Climate Shocks and the Social Assistance Grants for Empowerment (SAGE) Programme in Uganda

Irish Aid Climate Change and Development Learning Platform

Final Report

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Acronyms

CSP – Irish Aid's Country Strategy Paper in Uganda

ESP – Expanding Social Protection programme

IIED – International Institute for Environment and Development

IPCC – Intergovernmental Panel on Climate Change

OPM – Oxford Policy Management

LDC – Least Developed Country

MoGLSD – Ministry of Gender, Labour and Social Development

MoLGFC – Ministry of Local Government Finance Commission

mVAM – Mobile Vulnerability Analysis and Mapping

NUSAF 3 – Northern Uganda Social Action Fund 3

RCT – Randomised Control Trail

SAGE – Social Assistance Grants for Empowerment

SCG – Senior Citizen's Grant

TASAF III – Tanzania Social Action Fund

ToC – Theory-of-Change

UNMA – Uganda National Meteorological Authority

VFSG – Vulnerable Families Social Grant

VC-ARID – Value Chain Analysis for Resilience in Drylands

WFP – World Food Programme

Executive Summary

i. In recognition of the climate risk and poverty nexus, the role of social protection in facilitating climate resilience is under investigation. A synthesis of evidence from Sub-Saharan African countries indicates that cash transfers can reduce the impact of weather shocks for poor households (Asfaw and Davis, 2018). Innovations to make social protection provision more climate risk responsive are taking place in various countries, including Ethiopia and Mozambique.

ii. In Uganda, the Expanding Social Protection (ESP) programme (2010-2015) was designed to reduce poverty and improve life chances for the poorest. This included operationalization of a cash transfer pilot, the Social Assistance Grants for Empowerment (SAGE), to generate evidence of impact and establish / test delivery systems.

iii. Using the impact evaluation of the SAGE programme conducted by OPM (2012-2014), the case study reported here integrates data of climate shocks/stresses to re-evaluate the performance of social protection as an enabler for households to address such shocks. As a result, actionable recommendations are generated to increase the climate shock responsiveness and thus effectiveness of social protection delivery.

iv. The case study research adds value to and re-interprets the OPM data (OPM, 2015). It documents and assesses the effects of climate shocks, and the ability of social protection to contribute to climate resilience. OPM's objective was to evaluate programme impact, whereas this study looked specifically to integrate climate shocks.

v. The methodology enabled climate shocks to be contextualized to the specific sensitivities of the different localities, such as long hazardous dry spells that interact with farming and pastoralism. By integrating community level survey data with the historical climate record, the research team (IIED and UNMA) set out what constituted a climate hazard for each household, whilst considering how changes in households' context affect the experience of climate shocks. This established location-relevant climate shocks to which SAGE assists resilience and recovery. It establishes whether the effectiveness of social protection is inhibited by climate shocks; and it determines the effect of SAGE on the poorest households' ability to resist and recover from climate shocks.

Findings

vi. The study examined the effectiveness of the family grant (VFSG) and the senior citizens grant (SCG), but the main focus was the SCG. As these beneficiary groups are fundamentally different in terms of key socio-economic characteristics, and the transfer recipients live in different locations, no assessment of relative effectiveness between programmes should be made.

vii. *Climate shocks and poverty*: although effects were different in different locations, in general, climate shocks lead to increased poverty in terms of reduced consumption and to a lesser extent, the need to sell assets. This effect is greatest for the poorest households, and this category includes a high proportion that are female-headed.

viii. *Climate risks mediating effects of social protection*: being in receipt of SCG increases the probability of a household owning cattle relative to the control, but only if they did not experience a climate shock. This same pattern of the SCG being effective when climate conditions are stable, but less effective when shocks occur, is also present when following indicators of consumption and hunger. **As such, we contend there is some grounds to believe the effectiveness of SCG is inhibited by climate shocks.** It is only in relation to goat ownership where the SCG beneficiaries perform well when experiencing a climate shock.

Discussion

ix. While climate risks affect all households, they do so differently according to the differentiated resilience of the social units. Households experiencing climate shocks are typically poorer, and less able to regulate consumption. The poorest households appear to experience more climate shocks and were affected worse, and tended to live is geographic clusters.

x. The study shows that climate shocks are at times reducing the effectiveness of cash transfers. SCG beneficiary households sometimes failed to regulate consumption when they experienced a climate shock, while those who didn't experience a shock managed. A similar pattern is discernible in relation to cattle ownership.

xi. Livestock assets and cash transfers to the poorest can have important and complementary functions for poor households in dryland locations. In certain circumstances, beneficiary households receiving cash transfers are better able to maintain livestock keeping and benefit from the consumption, production and savings asset functions that livestock provde. But the analysis shows that climate shocks reduce the ability of cash transfer beneficiary households to purchase and maintain cattle.

Recommendations

xii. For SAGE to be more effective, the design of climate shock responsive social protection should be prioritised. Social protection systems can be adjusted to better address climate risks to those people eligible to be beneficiaries through different strategies. This could take the form of increasing the amounts paid to beneficiaries (i.e. vertical expansion), increasing the numbers of beneficiaries at times of or in advance of climate shocks (i.e. horizontal expansion), increasing the frequency of payments, and/or developing a more pre-emptive and shock informed delivery system. For a climate shock to be addressed, programme implementers need to know when a shock has occurred / is occurring / is likely to occur, the nature of the shock, and its likely impact on beneficiaries. An adequate climate sensitive shock response can then be implemented in terms of shock timing and severity. Other options include aligning the SAGE intervention with others across different regions (e.g. Karamoja), that despite not having social protection components, have similar resilience related objectives.

xiii. The relevant institutions and networks with related functions in Uganda are the following: Uganda Disaster Risk Information Centre (Department of Disaster Preparedness and Management) that produces the monthly National Integrated Multi-Hazard Early Warning Bulletin; UNMA that provides the Uganda Disaster Risk Information Centre with recent historical rainfall data in addition to the forecast for the

approaching season; Given UNMA's deep engagement with climate risk (including to farming, pastoralism and wider non-livelihood related risks), also UNMA's past and present direct collaboration with the Uganda Disaster Risk Information Centre and their monthly National Integrated Multi-Hazard Early Warning Bulletin, UNMA is the most appropriate entry point for ESP to develop climate shock responsive social protection.

xiv. A 3-step approach based on methods tested in this study is proposed to establish a system for triggering a climate shock responsive social protection system. Using livelihood-climate hazard thresholds and consumption data, it is possible to estimate the consumption gap attributable to different levels of climate shock severity. UNMA has the capacity to estimate the level of climate shock over multiple reference periods, and thus project the likely consumption gap. UNMA will then be in a position to collaborate with ESP and guide increases in money transfers to a level sufficient to address the consumption gap.

Introduction

1. In Uganda, the population is experiencing increases frequency and intensity droughts, floods and landslides (Winthrop et al., 2018; UDRA, 2018). Average temperatures have risen as much as 1.5^{o}C (1960-2009), and seasonal rains have decreased over the past 25 years (FEWSNET, 2012; Funk et al., 2012). In particular, droughts and floods are regularly interacting with structural vulnerabilities common in Least Developed Countries (LDCs) – such as weak infrastructure, population density and land degradation – to weigh on climate sensitive livelihoods, from coffee growers to cereals farmers and pastoralists (Niang et al, 2014).

2. Within Uganda, the Karamoja region has experienced considerable increases in temperature, and such warm areas are expected to expand up to 2039 (FEWSNET, 2012). The region is particularly susceptible to climate hazards and food insecurity, and this has contributed to high poverty rates, and low human development (Chaplin et al., 2017). The region displays various forms of structural vulnerability. Families have high rates of dependency (dependency ratio = 141), with over half (51%) the population under 24 years old, and only half of these ever attending school (UBS, 2017). Between 80-90% of households in Karamoja reported experiencing a drought between 2015-2016, with other common shocks including pests/diseases and food price shocks (FAO, 2018).

3. The Ugandan Expanding Social Protection (ESP I) programme (2010-2015) was designed to reduce poverty and improve life chances for the poorest (MoGLSD, 2013). The objective was to establish a national social protection system as a component of Uganda's national planning and budgeting processes. It focused on policy support to strengthen leadership on social protection across government, and the operationalization of the Social Assistance Grants for Empowerment (SAGE), including a cash transfer pilot to generate evidence of impact and test delivery systems.
4. In line with Uganda's Second National Development Plan (2016-2020), the ESP II (2015-2020) aims to deliver the Government's social protection goal of reducing poverty and inequality for inclusive development by 2020 (MoGLSD, 2015). ESP II expands direct income support and builds institutional capacity for the national social protection system.
5. Social protection is identified in Uganda's National Development Plan (2010-2015) as able to improve resilience to shocks by the poorest – particularly climate shocks. Cash transfers can enable prevention, coping and mitigation of climate risk by reducing acute social vulnerability and mitigating disadvantage (e.g. elderly, women, children and disabled). The linkages among poverty, shocks and social protection are also reflected in the Government's 2015 Social Protection Policy.
6. Annex 1 presents a review of literature on the linkages among social protection and supporting climate resilience, and Annex 2 outlines and discusses the ESP II ToC in terms of climate shocks to development.
7. Evaluations of the SAGE pilot programme indicated that focussing on social protection has potential for high impact on the poorest quintile if suitable delivery modalities are used. SAGE is seen as enabling adaptive capacity through improving economic and social vulnerability (Ulrichs and Slater, 2017). Other related initiatives in Uganda include the Northern Uganda Social Action Fund 3 (2015-2020) (World Bank, 2015) that seeks to

protect household assets through a 'shock responsive' contingency that increases resources post disaster (Ulrich and Slater, 2016).

