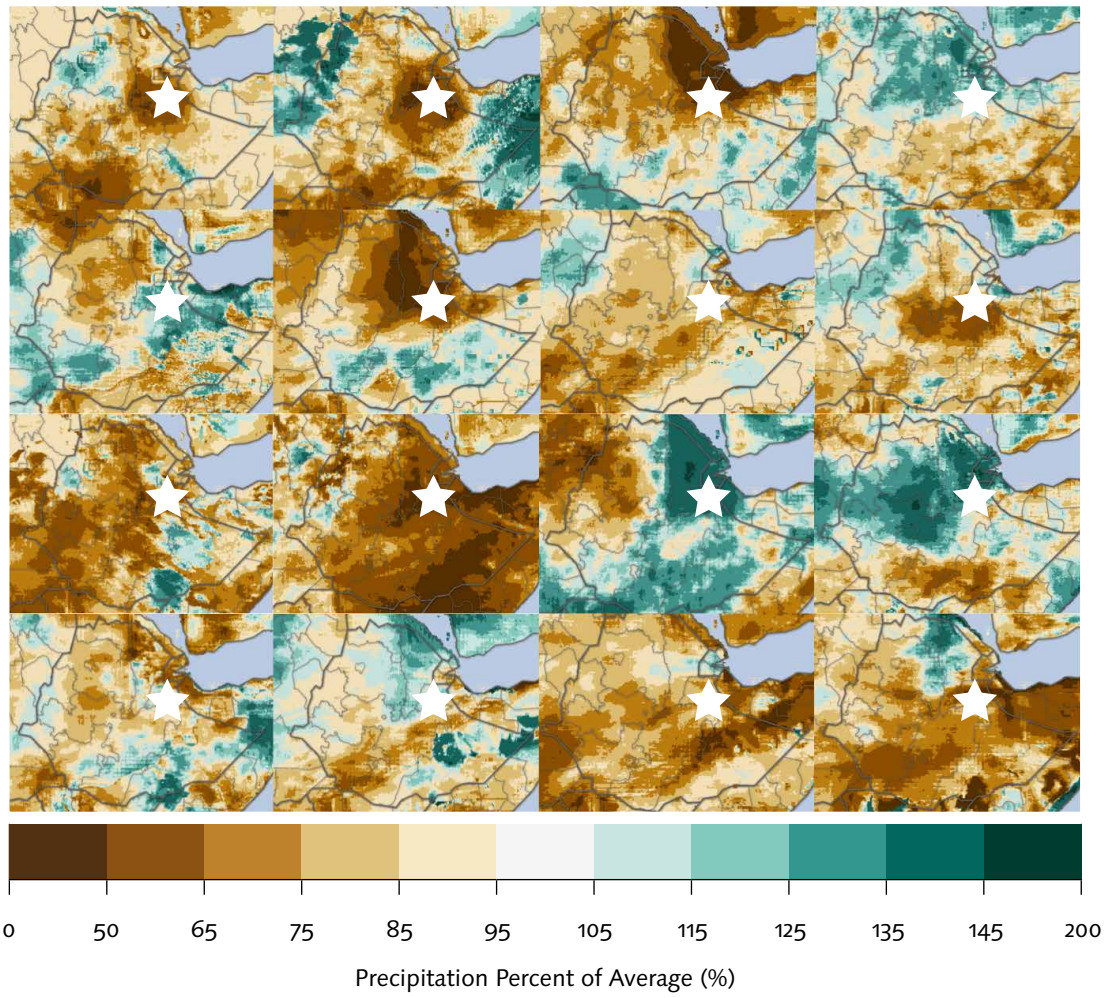
Data source: CHIRPS. Historical period: 1981 to 2016. The affected drought area is defined as the continuous area of northern, eastern and central Ethiopia, with precipitation deficits of at least 15% during the historical period.

TIMING IS KEY

Another way to understand the drought is to analyse areas that were unusually wet (green) or unusually dry (brown) from month to month within the two key rainy seasons (figure 5). This figure illustrates how some regions were indeed very dry for months on end. Equally, it wasn't constantly dry, everywhere. For example, northeastern Ethiopia was consistently drier than average in February, March and April. However, in May, that same area was wetter than average, showcasing the erratic and highly variable quality of the rainfall.

In the Kombolcha district (northeastern Ethiopia), the total rainfall deficits in 2015 were comparable to those in 1994 and 2002. This illustrates that the drought experienced by Ethiopians on the ground was, in some areas, similar to other events that had occurred in the recent past. For farmers in Kombolcha, as in much of Ethiopia, it was not the total rainfall deficits that resulted in impact, but rather the timing of rainfall. This meant this particular factor was of far greater importance.

Figure 5: Monthly precipitation departures from the long-term average during the *belg* and *kiremt* seasons in 2015 and 2016



First row, left to right: Feb, March, April and May 2015; second row, left to right: June, July, August and September 2015; third row, left to right: February, March, April and May 2016; fourth row, left to right: June, July, August and September 2016). The white star represents the location of the Kombolcha district.

THE DIFFERENCE BETWEEN METEOROLOGICAL AND AGRICULTURAL DROUGHT

Farmers usually wait until the first rain to sow their seeds; those in the Kombolcha district who planted early in the season in 2015 did not receive enough rain during the subsequent weeks for their crop to grow. Others waited too long for consistent rainfall, and subsequently planted too late, resulting in failed harvests. Similarly, failed or late onset rains may force pastoralists to range further and wider in search of forage and water resources than they would in a normal year. Determining the critical time periods and moisture thresholds for crop and pasture can help in the development of adaptation strategies that specifically target these livelihood activities. This is illustrated in the following case study, highlighting the adaptive decisions farmers in Kombolcha made as a result of frequent droughts.

Climate Information and Assets for Resilience in Ethiopia project

The CIARE (Climate Information and Assets for Resilience in Ethiopia) project is a consortium led by Christian Aid and is part of the BRACED programme. The project focuses on vulnerable communities in high-risk locations of Ethiopia, with the aim of building their resilience to climate extremes and disasters. These include droughts, floods, extreme temperatures and extreme precipitation. This case study is based on focus group discussions, key informant interviews, and a literature review undertaken by the CIARE project implemented in Kombolcha, a district in Eastern Ethiopia.

Case Study 1: Household resilience to El Niño driven drought: lessons from the Kombolcha district, by Mulugeta Worku

In Kombolcha, rural communities make a living from sedentary, rain-fed agriculture. On average, this district receives 778 mm of rainfall per year; in 2015 it only received 490 mm. The effects of below normal precipitation were worsened by irregular rainfall distribution during both the *belg* and kiremt rainy seasons. Findings from community level drought impact assessments conducted in January 2015 show that households' abilities to cope with the impacts of the drought, coupled with unpredictable rainfall, complicated adaptation decisions. In particular, many turned to a mild stimulant crop, 'chat' which has recently become a fast-expanding adaptation option in the area, with possible implications for local food supply.

A household's ability to absorb climate stresses, such as in the example of drought in Kombolcha, is connected to income, savings, water and livestock feed availability. During the 2015–16

© Mulugeta Worku and Peter Crawford, Nov 2015

Image 1: Community representatives during group discussion in Kombolcha.

drought, many households resorted to the undesired sale of livestock, particularly cattle and small ruminants, and cutting of trees for firewood. Some used their savings to meet family requirements, such as for food. Low-income households temporarily migrated to nearby towns to earn wages.

