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ECONOMICS OF RESILIENCE TO DROUGHT

ETHIOPIA ANALYSIS

This report was prepared by Courtenay Cabot Venton for the USAID Center for Resilience
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ACRONYMS

ASALs	Arid and Semi-Arid Lands
BCR	Benefit to Cost Ratio
DFID	Department for International Development (UK)
FEWSNET	Famine Early Warning Systems Network
FTS	Financial Tracking Services
GDP	Gross Domestic Product
HEA	Household Economy Approach
KG	Kilogram
LEWIE	Local Economy-Wide Impact Evaluation
LPT	Livelihood Protection Threshold
MT	Metric Tons
PSNP	Productive Safety Net Programme
USG	United States Government
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WASH	Water, sanitation and hygiene
WHO	World Health Organization
WFP	World Food Programme

SUMMARY OF KEY FINDINGS

AIM

The aim of this study is to investigate the impact of an early humanitarian response and resilience building on humanitarian outcomes in the Tigray and Somali regions of Ethiopia, both in terms of cost savings, as well as the avoided losses that can result from a more proactive response. The study investigates existing data and empirical evidence, and uses this to model the relative costs of different response scenarios.

KEY FINDINGS

The impacts of drought on households are complex and interrelated, with spikes in need arising from a combination of physical changes to rainfall, fodder and vegetation, price changes in local markets, as well as other factors such as the quality of institutional response and conflict, for example. Further, high impacts of drought in one year can have strong effects on households' abilities to cope in subsequent years.

It is very hard to measure this complex web of interactions and outcomes empirically. Hence, this analysis combines empirical evidence with the Household Economy Approach (HEA) to model the potential impact of different response scenarios over 15 years, for a population of 8.7 million across 17 livelihood zones. The model is dynamic, allowing impacts in one year to carry forward into subsequent years, and hence gives a nuanced prediction of how different interventions may affect humanitarian need over time.

Key Findings:

- An early humanitarian response would save an estimated US$965 million on cost of response alone over a 15-year period. When avoided income and livestock losses are incorporated, **an early humanitarian response could save US$1.2 billion, or an average of US$151 million per year**.

- Safety net programming at a transfer level of US$245/US$262 per household reduces the net cost of humanitarian response, saving an estimated US$1.2 billion over the cost of a late response. When this figure is adjusted to account for the benefits of the transfer beyond filling the food deficit, a safety net scenario saves US$1.4 billion over the cost of a late response. When avoided losses are incorporated, **a safety net transfer could save US$1.9 billion, or an average of US$127 million per year.**

- A resilience building scenario that results in an additional increase in income of US$120 per household reduces the net cost of humanitarian response by an estimated US$1.2 billion over the cost of a late response. When this figure is adjusted to account for the benefits of the transfer beyond filling the food deficit, a resilience scenario saves US$1.7 billion over the cost of a late response. When avoided losses are incorporated, **resilience building could save US$2.2 billion, or an average of US$150 million per year.**

- **Investing in early response and resilience measures yields average benefits of $3.3 for every $1 invested in the Somali region, and US$2.4 for every $1 invested in Tigray.**

- **When these estimates are applied to total U.S. Government (USG) spending on emergency food aid in Ethiopia, the USG could have saved US$1.2 billion over 15 years, a savings of 35% of total emergency spend.**

Figure E1: Total Net Cost of Response, Ethiopia, US$ Million

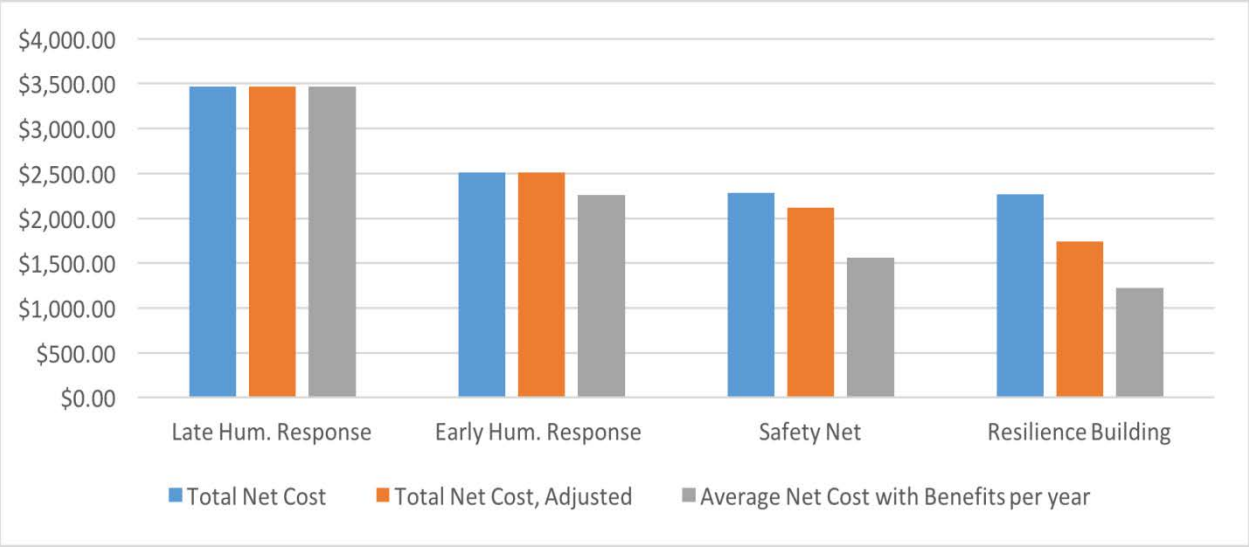


TABLE E1: SUMMARY OF COSTS, SOMALI AND TIGRAY, USD MILLION				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost, 15 years, discounted	$3,471.0	$2,506.4	$2,282.7	$2,266.4
Savings		*$964.6*	*$1,188.3*	*$1,204.6*
Total Net Cost, adjusted, 15 years, discounted	$3,471.0	$2,506.4	$2,118.6	$1,738.2
Savings		*$964.6*	*$1,352.4*	*$1,732.8*
Total Net Cost with Benefits, 15 years, discounted	$3,471.0	$2,262.7	$1,564.0	$1,226.9
Savings		*$1,208.2*	*$1,907.0*	*$2,244.1*
Average Net Cost with Benefits per year	$231.4	$150.9	$104.3	$81.8
Savings		*$80.6*	*$127.1*	*$149.6*

DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

The findings presented above clearly indicate that a scenario that seeks to build people's resilience to drought through a mixture of activities that build income and assets is significantly more cost effective than continuing to provide an emergency response.

In Tigray, investments in agricultural production have significantly and cost effectively mitigated a slide into deeper food insecurity. A comparison of 2006 and 2016 baseline data in Tigray reveals that household economies have not improved over the previous 10 years. However, the story is more complex, as agricultural production and yields have improved significantly, but have been offset by decreases in average landholdings due to population growth. The HEA model is used to estimate what would have happened to food security in Tigray if these investments had not been made, and estimates that the cost of response has been reduced by over US$1500 per household over the 15-year period, with substantial increases in income and livestock as a result of intervention.

The finding that resilience building is most cost effective is amplified by evidence on the impact of a more proactive approach to drought risk management. The analysis presented here was able to account for the cost of meeting people's immediate needs, as well as the impact on household income and livestock (measured as 'avoided losses'). However, the estimated savings are likely to be very conservative, as evidence globally is clear that investing in the types of activities that can allow people to cope in crisis times can also bring much wider gains in 'normal' times, and these gains would substantially increase the economic case for a proactive investment.

Reducing humanitarian impacts through greater resilience requires investment in complementary and layered approaches to build sustained change. Further, strengthening household resilience will require a mix of support for both consumption and production.

Investment in shock responsive and adaptive management approaches that can respond to the particular context and changing circumstances of households should help to realize outcomes most effectively. The analysis presented here makes the case for greater investment in resilience building, by demonstrating that initiatives to increase household income in advance of a crisis or shock are more cost effective than waiting and responding to a humanitarian need. However, this increase in income can be achieved by a variety of combinations of interventions. Further work is required to monitor the impact, and cost effectiveness, of packages of resilience building interventions. Even more so, a much broader perspective on adaptive investment that can respond to the multiple and changing needs of households and communities may be required to truly address resilience in an effective and sustained manner.

Intervening early to respond to spikes in need – i.e. before negative coping strategies are employed - can deliver significant gains and should be prioritized. While building resilience is the most cost effective option, there will always be spikes in humanitarian need, and having the systems in place to respond early when crises do arise will be critical. The model estimates that cost savings alone could result in total savings of US$965 million over the 15 years, or approximately US$64 million per year in Tigray and Somali alone. These funds could go a long way towards investing in a more complete package of resilience interventions.

A greater use of cash could add significant cost savings and bring benefits to the local community. Cash could bring cost savings both through reducing the cost of humanitarian aid and the cost of safety net transfers, as well as through benefits realized in the local economy. However, the findings do not suggest that cash should be used in all contexts, but rather only where conditions are appropriate.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 OVERVIEW OF THE STUDY

The aim of this study is to investigate the impact of an early humanitarian response and resilience building on humanitarian outcomes, both in terms of cost savings, as well as the avoided losses that can result from a more proactive response.

The study investigates the evidence for four broad scenarios. The late humanitarian response scenario is the counterfactual. The early response, safety net, and resilience scenarios build on each other from one scenario to the next, layering in additional changes with each scenario:

- **LATE HUMANITARIAN RESPONSE:** (counterfactual): This scenario estimates the cost of response and associated losses of a humanitarian response that arrives after negative coping strategies have been employed and after prices of food and other items have begun to destabilize.

- **EARLY HUMANITARIAN RESPONSE:** This scenario estimates the cost of response, as well as the reduction in humanitarian need and avoided losses, as a result of an earlier response. This response is assumed to occur before negative coping strategies have been employed, and before prices of food and other items have destabilized, thereby reducing household deficits and avoiding some income and livestock losses.

- **SAFETY NET:** This scenario integrates a safety net transfer into the early humanitarian response scenario. An increase in income, equivalent to the value of existing safety net transfers under the PSNP, is provided to all very poor and poor households in every year of the model. Combined with the effects of the early response, this transfer can be used to fill household deficits and reduce income and livestock losses even further.

- **RESILIENCE:** This scenario incorporates an additional increase in household income, on top of the safety net transfer, as a result of resilience building. This scenario is defined by the outcome – namely an increase in income - as a result of investment in resilience building; it does not specify the activities that lead to this change, or the resilience capacities (i.e. sources of resilience) that enable this outcome to be sustained over time in the face of shocks and stresses.

This report presents the analysis for Ethiopia. It is complemented by reports for Kenya and Somalia, as well as a summary report for all three countries. The full set of reports can be found here.

1.2 DROUGHT IN ETHIOPIA

The Horn of Africa is dominated by arid and semi-arid lands (ASALs). These areas are characterized by low and irregular rainfall as well as periodic droughts. The droughts can vary in intensity, but the region is no stranger to devastating conditions brought on by weather, conflict, government neglect or a combination of each. Between 1900 and 2011, more than 18 famine periods were registered in the region's history.[1] In 1985 a highly destructive drought in the area killed nearly 1 million people and in the last decade major droughts have occurred in 2001, 2003, 2005/06, 2008/09, 2011 and 2015/2016. Ethiopia is vulnerable to drought, with greater than a 40% annual probability of moderate to severe drought during the rainy season.[2] In Ethiopia, 70% of the country's land is categorized as drylands.

TABLE 1: HISTORICAL COMPARISON OF DROUGHT EVENTS IN ETHIOPIA

MAJOR DROUGHT EVENTS	INTERNATIONAL HUMANITARIAN AID RECEIVED (US$)[3]	NUMBER PEOPLE AFFECTED[4]
2011	823m	4.5m
2008	1,078m	6.4m
2005	545m	2.6m
2003	496m	12.6m

In Ethiopia droughts have a significant effect on the national economy. According to the Financial Tracking Service (FTS) at UNOCHA, emergency aid for droughts has averaged US$509 million per year over the last 10 years (excluding the cost of refugee operations for the major camps on the border with Somalia). Oxfam estimates that drought alone costs the country US$1.1 billion per year.[5] By comparison, in 2011 Ethiopia's Gross Domestic Product (GDP) was US$95 billion.[6] Figure 1 shows how GDP growth tracks rainfall variability in Ethiopia.