8. Embedding strengthened social protection systems is strongly aligned to Ireland's commitments to building resilience. Irish Aid's 2016-2020 Uganda Country Strategy Paper (CSP) seeks to improve living standards of poor and vulnerable individuals. The Irish Aid programme in Karamoja seeks to build synergies through programmes that support the provision of vocational training relevant to the agriculture and livestock sectors and that explore opportunities to integrate nutrition in social protection, HIV and education programmes (Embassy of Ireland, 2016).

Case Study

9. Irish Aid commissioned this study to identify potential improvements in the SAGE programme to increase its support of adaptive responses to climate risks and shocks. The objective is to contribute to the integration of climate risk management into Irish Aid's programming of social protection interventions in Karamoja. Specifically, the study investigates how social protection enables the poorest to resist and recover from climate shocks as indicated by household consumption and assets holding.
10. The study builds upon an Oxford Policy Management (OPM) study initiated in 2012, and commissioned by the Department for International Development (DfID) in the United Kingdom. Through this assessment of data, climate shocks/stresses are integrated with existing OPM study data to enable a re-interpretation of the performance of social protection and to understand the factors behind effective delivery.
11. Four districts were initially surveyed to establish the type of shocks people experience through their livelihoods. The result was a series of thresholds where normal climate variability becomes hazardous to livelihood activities. The survey data in four districts were used to determine the average livelihood hazard threshold for different livelihood activities. The survey data were combined with livelihood characteristics of the remaining 4 districts to establish their thresholds in relation to climate shocks and livelihoods. Therefore, the scope of the study is Kiboga, Katakwi, Kabermaido, Apac, Moroto, Nebbi, Nakapiripirit and Kyenjojo. Recommendations focus on Moroto and Nakapiripirit in Karamoja.
12. This study contributes to the evidence base on social protection and climate risk by integrating contextualized climate shock data into an evaluation of the SAGE social protection programme. It does this to establish: a) the level of exposure to climate shocks; b) whether the effectiveness of social protection is inhibited by climate shocks; and c) to determine the effect of SAGE on the poorest households' ability to resist and recover from climate shocks.
13. Little previous research has included climate shocks directly into an evaluation design for social protection[1]. In the study reported here climate shocks are contextualized using local

[1] One of the very few such studies used a randomised control trail in Zambia to evaluate the Child Grant Programme in terms of a household's ability to absorb weather shocks and maintain consumption

people's definitions of what constitutes a climate shock to crop agriculture and to livestock keeping. For example, long dry spells in otherwise average rainfall seasons were identified as a shock. This innovative approach offers insights into the location-relevant climate shocks to which SAGE supports resilience.

14. The case study addresses the key questions below. Annex 3 specifies how these questions were answered through data analysis including the hypotheses tested and the data used.

Q1. Do climate shocks push households into poverty or reduce their capability of escaping poverty?

Q2. Do cash transfers save productive assets of households experiencing climate and other shocks?

Q3. Do the assets saved via social protection enable households to regulate food and non-food consumption for the poorest households?

Q4. What asset levels are necessary to overcome climate shocks and stresses of differing magnitudes?

Q5. How can policy innovations in social protection be layered/integrated into the broad landscape of Irish Aid policy to improve capacity to deal with climate shocks and stresses?

Findings

15. The section starts with a series of thumbnail descriptions of people interviewed during the survey and the focus groups discussions. These provide information of local perceptions of climate risks and the ways people are coping. Then findings are presented for each of the key questions. A summary is given first, and a more detailed presentation follows.

16. The survey team gathered information in Moroto, Nakapiripirit, Kiboga and Kyenjojo to contextualize what climate shocks have a negative impact on livelihoods. The aim was to establish the thresholds for climate shocks that relate to losses in different types of livelihoods. Responses exclusively related to agriculture and pastoralism and the vast majority stated protracted dry spells and drought as the main hazard to livelihoods. Due to the dominance of severity and scale of drought and dry spells from respondents, the study focused on dry spells as the main hazard in the following analysis.

17. In relation to drought, respondents stated that animals were left short of pasture and water, and that crops suffered from wilting and drying. Pastoralists adapted by constructing dams to harvest water, used water from the boreholes replenish livestock, bought water from trucks, inoculated animals against potential disease outbreak, and others migrated with their animals. Some sold cows to reduce the burden in dry periods. Farmers changed to drought resistant crops, some practiced mulching to mitigate evaporation, there was ditch digging to contain water and small-scale irrigation, some

and food security. Climate shocks were defined as periods of lowest 20 percent of rainfall and using a seasonal index variable capturing rainfall magnitude and concentration (Asfaw et al., 2016).

managed to block farm in groups to reduce the burden of maintenance, and others replanted when the rains came. But the almost half took no measures to address the adverse affects of dry spells and drought.

18. The OPM survey also collected data on shocks likely determined by rainfall variability becoming hazardous, and asked respondents about the ways they cope (see Annex 4). When respondents experienced an shock related to lower income from farming, animals and fishing, they adapted in the following ways: 30% sought assistance from family and friends, 30% borrowed money either formally or informally; 10% sold livestock. In addition, respondents listed the coping strategies when they began to lose livestock: 29% began to sell livestock to reduce losses; 18% received assistance from family and friends; and 10% borrowed money informally.

Local people, and their climate risk perceptions and coping strategies

Joan of Moroto District. Joan is a 58-year old farmer. She weeds her crops in May and they mature in June/July. But prolonged dry spells turning into drought have affected her harvests. No crops survived in the seasons of 2017 and 2016. A series of dry spells in the most critical month after weeding dried-up all the sorghum plants. When the sorghum dried, she planted maize, but this also dried-up in June. Early planting could have helped, but this depends on the predictability of rain, and the availability of ox-ploughs and labour.

Elijah of Kiboga District. Elijah is a 61-year old herdsman and farmer with over 150 cows and 80 goats grazed on 450 acres of land. His entire family are involved in livestock keeping and subsistence farming of food crops. His crops and livestock were greatly affected by prolonged drought, which lasted for almost the entire year of 2017. There was livestock disease outbreak, green pasture and water was scarce, livestock died, the cattle tick population exploded, and crops dried-up. He said that 2016 was a better year compared to 2017 since they only experienced drought during January and February. To cope Elijah sprayed the ticks and vaccinated his animals.

Patricia of Kyenjojo District. Patricia, a 48-year old lady from Kyenjojo district, is involved in cultivation of crops (cassava, beans, Irish potatoes and maize) on 8 acres of land for both domestic use and cash sales. Her crops were severely affected by a prolonged dry spell from October to November 2016, which later turn into a drought. She said that most of her crops planted in September did not grow (dried-up) or mature. This led to 80% loss in her harvest. Again there was hardly any rain last year (2017), but it is now raining a lot this year (2018). She had no adaptive measures to combat the effect of drought/dry spells on her crops, but she prays for a good season to come.

Doris of Nakapiripirit District. Doris a 71-year old lady and SAGE beneficiary. Her livelihood depends upon cultivation of crops (maize and sorghum) and SAGE money. The prolonged dry spell/ drought affected her sorghum and maize, causing her 100% harvest loss. She further said that two months absence of rain is dangerous for both maize and sorghum. She attested that no adaptive measures were taken to control the hazards. She explained that local people believe in supernatural powers of their gods to bring rain. There are also attempts to improve soil fertility and water retention capacity, which have proved unsuccessful.

Brenda and Godfrey of Kyenjojo District: Godfrey and Brenda are 85-years old and 70-year old respectively. They are both SAGE beneficiaries and peasant farmers in Dumanyaze village, Bugaaki sub-county. They experienced a drought from March to April 2017 that led to

the loss of the crops in their garden. They also experienced heavy rains with hailstorms during the months of August to December 2017 that also destroyed their crops. The long spells of drought affected the growth of crops and when the rains came, they were too heavy for the crops to withstand. Weeding became very hard and hence weeds competed for water and light with the crops. As an adaptive measure, they replanted with new seeds when the rains returned and this was effective. Otherwise, no other measures were taken to cope with risks from heavy rains and hailstorms.

Q1. Do climate shocks push households into poverty or reduce their capability of escaping poverty?

Synopsis of main findings

19. Climate risks are exacerbating poverty in the districts surveyed. The poverty gap and consumption metrics best show the links between poverty and climate shocks. This can be viewed as a broad trend across the sample of households, but the effects are also location specific and geographically clustered.

20. Female headed households have lower consumption relative to their male headed counterparts, and this finding holds whether they have experienced a climate shock or not. When the broader measure of poverty is assessed, female-headed households tend to be poorer when they experience a climate shock.