Interviews revealed that anticipatory actions, such as animal feed preservation were seldom practiced. (Action Aid, CIARE's partner operating in Kombolcha, is confronting the animal feed problem through a 'model farmer' approach in which interested and exemplary farmers are selected to pursue climate compatible animal feed management actions.) Lack of income and savings are a key issue, partly due to subsistent livelihoods and a lack of access to financial services. Unless a portion of income is deposited for both future investments and the meeting of contingencies, any gains from income generating activities are compromised and even lost in the face of climate extremes. Setting up mechanisms that bring behavioral change towards 'saving' is an important lesson drawn from this drought.

Forecasts

Traditional weather forecasts rely on visible rain-bearing clouds and local wind patterns. They do not take large-scale atmospheric, oceanic and land surface factors into account. Traditional knowledge regarding the prediction of rainfall conditions, even for short time horizons, didn't hold true for the households in Kombolcha during this drought event. Interviews also revealed that people failed to take adaptive measures despite having a weather forecast from scientific sources that could have potentially helped them to undertake low or 'no-regret' adaptation options (such as animal feed preservation). This failure can be linked to individual skepticism around climate information, the coarse nature of the forecast and under-developed climate information exchange mechanisms. During the event detailed here, the flow of climate information from its source to end users, along with its content, intermediaries and feedback mechanisms, was not well structured. This indicates that existing Disaster Risk Reduction (DRR) and early warning

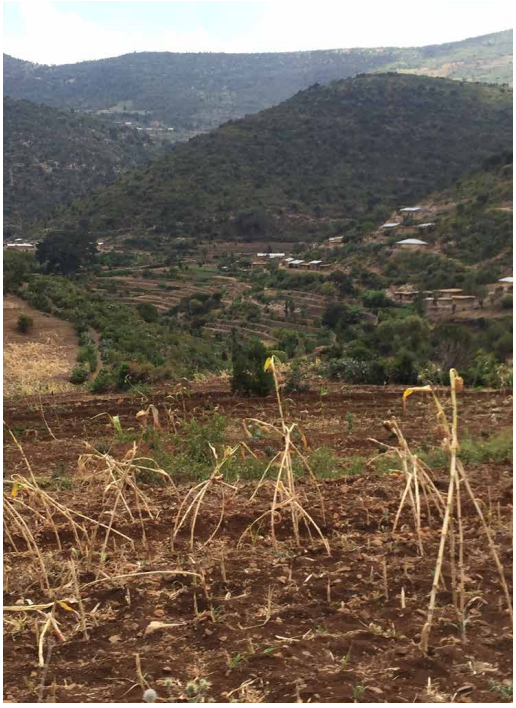
platforms at different levels need to integrate localised weather and climate information and traditional knowledge into their decisions.

Adaptation decisions: chat farming

Many farmers have moved away from cereal crops production towards extensive 'chat' farming. Evidence shows increasing trends in this regard in Kombolcha – covering up to 70% of productive agricultural land (Tefera, et al., 2003). Interviews revealed drought and rainfall variability as major reasons for this. Community members said that cereal crops cannot tolerate changes in soil moisture conditions, but that chat does. The leaves and soft twigs of this perennial shrub have attractive markets and serve as good sources of income. Most community members, except children, also chew it as a stimulant.

This case study neither advocates for or against chat farming over cereal production. Rather, it aims to identify livelihood trajectories and associated risks for resilience if such trends continue. Dedicating increasing agricultural lands for chat farming at the expense of cereal crops could potentially lead to dwindling grain production and local food availability. In contrast, expansion of chat farming is likely to be associated with its excess supply to the market and a corresponding reduction in price.

Previous findings show that households who produce chat have improved food security due to increased income (Tefera, et al., 2003). According to those interviewed for this case study, this was also true during the 2015–16 drought. However, a dramatic expansion of chat farming in almost all locations in Ethiopia could prevent prices from increasing, at least at a rate less than that of food grains.



© Mulugeta Worku and Peter Crawford, Nov 2015

Image 2: A drought-stricken sorghum field in Kombolcha.

In addition, the challenges of cereal crop production, due to variability of rainfall, are felt almost everywhere. This implies that a subsequently reduced harvest would be supplied to wider market networks in the country. Comprehensive research geared towards better understanding the implications of chat farming in Kombolcha and beyond will therefore be worthwhile.

This case study uses one district to illustrate the decisions farmers are faced with to adapt to an increasingly variable and drought-prone climate. Farmers all over Ethiopia and other semi-arid regions are facing similar decisions during climate shocks that erode household savings. In order to better understand how the 2015–16 Ethiopia drought impacted households, we can look to the debt they may have incurred during the event and how they chose to use their assets. The following case study explores the impact of the 2015–16 drought on household indebtedness (AKLDP, 2016).

The Agriculture Knowledge, Learning, Documentation and Policy Project (AKLDP)

The AKLDP is a five-year project of USAID Ethiopia that provides structured and responsive collaborative learning support across the Feed the Future portfolio, leading to improved agriculture, livestock and pastoral policy and programming. The AKLDP also supports the increased effectiveness of agriculture and livestock development projects through support to reviews, studies and analyses that highlight and document good practice. The AKLDP has played a support role to USAID, the United Nations and development partners in the on-going El Niño response and recovery. This case study is based on interviews, using a standardised questionnaire, with 140 households in South Tigray and Eastern Tigray zones (AKLDP, 2016). For more information on AKLDP visit: www.agri-learning-ethiopia.org

Case Study 2: Household Indebtedness, by Solomon Bogale and Adrian Cullis

In May 2016, some 140 Productive Safety Net Programme (PSNP) and non-PSNP households were interviewed in two severely drought affected woredas – Raya Alamata in South Tigray zone and Kilte Awlaelo in Eastern Tigray zone.

The majority of households in the two woredas are dependent on rainfed farming, although households are increasingly dependent on irrigation, off-farm seasonal employment and seasonal trading. This is particularly true of poorer households that are unable to produce enough food to meet their food and income needs from agriculture.

How do households use assets?

Householders note that at harvest cereals – sorghum, wheat, maize and teff – are divided, with a portion stored for household food consumption and a portion sold. The cash generated from sales is used for schooling, health care, livestock purchase, household improvements, farm inputs and technology, ceremonies and to pay off household debt.

Most smallholders also keep livestock – breeding stock, plough oxen and other animals – for fattening and sale. Livestock graze in communal pastures and arable stubbles. As feed becomes

Productive Safety Net Programme (PSNP)

In 2002–2003 an El Niño related drought resulted in widespread food shortages in the Horn of Africa, affecting an estimated 15 million Ethiopia. In response, the government launched the PSNP in 2005 with the support of international development partners. This is the first national level social protection programme in Africa. The main purpose of the PSNP is to improve household food insecurity and build household assets. The programme provides households with monthly cash and food transfers in exchange for public works.

depleted through the year, livestock are fed crop residues. Fattened animals are sold ahead of seasonal festivals when prices are highest. In drought years – including 2015 – livestock are sold and the income is used to purchase cereals and legumes to fill the household food gap. Livestock sales are therefore a useful proxy indicator of seasonal household wellbeing as well as an important asset for resilience and the smoothing of shocks when markets are available and prices are fair.