1 HTTP://WWW.GLOBALHUMANITARIANASSISTANCE.ORG/WP-CONTENT/UPLOADS/2011/07/GHA-FOOD-SECURITY-HORN-AFRICA-JULY-20111.PDF

2 HORN OF AFRICA NATURAL PROBABILITY AND RISK ANALYSIS, BARTEL AND MULLER, JUNE 2007.

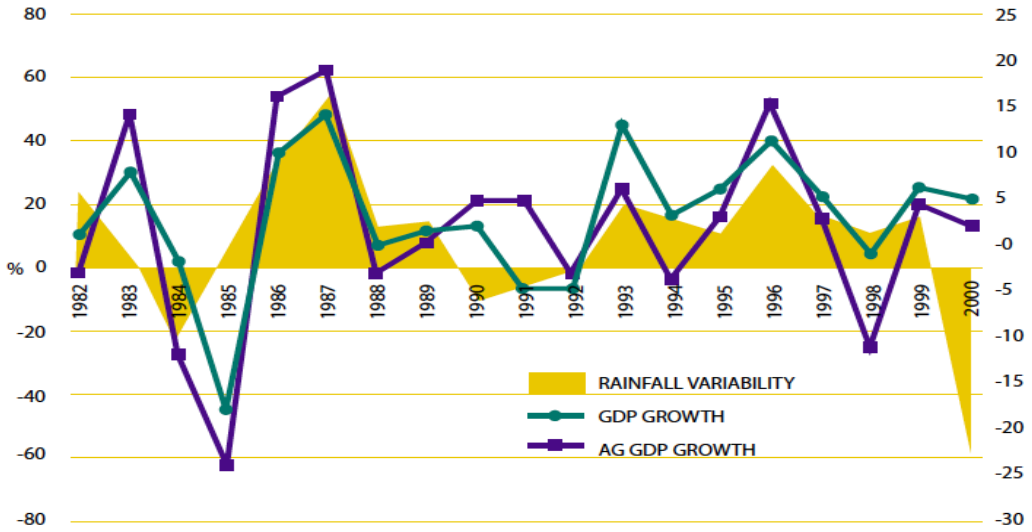
3 FINANCIAL TRACKING SERVICE OF UNOCHA

4 BASED ON THE CRED DATABASE (HTTP://WWW.EMDAT.BE)

5 OXFAM. (2011). "BRIEFING ON THE HORN OF AFRICA DROUGHT 2011: DISASTER RISK REDUCTION – FUNDAMENTAL TO SAVING LIVES AND REDUCING POVERTY."

6 CIA WORLD FACTBOOK, HTTPS://WWW.CIA.GOV/LIBRARY/PUBLICATIONS/THE-WORLD-FACTBOOK/GEOS/KE.HTML.

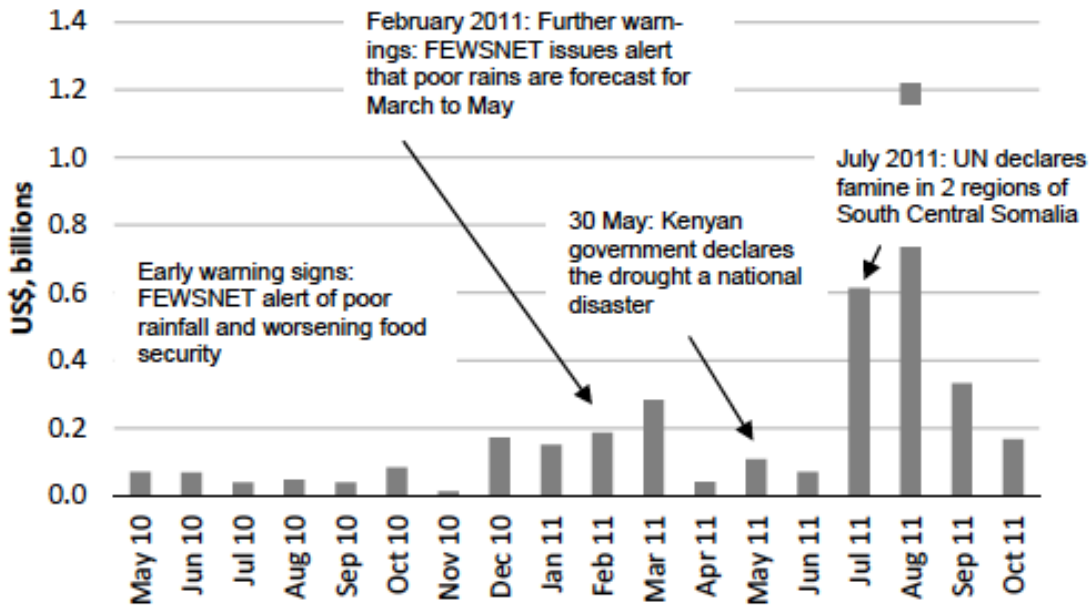
Figure 1: Economic Growth and Climate in Ethiopia[7]



During the 2006 drought, despite warnings that came as early as July 2005, substantial interventions did not start until February 2006. Additionally, during the recent 2011 drought, early warnings of poor rainfall were noted as early as May 2010. In February of 2011, the Famine Early Warning Systems Network (FEWSNET) issued a further warning that poor rains were forecasted for March to May. However, as Figure 2 shows, humanitarian funding did not increase significantly until the UN declared a famine in Somalia in July 2011. At this point, thousands had already suffered.

7 DE JONG, THE WORLD BANK (2005) IN WORLD BANK (2010) "THE ECONOMICS OF ADAPTATION TO CLIMATE CHANGE: ETHIOPIA". THE WORLD BANK GROUP, WASHINGTON, DC.

Figure 2: Humanitarian Funding for Ethiopia, Somalia and Kenya, 2010/2011[8]



In 2015-2016, Ethiopia experienced a severe drought that required the delivery of US$1.7 billion in food assistance to nearly 17 million people. The drought was concentrated in the crop producing regions in the north and west, leading to a significant shortfall in food availability. Straight off the back of the 2016 El Nino drought, in January 2017, the United Nations appealed to the General Assembly for an additional US $900 million to support roughly five million more people, this time with the most severe impacts felt in the pastoral regions of southern Ethiopia.[9]

1.3 STRUCTURE OF THIS REPORT

This report is structured as follows:

- Section 2 presents details on the overall approach to the analysis.
- Section 3 presents the findings from modeling across 13 livelihood zones in Tigray and 17 livelihood zones in Somali, representing a population of approximately 8.7 million people.
- Section 4 presents a discussion of the key findings and policy implications.

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8 SAVE THE CHILDREN, OXFAM (2012). "A DANGEROUS DELAY: THE COST OF LATE RESPONSE TO EARLY WARNING IN THE 2011 DROUGHT IN THE HORN OF AFRICA". DATA TAKEN FROM OCHA FINANCIAL TRACKING SERVICE (FTS)

9 K MIGIRO, NEW DROUGHT STRIKES MILLIONS IN ETHIOPIA, STILL REELING FROM EL NINO. REUTERS. 2017. HTTP://UK.REUTERS.COM/ARTICLE/UK-ETHIOPIA-DROUGHT-AID-IDUKKBN1511UH

- Annex A summarizes an overview of empirical evidence on the impact of early response and resilience on humanitarian and longer term outcomes in Ethiopia.
- Annex B contains full details of the HEA modeling and underlying assumptions.

2 OVERALL APPROACH AND METHODOLOGY

2.1 OVERVIEW

Review of Existing Evidence

A review of empirical evidence was conducted to identify any completed or ongoing data collection that specifically aims to understand the impact of early intervention and resilience building on outcomes in a crisis. It was not within the scope of this study to conduct new primary data collection. Further, understanding the shifts in outcomes in different disaster contexts requires the collection of longitudinal data over multiple years to observe change, and a multi-year study was outside of the scope of this study. Therefore, the aim was to investigate whether other ongoing data collection efforts are able to identify the impacts of a more proactive response.

We also reviewed the literature to look for any studies that have already sought to understand the impact of an early response and/or resilience building, specifically on humanitarian outcomes. This review is presented in Annex A.

Modeling the Economics of Resilience

The second part of the analysis used the available empirical evidence, combined with the Household Economy Approach (HEA), to create an economic model that estimates the potential change in outcomes due to an earlier response.

The empirical evidence provides a useful snapshot in time of the potential impact of investments on food security and other outcomes. However, we also know that the impacts on households are complex and interrelated, with spikes in need arising from a combination of physical changes to rainfall, fodder and vegetation, price changes in local markets, as well as other factors such as the quality of institutional response and conflict, for example. Further, high impacts in one year can have strong effects on the ability of households to cope in subsequent years.

It is very hard to measure this complex web of interactions and outcomes empirically. Hence, this part of the analysis uses HEA, underpinned by empirical data where relevant, to model the potential impact of different response scenarios over 15 years. The model is dynamic, allowing impacts in one year to carry forward into subsequent years, and gives a more nuanced understanding of how different interventions may affect humanitarian need over time as a result.

The methodology can be summarized as follows – each of these steps are described in greater detail below:

- The HEA model uses actual baseline data on household economies, combined with actual price, production and rainfall data for the last 15 years, to estimate the size of the household food deficit whenever there is a change in any of these three variables.

- The HEA model is first run assuming a late humanitarian response, at the point where prices have destabilized, and negative coping strategies have been engaged. The model is the run three more times, each time accounting for a different set of parameters for early response, a safety net transfer, and a resilience scenario.

- The HEA model provides estimates of the number of people with a food deficit and the size of that deficit for each of the 15 years modeled, for each of the four scenarios. This shows how humanitarian need changes with each scenario.

- The HEA model also generates estimates of total household income and average livestock holdings for each scenario. Differences in these outcomes from one scenario to the next are then used to measure avoided losses.

- The economic model then estimates the economic cost of each scenario. While humanitarian need is reduced under each successive scenario, this needs to be offset by the cost of providing the safety net transfer and resilience inputs, to determine the scenario that is most cost effective. Data on the cost of humanitarian response (differentiated depending on whether it is provided late or early), and the cost of safety net transfer/resilience programming, is combined with the HEA data on estimated deficits to create an economic model that estimates the total net cost of each scenario considered.

2.2 HOUSEHOLD ECONOMY ANALYSIS

HEA is a livelihoods-based framework for analyzing the way people obtain access to the things they need to survive and prosper. It was designed to help determine people's food and non-food needs, and identify appropriate means of assistance, whether related to short-term emergency needs or longer term development program planning and policy changes.

HEA is based on the principle that an analysis of local livelihoods and how people make ends meet is essential for a proper understanding of the impact – at household level – of hazards such as drought or conflict or market dislocation.

The objective of HEA-based analysis is to investigate the effects of external hazards and shocks (whether negative or positive) on future access to food and income. Three types of information are combined: (i) information on baseline access to food and income; (ii) information on hazard (i.e. factors affecting access to food/income, such as livestock production or market prices) and (iii) information on household level coping strategies (i.e. the strategies households can use to increase access to food or income when exposed to a hazard).

HEA Scenario Analysis compares conditions in the reference year to conditions in the current or modeled year, and assesses the impact of such changes on households' ability to meet a set of defined minimum survival and livelihoods protection requirements.