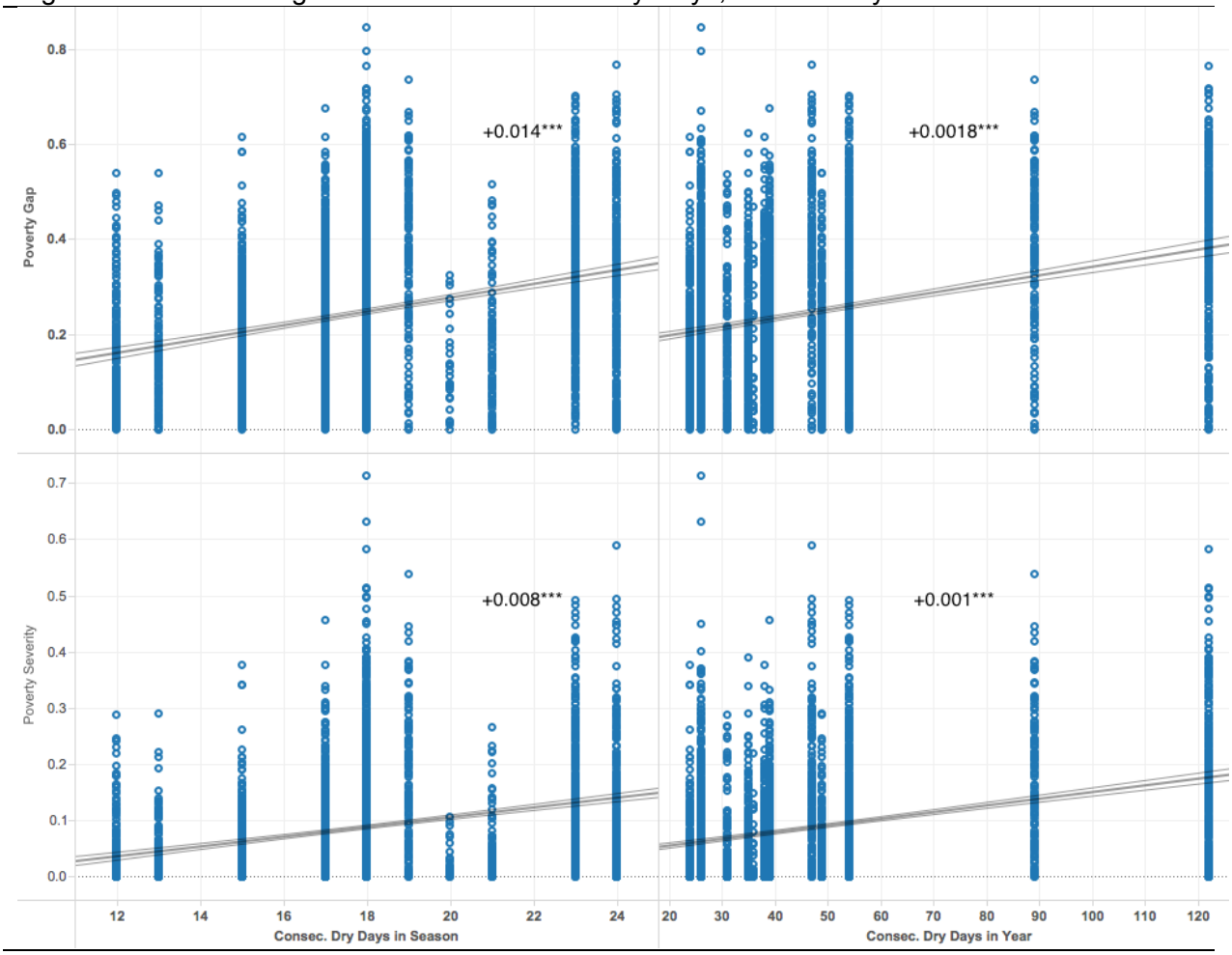
Detailed findings

21. Detailed analysis is presented below that shows the linkages between climate shocks and poverty.

22. The clearest metrics of poverty in the OPM data are measures of the poverty gap and poverty severity. The poverty gap index demonstrates the extent households' fall below the poverty line. While poverty severity is a weighted sum of poverty gaps as a proportion of the poverty line. This provides a measure that accounts for inequality among the poor by putting more weight on households falling significantly below the poverty line. This data was only available for 2013 and 2014.

23. Figure 1 below shows the broad association between consecutive dry days and the poverty gap/severity. As the number of consecutive dry days increase in both the wet season (interpreted as a shock to crop agriculture) and throughout the year (interpreted as a shock to livestock keeping), the level of poverty rises considerably on both metrics. For every additional consecutive dry day, the poverty gap (see top two charts) is exacerbated by 0.014 and 0.0018 for the wet season and throughout the year respectively. The implication is that the poverty gap approximately doubles across the full range of values for consecutive dry days – between 0-25 days in the wet season; and 20-120 days throughout the year.

Figure 1. Bivariate Regression of Consecutive Dry Days, and Poverty Metrics



*** p<0.01, ** p<0.05, * p<0.1

24. For every additional consecutive dry day, poverty severity (see bottom two charts) rises by 0.008 and 0.001 for the wet season and throughout the year respectively. This means that the average severity of poverty also approximately doubles across the range of values – between 0-25 days in the wet season; and 20-120 days throughout the year.

25. These results show that consecutive dry days are highly correlated with poverty levels in the households of Northern, Central and Eastern Uganda. Shocks and stresses are interrupting climate sensitive aspects of economic production, indirectly threatening physical security through hunger and malnutrition, and compromising future development progress. However, correlation is not causation. First, structural factors make it possible to interpret the relationship in reverse – pre-existing poverty can exacerbate the adverse social impacts of climate shocks. Areas of historical poor rainfall typically have poor soils, are politically and economically marginal, and are often the least preferable and last lands to be settled, especially for agriculture. These structural issues account for some of the differences in poverty levels before any physical effects have occurred, particularly in the figure shown for the wet season (shocks relating to agriculture).

26. Figure 2 below demonstrates the association between consecutive dry days and other key outcome indicators of the SAGE evaluation that are at least partially climate sensitive. As the number of consecutive dry days rise in both the wet season and throughout the year, the level of general consumption per adult falls, and in terms of expenditures on food. For each additional consecutive dry day, general consumption falls between 285-696 Ugandan shillings (Ush), and food expenditures reduce between 173-346 Ush. These findings were statistically significant.

27. The analysis of the relations among climate shocks and household asset sales and purchases is less clear. For each consecutive dry day, the number of assets purchased declines slightly from minus 27 and minus 685 Ush. As consecutive dry days increase the number of asset sales reduce from minus 277 to minus 4276 Ush. The number of households declaring asset sales is low (n=47) and the finding should be interpreted with the low number of entries in mind.

28. Cash savings display some negative relation to the consecutive number of dry days. This is more pronounced when dry spells occur in the wet season (i.e. an average reduction of 8087 Ush for each additional day) compared to the year overall (i.e. 3394 Ush for each additional day). However, the result is not statistically significant.

29. Linkages between climate shocks and poverty are observable within the same households. Table 1 below shows the association between climate shocks and stresses on general and food consumption per adult over time (2012-2014) in the same households, and separated by district. Consumption metrics were developed by the OPM survey team through monthly household visits that enabled consumption metric to be established that accounted for changes in consumption levels throughout each year. The climate variables (AgShock for agriculture shocks; LiveShock for livestock shocks) are the result of integrating survey data of livelihood—climate hazard thresholds with records of consecutive dry days, to establish contextualised shock metrics.

30. The within household statistical model (change between 2012-2014) identifies patterns of marked change in climate shocks and consumption *relative to the mean value for the household*. Therefore, a lack of effect and/or significance does not necessarily mean households are not being exposed to climate shock and suffering/adapting. They could be, but the shocks may be consistent through the period modelled, or subject to balancing oscillations in upward or downward pressure on consumption.

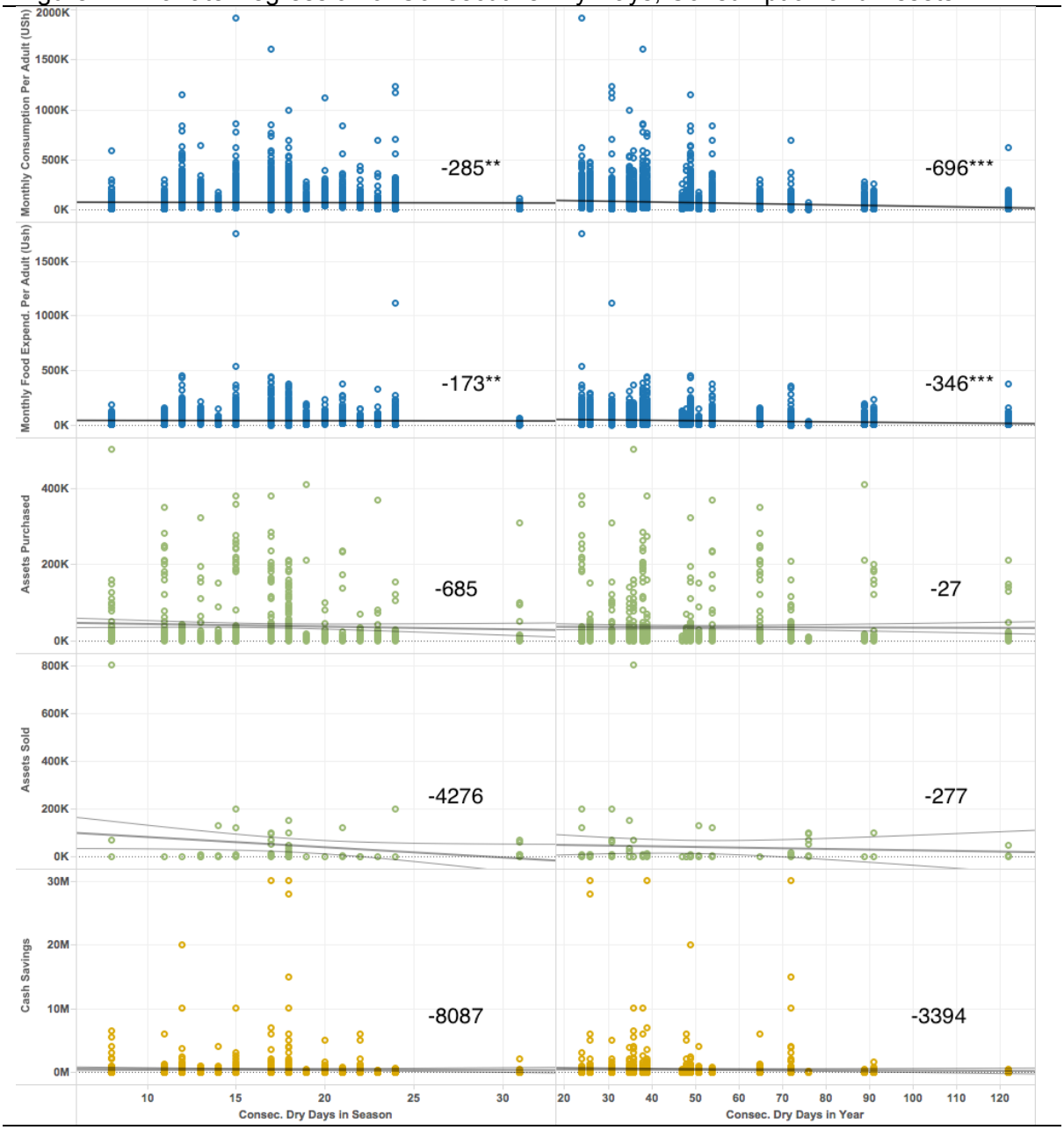
31. Table 1 also shows the association between climate variability and upward/downward changes in consumption. In Katakwi (minus 9583 Ush and minus 4521 Ush) and Apac (minus 5079 Ush and minus 2761 Ush) households are both highly sensitive to climate shocks to livestock keeping that affect consumption within households. Even when cattle holdings are particularly high (40% and 45% for Apac and Katakwi respectively), large reserves appear to provide insufficient options to smooth consumption in times of shock. This may imply that households are reluctant to sell livestock to offset shock effects and maintain consumption. In addition, households in Nebbi district find it difficult to regulate consumption when agriculture-based climate shocks occur over the growing season (minus 8855 Ush and minus 5977 Ush).