The 2015–16 drought and erosion of household purchasing power

In normal years, cereal and legume prices typically fall after the onset of the September harvest and then decline to March the following year, which is followed by prices tending to stabilise through to June, before rising again to the August peak. In contrast, the 2015 drought triggered price increases from August 2015 through to May 2016, with average nominal price increases of 5.7%, 16%, and 15% for maize, sorghum and teff respectively, along with a 22.5% price increase for aggregate pulses. During the same period, however, the price of wheat fell by 10.5%, due to the wheat quality produced in 2015 – the result of the El Niño drought – and significant government imports.

In contrast, the price of livestock fell by 25% for plough oxen, 54% for cows and 38% for sheep and goats during the period of November 2014 to November 2015. Individual household interviews during this case study confirmed that 90% of the households interviewed sold livestock during the September 2015 to May 2016 period, including many that had sold more than one animal.

Households confirmed changes in prices had forced them to sell more animals to secure the equivalent amount of grain. The drought therefore triggered a collapse in livestock-cereals terms-of-trade and severely compromised household purchasing power.

Recent and long-term trends in household indebtedness

Interviews using a standardised questionnaire revealed 106 of the 140 households interviewed had taken additional loans during the September 2015 to May 2016 period. The average size of these new loans was $102 for PSNP households and $112 for those categorised as non-PSNP. In addition, PSNP households had longer-term outstanding loans, averaging $169, while those for non-PSNP households stood at $197. At the time of the study, therefore, average total household indebtedness was $271 and $310 for PSNP and non-PSNP households, respectively.

Causes of household indebtedness

Interviewees offered the following reasons for household indebtedness:

- The 2015 failed *belg* and El Niño induced poor summer *kiremt* rains and poor *meher* harvest, losing livestock production.
- Costs of agriculture inputs steadily rose, but with this particularly applying to fertiliser.
- Loan repayments were inappropriately timed.
- Religious and community festivals incurred high costs.

Reasons for borrowing

In normal years, informants reported borrowing for productive purposes – purchase of agriculture inputs or purchase

of livestock for breeding or fattening. In contrast, as a result of the onset of drought condition and poor harvest, the primary purpose of loans had switched to the purchase of food to meet household food needs.

Informant's perceptions of indebtedness

There was widespread agreement among informants that the main harvest was still several months away, meaning poorer households with unmet food, health, schooling and other requirements would be forced to continue to borrow, as levels of support – PSNP and the emergency assistance – were inadequate.

Informants expressed concern that their increased level of borrowing meant they would not be able to clear all debt in 2016, even after the harvest, and that some of this would be carried over into 2017.

Many of the informants stated that the current level of indebtedness was a 'major burden' (70.8%) and that it would have long-term consequences on livelihoods. While expressing concern for themselves, some articulated concerns for the landless and young families with young children, as it was felt they were particularly vulnerable to rising levels of indebtedness.

Conclusions

While informants attributed recent increases in household debt to the El Niño driven drought, they also reported other factors impacting on current and longer-term indebtedness, including year-on-year price-increases with regard to agriculture inputs. The El Niño-driven drought has therefore only exacerbated levels of indebtedness in the smallholder farming community in the eastern part of Tigray. Levels of household indebtedness are a cause of major concern for the vast majority of households in this area and many in this case study concluded that the effects of the 2015 El Niño-driven drought will continue through the remainder of 2016 and, potentially, into 2017 and beyond if this drought is followed by others in the near future. Households were concerned that, without increased assistance, they will have to continue to sell assets – including livestock – and migrate in search of casual labour in nearby towns and cities.

PREDICTING DROUGHTS AND TAKING ACTION

The ability to predict extreme events well in advance of their onset and impact is key to ensuring government, humanitarian and development actors can take preventative early actions. This predictability depends on the relationship between rainfall and large-scale climate features, such as the El Niño Southern Oscillation (ENSO). Droughts can occur in years without an El Niño, but such an event allows climate models to pick up signs of possible drought in advance of their onset. This is because El Niño (and La Niña) events create known and predictable patterns of increased or reduced rainfall in different parts the world. El Niño interacts with other parts of the ocean-atmosphere system, which means that the pattern is never exactly the same from year to year, but forecast models are typically able to pick up those interactions and integrate them into seasonal forecasts.

What is El Niño Southern Oscillation (ENSO)?

Commonly referred to as 'El Niño', ENSO is a natural climate phenomenon that involves cyclic shift in both the ocean and the atmosphere in the tropical Pacific. ENSO has two phases that its cycles between: El Niño and La Niña. Each phase results in predictable but different changes in weather patterns all over the world.

The June to September *kiremt* rains are important for regions with high agricultural productivity and major water reservoirs, accounting for 50–80% of annual rainfall (Korecha and Barnston, 2006). The El Niño Southern Oscillation (ENSO) is a major driver of the *kiremt* rainy season while local climate indicators have secondary effects (Korecha and Barnston, 2006). How far ahead we can predict seasonal rainfall depends on when the El Niño forms, usually between April and June. While seasonal forecasts are also issued for February to May, the rainfall during this season is not linked to El Niño or La Niña conditions and forecasts have been notoriously unreliable for predicting rainfall deficits in the past (Korecha and Sorteberg, 2013).

Seasonal forecasts for 2015 *kiremt* season

Most global forecasting centres have declared that El Niño conditions officially began in March 2015 (US-based NOAA and IRI) or May 2015 (Australian Bureau of Meteorology). (The thresholds, data sets, and parts of the ocean used observe sea-surface temperatures differ slightly amongst global forecasting centres, accounting for the differences in declaration.) In mid-May that year, many of the seasonal forecasts produced by global or regional forecasting centres showed some indication of unusually dry conditions for the *kiremt* rains. However, the area, confidence and timing differed depending on the forecast.

For example, the consensus-based Greater Horn of Africa Climate Outlook Forum (GHACOF) forecast issued in May 2015 suggests an increased likelihood of near to below normal rainfall (GHACOF 40, 2015). The below normal category was forecast at 35%, only a 2% increased chance from the climatological mean (the expected chance with no forecast). A verification of these forecasts has suggested they are hedged towards the normal category, while below normal rainfall occurs more extensively than is forecast (Mason and Chidzambwa, 2008).

The International Research Institute for Climate and Society's June-August forecast (issued in May 2015) showed no new information for Ethiopia (IRIDL, 2015b). However, the forecasts issued in May (IRIDL, 2015a) and June 2015 (IRIDL, 2015b) indicated that July-September in Eastern Ethiopia would have a 35% to 55% increased chance of below normal rainfall. Finally, the ECMWF long-range forecast for June to August (ECMWF, 2015) strongly indicated a below normal season in roughly the correct north, central and eastern areas of Ethiopia.