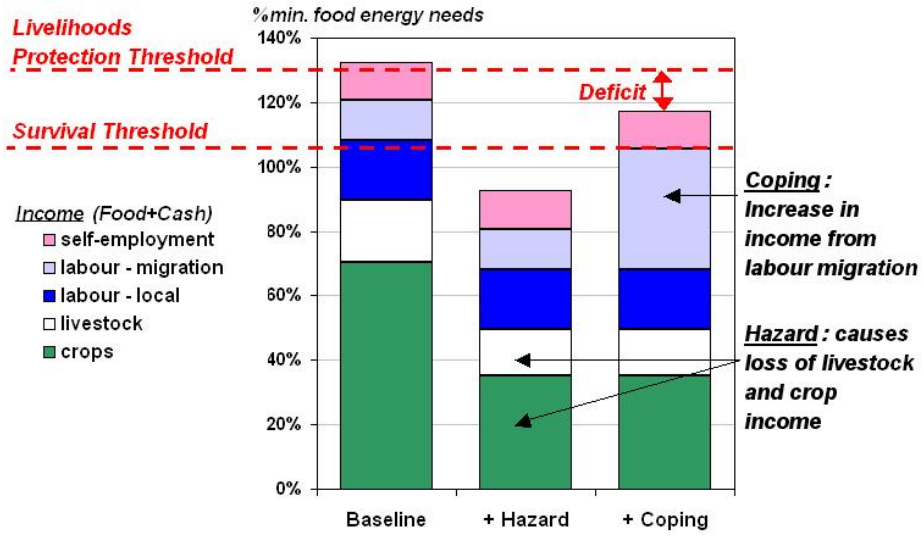
In HEA outcome analysis, projected 'total income' – or the sum of all food and cash income households secure, converted into a common unit or currency (either %kcals or cash) – is compared against two thresholds. These thresholds are defined on the basis of local patterns of expenditure, and in the case of the analysis presented here, the Livelihoods Protection Threshold (LPT) is used as the level required for households to be able to meet their own needs and not incur a deficit. Figure 3 shows the steps in an outcome analysis.

Figure 3: An Example of Outcome Analysis

First, the effects of the hazard on baseline sources of food and cash income are calculated (middle bar in the chart).

Then the effect of any coping strategies is added (right-hand bar).

Finally, the result is compared against the two thresholds to determine the size of any deficit.



Note: *This graphic shows changes in total income, i.e. food and cash income added together and, in this case, expressed in food terms.*

2.2.1 HEA ASSUMPTIONS

The HEA model uses actual rainfall, crop and price data (adjusted for inflation) from 2000 to 2015 and is conducted for livelihood zones where baseline data has been collected[10] across a population of 8.7 million in 17 livelihood zones across Tigray and Somali regions.

The HEA model provides the following output by year, livelihood zone, and wealth group:

- Number of people with a food deficit and therefore in need of humanitarian assistance;
- The magnitude of the food deficit measured in Metric Tons (MT); and
- The total income and livestock value for the population modeled.

This data can then be used to estimate the number of people in need, and the size of that need, and how this deficit changes when the model considers different types of response.

The hypothesis is that early intervention reduces the amount of assistance that is required to fill household deficits. In other words, if you intervene early, you will not need to provide as much assistance as if you intervene late. The assumptions that underlie this hypothesis are described below. It should be noted that there is very little concrete data on these putative effects, and the early and late intervention scenarios are based primarily upon logical deduction, not field data.

Early intervention can also reduce the deficit in post-shock years, which is why it is important to run the analysis over a sequence of years, to assess the full effects of early versus late intervention. These carry-over effects are linked to reductions in the use of medium- and high-cost coping strategies in the 'shock' year[11].

- In general terms, the main expected effects of early compared to late intervention are to:
- allow purchase of staple food earlier in the year, at lower prices than in the case of late intervention,
- reduce the use of certain types of coping (e.g. increased casual labor and self-employment[12])
- counter any decline in prices for livestock, labor and self-employment products.
- increase expenditure on crop and livestock inputs, with positive effects on next year's production.

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10 SOURCES OF BASELINE DATA ARE AS FOLLOWS: ADESO/ACTED/KASMODEV (WWW.ADESOAFRICA.ORG, WWW.ACTED.ORG, AND KASMODEV.COM), FSNAU/FEWS NET (WWW.FSNAU.ORG AND WWW.FEWS.NET)

11 NOTE: VERY HIGH COST COPING STRATEGIES, SUCH AS DISTRESS MIGRATION, SALE OF ALL ANIMALS OWNED, SALES OR MORTGAGING OF LAND, ARE GENERALLY EXCLUDED FROM AN HEA OUTCOME ANALYSIS. THIS IS BECAUSE THE OBJECTIVE OF THE ANALYSIS IS TO DETERMINE THE LEVEL OF DEFICIT BEFORE THESE STRATEGIES ARE USED, I.E. TO ESTIMATE THE AMOUNT OF ASSISTANCE THAT SHOULD BE PROVIDED TO PREVENT PEOPLE TURNING TO THESE DAMAGING STRATEGIES.

12 SELF-EMPLOYMENT INCLUDES ACTIVITIES SUCH AS FIREWOOD AND CHARCOAL COLLECTION, BRICK-MAKING, SMALL-SCALE PETTY TRADE AND CARPENTRY.

- increase expenditure on human health and food, increasing labor productivity compared to late intervention

In the case of resilience, the model considers a scenario where a safety net transfer is complemented by investments that increase household income by a set amount. Household incomes could be increased by a wide range of resilience interventions, as investments in health, education, income diversification, roads, markets, etc. ultimately all result in a change in household incomes, whether directly through improvements to household income, or indirectly through cost savings on health or other expenses. Any type of intervention that improves disposable income could be considered here and further work on the cost effectiveness analysis of different types of interventions will help to build this analysis.

Annex B contains a full description of the HEA assumptions and data used for this analysis.

2.3 ECONOMIC MODEL: DATA COMPONENTS

The following section describes each of the data components that underpin the model. Table 6, presented at the end of this section, summarizes these data for easy reference, and the findings are presented in Section 3. All figures are presented in 2015/2016 dollars.

2.3.1 COST OF HUMANITARIAN RESPONSE

The total cost of humanitarian response is measured by combining the total number of people with a food deficit (as predicted by the HEA model) with the unit cost of filling that deficit.

Number of people affected: HEA measures the total number of people with a food deficit for each year of the model.

Magnitude of the deficit: HEA also measures the magnitude of that deficit, measured in terms of the number of MT required per person to fill the food deficit. We refer to this as the MT weighting factor. This measure is very important, because it reflects the fact that while some people may still require assistance, the level of the assistance required may have decreased.

The overall model is built on the number of people facing a deficit, as this is how aid is normally delivered. However, to reflect the fact that there can be substantial declines in the amount of aid required per person, we weight the total food aid required each year according to the ratio of the deficit compared with the late response scenario (see Table 2). For example, the deficit decreases from an average of 69 Kilograms (KG) to 60 KG per person between the late and the early response scenarios in Somali region. We therefore weight the cost of response under the early scenario downwards by a factor of 0.87 (the ratio of 60 to 69). The deficit actually increases slightly from an early to a safety net/resilience scenario – but this is minor, and overall the number of beneficiaries and total deficit decreases between each scenario.

TABLE 2: FOOD DEFICIT, AVERAGE KG REQUIRED, PER PERSON PER YEAR		
	DEFICIT - SOMALI	DEFICIT - TIGRAY
Late	68.6	69.9
Early	59.6	50.4
Safety Net	63.3	18.0
Resilience Building	63.5	21.3

Unit Cost of Humanitarian Response: A typical food basket is made up of cereals, pulses and oil. The full cost is estimated using data from the World Food Programme (WFP) on the cost of commodity procurement, transport and storage, as well as all administrative and overhead costs. The following assumptions are made:

- For a **late response**, cereals and pulses are purchased internationally at peak prices. The WFP estimates a cost of US$899 per MT of food aid, or US$91 per person for a 6-month package of support using a full ration.
- For an **early response**, it is assumed that cereals, pulses and oil continue to be purchased internationally, but in advance when prices are optimized, estimated at US$817 per MT, or US$83 per person, equivalent to a 9 percent reduction in costs over a late response.
- It is also possible that more local purchase could be made at lower prices and lower transport and handling costs. Local procurement could significantly reduce this cost even further, to US$540 per MT, or US$55 per person. This figure is not used in the analysis but highlights the significant cost savings that can come from more local purchase.
- The same set of assumptions is used for an early response using a safety net approach and for the resilience building scenarios. However, it should be noted that a greater use of cash and local procurement could significantly reduce this cost further. Therefore, the analysis is also run assuming that cash, rather than in-kind food aid, is used for any remaining food deficit. Cash is estimated at US$423 per MT equivalent, or US$43 per person.

TABLE 3: UNIT COST OF RESPONSE		
	COST PER MT	COST PP
Intl Purchase, peak	$899	$91
Intl Purchase, optimized	$817	$83
Cash	$423	$43

The cost of response is applied to the total number of people in need of assistance as modeled by the HEA.

Food aid is not the only component of a humanitarian response. Aid can also include malnutrition treatment, WASH, shelter and other items. Food aid represents on average 74% of the total cost of humanitarian response[13], and hence the figures presented here are inflated to represent the full cost of a humanitarian response.

2.3.2 COST OF PROGRAMMING

In the case of an early response, the model assumes that assistance arrives before market prices have increased, and before negative coping strategies have set in, and then estimates the resulting food deficit. As such there is not a specific additional cost associated with an early humanitarian intervention. However, in the case of the safety net and resilience building scenarios, specific interventions with additional associated costs are layered into the model.

Safety Net

The model assumes that a transfer under the Productive Safety Net Programme (PSNP) is made to very poor and poor households every year. The following costs and transfer amounts are based on actual PSNP cost and transfer amounts.

In the case of Somali region, a food transfer of a 6-month ration (consisting of 15kg cereals and 4kg of pulses) is made every year to all very poor and poor households, across all 15 years modeled. The cash value of this transfer is estimated at US$245 per household. The cost of this transfer is estimated at US$284 per household (administrative, M&E and all associated costs are 16 percent of the total cost of providing a transfer; the remainder is the transfer itself).

In Tigray, transfers are roughly equivalent to 3 months of food and 3 months of cash. When the food portion is transferred into cash equivalent, the total value of the transfer is approximately US$262 per

13 THE RATIO OF FOOD AID TO TOTAL AID COSTS CAN VARY QUITE SIGNIFICANTLY. IN ETHIOPIA, THE 2016 HUMANITARIAN REQUIREMENTS DOCUMENT (HRD) CALLED FOR US$1.4 BILLION IN HUMANITARIAN AID, OF WHICH US$1.2 BILLION WAS FOOD (85%). THE 2017 HRD CALLED FOR A TOTAL OF US$948 MILLION OF WHICH US$598 MILLION WAS FOOD (63%). AN AVERAGE OF THESE TWO VALUES SUGGESTS THAT FOOD AID REPRESENTS 74% OF THE TOTAL.

year per household. This figure is marked up by 16 percent to account for the total cost of the transfer, equivalent to US$304 per household per year.

Impact of Resilience Building

A wide variety of measures can be used to build resilience to shocks and stresses. Critically, these investments are interdependent. For example, investment in income diversification or animal strengthening will not raise household incomes unless investment in markets and roads come alongside.

For the purposes of this analysis, we assess the impact of an increase in income on household outcomes. **We do not specify the type of intervention that could be used to achieve this increase in income.** Different interventions will have different and wide-ranging impacts on the community, and the relative cost effectiveness of different interventions at achieving a certain level of income would be an important next step.

Rather, we look at what a specific increase in income will do to household deficits and longer-term ability to cope with crises, and then we estimate the cost that will be required to achieve that increase in income based on existing intervention data.

We use a cost effectiveness analysis to look at the relative costs of some of the possible measures that could be used to improve incomes. For this analysis, the studies available were used to get an approximate idea of the cost of delivering an increase of US$120 income per household[14].

Impact evaluations of the PSNP document benefit to cost ratios for a wide range of projects implemented under the PSNP public works program, including investments in soil and water conservation, small-scale irrigation, roads, water supply, health facilities, and schools, across a large number of regions in Ethiopia. These ratios were derived from three separate assessments.[15]

The impact evaluation then estimates a median Benefit to Cost Ratio (BCR) by multiplying the median BCRs for each of the various types of public works outputs presented in the table above by the number of sample watersheds in which projects of that type were found; totaled these values; and divided by the total number of projects studied to obtain a weighted average BCR of 4.42. The average for Somali and Tigray – the two regions considered in this study – is very similar at 4.89. The weighted average for all regions is used here because it considers a wider sample of potential projects.

14 THIS INCREASE EQUATES TO AN ADDITIONAL 50 PERCENT OF THE VALUE OF THE SAFETY NET TRANSFER. THE VALUE OF 50 PERCENT WAS SELECTED AS A HIGH ENOUGH AMOUNT TO MAKE A NOTICEABLE IMPACT ON HOUSEHOLD ECONOMIES WITHOUT BEING AN UNACHIEVABLE LEVEL OF INCREASE.