32. The least affected district, and one which is different from the overall downward pressure on consumption when exposed to climate shock, is Kyenjojo. Climate shocks in the growing season are associated with increased consumption per adult (36674 Ush and

19454 Ush for general and food consumption respectively) for each additional dry day over the shock threshold. This implies highly climate resilient household productivity. The insight of programme implementers and other people with local contextual knowledge on the reasons behind this more climate resilient consumption in Kyenjojo is needed to better interpret this finding.

33. Moroto and Nakapiripirit are both districts with high cattle ownership (19.6% and 23.6% of households respectively). It follows that such households should experience pressure on consumption when year-round longer-term climate shocks strike livestock. Households in Moroto are particularly susceptible to agriculture-based shocks in the growing season (minus 6235 Ush and minus 3067 Ush), but the districts were resilient to livestock shocks (+487 Ush and +243 Ush in Moroto; and, +267 Ush and +161 Ush in Nakapiripirit change in consumption for each additional dry day over the shock threshold). Though, as will be seen below, modelling within household change in shocks and consumption does not reveal the outliers in terms of overall low consumption, poverty and climate shocks in Moroto. Lastly, Kyenjojo is also resilient with no observable negative impact (1758 Ush and 942 Ush) for each additional dry day over the shock threshold. Once again, contextual knowledge is needed to interpret these findings in relation to such disparities between districts.
34. Figure 3 below shows the effect of livestock climate shocks on consumption and poverty simultaneously. The average value is shown by the grey line through the middle of the charts, and the bottom 20% of the average is shown by the grey band at the base. Shocked households tend to have lower household consumption (44,350 Ush versus 46,399 Ush), and show a greater tendency to fall deeper into poverty, as seen from the density of the entries in the bottom left of the charts. Crucially, the poorest are affected worse than those on average or above average income. The relatively wealthy appear to not need to adjust consumption when a shock strikes. But the longer tail of the curve demonstrates that, when shocks occur, it is the poorest that suffer both in terms of deeper poverty and reduced consumption.
35. Figure 4 compares male- and female-headed households in terms of average consumption, and whether they experienced a climate shock or not. Male-headed households maintain higher consumption whether they experience a climate shock or not. The difference is greater in a no-shock scenario.
36. Figure 5 compares male- and female-headed households in terms of the average poverty gap, and whether they experienced a climate shock or not. To recall, the poverty gap index demonstrates the extent households' fall below the poverty line. In a no-shock scenario, female-headed households have a smaller poverty gap than male-headed households. However, when households experience a climate shock, female-headed households fall into deeper poverty relative to male-headed households.

Figure 2. Bivariate Regression of Consecutive Dry Days, Consumption and Assets



*** p<0.01, ** p<0.05, * p<0.1

Table 1. Poverty and Climate Shocks by District

District	Shock/Stress Metric	Consumption p/a	Food Consumption p/a
Kiboga	AgShock	20679***	10235***
	LiveShock	-1472***	-870***
Katakwi	AgShock	-8965***	-4283***
	LiveShock	-9583***	-4521***
Kabermaido	AgShock	11008***	2553***
	LiveShock	-3921***	-1154***
Apac	AgShock	1470***	919***
	LiveShock	-5079***	-2761***
Moroto	AgShock	-6235**	-3067***
	LiveShock	487***	243***
Nebbi	AgShock	-8855***	-5977***
	LiveShock	-2434***	-469***
Nakapiripirit	AgShock	-250	-73
	LiveShock	267***	161***
Kyenjojo	AgShock	36674***	19454***
	LiveShock	1758***	942***

*** p<0.01, ** p<0.05, * p<0.1

Figure 3. Poverty Gaps, Consumption and Climate Shocks

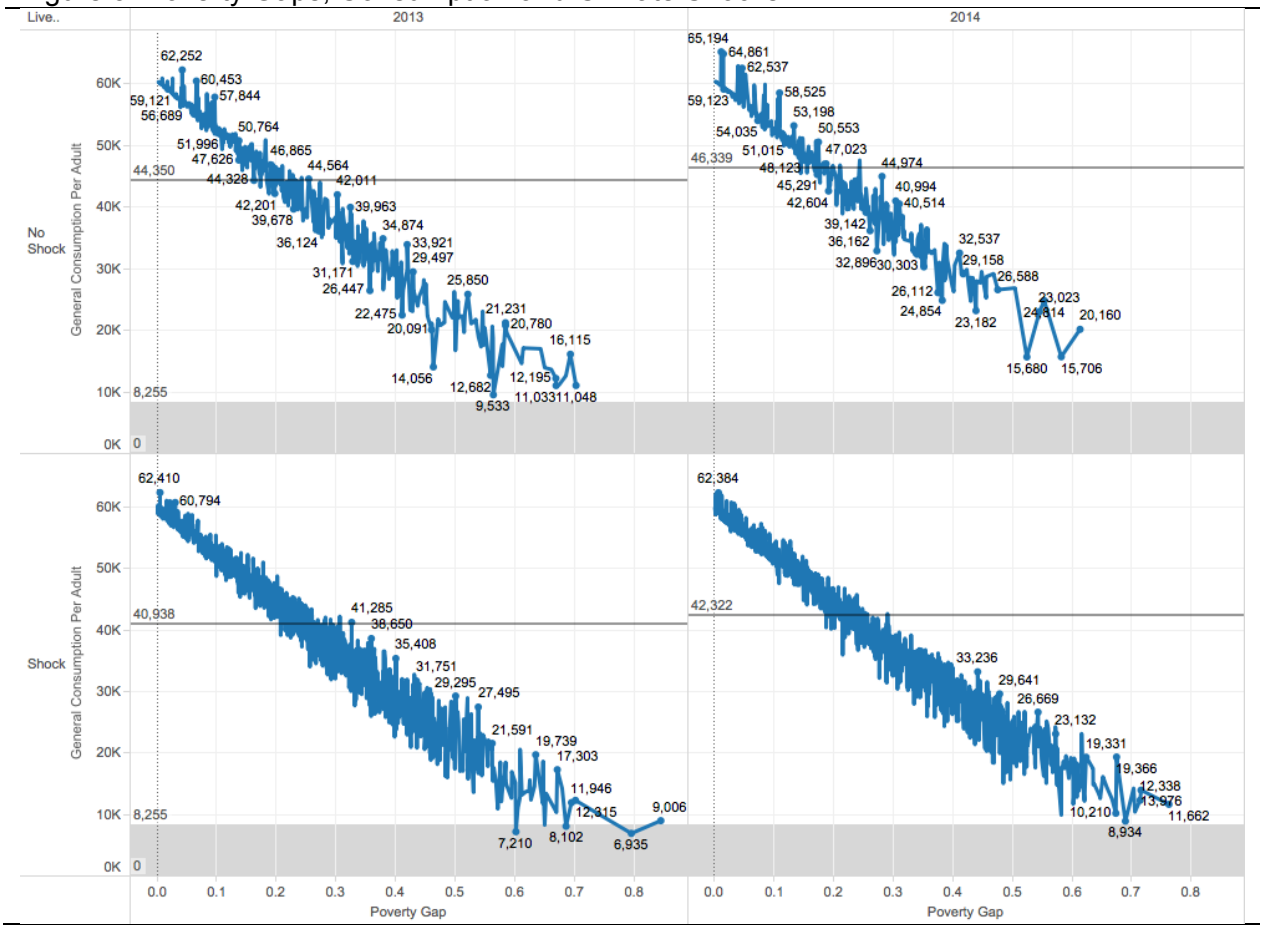


Figure 5. Average Household Consumption, Climate Shocks and Male/Female Headed Households