Forecast skill in Ethiopia during the June to August season ranges from 0.5 to 0.78 (Columbia, n.d.) (1 being a perfectly skillful forecast, and anything below 0.5 being equivalent to a random guess). While most forecasts in May and June 2015 showed some form of below-average precipitation for parts of the Horn of Africa, they were not the highly confident indications of the risk of reduced rainfall for the season

PRIME (Pastoralist Areas Resilience Improvement through Market Expansion)

PRIME is a Feed the Future initiative with the objective of increasing the incomes of 250,000 households and enhancing resilience to climate change through market opportunities in Ethiopia's pastoral dry land areas. PRIME will achieve its overall objective through the implementation of five intermediate results:

- improving livestock production and productivity
- increasing resilience and ability to adapt to climate change
- strengthening alternative livelihoods for people transitioning out of pastoralism through long-term market opportunities
- improving household nutritional outcomes
- enhancing knowledge management and learning of pastoralist issues.

This climate change adaptation experience is captured and shared by the USAID funded PRIME programme. PRIME is implemented by a consortium of 10 International and national Non-Government Organisations, led by MERCY CORPS and CARE. CARE Ethiopia is the lead agency for the climate change adaptation and PSP work under PRIME. For more details, see www.prime-ethiopia.org

that decision-makers may have been looking for in order to take action.

Making decisions in uncertain conditions is difficult, but there are systems that could be enacted in the future to allow decision-makers to make risk-informed decisions far in advance of a disaster and prompt appropriate early action (Hallegate, 2009). The following case study illustrates one such system, the Participatory Scenario Planning process (PSP).

Pastoralists are already experts in adaptive management, having lived and adapted to environmental challenges for hundreds of years

Case Study 3: Using climate information and Participatory Scenario Planning to help pastoralist communities prepare for El Niño, by Alebachew Adem, Ben Irwin and Sheri Lim.

Dry lowland areas of Ethiopia are among the regions most affected by the global change in climate. Pastoralist communities living in these ecosystems are increasingly affected severely by climatic hazards, such as drought and more erratic and unpredictable rainfall. However, pastoralists are already experts in adaptive management, having lived and adapted to environmental challenges for hundreds of years. Part of their adaptive management capacity includes customary weather forecast systems, using the skills and knowledge acquired through generations. In pastoral communities, individuals are often recognised and valued for having the skills to interpret weather signals. In the Borana pastoral regions, *Ayyantu* (a term for those who look at astronomical features), *Uchu* (those who read animal intestines) and W*aragu* (those who study animal behaviours) are all recognised as sources of climate information.

At the same time, scientific meteorological forecast information has not been widely available to pastoral communities. However, more recently, the Government of Ethiopia National Meteorological

Agency (NMA) is now recognised for its increasingly important role in national, regional and local responses to climate change, particularly the importance of weather forecast information. Most work to date has been targeted towards the national NMA, with training and capacity-building activities. Local level NMA office activity and information to support communities remains limited.

The USAID-funded Pastoral Resilience Improvement through Market Expansion (PRIME) project implemented by a consortium led by Mercy Corp and CARE has introduced the facilitation of regular PSP forums to help pastoral communities access and interpret climate information to inform their seasonal decision-making. These forums bring together both traditional weather and scientific NMA forecasters, community leaders, representative bodies and local government agencies to produce blended forecasts and weather advisories to be disseminated to pastoral and ago-pastoral communities. The PSP approach is underpinned by collective sharing and analysis of past and future weather patterns and predictions, bringing together different stakeholders, decision-makers and information providers on an equal platform. It is also dedicated to understanding people's needs; with this goal guiding what information and advisories should be generated. PSP forums produce quality weather information with a high degree of accuracy and specificity. This enables them to assist pastoralists in making informed decisions on appropriate actions in relation to anticipated weather-related hazards or shocks.

PSP for El Niño preparedness in the Afar region

National forecasts at the time predicted that the El Niño event of 2015 was likely to last through 2015 and possibly extend into early 2016, potentially becoming one of the strongest El Niños of the last 40 years. The south and eastern parts of Afar, Central and northeastern Tigray, along with the south and central Somali regions were expected to be most impacted by El Niño. However, this national level of information was not specific enough to help with local decision-making. PSP workshops were conducted in districts under the PRIME project as part of annual pre-season planning. The weather forecasts and advice generated provided more localised information for pastoral communities to prepare for the impacts of El Niño.

Awash Fentale woreda in the Afar region was one of the districts hardest hit by the 2015 El Niño-driven drought. In February 2015, at its early stages, a PSP workshop was held in the district. The process concerned the forthcoming rainy season, called Sugum in the local language, which runs from late February to early May and the workshop brought together 58 participants, including:

- the regional branch of the National Meteorological Agency (NMA)
- traditional weather forecasters
- clan leaders
- pasture scouts
- representatives of women's groups
- relevant experts from the Woreda-level government, including:
    - pastoral and agricultural development officers
    - crop and livestock extension agents
    - health officers
    - early warning officers.

The meteorological agency presented a review of the rainfall performance during the previous rainy period, Karma in Afari language (known as *kiremt* nationally),

and predictions for the Sugum. The traditional weather forecasters also presented their observations and predictions and were generally in agreement with the scientific projections, notably in terms of predicting a late start to the rains. Community members stressed that this overall assessment did not capture the variability experienced locally, and presented their own experiences and observations for the Sugum to feed into the development of the agreed weather scenarios. Participants also discussed the current status of key crisis indicators, noting that pasture and water were becoming scarce. Another shared prediction was the potential late arrival of the early rains, Lahirobu (meaning 'cattle rains' in the local language). The Lahirobu rains generally last a couple of days and precede the main Sugum rains by about four weeks. They are critical for livestock health because they initiate the growth of fodder after the dry season.

In addition to weather scenarios, the associated hazards, risks, preparedness/mitigation actions and opportunities are discussed and agreed during a PSP workshop. Such weather scenarios and advisories are communicated widely to communities, the public and any agencies that need to be engaged in supporting preparedness action. The process of developing scenarios and advisories brings together different sources. It also facilitates agreement between often opposing ways of generating weather and climate information. This builds trust in the process and the outputs for others to act on the advisories. As a result of this, those involved in the process can become strong champions for ensuring the information is communicated, with the trust that it will be acted upon.

Those involved in the Participatory Scenario Planning process can become champions for ensuring the information is communicated, with the trust that it will be acted upon

The following season, during the July-October 2015 Karma rains, forecasts in parts of Afar, Somali and central and northeastern Ethiopia were pessimistic. In all PRIME woredas in Afar, where PSP events were organised, both traditional and meteorological agency forecasts at the local level predicted below normal rains with pessimistic views on pasture, water, market and livestock conditions. Some of the mitigation and preparedness actions recommended in the advisories were:

- Timely and planned sale of livestock before the advent of the dry season.
- Diversifying animals towards more resilient species (some species of cattle require high amounts of feed and water).
- Cultivating short maturing feed and food crops that can tolerate heat stress and diseases.
- Water harvesting and management, including design of water reservoirs to reduce sun exposure.
- Planned/regular vaccination of livestock (rather than eme rgency vaccination).
- Savings (money, fodder and water in various forms).