15 DFID BUSINESS CASE (2015). "ETHIOPIA PRODUCTIVE SAFETY NET PROGRAMME PHASE 4 (PSNP 4)"

TABLE 4: BENEFIT COST RATIOS FOR PUBLIC WORKS UNDER PSNP 3 (2012)							
REGION	MICRO-WATERSHED	SWC	SMALL-SCALE IRRIGATION	ROADS	WATER SUPPLY	HEALTH FACILITY	SCHOOL
Tigray	Adi Tsalka	1.12	2.86	4.32	1.61	2.34	5.01
	Keshi Aynalem	1.04	1.48	3.11	1.58	1.25	5.13
Amhara	Molla Geremoch	1.22				1.28	5.04
	Legabero Wekelo	2.57	3.03	1.06	2.17	1.71	5.95
Afar	Halle Ella - Yallo	1.41	1.74	2.90			4.30
Oromia	Gola Gorba	1.55		2.09	32.56		
	Garaguracha - Habro	1.11		1.21			
Harari	Negadras - Sofi	3.32					4.49
Dire Dawa	Lega Dhugo	1.21		1.35	18.12		6.02
Somali	Bulabora - Bike			1.54	36.12		
SNNP	Arbegna Koste	7.25		2.20	9.81	4.51	4.66
	Doyancho	1.01		2.16	18.84	2.13	4.03
minimum		1.01	1.48	1.06	1.58	1.25	4.03
maximum		7.25	3.03	4.32	36.12	4.51	6.02
median		**1.22**	**2.30**	**2.13**	**13.97**	**1.92**	**5.01**
number of micro-watersheds		11	4	10	8	6	9
		p. 77	*p. 90*	*p. 92*	*p. 94*	*p. 96*	*p.98*

Source: Metafaria Consult 2013. BCRs based on discount rate of 15% over 25 years.

TABLE 5: OBTAINING AN ESTIMATED ALL PSNP BCR

	SWC	SMALL-SCALE IRRIGATION	ROADS	WATER SUPPLY	HEALTH FACILITY	SCHOOL	TOTAL
Number of projects in PWIA sample	11	4	10	8	6	9	48
Median BCR (25 years, 15% discount) for this type of project	1.22	2.3	2.13	13.97	1.92	5.01	
Weighted total (number of projects x median BCR)	13.42	9.20	21.30	111.76	11.52	45.09	212.29
Weighted average BCR for projects in the PWIA sample							4.42

A study on graduation programming in Ethiopia[16] found a return of US$2.6 to US$1, a bit lower than the PSNP estimates above.

Because the PSNP estimates are based on such a wide range of potential interventions to build resilience, they are likely to be more representative of the potential returns from a project (as opposed to project specific returns such as the graduation model), and hence a return of US$4.4:1 is used here. The model assumes an increase in income of an additional US$120 per household as a result of any investment that improves household incomes. It follows that an increase of US$120 would require an additional investment of US$27 per household. It is assumed that this investment is made every three years, though evidence suggests that the benefits of this investment in year one could sustain benefits well beyond three years, and therefore this assumption is assumed to be conservative.

The PSNP4 business case[17] estimates that the PSNP should result in a 70% increase of per capita income, from 212 birr per capita per month in 2012 to 360 birr in 2020. This is equivalent to an increase of US$80 per year per capita, or approximately US$160 per household per year. While this number is an estimate/best guess, it provides a useful benchmark, indicating that our assumed increase of US$120 per household per year is in line with other estimates of what is realistic.

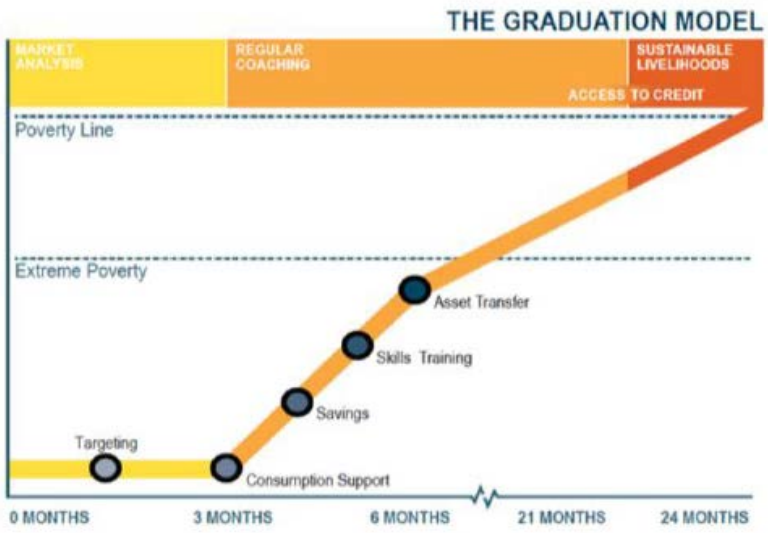
We follow a graduation-type model (see Figure 4), in which it is assumed that households will need to fulfill their food deficit first, through a safety net or similar transfer, after which they can then begin to invest in productive activities. It is assumed that this intervention is layered onto the PSNP transfer. This is important, as graduation programming is believed to work best when consumption support – via a PSNP transfer – underpins savings and skills training, allowing households to invest in more productive activities. These income gains may also result from decreased costs – for example through better health.

16 A BANERJEE ET AL, 2015, "A MULTI-FACETED PROGRAM CAUSES LASTING PROGRESS FOR THE VERY POOR: EVIDENCE FROM SIX COUNTRIES."

17 DFID BUSINESS CASE (2015). "ETHIOPIA PRODUCTIVE SAFETY NET PROGRAMME PHASE 4 (PSNP 4)"

In more recent rounds of the PSNP impact evaluation, when transfer values have been significantly higher than pre-2010 levels, households have on average consumed 75% of the amount they receive as cash transfers, and invested 25%.[18]

Figure 4: Graduation Model



2.3.3 AVOIDED LOSSES – INCOME AND LIVESTOCK

The HEA model estimates the change in income and the value of livestock holdings as a result of early humanitarian response.

Some of this income is used to maintain consumption, thereby reducing the food deficit. In order to avoid double counting with the reduction in humanitarian aid costs, the total increase in income as a result of an early/resilience scenario is reduced by the avoided cost of humanitarian aid. As a result, **the avoided losses to income only estimates the additional income as a result of early response that is surplus to the food deficit**. Along the same lines, the estimated cost of response also accounts for any surplus income.

Livestock values increase for a number of reasons as a result of an earlier response, based on a reduction in the number of animal deaths, as well as greater investment in animals to maintain their condition. The HEA estimates the change in livestock value under each of the four scenarios.

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18 WORLD BANK (2014) "PROJECT APPRAISAL DOCUMENT ON A PROPOSED CREDIT IN THE AMOUNT OF SDR 391.9 MILLION (US$ 600 MILLION EQUIVALENT) TO THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA FOR A PRODUCTIVE SAFETY NET PROJECT 4." SOCIAL PROTECTION AND LABOR GLOBAL PRACTICE, EASTERN AFRICA 1: SEPTEMBER 4, 2014.

2.3.4 MULTIPLIER EFFECT ON THE LOCAL ECONOMY

A Local Economy-Wide Impact Evaluation (LEWIE) of the PSNP[19] estimates multiplier effects, controlling for credit and other factors, at 1.26 and 1.84 in two different markets. For the analysis presented here, we use the median value of 1.55. Therefore, the model assumes that for each US$1 transferred under the PSNP, an additional US$0.55 is generated as a benefit in the local economy.

2.4 LIMITATIONS TO THE ANALYSIS

Throughout the analysis, conservative assumptions have been used to ensure that the findings are representative but do not overstate the case for each of the scenarios considered. Therefore, it is likely that any changes to the assumptions will only strengthen the case for early investment and resilience building. The following limitations should be considered when reviewing the findings:

- The model does not account for population growth. Rather, it estimates the deficit for the full population modeled based on total population figures in 2015/2016 as reflected in the baseline data. Total net savings would increase as population increases.
- All analysis is based on actual price and rainfall data for the past 15 years. Studies indicate that drought occurrence and intensity is worsening as a result of climate change and other factors, and therefore it is possible that the deficits estimated here will worsen over time.
- It is very likely that investments in resilience will grow in their impact over time. In other words, if incomes increase by a certain amount in year one, some of this can be invested so that the income in the next year may have increased slightly, and so on. The model presented looks at an increase in income that is constant and does not account for any growth in that income.

19 KAGIN, JUSTIN, EDWARD TAYLOR, FREDERICA ALFANI AND BENJAMIN DAVIS (2014) LOCAL ECONOMY-WIDE IMPACT EVALUATION (LEWIE) OF ETHIOPIA'S SOCIAL CASH TRANSFER PILOT PROGRAMME. PTOP; UNIVERSITY OF CALIFORNIA DAVIS AND FAO.

TABLE 6: SUMMARY OF SCENARIOS AND ASSUMPTIONS		
SCENARIO	DESCRIPTION	ASSUMPTIONS
Late humanitarian response	Used as the counterfactual, HEA is used to estimate the cost of response of a typical humanitarian response that arrives once a crisis has been declared. The number of people with a food deficit, and hence requiring humanitarian assistance, is combined with the cost of response, to estimate the total cost.	Number of people with a deficit: Modeled by HEA Unit cost of aid: $899 per Metric Ton (MT); $91 per person
Early humanitarian response	The total number of people requiring a transfer, as well as the magnitude of the deficit, is reduced, as a result of stabilized food prices, as well as the ability of households to maintain productive activities such as wage labor. These data are combined with the cost of response based on optimized food prices, to estimate the total cost of humanitarian response. The HEA is also used to estimate the avoided income and livestock value losses as a result of an earlier response.	Number of people with a deficit: Modeled by HEA Unit cost of aid: $817 per Metric Ton (MT); $83 per person Deficit Weighting: Cost of humanitarian aid revised downwards based on decrease in food deficit modeled by HEA: Somali – 0.87; Tigray – 0.72 Avoided Losses: Increase in income and livestock value as modeled in HEA
A safety net response	This scenario assumes that a safety net transfer for consumption support is used to help prevent a food deficit. In some years, the total amount of consumption support transferred to households exceeds the food deficit, and therefore it is assumed that the difference is surplus income that could be used for productive and other purposes. This surplus is deducted from the total cost of response under this scenario.	Number of people with a deficit: Modeled by HEA Unit cost of aid: $817 per Metric Ton (MT); $83 per person Deficit Weighting: Cost of humanitarian aid revised downwards based on decrease in food deficit modeled by HEA: Somali – 0.92; Tigray – 0.26 Cost of Transfer Program: Somali - $284 per household ($245 transfer plus 16% admin and overhead costs). Tigray - $304 per household ($262 transfer plus 16%) Avoided Losses: Increase in income and livestock value as modeled in HEA Multiplier effects in the local economy: $0.55 for every $1 of cash delivered.
Resilience Building	This scenario assumes that investments in resilience building increase household income in addition to the safety net transfer.	Number of people with a deficit: Modeled by HEA Unit cost of aid: $817 per Metric Ton (MT); $83 per person Deficit Weighting: Cost of humanitarian aid revised downwards based on decrease in food deficit modeled by HEA: Somali – 0.92; Tigray – 0.31 Cost of Transfer Program: Somali - $284 per household ($245 transfer plus 16% admin and overhead costs). Tigray - $304 per household ($262 transfer plus 16%) Cost of resilience program: $27 per person (based on return of 4.4:1) Avoided Losses: Increase in income and livestock value as modeled in HEA Multiplier effects in the local economy: $0.55 for every $1 of cash delivered.

3 COST COMPARISON OF DROUGHT RESPONSE

The following sections summarize the findings from the economic model for Somali and Tigray regions of Ethiopia. The first section summarizes the aggregate impact of early response and resilience building across a modeled population of approximately 8.7 million people, combining Somali and Tigray. This is followed by results broken down for Somali and Tigray.