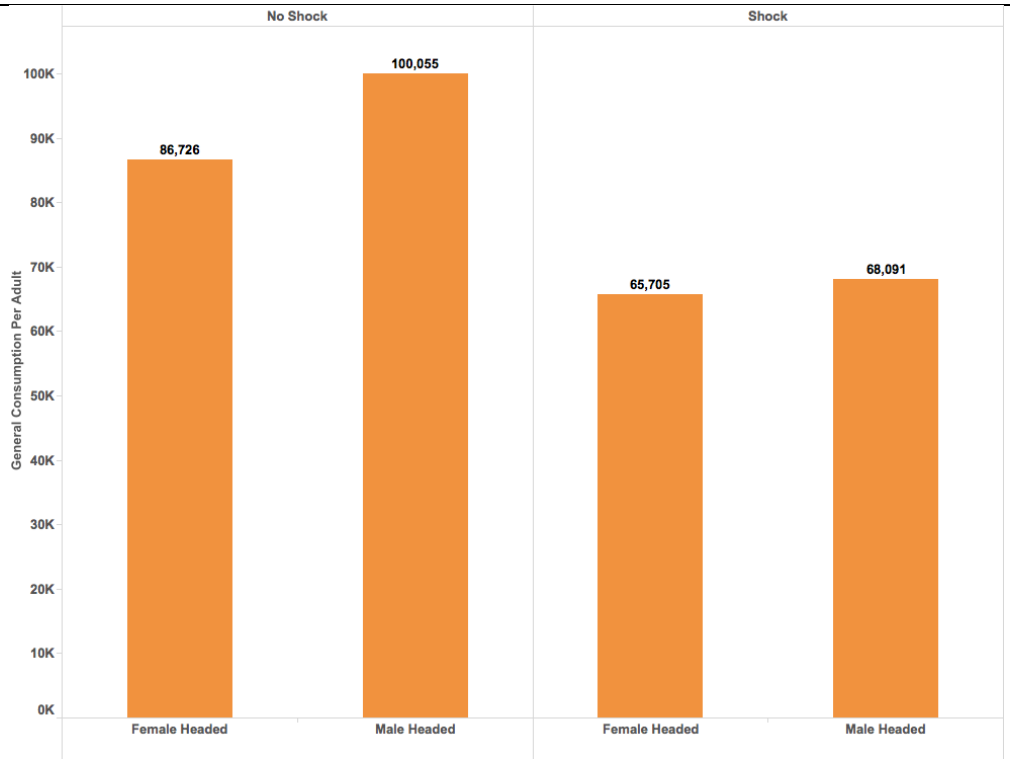
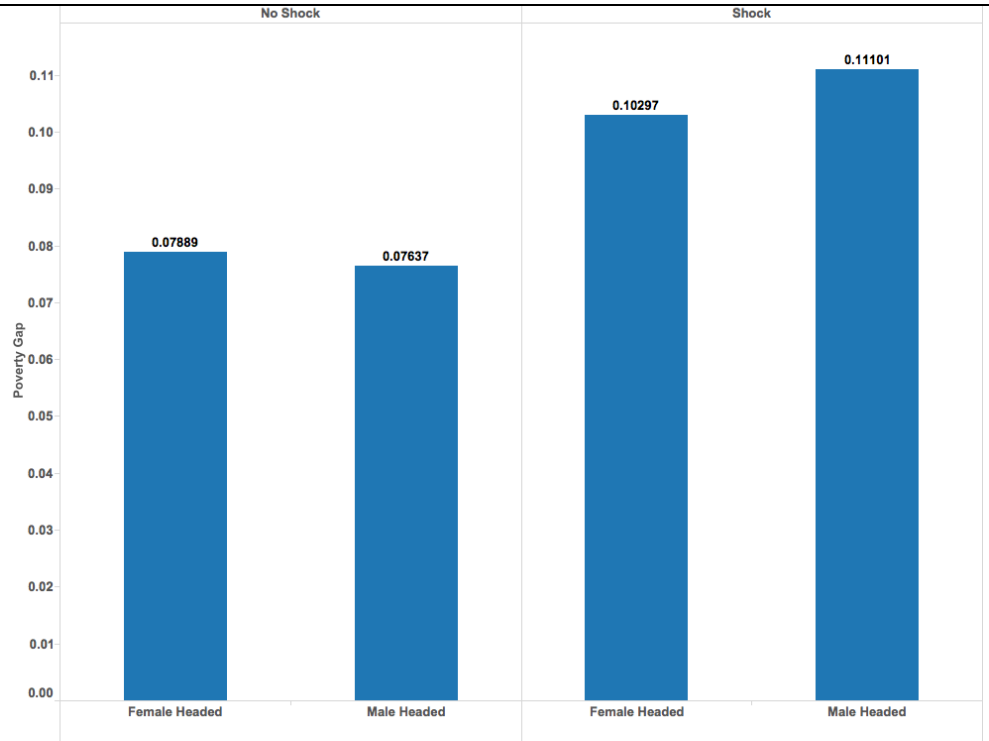


Figure 4. Average Poverty Gap, Climate Shocks and Male/Female Headed Households



Q2. Do cash transfers save productive assets of households experiencing climate and other shocks?

Synopsis of main findings

38. VFSG beneficiaries maintain better general asset holding in climate shocked and non-shocked scenarios.
39. SCG beneficiaries maintain cattle and goat keeping best under stable climate circumstances.

Detailed findings

40. This sub-section tests whether cash transfers protect household assets in times of climate stress/shock. It combines OPM and climate data to establish the role of social protection programmes in maintaining asset levels in times of climate stress. Difference-in-difference models provide insight into the effect of social protection in enabling poor households to maintain and build assets compared the counterfactual of not receiving such transfers. By integrating data on climate shock, the analysis can establish the role of social protection in asset saving or building during times of climate stress.
41. Table 2 below shows the performance of cash transfers in saving assets when households are divided according to whether they experienced a climate shock or not. There is little statistically significant effect of cash transfers on the outcomes of livestock sales and asset purchases for SCG households. A reduction is notable in livestock sales in SCG households that experience a climate shock in both the growing season and year-round, but none of the findings are statistically significant. The reduction may imply that, in some instances, SCG is enabling households to avoid selling livestock even during times of climate stress.

Table 2. Assets, Cash Transfers and Climate Shocks

District	Shock Metric	SCG Shocked	SCG No Shock	VFSG Shocked	VFSG No Shock
Livestock Sale	Agriculture	-46253	32360	-20278.	46512**
	Livestock	-12657	18697	1124	-100732*
Assets Purchased	Agriculture	-1679	1860	2004	2949
	Livestock	-305	3758	2688**	-82
Cash Savings	Agriculture	-20661	63323	44563	67855
	Livestock	13078	171744	124898*	-143150

**** p<0.01, ** p<0.05, * p<0.1*

42. VFSG is linked to changes in asset holding in shocked and non-shocked scenarios. For households not experiencing a shock in the growing season, those receiving the VFSG sell more livestock, while VFSG households that experience a year-round shock reduce their livestock sales relative to the control. The latter indicates that the VFSG may enable households, relative to control households experiencing a climate shock, to avoid asset shedding out of necessity, and retain animals even when under climate stress. The former suggests household sensitivity to climate stress in the growing season may be

encouraging the shedding livestock as transferable assets to be able to invest in adaptative activities, or as an attempt to smooth consumption.

43. In relation to assets purchased and cash saving, there are statistically significant results. In households experiencing a year-round climate shock, the VFSG enabled households, compared to control households also experiencing a climate shock, to purchase assets and increase cash savings simultaneously. Compared to control households who experience a climate shock, the VFSG households were better positioned to accumulate assets and generate saving under adverse climate conditions.

44. The SCG and VFSG improved the likelihood of owning livestock whether a climate shock occurs or not. The stronger and more consistent results come from the SCG sample. Table 3 below shows that receiving the SCG increases the probability of a household owning cattle relative to the control, but only if they did not experience a climate shock. For those experiencing a climate shock, there was no statistically significant affect for SCG recorded.

45. In relation to the ownership of goats, the effect of the SCG on households is different according to the type of shock experienced. As with cattle ownership, the SCG supports goat ownership in households that do not experience a climate shock in the growing season. While the VFSG is associated with higher likelihood of goat ownership even when households experience a climate shock in the growing season. When households witness a year-round climate shock, SCG enables significantly greater goat ownership compared to the control.

Table 3. Livestock Ownership, Climate Shocks and Cash Transfers

District	Shock Metric	SCG Shocked	SCG No Shock	VFSG Shocked	VFSG No Shock
Household Owns Cattle	Agriculture	0.008	0.06**	0.15	0.03
	Livestock	0.02	0.12**	0.01	0.02
Household Owns Goat(s)	Agriculture	0.02	0.07**	0.05*	0.05
	Livestock	0.04*	0.08	0.02	0.01

*** p<0.01, ** p<0.05, * p<0.1*

Q3. Do the assets saved via social protection enable households to regulate food and non-food consumption for the poorest households?

Synopsis of main findings

46. Climate shocks reduce the effectiveness of social protection to enable beneficiary households to regulate consumption.

47. In comparison to non-beneficiaries, VFSG beneficiaries have better key consumption indicators when households experience a climate shock to agricultural production, but not when there is livestock shock (year-round scenario).
48. SCG supports better consumption compared to controls when there are stable climatic conditions, while the VFSG supports household consumption better than controls when there is a climate shock.