Due to the trust and collective process of the PSP, there was a stronger culture of preparedness at household and community levels amongst PRIME pastoral communities throughout El Niño. There was also a reduced loss of animals, with households able to gain better prices from their sale (selling when the animals were in good condition and when the price was higher, rather than during a drought when large numbers would be trying to sell their livestock too).

Lessons from the PSP process during El Niño

Religion presented a major challenge in the PSP process in Awash Fentale. Afar pastoralists are predominantly Muslim. Religious leaders used to be

resistant to the concept of forecasting in and of itself, because they believed that only God can know the future. This necessitated efforts to involve them in the seasonal forecasting process, so they could come to a common understanding of its role. The scale of the meteorological agency forecasts was very large in relation to the area of concern for the Afar communities involved, emphasising the importance of integrating traditional and scientific forecasts. This also underlines the usefulness of valuing and documenting community experiences while observing trends and events in localities. Meteorology experts are not generally accustomed to working at the community level and it was difficult, during the PSP process in Afar, for them to present concepts such as probability in accessible ways, particularly to participants with lower literacy levels. This made the dialogue on the forecasts critically important, as it served as a way of placing the broader scenarios in the local context and building a deeper understanding on both sides.

Access to information is only an initial step. In the initial PSP processes in Afar, participants identified many actions that would require external support and/or inputs in order to be acted upon. This presented a barrier to action in response to the advisories. It is generally understood that, while local government institutions are active participants in the PSP process, they face resource and capacity limitations in supporting community action. To better understand these barriers, PRIME organised a meeting bringing community members together with local government and other institutions to discuss how to better support action in line with the advisories. At the same time, however, it was noted by one of the facilitators that the most recent PSP process yielded significantly more activities where community members themselves held the main responsibility, rather than government or other sources of support. This was a sign of increasing agency, which is critical for climate change adaptation and building adaptive capacity. People need to see the benefits of the advised actions in relation to climate risks to be motivated to act and the most recent PSP process was a good example of this.

This case study demonstrates how preparedness actions at the household level, triggered by a forecast resulted in reduced losses during the drought. The CARE-led PSP process is one of many initiatives in Ethiopia working to pre-emptively act, based on a forecast The Livelihoods, Early Assessment and Protection (LEAP) programme is another example that uses observations of rainfall to estimate whether drought conditions are starting to occur and if there is a risk of food insecurity (Drechsler et al., 2016).

The Ethiopian Red Cross Society along with the Red Cross Red Crescent Climate Centre is piloting Forecast-based Financing (FbF), in which funding and pre-defined early actions are triggered on the basis of a forecast (Coughlan de Perez et. al., 2015). Under FbF, forecasts are verified and their skill analysed for how well they predict observed conditions in the areas of interest. If the forecast is found to be sufficiently skillful (defined by the user's risk appetite), it is used to set 'danger levels', above which it is deemed worthwhile to take action. Funding is set aside in advance of the rainy season, along with a standard operating procedure document that is agreed upon by all actors. This guides the actions that will be automatically triggered on the basis of the danger level.

R4 Rural Resilience Initiative

R4 is a comprehensive risk-management approach, launched by the United Nations World Food Programme (WFP) and Oxfam America (OA) in 2011 to enable vulnerable rural households to increase their food and income security in the face of increasing climate risks. R4 combines improved resource management through asset creation (risk reduction); insurance (risk transfer); livelihoods diversification and microcredit (prudent risk taking); and avings (risk reserves). One of the biggest innovations of the R4 programme is that insurance is provided in exchange of labour carried by individuals on productive assets at the community or household level. In this way, insurance is made affordable to cash-poor farmers, who otherwise would not be able to purchase it. The following case study is based on analysis of R4 initiative in Ethiopia following the 2015–16 drought. For more information visit: www.wfp.org/climate-change/initiatives/r4-rural-resilience-initiative and https://policy-practice.oxfamamerica.org/work/rural-resilience/r4/

One mechanism in place in Ethiopia to reduce the risk of weather-related shocks in 2015–16 was index-based insurance. This mechanism allows farmers to invest in measures that can mitigate the impact of the drought on their assets. The following case study explains how the R4 Rural Resilience Initiative worked during the drought to reduce impacts on farmers in TIgray.

Case Study 4: Index-based Insurance during the 2015 Ethiopia Drought: The R4 Rural Resilience Initiative Case, by Lorenzo Bosi

Insurance payouts typically enable farmers to buy food covering the lean season and also repay existing loans without having to sell productive assets such as oxen and agricultural tools. Some farmers also use the payout to invest in alternative livelihoods such as petty trade. According to the first impact evaluation carried out in Ethiopia in 2012, when more than 12,000 drought-affected households received an insurance payout of over $320,000, in some villages insured farmers saved more than the uninsured, bought more oxen and made further investments in seeds, fertiliser and productive assets. They were also more likely to hire labour and plough oxen. Women, often heading the poorest households, achieved the largest gains in productivity, through investments in labour and improved planting materials. In 2015, a complementary risk fund was launched, providing formal protection to supplement insurance coverage in cases where insurance could not be cost-effective.

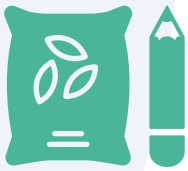
El-Niño and R4 in Ethiopia

As a result of El Niño-related droughts in 2015 and 2016, weather insurance payouts were triggered in Ethiopia, Senegal and Malawi. This led to almost 30,000 farmers and their families – 180,000 people – receiving over $445,000.

As the country with the biggest number of R4 participants, Ethiopia witnessed the lion's share of the payouts. While the programme has been present since 2011 in both the Amhara and Tigray regions,

providing insurance to 27,668 farmers, all payouts during the El Niño event were concentrated in Tigray, with these distributed to 25,773 households.

El Niño brought a major drought across most of Tigray, with substantial yield losses caused by a late start of the rainfall season and significant dry spells along it. In this context, the R4 early window index was triggered in 10 of the 12 Woredas (districts), with unprecedented index levels in many villages.



Insurance can be an importantprotection tool, using the payouts to repay loans, purchase food and buy school supplies for children

In addition to this, the complementary risk fund was effective in its inaugural year, covering some of the drought-related risks for which the insurance could not be cost-effectively offered. It also allowed for a new satellite vegetation component of the insurance to be phased in slowly, prevented farmers from being exposed to untested products and provided formal protection against basis risk: the potential mismatch between the index results and the situation on the ground. After consultations with farmers and data driven adjudication, using fund protocols, the fund complemented the original insurance payouts of $129,899 with another $234,195, which was distributed to all insured farmers in Tigray (an average payout sum of $14 per household). The R4 programme is unique in its kind for having envisioned such a mechanism.

Impact and Lessons Learned

Both R4's 2012 impact evaluation in Ethiopia and the one conducted in Senegal in 2015 confirm that R4's comprehensive risk management approach contributes to farmers' food security in times of climate shocks. R4 achieves this by improving farmers' ability to invest in, and increase, agricultural production in 'normal' times, while providing more diversified and 'safer' ways of storing the increased wealth generated from agriculture.