The costs and benefits of each scenario are modeled over 15 years, using a discount rate of 10%. Discounting is used to reduce the value of a stream of costs and benefits over time, back to their present value to allow comparability, particularly where a large up-front investment cost may be required that yields benefits over many years to come. However, in this model costs and benefits are distributed proportionally across time. Therefore, if a discount rate were not applied, the percentage change between scenarios would be similar; in other words, if the cost of an early response was 20% less than the cost of a late response, this would hold true whether or not discounting was applied. However, the absolute net cost of each scenario would be significantly higher without discounting; in other words, if the discounted net cost of a scenario is US$400 million, the undiscounted cost might be double this.

Four estimates are presented for each of the four scenarios:

- **TOTAL NET COST:** This estimate sums together the cost of humanitarian response and the cost of programming (e.g. safety net and resilience) for each of the scenarios. In this estimate, a uniform increase in income is assumed for all very poor and poor households (safety net and resilience scenarios). As a result, in many cases the transfer amount is more than households require to fill their food deficit, and therefore this scenario can look more expensive, but is the more accurate representation of the full cost to donors. This figure represents the total net cost over 15 years.

- **TOTAL NET COST, ADJUSTED:** This estimate adjusts for the transfer amount that is additional to household deficits. The surplus income that arises as a result of the safety net and resilience building interventions is added in as a benefit, to account for the fact that this amount is not only a cost to a donor, but also a benefit for those households. This estimate is conservative, as it assumes that every $1 transferred is a $1 benefit to the household; it is highly likely that the benefit to the household would be greater than the actual transfer amount. This figure presents the total net cost, adjusted for surplus income, over 15 years.

- **TOTAL NET COST WITH BENEFITS:** This estimate sums together the costs of humanitarian aid, cost of programming, as well as the avoided income and livestock losses estimated by the model. As a result, this estimate represents a more complete picture of both the costs to donors as well as the benefits to households. This figure represents the total net cost with benefits, over 15 years.

- **AVERAGE NET COST WITH BENEFITS PER YEAR:** This estimate averages the previous figure over 15 years, to give an average cost per year.

3.1 SUMMATIVE FINDINGS

Key Findings - Early Humanitarian Response:

- An early humanitarian response would save an estimated US$965 million in humanitarian aid costs over a 15-year period on the cost of humanitarian response alone.
- When avoided losses are incorporated, an early humanitarian response could save US$1.2 billion, or an average of US$151 million per year.

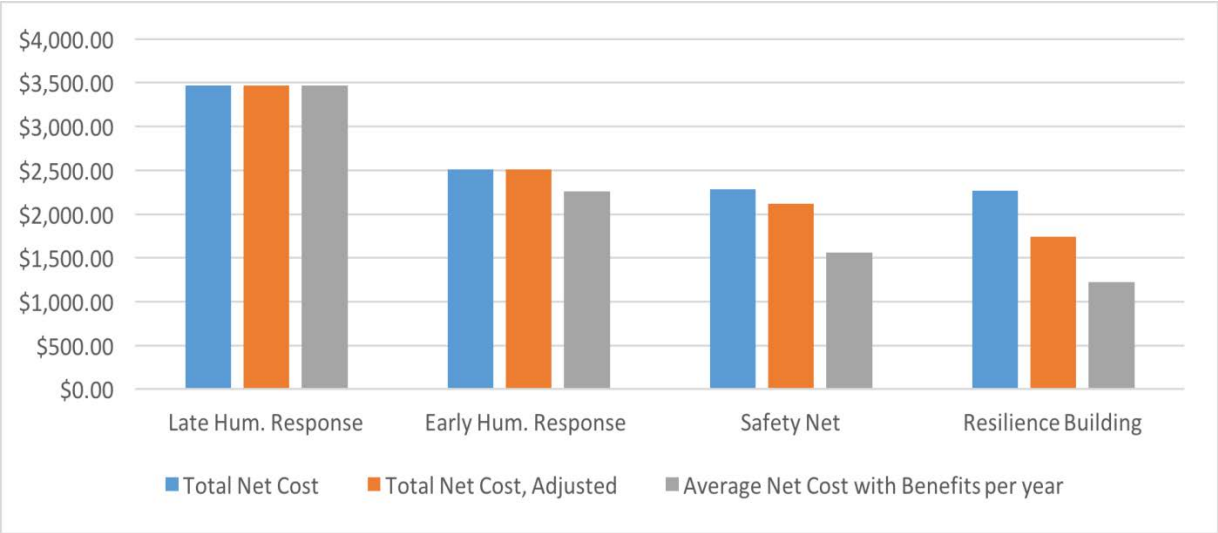
Key Findings – Safety Net:

- Safety net programming at a transfer level of US$245/262 per household reduces the net cost of humanitarian response, saving an estimated US$1.2 billion over the cost of a late response. When this figure is adjusted to account for the benefits of the transfer beyond filling the food deficit, a safety net scenario saves US$1.4 billion over the cost of a late response.
- When avoided losses are incorporated, a safety net transfer could save US$1.9 billion, or an average of US$127 million per year.

Key Findings – Resilience Building:

- Safety net programming at a transfer level of US$245/262 per household plus an increase in income of an additional US$120 per household, reduces the net cost of humanitarian response by an estimated US$1.2 billion over the cost of a late response. When this figure is adjusted to account for the benefits of the transfer beyond filling the food deficit, a resilience scenario saves US$1.7 billion over the cost of a late response.
- When avoided losses are incorporated, a resilience building scenario could save US$2.2 billion, or an average of US$150 million per year.

Figure 5: Total Net Cost of Response, Ethiopia, US$ Million



Investing in early response and resilience measures yields benefits of US$3.3 for every US$1 invested in Somali, and US$2.4 for every $1 invested in Tigray. When the costs of investing in early response and resilience are offset against the benefits (avoided humanitarian aid and avoided income and livestock losses), the benefits exceed the costs by between $2.4 and US$3.3 for every $1 spent.

Total U.S. Government (USG) expenditures on emergency food aid in Ethiopia for the years 2001 to 2016 equated to US$3.5 billion. **Applying the same ratios as estimated in this analysis of savings to total USG spend, the USG could have saved US$1.2 billion over 15 years, a savings of 35% of total emergency spend.** These are estimated direct cost savings by investing in resilience building measures, net of the cost of implementing a resilience building package of interventions. **Incorporating the avoided losses to households, the model estimates net savings of US$2.2 billion.**

TABLE 7: SUMMARY OF COSTS, SOMALI AND TIGRAY LZS, USD MILLION				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost, 15 years	$3,471.0	$2,506.4	$2,282.7	$2,266.4
Savings		*$964.6*	*$1,188.3*	*$1,204.6*
Total Net Cost, adjusted, 15 years	$3,471.0	$2,506.4	$2,118.6	$1,738.2
Savings		*$964.6*	*$1,352.4*	*$1,732.8*
Total Net Cost with Benefits, 15 years	$3,471.0	$2,262.7	$1,564.0	$1,226.9
Savings		*$1,208.2*	*$1,907.0*	*$2,244.1*
Average Net Cost with Benefits per year	$231.4	$150.9	$104.3	$81.8
Savings		*$80.6*	*$127.1*	*$149.6*

These figures are representative of only part of the population of Ethiopia – clearly there are many more areas that suffer from food insecurity and require humanitarian assistance. The PSNP covers approximately 8 million people across Ethiopia who are chronically food insecure. The population modelled in this analysis covers 8.7 million people, approximately 2.7 million of which are covered by the PSNP. **Therefore, this analysis can be estimated to be representative of approximately one third of the total population affected.**

As cited previously, emergency aid for droughts has averaged US$509m per year over the last 10 years in Ethiopia as a whole (approximately double our estimated cost of US$222m per year for Tigray and Somali). Oxfam's estimate that drought costs Ethiopia US$1.1 billion per year clearly reflects the much higher cost of drought when all impacts are considered, and aligns with the findings presented here that demonstrate that losses due to drought are large.

3.1.1 SOMALI

The following section presents the findings modeled for approximately 5.4 million people in the Somali region of Ethiopia. **The baseline analysis**, presented in Table 8, assumes that a food transfer is used both for the PSNP transfer as well as to fill any remaining food deficit as part of a humanitarian response. The latest data for Somali region suggests that PSNP transfers are provided as food only – whereas other regions tend to use much more of a mix of food and cash, depending on levels of market integration and other factors. While it may be that the Somali region is not yet ready for a greater use of cash, **the section that follows compares the relative costs of different transfer modalities**, to give a sense of the potential shift in costs should cash become a greater part of response, as appropriate. **This is followed by a comparison of pastoral and agro-pastoral livelihood zones.**

Baseline: Food/Food Analysis

Table 8 summarizes the findings from the economic model for Somali region.

TABLE 8: SUMMARY OF COSTS, SOMALI REGION, USD MILLION				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Cost of Humanitarian Response	$3,224.6	$2,424.3	$1,443.1	$1,376.7
Cost of Transfer Program	-	-	$1,087.3	$1,087.3
Cost of Resilience Program	-	-	-	$34.4
Avoided Losses - Income	-	-$208.0	-$1,142.9	-$1,661.8
Avoided Losses - Livestock	-	-$252.5	-$252.5	-$252.5
Multiplier benefits	-	-	-	-
Total Net Cost, 15 years	$2,087.8	$1,587.7	$1,664.2	$1,616.2
Total Net Cost, Adjusted, 15 years	$2,087.8	$1,587.7	$1,482.5	$1,250.0
Total Net Cost with Benefits, 15 years	$2,087.8	$1,366.1	$947.5	$643.3
Average Net Cost with Benefits per year	$139.2	$91.1	$63.2	$42.9

The benefits of early humanitarian action and resilience building can be measured against the costs. For this analysis, three BCRS are provided.

- (1): The costs of investment (HSNP, resilience interventions) are offset against the benefits, measured in terms of the avoided costs of humanitarian aid. A BCR above one indicates that the avoided cost of aid required to fill the humanitarian deficit is greater than the additional cost of safety net/resilience programming.
- (2): This figure is adjusted to account for the benefit of any transfer to households that are above their food deficit.
- (3): The cost of investment is offset against the avoided cost of humanitarian aid as well as the avoided income and asset losses.

TABLE 9: BCRS, SOMALI			
	BCR: AVOIDED COST OF AID (1)	BCR: AVOIDED COST OF AID, ADJUSTED (2)	BCR: AVOIDED COST OF AID + AVOIDED LOSSES (3)
Safety Net	1.73	2.00	2.88
Resilience Building	1.75	2.34	3.31

Comparison of Transfer Modalities

Ethiopia uses a mixture of both cash and food – both for their safety net transfers as well as their humanitarian response. In Somali, safety net transfers were provided entirely as food in 2015/2016[20], and the findings above are based on a food/food model (as described below). This is compared here with two further potential scenarios:

- **FOOD/FOOD:** it is assumed that the safety net transfer is provided as food, and hence no multiplier effect in the local economy is present in this analysis. It also assumes that humanitarian response to the residual food deficit is provided as food (using a transfer amount of US$817/MT).
- **CASH/FOOD:** it is assumed that the safety net transfer is provided as cash. The cost is the same as food (the PSNP data does not differentiate the cost of a cash and a food transfer but rather averages the two), but the multiplier in the local economy is present. The humanitarian response is provided as food (using a transfer amount of US$817/MT).
- **CASH/CASH:** It is assumed that the safety net transfer is provided as cash (with multiplier) and the humanitarian response is now also provided as a cash transfer, at a reduced cost of US$423 per MT.

The comparison below demonstrates the significant cost savings that can be realized through a greater use of cash. The findings, however, do not suggest that all transfers should be shifted to cash. Cash can have a negative impact on households if used out of context, for example where markets are not well integrated, and there are high levels of inflation.

Shifting to a cash based safety net transfer is estimated to increase savings from $1,140 million to US$1,428 million (over a late response). This shift would save an additional US$288 million in Somali region alone, or on average $14 million every year.

If the humanitarian response was also shifted to a cash based transfer, this would directly save the Government of Ethiopia and the international donor community an additional US$765 million over 15 years (reducing the cost of an early response from US$1,588 million to US$823 million.