Detailed findings

49. Table 4 below shows the effect of cash transfers on consumption levels when households experience climate shocks. Cash transfers through the SCG only have a statistically significant effect on general consumption when households do not experience a climate shock in the growing season. There is no discernible association between SCG provision and general/food consumption when households experience a shock. The VFSG cash transfer had a strong effect on general and food consumption when households experienced a shock in the growing season. This latter finding suggests that VFSG cash transfers enable households, when compared to the controls, to maintain general and food consumption in periods of coping, when disruption to consumption is likely.

Table 4. Cash Transfers, Climate Shocks and Consumption

District	Shock Metric	SCG Shocked	SCG No Shock	VFSG Shocked	VFSG No Shock
General Consumption Per Adult	Agriculture	-3244	8066*	17012*	18746
	Livestock	294	19402	3656	6121
Food Consumption Per Adult	Agriculture	-1440	2862	4551**	9773
	Livestock	260	3070	2408	-2719
Hunger Score	Agriculture	-.019	-0.162**	-0.142*	-0.091
	Livestock	-.017	-0.294**	-0.099	0.115

*** p<0.01, ** p<0.05, * p<0.1*

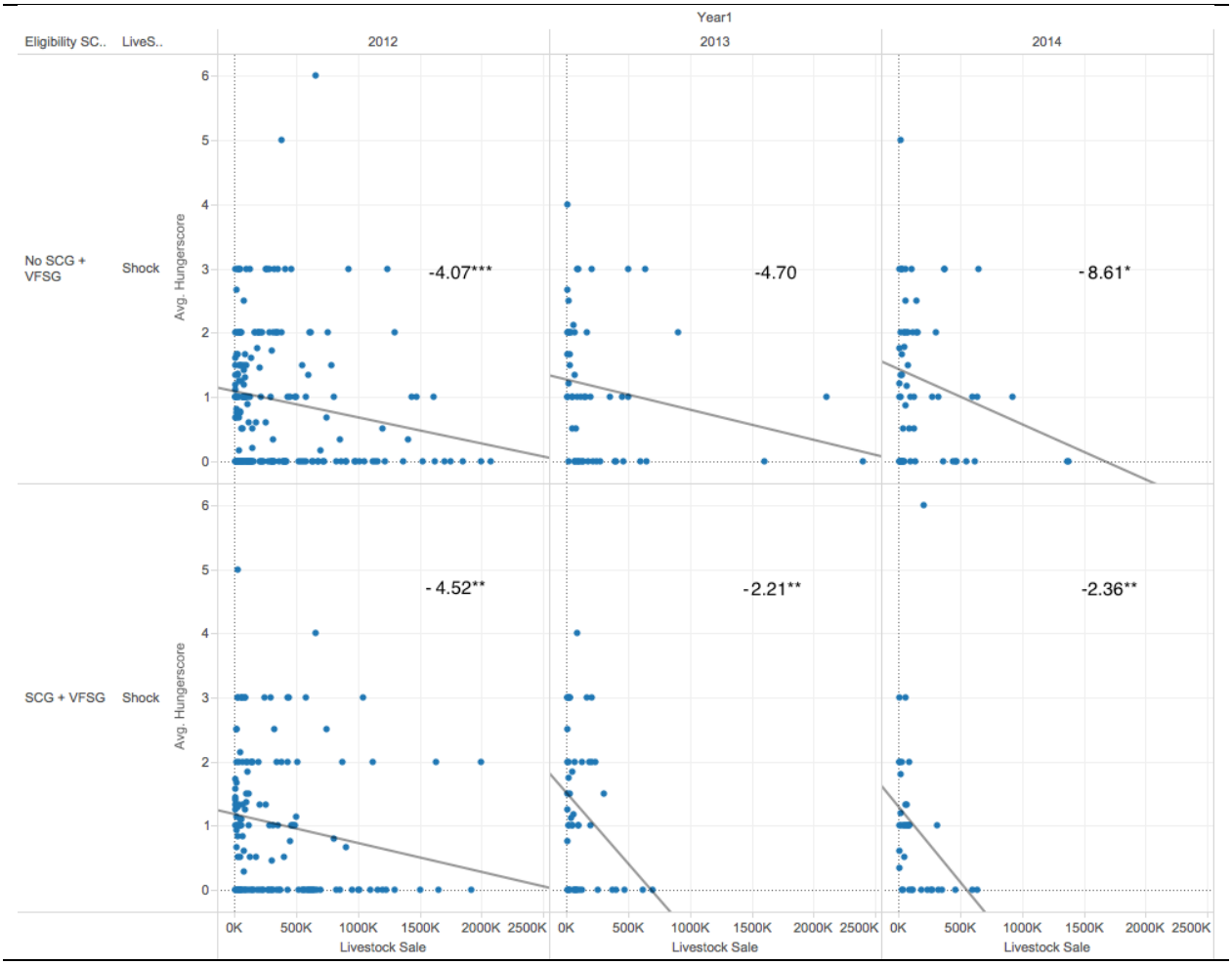
50. In the lower rows of Table 4 above, hunger score (a standard metric indicating meals eaten in the past 30 days) analysed for effect of social protection provision. When households are not exposed to agricultural or livestock climate shocks, the SCG is associated with reduced levels of hunger over time as compared to the control households. Though the same improvement in hunger enabled by SCG is not observable when households are shocked, suggesting that the programme is less effective at reducing hunger during climate stress. Conversely, the VFSG does have a positive effect on hunger during dry spells in the growing season.

51. To identify the linkages between hunger and livestock keeping offers insight into another possible dynamic of cash transfers. Figure 6 below illustrates the relationship between the hunger score and livestock sales for climate shocked households only [SCG/VFSG

recipients (bottom half), control households (top half)]. On one hand, the sale of livestock, especially high value sales, can indicate wealth and the liquidation of valuable assets for consumption; on the other, and often in times of climate shock/stress, it can mean that coping has set in when other monetary flows are interrupted, and households are selling animals out of necessity.

52. Clearly, there is a negative relationship between the sale of livestock and the level of hunger in the household. This suggests that poorer households, who are more prone to hunger, sell less livestock, perhaps because they have less livestock to sell. Crucially, the SCG and VFSG households are less likely to be selling large quantities of livestock while also remaining high on the hunger scale (see the spread of households with medium-to-high hunger and sales in the centre). This analysis may indicate that the SCG and VFSG enabled households to circumnavigate hunger in times of climate stress differently to control (non-beneficiary) households who sold more livestock (see clustering in bottom corner of X and Y axis).

Figure 6. Hunger, Livestock Sales and Climate Shocks



*** p<0.01, ** p<0.05, * p<0.1

Q4. What asset levels are necessary to overcome climate shocks and stresses of differing magnitudes?

Synopsis of main findings

53. Climate shocks are linked to lower household asset levels and climate shocks in the growing season reduce cash savings.

54. Climate shock severity and household asset levels are negatively corelated. Livestock ownership diversity and asset purchases both fall as shock severity rises. Thresholds are observable in the levels of shocks linked to changes in livestock diversity and asset purchases.

Detailed findings

55. The OPM study focused mainly on whether households owned particular assets or not. While this Irish Aid-IIED study developed several dichotomous variables to assess household asset levels. One measure of asset levels used was the diversity of livestock holdings, including 4 categories of livestock ownership (e.g. cattle, pigs, goats and sheep). The measure equals 1 if the household owns all livestock types (i.e. cattle = 0.25, pigs =

0.25, goats = 0.25 and sheep = 0.25). Another continuous measure of asset levels relates to the cash savings held by the household at the point the survey was undertaken.

56. Table 5 below shows the mean level of livestock holding for the categories of climate shock varying in severity. For both the SCG and VFSG, diversity in livestock holding falls consistently from households experiencing no shock to high shock. From having more than one animal type (SCG = 0.35; VFSG = 0.33) in the no shock category, the households witnessing a high shock are increasingly likely not to own any large livestock (SCG = 0.21; VFSG = 0.20).

Table 5. Diversity of Livestock Holdings and Climate Shocks (Livestock)

SCG Sample		VFSG Sample	
Livestock Shock Level	Livestock Mean Value	Livestock Shock Level	Livestock Mean Value
No Shock	0.35	**No Shock**	0.33
Low	0.33	**Low**	0.22
Medium	0.33	**Medium**	0.28
High	0.21	**High**	0.20