After the 2015 drought in Tigray, the interviewed farmers mentioned coping strategies such as selling their livestock or spending down their savings, rather than fully resorting to emergency food aid or eating less. In addition, project participants stressed the importance of insurance as a protection tool, mentioning that they used the insurance payouts to repay loans and purchase food and consumable goods, as well as to buy school supplies for their children. In a drought year like 2015, this could have been possible, without insurance, only through the selling of limited assets and sacrificing future productivity.Pertinently, the government encouraged the expansion of R4 to cover additional villages, awarding R4, and its implementing partner REST, with one of the 'Best Development Project' prizes in Ethiopia for 2015. However, a series of lessons have been learned following the 2015 El Niño event, teaching the R4 team how to better face similar crises in the future.

Further improving the indexes

The challenges posed by the 2015 droughts forced the R4 team, in close collaboration with the International Research Institute for Climate and Society (IRI) of Columbia University, to complete the phase-in of a hybrid index. This included the Enhanced Vegetation Index (EVI) to complement rainfall estimates. Dry runs have already shown that such a technical improvement would have improved the response of the index in 2015, increasing the payout amount. Changes in the maximum amount of payouts due between the two periods (windows) covered by the index were also introduced. The original 30%–70% split between the two

windows changed to a 50%–70% split, capped at a maximum 100% payout between the two windows. During 2015, the complimentary risk fund was utilised to offer the supervised protection of these innovations without exposing farmers to untested, experimental products. The phase-in of these successful components will be completed during the 2016/2017 season.

Making insurance more affordable

Lowering the price of insurance further would result in farmers insuring more for the same price and consequently being more protected against droughts. Since 2015, R4 has successfully managed to considerably lower the insurance costs, which has resulted in farmers increasing their usual sum insured by one third.

Increased integration with all R4 components

More efforts are needed to integrate savings and credit components with index insurance as a buffer for non-catastrophic events. Given the success of the complimentary risk fund in 2015/2016, the R4 team is now focusing on more widespread application of the fund, along with further development of the processes for its long-term financial sustainability.

In addition, the R4 initiative is strengthening education to help farmers to better understand the frequency and magnitude of payouts that they should expect from their insurance policies.

Introducing mobile payment systems

Providing timely payouts is crucial in alleviating the effects of droughts on farmers' livelihoods. In order to achieve this, the R4 team is working on setting up a payment system that could disburse payouts immediately after the end of season, instead of waiting for the physical distribution of the cash payouts for a number of weeks.

Insurance is only part of the solution

Although insurance can play a fundamental part in alleviating drought impacts on large communities when major events like El Niño happen, it can only be part of the solution. In this scenario, the Government, local NGOs and humanitarian actors implementing social safety nets or relief response should work closely with R4-like projects to coordinate the outreach to affected communities. In addition, the introduction of seasonal forecasts and better preparedness could be seen as synergic to insurance mechanisms. While insurance could provide payouts at the end of the season, seasonal forecasts and preparedness could inform ad-hoc food security actions to be implemented before and during the season. This would minimise the impacts of the weather risk. In this way, the livelihoods of vulnerable food insecure farmers could be supported throughout all the phases of a drought.

This case study highlights the importance of a) weather index-based insurance mechanism working as part of an integrated risk management framework and b) long-term development initiatives, like social safety nets, to help households bounce back from climate shocks and stresses. New innovations, such as adaptive social protection in which climate information is used to trigger additional payments based on when needs are greatest, are gaining momentum for building the resilience of vulnerable communities (Ulrichs, 2016). While looking at the household level is important in the attempt to understand the issues that need to be addressed and how actions can be taken at the

local level, another key aspect of the Ethiopia drought is how the humanitarian system as a whole responded once the crises began to unfold. The following case study is based on a Value for Money assessment of contingency funding that was provided early during the Ethiopia drought crisis. The study forms one component of the Multi-Year Humanitarian Financing (MYHF) evaluation commissioned by DFID centrally, and uses data gathered during field visits and from an extensive review of partner programming in Ethiopia to construct an analysis of the relative costs of early and late response to the drought (Carbot Venton, 2016).

Case Study 5: The benefits of early response to the 2015/2016 Ethiopia drought, by Courtenay Cabot Venton

The humanitarian system is under substantial pressure. Over the last decade, humanitarian needs have grown six-fold, and the funding provided to respond to these needs has fallen consistently short of what is required. Within this context, humanitarian actors are in a constant state of crisis response mode, struggling to respond to multiple events, with funding typically arriving just as a crisis reaches its peak.

Ethiopia is no exception. Response to drought typically arrives late – despite the fact that drought is slow onset and there is ample time to anticipate and act. During the 2015 drought, only 51% of humanitarian needs had been funded more than three months after the launch of the Ethiopia Humanitarian Requirements Document (HRD).

Early response facilitates early purchase of food and supplies, which can result in substantial savings to donor budgets. Pre-positioning of lifesaving aid can allow for a faster response and save on transportation costs in an emergency. Even more so, it can ensure that families receive the support they need before they begin to engage in negative coping strategies with lifetime economic implications, such as selling off assets and pulling children out of school.

As part of its continued efforts to contribute to the international discourse on improved humanitarian financing, The UK Department for International Development (DFID) commissioned a study to look at the economics of early response to the 2015/2016 drought in Ethiopia, the findings of which are summarised here.

The funding gap for food

The scale of the 2015/2016 drought has put immense strain on the systems underpinning both the PSNP and the HRD, including limited port capacity, trucking capacity and warehouse space.

Food aid typically takes between three and five months from funding to distribution. This makes early funding

Humanitarian Requirements Document (HRD)

The HRD is a joint document issued annually by humanitarian organisations and the Government of Ethiopia. It reviews collective needs and provides projections for the next calendar year and has three objectives: to save lives and reduce morbidity caused by drought; protect and restore livelihoods; and to prepare for and respond to other humanitarian shocks, including flooding and displacement.

for food critical for protection against pipeline breaks. Unlike most years, in this particular drought, local supplies of this commodity are more expensive than those that are internationally procured. As a result of the shortfall in funding, food has not been arriving in Ethiopia fast enough to meet needs. This forces households to turn to purchasing local cereals. Therefore, the cost of filling the food gap locally by providing people with cash transfers to purchase what they need is used as a proxy for the cost of late aid.

The financial cost of late food procurement

Under the HRD, $1.1 billion was requested for food aid. As of 31 March, 2016, $500 million had been funded, leaving a funding shortfall of $600 million.

In June 2016, the cost of procuring cereals locally was 21% higher than international procurement earlier in the year. Cereals comprise 88% of the food basket ($528 million out of the $600m shortfall); substituting local purchase of cereals due to the delay in imported food increases the cost from $528m to $639 million, an additional cost of $111 million, compared to the cost of timely response. This finding is conservative.

The assumption that funds received before April 2016 are 'early' is generous, given that calls for emergency assistance were made as early as August 2015 and also considering the substantial lead time between funding and delivery of food. As of 7 December, 2015, $158.2 million of funding was available for food (Government of Ethiopia, 2016), leaving a food gap of $942 million. Using the same principles applied above, late procurement resulted in an additional cost of $174m for food under this scenario.

If this same analysis is conducted for a pipeline analysis of the food deficit for caseloads under both the HRD and the PSNP, timely funding for the full food requirement could have avoided additional costs of between $127 million and $271 million when compared with late procurement. This funding could have provided an additional 1.4 million to 3 million people with a nine-month food ration.