20 ETHIOPIA PRODUCTIVE SAFETY NET PROGRAMME, DFID ANNUAL REVIEW, FEBRUARY 2015

TABLE 10: SUMMARY OF FINDINGS, SOMALI, FOOD/FOOD (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$2,087.8	$1,587.7	$1,644.2	$1,616.2
Savings		*$500.1*	*$443.6*	*$471.6*
Total Net Cost, Adjusted	$2,087.8	$1,587.7	$1,482.5	$1,250.0
Savings		*$500.1*	*$605.3*	*$837.8*
Total Net Cost with Benefits	$2,087.8	$1,366.1	$947.5	$643.3
Savings		*$721.7*	*$1,140.3*	*$1,444.5*
Average Net Cost with Benefits per year	$139.2	$91.1	$63.2	$42.9
Savings		*$48.1*	*$76.0*	*$96.3*

TABLE 11: SUMMARY OF FINDINGS, SOMALI, CASH/FOOD (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$2,087.8	$1,587.7	$1,644.2	$1,616.2
Savings		*$500.1*	*$443.6*	*$471.6*
Total Net Cost, Adjusted	$2,087.8	$1,587.7	$1,482.5	$1,250.0
Savings		*$500.1*	*$605.3*	*$837.8*
Total Net Cost with Benefits	$2,087.8	$1,366.1	$659.9	$355.7
Savings		*$721.7*	*$1,427.9*	*$1,732.1*
Average Net Cost with Benefits per year	$139.2	$91.1	$44.0	$23.7
Savings		*$48.1*	*$95.2*	*$115.5*

TABLE 12: SUMMARY OF FINDINGS, SOMALI, CASH/CASH (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$2,087.8	$822.5	$1,144.1	$1,138.9
Savings		*$1,265.3*	*$943.7*	*$948.9*
Total Net Cost, Adjusted	$2,087.8	$822.5	$817.6	$573.7
Savings		*$1,265.3*	*$1,270.2*	*$1,514.1*
Total Net Cost with Benefits	$2,087.8	$662.3	$306.5	$81.6
Savings		*$1,425.5*	*$1,781.3*	*$2,005.9*
Average Net Cost with Benefits per year	$139.2	$44.2	$20.4	$5.5
Savings		*$95.0*	*$118.8*	*$133.7*

Comparison of Pastoral and Agro-Pastoral Populations

Table 12 compares some of the characteristics of pastoral and agro-pastoral populations in Somali Region. Incomes in the two groups are similar, but as one would expect, livestock values in the pastoral areas are significantly higher. While the deficits are quite similar across each of the scenarios, the number of people in need of assistance ('beneficiaries') is higher in the agro-pastoral regions.

TABLE 13: COMPARISON OF KEY CHARACTERISTICS BY LIVELIHOOD GROUP				
	LATE	EARLY	SAFETY NET	RESILIENCE
SOMALI PASTORAL				
Beneficiaries as a % of population	35%	34%	20%	19%
Beneficiaries as a % of late intervention	100%	96%	58%	54%
Deficit as a % of late intervention	100%	79%	49%	46%
Income - USD per person per day	0.72	0.74	0.80	0.82
Average value of livestock - USD per person	1,280	1,336	1,336	1,336
SOMALI AGROPASTORAL				
Beneficiaries as a % of population	30%	24%	12%	12%
Beneficiaries as a % of late intervention	100%	82%	41%	40%
Deficit as a % of late intervention	100%	79%	46%	44%
Income - USD per person per day	0.69	0.72	0.77	0.79
Average value of livestock - USD per person	752	786	786	786

The differences between these groups is highlighted in the following three figures, that show the effect of a late humanitarian response on the poor wealth group over the 15 years of analysis, for the pastoral livelihood groups, the Northern Agro-Pastoral groups, and the Southern Agro-Pastoral groups.

Both the pastoral and the South Agro-Pastoral groups face deficits fairly consistently over the 15 years, often hovering just above or below the Livelihoods Protection Threshold (LPT), suggesting a much more chronic food insecurity, without any interventions. By contrast, the Northern Agro-Pastoral groups tend to sit above their LPT, with the acute shocks in 2001, 2007/08, and 2011 pushing them below their threshold.

Figure 5: Household Economy Modeling for Pastoral Livelihood Zones, Somali Region

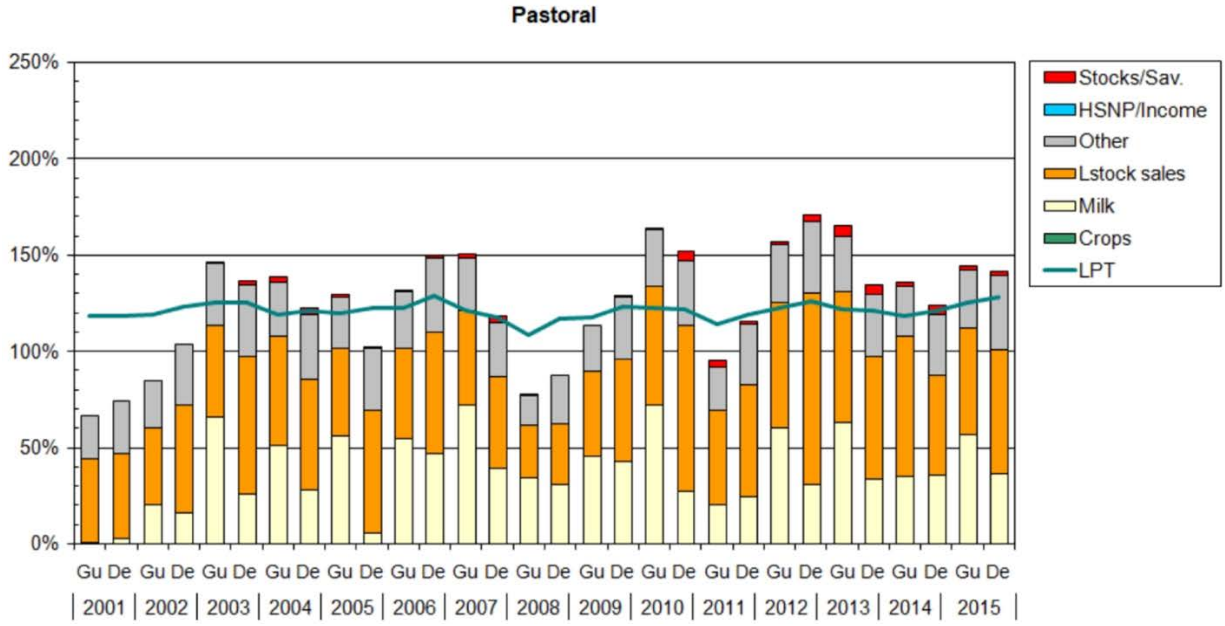


Figure 6: Household Economy Modeling for South, Agro-Pastoral Livelihood Zones, Somali Region

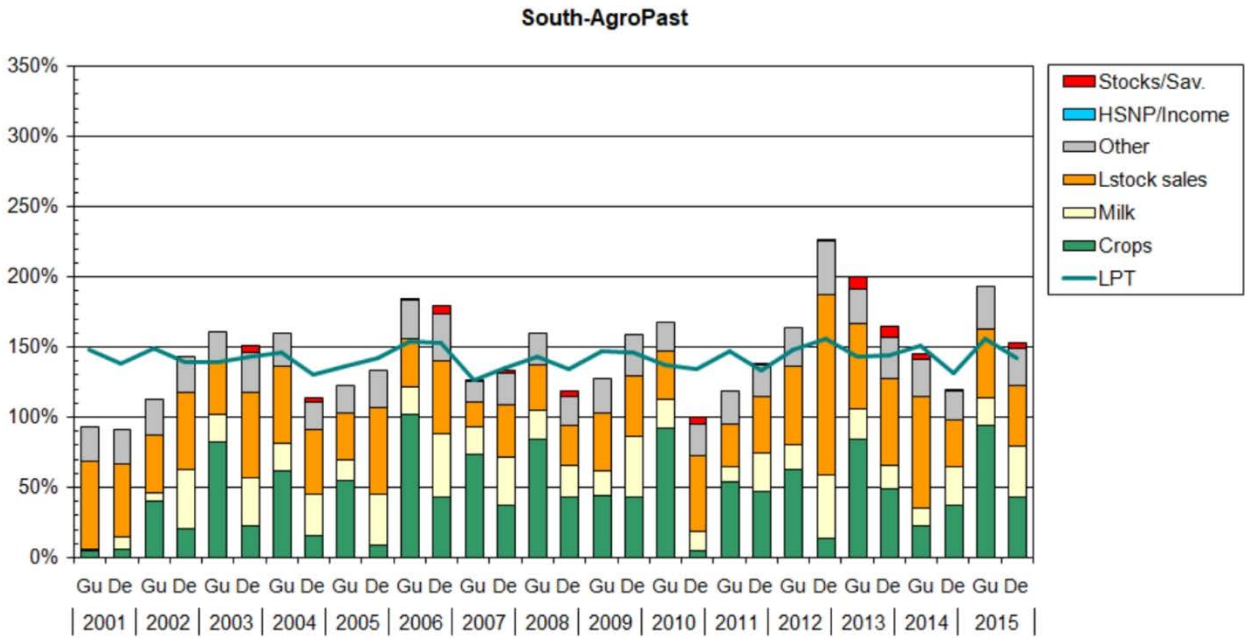
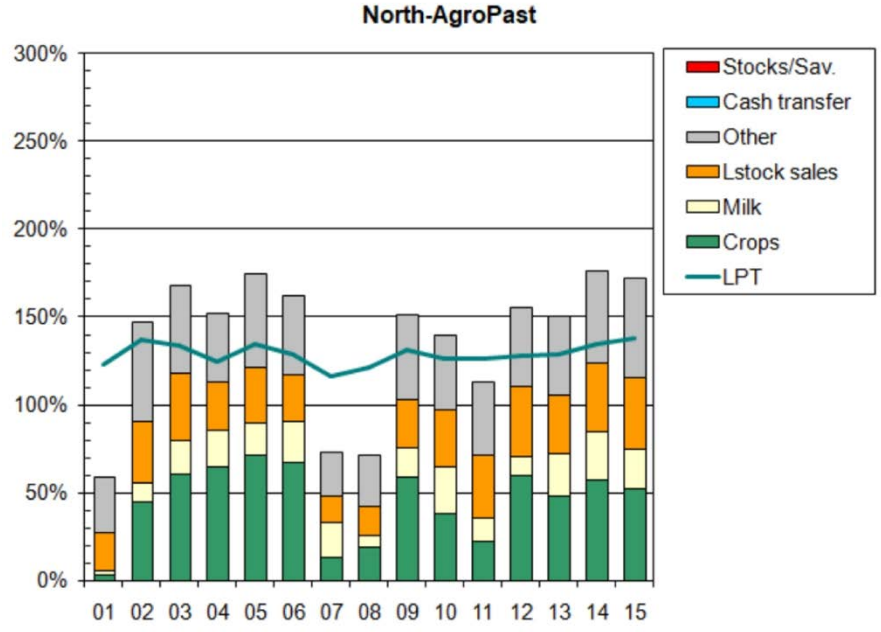


Figure 7: Household Economy Modeling for North, Agro-Pastoral Livelihood Zones, Somali Region



3.1.2 TIGRAY

The following section presents the findings modeled for approximately 3.3 million people in the Central, Eastern and Southern regions of Tigray (the west is not included because it does not have food deficits). **The first section reviews the baseline analysis for Tigray, and the second section compares costs across different transfer modalities.** Tigray uses a mixed transfer[21], roughly half food, half cash, and this ratio is used to determine the transfer amount inputted into the HEA model. However, to be comparable with the Somali analysis presented above, the economic model is presented for the three cash and food scenarios described previously.