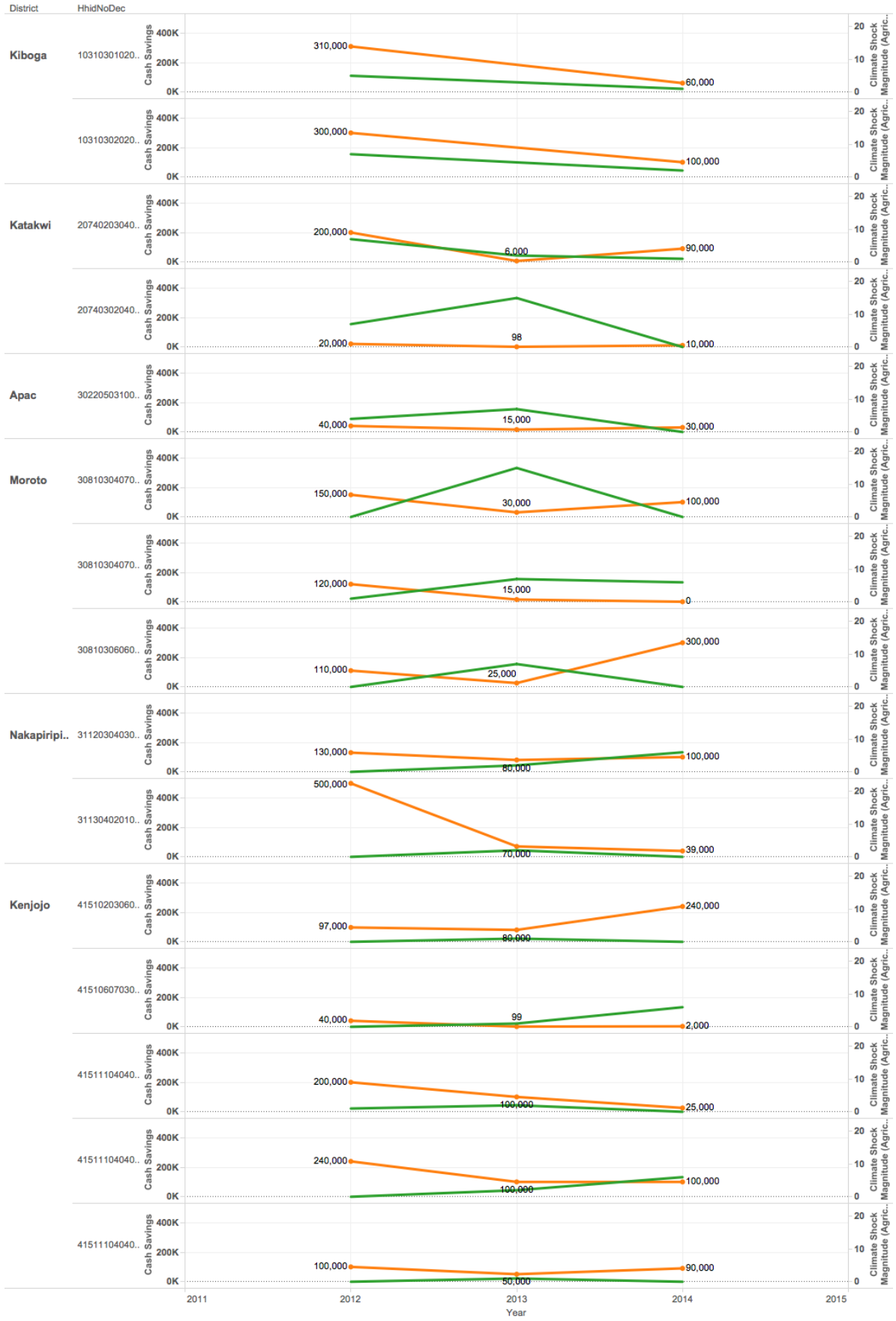
57. A proxy indicator for asset holding is the level of assets purchased over the previous 12 months. As indicated in Table 6 below for both SCG and VFSG households, the level of asset purchases fell consistently from the low to high shock categories. For SCG, the level of purchases fell on average by 3,289 Ush; for VFSG, the level of purchases fell more moderately on average by 1,121 Ush.

Table 6. Value of Asset Purchases and Climate Shocks

SCG		VFSG	
Agriculture Shock Level	Value Assets Purchased	Agriculture Shock Level	Value Assets Purchased
No Shock	5469	**No Shock**	6134
Low	5479	**Low**	6686
Medium	4936	**Medium**	4972
High	2190	**High**	5565

58. Figure 7 below shows changes in cash savings and exposure to climate shocks in the crop growing season. These data were purposefully selected to illustrate the degree of variation within the same households. Some households, best illustrated by households in Moroto, show that cash savings fell as the severity of climate shock rose. Other households, such as those from Kiboga, show that climate shocks have little relation to cash savings. What is also shown through some examples, particularly some households in Moroto and Nakapiripirit, is that households with high levels of savings in 2012 were better situated to resist and recover from the early shock and moderate losses. Overall, the climate shocks are negatively related to cash savings (for every additional dry day over the thresholds, the average household reduces cash savings by 10,981 Ush) and this is statistically significant at the p = 0.07 level.

Figure 7. Changes in Cash Savings (Orange) and Climate Shock Severity in the Growing Season (Green)



59. Figure 8 shows changes in average cash savings and exposure to livestock related climate shocks in Karamoja, while also showing male and female households separately. It could be expected that cash savings would rise when climate shocks strike, because assets are sometimes transferred from livestock to cash form. This isn't the case in Karamjoa over these years, which suggests cash generated from livestock sales is likely used for consumption or transferred into different asset holdings. In addition, it isn't the case that cash savings are particularly lower for female headed households. Further, they appear to accumulate cash faster between 2013 and 2014.

60. Figure 9 below shows changes in cash savings and exposure to climate shocks for the same households, but this time using the year-round measure of climate shock best suited for livestock. Again, these data were purposefully selected to illustrate the degree of variation within the same households. Using the livestock shock measure brings out different findings. The middle household depicted in the illustration from Moroto failed to bounce back and accumulate cash savings when it experienced a livestock shock in 2013. As the household from Apac illustrates, it is sometimes especially difficult to accumulate surplus cash savings when experiencing consistent and ever more severe shocks. Overall, the same negative relationship is observable between climate shocks for livestock and cash savings (for every additional dry day over the thresholds, the average household reduces cash savings by 5,498 Ush), but this association falls short of statistical significance (p = 0.24).

Figure 8. Changes in Cash Savings (Orange) and Climate Shock Severity in the Livestock Shock (Blue) by Female / Male Headed Household in Karamoja

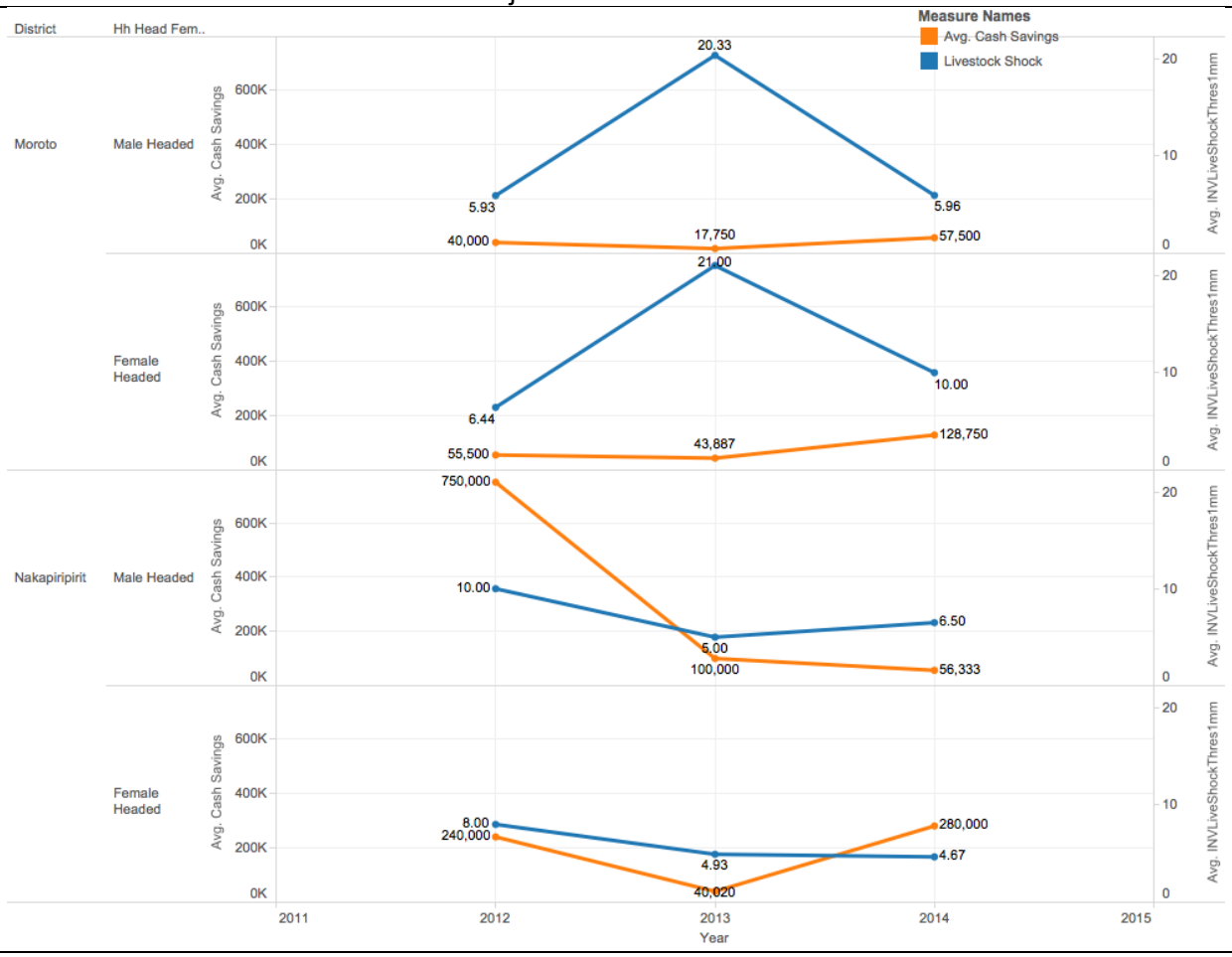
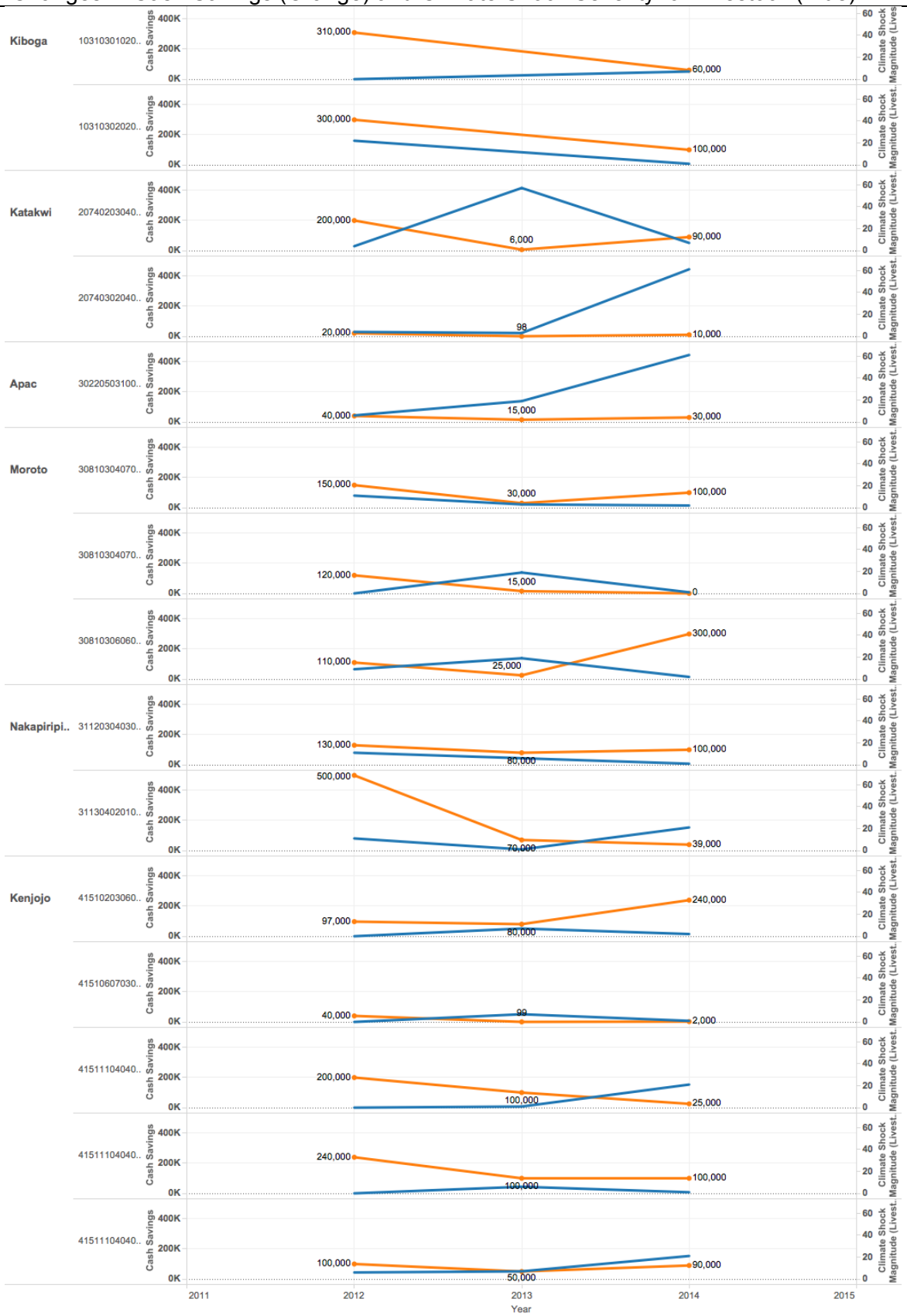