The economic cost of late food procurement

In reality, it is likely that procurement will not happen in full, with evidence already pointing to households suffering from severe shortages of food and other supplies. A lack of food can, in turn, have lifetime economic consequences for those affected. The existing evidence can be used to make an indicative calculation of the relative magnitude of impact that could result from a lack of response. This suggests that the economic cost of 'no response' could more than double the cost of an early response.

Conclusions

Timely responses to humanitarian crises can result in financial and economic gains, releasing pressure on the overall humanitarian system and freeing up important resources that can be invested in proactive rather than reactive responses. The saved costs from early procurement would provide the donor system with additional resources to meet humanitarian need. Early responses can also have important implications for those affected by a drought, by providing assistance before households have had to resort to negative coping strategies. This can help these same households

Timely funding for the full food requirement could have avoided additional costs of between $127 million and $271 million when compared with late procurement

to shore up for the next crisis, and cope better than they would have otherwise. The combination of decreasing costs and household asset protection can create a virtuous cycle of economic development and poverty reduction.

The Grand Bargain, launched at the 2016 World Humanitarian Summit, specifically calls for new ways of financing humanitarian crises. It refers to flexible funding – including multi-year and un-earmarked humanitarian funding – as the 'lifeblood' of any humanitarian operation. The findings from this study fully support this call. It is imperative that funding models shift to respond to the first signs of a crisis. Flexible funding can allow Implementing Partners to pivot funds depending on need and help stimulate a quicker response. Importantly, mechanisms that trigger early funding based on pre-agreed indicators are critical for overcoming some of the political, institutional and media effects that have held the humanitarian system in a state of crisis response.

Conclusion and recommendations

The El Niño-driven drought in Ethiopia increased the level of debt in smallholder farming communities, resulting in increased borrowing in order to meet household food requirements. The erratic and depressed rainfall also pushed some farmers to take adaptation decisions. These brought uncertain long-term implications, including switching from cereal production to chat farming. In communities in Afar, some pastoralists took action, such as timely selling of livestock and saving based on traditional and scientific forecasts. These actions improved households' abilities to absorb the drought stress, allowing them to avoid some losses.

We have an opportunity to learn from this extreme event and ensure that fewer livelihoods and people are impacted during future extreme events. The evidence is clear that an earlier and more proactive response is significantly more cost effective than a delayed response. Not only are costs of procurement less, but the impact on households is also mitigated through earlier action, reducing longer term economic losses. The lessons from these case studies highlight some of the effective approaches taken to anticipate or absorb climate shocks and stresses, and what can be done to further strengthen resilience.

Financial services for building resilience

Insurance mechanisms during the El Niño-driven drought allowed farmers to repay loans and purchase food and consumable goods, as well as helping them buy school supplies for their children during the drought, without resorting to selling their limited assets and sacrificing future productivity. This adds to a growing body of evidence that financial services, such as insurance, can be an important protection tool for vulnerable people during shocks and stresses. There is a need for these to be more accessible to the most vulnerable people. They also

need to use the latest technology to provide timely services and allow for saving and borrowing in order to insulate against extreme weather events. Financial services are an important part of the solution. However, they must be coupled with anticipatory and shock-responsive actions taken in coordination with development, humanitarian and government actors.

Flexible funding and adaptive programming

It is clear that much work still needs to be done to improve household options during drought, reduce indebtedness and avoid maladaptation and detrimental coping mechanisms. INGOs and NGOs require flexible funding and adaptive programming in order to innovate, protect development gains and respond to the most pressing needs during a crisis. This will allow the organisations that work locally and are well attuned to the needs of communities to pivot funds on the basis of what is needed and help stimulate an appropriately timed response at the very local level. In addition, it can allow these organisations to prioritise funds when forecasts indicate that an extreme event is highly likely to impact the communities they work with.

Addressing research questions from the ground

This drought has brought research questions such as the implications of chat farming on household resilience to the fore. Research that addresses operational and measurement-related questions can be readily applied to inform the design of interventions and eventually result in improved resilience outcomes. For example, research into the viability of rainwater harvesting or other mechanisms for increased water management can inform what types investments in this sector are worthwhile ahead of the next climate shock or stress.

Using climate information to anticipate extreme events

There are already many systems in place that use forecast information to inform decisions, including the PSP process undertaken in Afar, along with the ongoing Forecast-based Financing pilots in Ethiopia and seven other countries around the world. Humanitarian and development practitioners need to take advantage of the information that is available to implement forecast-based action.

Combining forecast information with observations of the current rainfall is also worthwhile. Forecasts can be supplemented by ongoing crop assessments as soon as the rainy season gets underway. These assessments can greatly reduce the uncertainty associated with relying solely on forecasts (no matter how skillful). This, together with cumulative rainfall monitoring (e.g. Rainwatch in West Africa), can give near certainty of impact, which some policy-makers require. This can take place months ahead of an eventual food security emergency.

Trust in climate or weather information, and the person who communicates it is often a deciding factor in whether or not communities take action based on a forecast. When users and producers of climate information are brought together to co-generate and

interpret information, they can co-develop advisories that are suitable for decision-making. Through conversations with users there may also be opportunities to tailor currently available forecast information. For example, forecasts could be tailored to provide the onset dates for the rainy season, which can help farmers know when to plant.

Exciting new frontiers of science, such as seasonal to sub-seasonal forecasting (S2S), may eventually allow forecasters to predict high-impact weather events between two weeks and two months in advance. In fact, these forecasts already exist in some areas, but a review of their skill should be conducted to ensure they provide useful information. This could enable them to become the link between seasonal and weather forecasts, providing information during a time period that has previously lacked it. This new avenue of forecasting, with those already available, can help build anticipatory capacity within the humanitarian system. It has the potential to prevent impacts and reduce the amount of funding needed to respond to future droughts in Ethiopia.

Verifying forecasts

Acting on the basis of a forecast inevitably means actions will be in vain some of the time, because no forecast system is correct all of the time. This means there needs to be a verification of its skill, offering the opportunity to prove it is better than pure chance, for it to be to be useful (particularly for risk-averse decision-makers). A verification analysis can provide information on how often the forecast has been correct in the past, whether it is biased towards predicting more wet or dry periods, and how reliably it has forecast the likelihood of different conditions. In this way, decision-makers can choose the forecast, danger levels and actions that align with their risk threshold. This requires humanitarian and development actors to express demand for forecast verification and work with forecast providers to ensure it becomes standard practice.

El Niño: Connecting actions from global to local scales

Global efforts, led by the UN Special Envoys on El Niño and Climate, are underway to set up Standard Operating Procedures for El Niño and La Niña. While the steering and cooperation at the global level is needed, the impact of El Niño and La Niña varies from region to region and this necessitates that global efforts are linked to regional and national ones. Global thresholds for El Niño have little bearing on the impacts that will occur locally. This means they must be linked to national or sub-national mechanisms that trigger early funding, based on seasonal or short-term forecasts that are specific to a region. In addition, the local vulnerability and exposure to the hazard should be determined at the sub-national level so that funding can be targeted to the areas that are most vulnerable and thus susceptible to impacts. With forecasts of El Niño reaching more people, alongside improved understanding of its implications, we can start to think of it as an opportunity to avoid disaster, instead of a frightening course to an impending crisis.