The third section looks more closely at household economies over the 15 years. Tigray is an agricultural region and hence there is no discussion by livelihood zone as with the Somali analysis. **The final section uses a comparison of empirical data from the 2006 and 2016 HEA baseline** that shows a significant increase in agricultural productivity and inputs, alongside a decrease in land holdings, and simulates 2006 baseline conditions, **to evaluate what would have happened to the modeled population if we had not invested so heavily in agricultural interventions.**

Baseline: Food/Food Analysis

TABLE 14: SUMMARY OF COSTS, TIGRAY, USD MILLION				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Cost of Humanitarian Response	$2,496.7	$1,623.7	$40.7	$27.1
Cost of Transfer Program	-	-	$1,099.9	$1,099.9
Cost of Resilience Program	-	-	-	$32.6
Avoided Losses - Income	-	$0	$0	-$84.0
Avoided Losses - Livestock	-	-$42.2	-$42.2	-$42.2
Multiplier benefits	-	-	-	-
Total Net Cost, 15 years	$1,383.2	$918.7	$638.5	$650.2
Total Net Cost, Adjusted, 15 years	$1,383.2	$918.7	$636.1	$488.3
Total Net Cost with Benefits, 15 years	$1,383.2	$896.7	$616.5	$583.6
Average Net Cost with Benefits per year	$92.2	$59.8	$41.1	$38.9

The benefits of early humanitarian action and resilience building can be measured against the costs. For this analysis, three BCRS are provided.

21 ETHIOPIA PRODUCTIVE SAFETY NET PROGRAMME, DFID ANNUAL REVIEW, FEBRUARY 2015

- (1): The costs of investment (HSNP, resilience interventions) are offset against the benefits, measured in terms of the avoided costs of humanitarian aid. A positive BCR indicates that the avoided cost of aid required to fill the humanitarian deficit is greater than the additional cost of safety net/resilience programming.

- (2): This figure is adjusted to account for the benefit of any transfer to households that is above their food deficit.

- (3): The cost of investment is offset against the avoided cost of humanitarian aid as well as the avoided income and asset losses.

TABLE 15: BCRS, TIGRAY

	BCR: AVOIDED COST OF AID (1)	BCR: AVOIDED COST OF AID, ADJUSTED (2)	BCR: AVOIDED COST OF AID + AVOIDED LOSSES (3)
Safety Net	2.21	2.22	2.25
Resilience Building	2.16	2.42	2.27

Comparison of Transfer Modalities

The comparison below demonstrates the significant cost savings that can be realized through a greater use of cash. Approximately half of the transfer provided under the PSNP in Tigray is already cash, and therefore should be bringing benefits through multiplier effects. The analysis presented below suggests that shifting to a cash based safety net transfer is estimated to increase savings from US$767 million to US$1,058 million (over a late response), saving US$291 million over 15 years. Assuming that half of this is already being realized, this would approximate that an additional $146 million could be saved, or approximately US$10 million per year on average.

If the humanitarian response was also shifted to a cash based transfer, this would directly save the Government of Ethiopia and the international donor community an additional US$443m over 15 years (reducing the cost of an early response from US$919 million to US$476 million), or approximately US$30 million per year on average over 15 years, in Tigray.

The findings, however, do not suggest that all transfers should be shifted to cash. Cash can have a negative impact on households if used out of context, for example where markets are not well integrated, and there are high levels of inflation.

TABLE 16: SUMMARY OF FINDINGS, TIGRAY, FOOD/FOOD (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$1,383.2	$918.7	$638.5	$650.2
Savings		*$464.5*	*$744.7*	*$733.0*
Total Net Cost, Adjusted	$1,383.2	$918.7	$636.1	$488.2
Savings		*$464.5*	*$747.1*	*$894.9*
Total Net Cost with Benefits	$1,383.2	$896.7	$616.5	$583.6
Savings		*$486.5*	*$766.7*	*$799.6*
Average Net Cost with Benefits per year	$92.2	$59.8	$41.1	$38.9
Savings		*$32.4*	*$51.1*	*$53.3*

TABLE 17: SUMMARY OF FINDINGS, TIGRAY, CASH/FOOD (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$1,383.2	$918.7	$638.5	$650.2
Savings		*$464.5*	*$744.7*	*$733.0*
Total Net Cost, Adjusted	$1,383.2	$918.7	$636.1	$488.2
Savings		*$464.5*	*$747.1*	*$894.9*
Total Net Cost with Benefits	$1,383.2	$896.7	$325.6	$292.7
Savings		*$486.5*	*$1,057.6*	*$1,090.5*
Average Net Cost with Benefits per year	$92.2	$59.8	$21.7	$19.5
Savings		*$32.4*	*$72.7*	*$72.7*

TABLE 18: SUMMARY OF FINDINGS, TIGRAY, CASH/CASH (USD MILLION)				
INTERVENTIONS	LATE HUM. RESPONSE	EARLY HUM. RESPONSE	SAFETY NET	RESILIENCE BUILDING
Total Net Cost	$1,383.2	$476.0	$626.5	$641.2
Savings		*$907.2*	*$756.7*	*$741.9*
Total Net Cost, Adjusted	$1,383.2	$476.0	$412.2	$185.7
Savings		*$907.2*	*$971.0*	*$1,197.4*
Total Net Cost with Benefits	$1,383.2	$453.9	$313.6	$285.0
Savings		*$929.2*	*$1,069.6*	*$1,098.2*
Average Net Cost with Benefits per year	$92.2	$30.3	$20.9	$19.0
Savings		*$62.0*	*$71.3*	*$73.2*

Comparison of Response

The Tigray livelihood zones are entirely agricultural; therefore, we do not break out this comparison by region/livelihood zone as we did with Somali. The graphs presented below show the household deficit pattern for very poor households, for the late response and for the resilience scenario.

Tigray is the one analysis across all three countries evaluated for this study where the resilience scenario is relatively more expensive than a safety net only approach. The graphs highlight that while all households face a deficit in all years under the late scenario, and therefore are chronically food insecure, the resilience scenario puts them substantially above their livelihoods protection threshold, suggesting that potentially the transfer amount assumed is paying well beyond the point of filling the deficit, and therefore appears to be more expensive (and this is likely to be more pronounced for the other wealth groups). In reality, this addition of cash will have its own set of productive benefits that are not accounted for here, so this is not necessarily a less cost effective scenario. However, it does explain why the modeling estimates are higher for the resilience scenario.

Figure 8: Household Economy Modeling for Tigray, Late

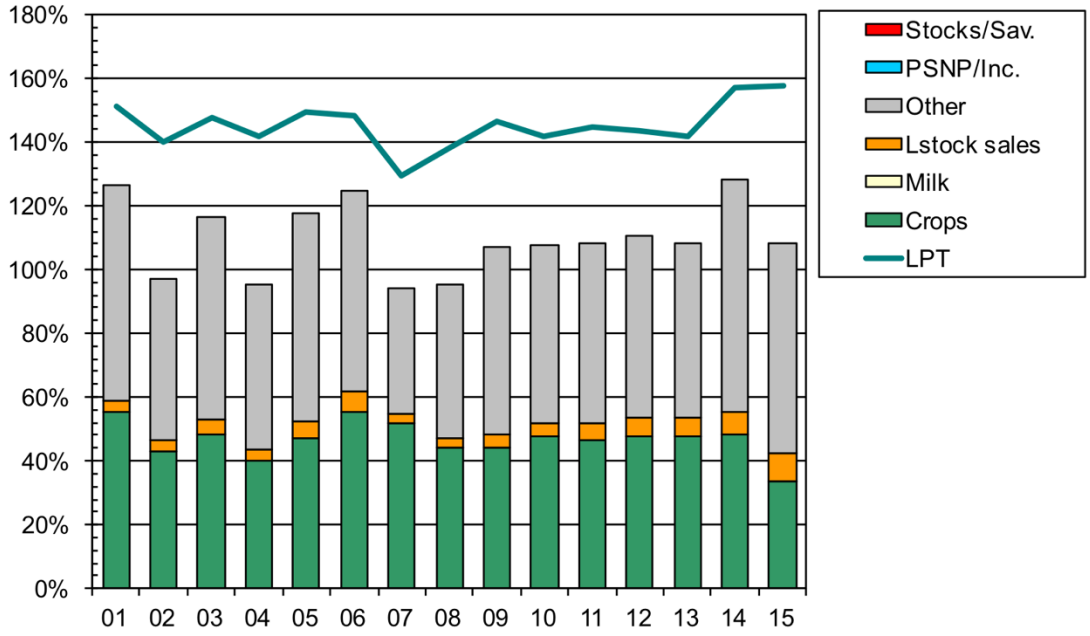
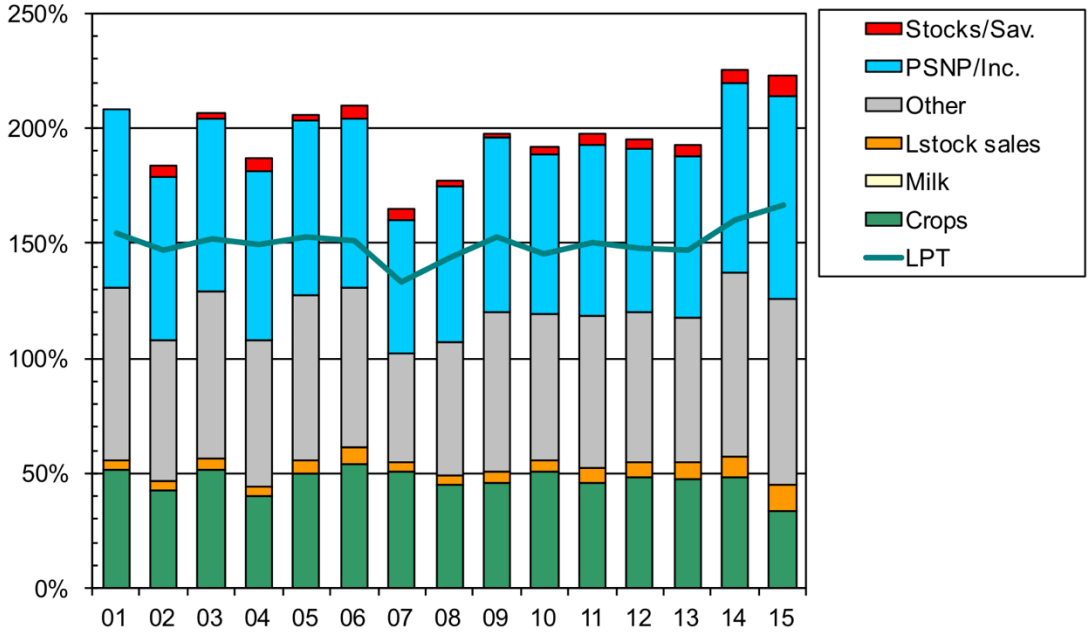


Figure 9: Household Economy Modeling for Tigray, Resilience



Baseline Analysis

The first set of HEA baselines were undertaken in 2006 in Ethiopia, and were conducted in over 170 livelihood zones to ensure complete national coverage. In 2016, these baselines were updated, through a partnership between USAID, Save the Children and the Food Economy Group. The data for both baselines was collected using the same data structure, tools, and analytical framework. Both years were also considered average to good years. As a result, the data can be used to empirically compare changes over the ten-year period.

A comparison of the two baselines[22] shows that a great deal has changed. There have been notable changes in crop production, and expansion of agricultural extension services. There have been investments in livestock health, leading to reduced mortality, though livestock herds have also decreased due to the shortage of grazing and the high cost of fodder. Markets have expanded and road networks have been built, rural saving and credit cooperatives have expanded significantly, and mobile phone use has expanded to reach almost all households.

Despite all of these changes, the evidence does not point to major changes in the patterns of household food and cash income. On the face of it, the findings seem disappointing. However, a deeper analysis reveals that investments in agricultural production have actually increased, and potentially protected these households from significantly declining.

Over the 10-year period, there has been a concerted effort to increase yields in the region, through encouraging the uptake of inputs and improved seed varieties, promoting soil conservation, etc. These efforts appear to have had an impact – in 12 of the 16 livelihood zones analysed, yields increased by more than 20%. The data also shows that households are spending significantly more on improved seeds, fertilizers and pesticides in order to achieve the increase in production.

However, over the same time period, population has grown by an estimated 9-11%. This population growth has in turn affected the amount of land that people have. Comparing data on the area cultivated by households shows that all but two livelihood zones have experienced a distinct decline between the two baselines.

The significant increase in yields is thus offset by smaller landholdings, and as a result households have more or less maintained a similar pattern of access to food and cash income.