REFERENCES

Agriculture Knowledge, Learning, Documentation and Policy (AKLDP), (2016) *El Niño and Indebtedness in Ethiopia: Impacts of drought on household debts in Tigray National Regional State.* London: AKLDP (www.agri-learning-ethiopia.org/wp-content/uploads/2016/01/AKLDP-Indebtedness-study.pdf)

Coughlan de Perez, E., van den Hurk, B., van Aalst, M., Jongman, B., Klose, T. and Suarez, P. (2015) 'Forecast-based financing: an approach for catalyzing humanitarian action based on extreme weather and climate forecasts', *Natural Hazards and Earth System Sciences* 15: 895-904. doi:10.5194/nhess-15-895-2015

Davison, W. (2015) 'Ethiopia Faces Worst Drought in 50 Years, Millions Affected'. New York: Bloomberg (www.bloomberg.com/news/articles/2015-12-07/ethiopia-suffering-worst-drought-in-50-years-millions-affected).

Degefu, W. (1987) 'Some aspects of meteorological drought in Ethiopia'. In M. H. Glantz (Ed.), *Drought and Hunger in Africa*. Cambridge: Cambridge University Press.

Drechsler, M. and Soer, W. (2016) 'Early warning, early action: the use of predictive tools in drought response through Ethiopia's productive safety net programme'. Policy Research Working Papers. Washington D.C.: World Bank (http://documents.worldbank.org/curated/en/346411468188663201/Early-warning-early-action-the-use-of-predictive-tools-in-drought-response-through-Ethiopias-productive-safety-net-programme).

ECMWF. (2015) 'Rain (Public charts) – Long range forecast' Reading: European Centre for Medium-Range Weather Forecasts (www.ecmwf.int/en/forecasts/charts/seasonal/rain-public-charts-long-range-forecast?time=2015050100,2928,2015083100&area=Africa&forecast_type_and_skill_measures=tercile%20summary)

Gissila, T., Black, E., Grimes, D. I. F., and Slingo, J. M. (2004) Seasonal forecasting of the Ethiopia summer rains', *International Journal of Climatology* 24: 1345-1358. doi: 10.1002/joc.1078

GHACOF 40. (2015) *Statement from the fortieth Greater Horn of Africa Climate Outlook Forum (GHACOF 40): 25–26 May 2015, Kempinski Palace Hotel, Djbouti.* Bankouale: GHACOF (www.icpac.net/wp-content/uploads/2015/06/GHACOF40_statement.pdf)

Government of Ethiopia. (2016) *Ethiopia humanitarian requirements document: mid-year review.* Addis Ababa: Government of Ethiopia (http://reliefweb.int/sites/reliefweb.int/files/resources/ethiopia_hrd_-_mid_year_review_12_august_2016.pdf).

Hallegate, S. (2009) 'Strategies to adapt to an uncertain climate change', *Global Environmental Change* 19(2): 240–247. doi org/10.1016/j.gloenvcha.2008.12.003

IRIDL, (2015a) 'Forecast for Jun-Aug 2015, Forecast Issued May 2015.' New York: International Research Institute for Climate and Society (http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A26.21%3A-28.80%3A65.10%3A17.22%3Abb&F=May%202015&L=1.0)

IRIDL, (2015b) 'Forecast for Jul-Sep 2015, Forecast Issued May 2015.' New York: International Research Institute for Climate and Society (http://iridl.ldeo.columbia.edu/maproom/IFRC/FIC/prcp_fcst.html?bbox=bb%3A26.21%3A-28.80%3A65.10%3A17.22%3Abb&F=May%202015&L=2.0)

Korecha, D. and Barnston, A. (2006) 'Predictability of June-September Rainfall in Ethiopia', *Monthly Weather Review* 135(2): 628–650 (http://dx.doi.org/10.1175/MWR3304.1).

Korecha, D. and Sorteberg, A. (2013) 'Validation of operational seasonal rainfall forecast in Ethiopia', *Water Resources Research* 49: 7681–7697. doi:10.1002/2013WR013760.

Mason, S. and Chidzambwa, S. (2008) 'Position Paper: Verification of African RCOF Forecasts'. New York: Columbia University Academic Commons (http://hdl.handle.net/10022/AC:P:8908).

Singh, R., (2016) 'Reality of Resilience: Learning from climate extremes', BRACED Knowledge Manager Working Paper. New York: BRACED.

Tefera, T. L., Johann, K. and Sylvain, P., (2003) 'Market Incentives, Farmers' Response and A Policy Dilemma: A Case Study on Expansion of Chat Production as a Cash Crop in the Eastern Ethiopian Highlands'. International Conference on African Development Archives. Paper 71. Kalamazoo: Western Michigan University (http://scholarworks.wmich.edu/africancenter_icad_archive/71).

Ulrichs, M. (2016) 'Increasing People's Resilience Through Social Protection'. BRACED Knowledge Manager Resilience Intel Paper. London: ODI.

Cabot Venton, C. (2016) 'The Economic Case for Early Humanitarian Response to the Ethiopia 2015/2016 Drought' London: DFID (https://static1.squarespace.com/static/5567b109e4b0101076d7f0bd/t/581b75e0cd0f68b05009b283/1478194658325/Ethiopia+Contingency+Analysis.pdf)

Walker, B. (2016) Seasonal Weather Assessment for Ethiopia during March-July 2016. London: Government of the United Kingdom (http://reliefweb.int/report/ethiopia/seasonal-weather-assessment-ethiopia-during-march-july-2016).

ACKNOWLEDGEMENTS

The authors would like to thank Carina Bachofen (Red Cross Red Crescent Climate Centre), Elizabeth Carabine (Overseas Development Institute), Ashley Curtis (International Research Institute for Climate and Society) and Richard Ewbank (Christian Aid) for their review of earlier versions of this report. This report has benefited from the insights Climate Information and Assets for Resilience in Ethiopia (CIARE) BRACED project. We would also to acknowledge, Amanuel Zenebe Abraha (ENDA Energie), Sophia Belay (Oxfam America), Dan Osgood (International Research Institute for Climate and Society), Demelash Geleta (Action Aid) and Gemechu Kebede (Action Aid) for their support to various parts of this report.

DISCLAIMER

The findings and conclusions detailed in this report are those of the author(s) alone and do not necessarily reflect the views of the Red Cross Red Crescent Climate Centre, the IFRC or its National Societies.

The report and any links it may contain are offered to stimulate discussion and thinking on the humanitarian and development impacts of climate change and variability.

Note to reader, all dollar prices stated in the paper are USD.

UKaid
from the British people

The BRACED Knowledge Manager generates evidence and learning on resilience and adaptation in partnership with the BRACED projects and the wider resilience community. It gathers robust evidence of what works to strengthen resilience to climate extremes and disasters, and initiates and supports processes to ensure that evidence is put into use in policy and programmes. The Knowledge Manager also fosters partnerships to amplify the impact of new evidence and learning, in order to significantly improve levels of resilience in poor and vulnerable countries and communities around the world.

Designed and typeset by Soapbox, www.soapbox.co.uk