This context clearly demonstrates why it is so hard to measure whether resilience is improving or not – the confluence of a whole variety of factors and conditions can confound a clear understanding of whether things are better or worse. And these findings also beg the question – **what would have happened to this population if there had not been a significant investment in production?**

To answer this question, we used the 15-year HEA model developed for this study, using actual data on crop production, market prices, and rainfall, to estimate the total cost of the household deficit. This model estimates the deficit under 2016 conditions – increased crop production, increased expenditure on inputs, and smaller landholdings.

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22 BOUDREAU, T (2017). "HOUSEHOLD ECONOMY ANALYSIS RESULTS. TIGRAY REGIONAL OVERVIEW 2016 AND CHANGES IN LIVELIHOODS SINCE 2006/2006." FOOD ECONOMY GROUP, USAID.

We then ran the same model again, but this time we simulated what the conditions would have been like if we had the same smaller landholdings as in 2016, but without any investment in improved crop production. In other words, we reduced crop production, as well as expenditure on agricultural inputs, back to their 2006 levels, in order to estimate what the household deficit might have been had we not made the significant investment in improving crop yields over the 15-year period. We ran both simulations assuming an early intervention scenario, and the analysis was undertaken for a population of 1.9 million people.

Under an early humanitarian intervention scenario with improved yields, the cost of aid to fill the deficit is estimated at US$494 million, and total income and assets are estimated at US$3.2 billion. If we hadn't made any investment in improved agricultural practices, the deficit would have been US$700m – an additional cost of US$206 million over 15 years. If we average this savings across the total number of very poor and poor households in our sample (794k), this is equivalent to **a cost savings of US$259 per person, or US$1,557 per household**.

The data on income and assets suggests that these household savings would be nearly doubled. If we also incorporated data on the ongoing benefits of better health and nutrition, education and psychosocial impacts of mitigating crises, the savings would be even higher still.

Clearly there is a cost associated with achieving these gains. The cost of fertilizer and other inputs is already accounted for in the HEA estimates (the "early without improved yields" reduces yields, but also removes the cost of inputs that households report in their baseline data). The cost of an agricultural extension agent in Ethiopia is approximately US$3,000 per year, and each of these agents supports approximately 400 farmers in Tigray, or approximately US$7.50 per farmer per year.[23]

TABLE 19: COMPARISON OF BASELINE SCENARIOS, IMPROVED YIELDS

	EARLY WITH IMPROVED YIELDS (US$ MILLION)	EARLY WITHOUT IMPROVED YIELDS (US$ MILLION)
Cost of Aid	$494	$700
Total Income and Assets	$3,156	$2,722

These findings echo trends seen in Ethiopia as a whole. According to the Ethiopia Trends Assessment[24], from 2004 to 2014, total land area, crop yield, and total production increased by an average of 2.7%, 7%, and 9.4%, respectively.[25] Crop land use increases are the result of a concerted effort by the GoE to bring more land under cultivation for both smallholder and commercial farmers, but land cultivation growth has slowed significantly over the past 5 years. Meanwhile, Ethiopia's increases in crop yield have

23 PERSONAL COMMUNICATION, NATHANIEL SCOTT, USAID ETHIOPIA, OCT 17 2017

24 DONNENFELD, Z ET AL (2017). "ETHIOPIA DEVELOPMENT TRENDS ASSESSMENT: ETHIOPIA PERFORMANCE MONITORING AND EVALUATION SERVICE." USAID

25 FNN BACHEWE ET AL, AGRICULTURAL GROWTH IN ETHIOPIA (2004-2014): EVIDENCE AND DRIVERS, INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE WORKING PAPER 81, 2014.

been consistently rising, reflecting land intensification efforts, the adoption of improved agriculture technologies and far reaching agricultural extension programs.[26]

4 DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

The findings presented above clearly indicate that a scenario that seeks to build people's resilience to drought through a mixture of activities that build income and assets is significantly more cost effective than continuing to provide an emergency response.

Interventions that build people's resilience, as modeled here through an increase in household income are far more cost effective than meeting household needs in a crisis. This increase in income can be achieved in numerous ways, and will require a package of complementary interventions that can sustain this income over the longer term. The amount of increase in income required will vary depending on the context and over time.

Importantly, these investments are proactive and do not require triggering by a specific threshold. Resilience building can include a whole range of interventions that should complement each other and work together to maximize effectiveness. Further analysis on the cost effectiveness, and strong monitoring of the impact of different packages, should be a priority moving forward.

This does not suggest that an emergency response is not, or will never be, needed. In fact, the model includes the cost of responding with humanitarian aid to spikes in need that push people beyond their ability to cope on their own. However, it does clearly indicate that investing in drought resilience saves money and should be the priority.

In Tigray, investments in agricultural production have significantly and cost effectively mitigated a slide into deeper food insecurity. A comparison of 2006 and 2016 baseline data in Tigray reveals that household economies have not improved over the previous 10 years. However, the story is more complex, as agricultural production and yields have improved significantly, but have been offset by decreases in average landholdings due to population growth. The HEA model is used to estimate what would have happened to food security in Tigray if these investments had not been made, and estimates that the cost of response has been reduced by over US$1500 per household over the 15-year period, with substantial increases in income and livestock as a result of intervention.

The finding that resilience building is most cost effective is amplified by evidence on the impact of a more proactive approach to drought risk management. The analysis presented was able to account for the cost of meeting people's immediate needs, as well as the impact on household income and livestock (measured as 'avoided losses'). However, the estimated savings are likely to be very conservative, as evidence globally is clear that investing in the types of activities that can allow people to cope in crisis times can also bring much wider gains in 'normal' times, and these gains would substantially increase the economic case for a proactive investment. For example:

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26 WORLD BANK ETHIOPIA'S GREAT RUN, 2014; FNN BACHEWE ET AL, AGRICULTURAL GROWTH IN ETHIOPIA (2004-2014): EVIDENCE AND DRIVERS, INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE WORKING PAPER 81, 2014.

- A World Bank review of social safety nets globally finds that the benefits of regular cash transfers extend well beyond the immediate positive impacts. Studies confirm the positive and significant impacts of cash transfers on school enrollment and attendance; increased live births in safer facilities; improved prenatal and postnatal care; and regular growth monitoring of children during critically important early ages. All of these impacts would help to reduce household expenditure and/or improve lifetime earnings.[27]

- The World Health Organization (WHO) has quantified the return on investment for WASH investments globally, and found that for every US$1 invested, benefits of US$4.3 are generated. These benefits arise as a result of a reduction in adverse health effects and time saving.[28]

- A study for the Copenhagen Consensus evaluated the impact of schooling, and found that the median increase in earnings averages 8-10 percent per added year of schooling.[29]

- A study on the economic rationale for investing in stunting reduction found that investing in nutrition interventions in Ethiopia yielded returns of US$10.6 for every US$1 invested.[30] The package of interventions was estimated to cost US$102.50 per child[31], which would result in lifetime discounted benefits of US$1,087 per child.

- Further to this, the social impacts of minimizing the effects of a crisis are substantial. Avoided distress, childhood marriage, migration, and conflict can also have very significant effects on those affected.

Reducing humanitarian impacts through greater resilience requires investment in complementary and layered approaches to build sustained change. Individual actions rarely build resilience in a sustained manner. For example, improved awareness on health practices needs to be complemented by adequate health facilities and services at those facilities; investment in productive activities requires access to markets and investment in roads; cash transfers are not effective unless they take place within the context of highly integrated markets and access to goods and supplies. The model presented here assumes an increase in household income of US$245/US$262 through a direct cash transfer and US$120 through an improvement in income. Different types of interventions, and packages of interventions, will be more or less cost effective at not only achieving, but also sustaining, these outcomes.

Investment in shock responsive and adaptive management approaches that can respond to the particular context and changing circumstances of households should help to realize

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27 WORLD BANK. 2015. THE STATE OF SOCIAL SAFETY NETS 2015. WASHINGTON, DC: WORLD BANK.

28 HUTTON, G (2012). "GLOBAL COSTS AND BENEFITS OF DRINKING-WATER SUPPLY AND SANITATION INTERVENTIONS TO REACH THE MDG TARGET AND UNIVERSAL COVERAGE." WORLD HEALTH ORGANIZATION

29 ORAZEM, P, P GLEWWE, H PATRINOS (2009). "LOWERING THE PRICE OF SCHOOLING". COPENHAGEN CONSENSUS BEST PRACTICE PAPER

30 HODDINOTT, JOHN, HAROLD ALDERMAN, JERE R. BEHRMAN, LAWRENCE HADDAD, AND SUSAN HORTON. 2013. "THE ECONOMIC RATIONALE FOR INVESTING IN STUNTING REDUCTION." GCC WORKING PAPER SERIES, GCC 13-08.

31 THE PACKAGE INCLUDES SALT IODIZATION, IRON FORTIFICATION, IRON-FOLIC ACID SUPPLEMENTATION, COMMUNITY BASED NUTRITION PROGRAMMING, PROVISION OF COMPLEMENTARY FOODS, COMMUNITY BASED MANAGEMENT OF SAM, VITAMIN A SUPPLEMENTATION, MICRONUTRIENT POWDERS, ZINC SUPPLEMENTATION, AND DEWORMING.

outcomes most effectively. The analysis presented here makes the case for greater investment in resilience building, by demonstrating that initiatives to increase household income in advance of a crisis or shock are more cost effective than waiting and responding to a humanitarian need. However, this increase in income can be achieved by a variety of combinations of interventions. Further work is required to monitor the impact, and cost effectiveness, of packages of resilience building interventions.

Even more so, a much broader perspective on adaptive investment that can respond to the multiple and changing needs of households and communities may be required to truly address resilience in an effective and sustained manner.

The findings also raise some tough questions around what 'building resilience' might look like for different populations. Providing significant investment in a chronically poor context still may not lift households to a point where they can cope on their own without compromising their welfare. Building systems to allow for people to maximize their productive potential won't work in all contexts, for example where household land holdings are so small that self-sufficiency is simply not possible, no matter how productive that piece of land.

Intervening early to respond to spikes in need – i.e. before negative coping strategies are employed - can deliver significant gains and should be prioritized. While building resilience is the most cost effective option, there will always be spikes in humanitarian need, and having the systems in place to respond early when crises do arise will be critical. The model estimates that cost savings alone could result in total savings of $965 million over the 15 years, or approximately $64 million per year in Tigray and Somali alone. These funds could go a long way towards investing in a more complete package of resilience interventions.

While cost savings due to early procurement make up a substantial part of the savings, the avoided losses – both income and livestock – account for the majority of savings. These avoided losses are generated in the model as a result of intervention taking place before negative coping strategies are employed. A wider mix of activities can be used as part of an early response. Contingency planning designed around the principles of 'low regrets' should facilitate a system where any early action is cost effective regardless of the scale of the crisis that materializes, because these activities will contribute to overall household resilience in either case.

There is not a clear or definitive measure for when an early response needs to be triggered. In the model, it is assumed to take place before negative coping strategies are employed and assumes some reduction in the escalation of food prices. However, it also clearly shows that different populations are dependent on different factors.

Even in the context of a later response, systems that ensure that food and other commodities can be procured and pre-positioned well ahead of a crisis can result in significant cost savings. This is particularly true in the context of Ethiopia, where crises are regular and protracted and hence pre-positioned goods can be put to good use. Mechanisms such as multi-year humanitarian funding can contribute substantially to cost savings by ensuring that agencies have the funds in place to procure at the time of the year that optimizes prices, rather than delaying until emergency funds are released. Optimized procurement to stock pipelines can allow for significant cost savings.

A greater use of cash could add significant cost savings and bring benefits to the local community. If the humanitarian response was shifted to a cash based transfer, this would directly save the Government of Ethiopia and the international donor community an estimated US$765m over 15 years, or approximately US$51 million per year on average over 15 years, in Somali region. In Tigray, savings are estimated at US$443 million, or US$30 million per year.

These findings do not suggest that cash should be used at scale in all contexts; cash can bring substantial losses if used in contexts where market integration is not strong, or inflation is high, for example. Further, Ethiopia is a food deficit country that relies on imports for at least some of its consumption needs, and hence cash cannot be the only response modality. The findings do indicate, however, that substantial cost savings can be made if cash is used in more contexts as appropriate.