Figure 9. Changes in Cash Savings (Orange) and Climate Shock Severity for Livestock (Blue)



Q5. How can policy innovations in social protection be layered/integrated into the broad landscape of Irish Aid policy to improve capacity to deal with climate shocks and stresses?

Synopsis of main findings

61. The findings under Q1 to Q4 provide an evidence base for this discussion of policy innovations. As a synopsis of the main relevant findings on Q4 we see that the current level of climate risks to which the poorest people in Karamoja are exposed challenge the effectiveness of the SCG. Households reduce consumption and sell assets (often valuable livestock) to cope with climate shocks, and such shocks disrupt consumption and inhibit progress on hunger.

62. Social protection systems can be adjusted to better address climate risks to those people eligible to be beneficiaries through different, but not mutually exclusive, strategies. These include vertical expansion (i.e. greater transfers to beneficiaries at times of or in advance of climate shocks; horizontal expansion i.e. increasing the numbers of beneficiaries at times of or in advance of climate shocks; piggy-backing where elements of an existing programme (lists of beneficiaries, payment methods, etc.) are used to deliver a separate emergency response; and, aligning social protection with other processes to deliver climate resilience such as local climate adaptation planning.

63. Options exist for aligning the SAGE intervention with others across Karamoja that despite not having social protection components have similar resilience related objectives.

Detailed findings

64. With regard to the climate risk challenges to the social protection programmes in Karamoja the study found that:

    - Climate shocks (e.g. prolonged dry spells) reduced households' consumption and increased sale of assets. This effect is greatest for the poorest households.
    - Recipients of the grants (family and senior citizen) were more likely to purchase livestock (cattle and goats), and during shocks households in receipt of the family grant were less likely to sell goats (but as likely to sell cattle). The grant to senior citizens did not generate such comparative advantages during climate shocks.
    - The family grant enabled better household consumption during climate shocks to agricultural production. The senior citizens grant did not do this so well, but provision of this grant did improve consumption of beneficiaries during non-climate shock periods.

65. Climate change projections for Uganda indicate that the level of climate risk exposure of the poorest people in Karamoja will increase significantly in the next 30 years. This combined with a steep trajectory of rural population size will exacerbate current poverty levels and out even greater strain on the effectiveness of the social protection provision.

66. For the social protection programmes under SAGE to be more effective, the design of climate shock responsive social protection should be prioritised. Such an intervention needs to take into account and support livestock asset holding by poor households as the

research shows the importance of livestock as an asset buffer for shocks and as an indicator of coping.

67. There are different options for programming social protection systems to better address climate risks to beneficiaries. The Shock Responsive Social Protection initiative led by OPM[2] considered how social protection programmes can be more effective in addressing the effects of shocks, including those that are climate-related. This excellent body of work was carried out largely from the perspective of linking humanitarian, disaster risk reduction and social protection, and is most relevant to more sudden onset shocks. The toolkit developed includes options for vertical expansion i.e. greater transfers to beneficiaries at times of climate shocks; horizontal expansion i.e. increasing the numbers of beneficiaries at times of climate shocks; piggy-backing where elements of an existing programme (lists of beneficiaries, payment methods) are used to deliver a separate emergency response; and, aligning social protection described as designing an intervention with elements resembling others that already exist or are planned, but without integrating the two.

68. In Mozambique Irish Aid and IIED are assessing how another approach to social protection alignment can work[3]. Social protection provision and local climate adaptation planning and implementation are being linked in a bottom-up approach at the district level to deliver climate resilience for populations of social protection eligible people. This initiative – 'PRIORIZE' – is led by the district authority with technical support from a small team of specialists from a national university and from IIED, and oversight of the provincial government. With a view to scaling out across more districts PRIORIZE links up to both the ministry of gender, social action and children, and the ministry of environment, land and rural development.

69. Options for linking the provision of social protection in Karamoja with other development poverty focused interventions exist. From the recent Karamoja Donors Mapping Report[4] prepared by the Karamoja Resilience Support Unit the following options are identified. The World Bank supported Third Northern Uganda Social Action Fund (NUSAF3) has a social protection component. The use of climate forecasts – particularly prolonged dry spells – as triggers for either anticipatory increased transfers and/ or increased beneficiary numbers can be explored in a collaborative way by both the Irish Aid/ DFID supported SAGE and the NUSAF3.

70. The Aplou intervention[5] supported by USAid seeks to benefit vulnerable households across Karamoja. Given the strong likelihood that some at least of the senior citizens supported through SAGE will have relatives that benefit through Aplou it makes sense to look at how kinship networks and informal social protection practices could be strengthened through an integration of Aplou and SAGE.

[2] See: https://www.opml.co.uk/projects/shock-responsive-social-protection-systems
[3] See: https://www.climatelearningplatform.org/2016-mozambique-report-assessment-how-link-social-protection-and-climate-resilience-objectives-and
[4] See: Karamoja Resilience Support Unit (2017). Karamoja Donors Mapping Report. Karamoja Resilience Support Unit, USAID/Uganda, Kampala.
[5] Aplou's goal is improved food and nutrition security for vulnerable households in Karamoja through inclusive and effective governance contributing to improved food and nutrition security; improved health and nutritional status of pregnant and lactating women, children under five, and adolescent girls in targeted districts; improved WASH conditions among targeted households; adolescent girls, adolescent boys, women, and men access diverse and secure livelihoods, through improved capacities and strengthened market systems.

71. The Development initiative for northern Uganda (DINU) includes a component on enhancing climate resilience through increased water for production capacities in Karamoja. The ways that beneficiaries of SAGE benefit from this other initiative should be assessed. Access to water by the elderly at times of drought could greatly ameliorate climate risks face by SAGE target individuals and households.

72. The learning from the initiative "Strengthening the Capacity of IGAD towards Enhanced Drought Resilience in the Horn of Africa" implemented by GIZ could be important for any further work of SAGE. The ways that local authorities identify and prioritise the climate resilience needs of senior citizens and the focus this has had in the strengthening of planning capacities of district local governments may provide ways to strengthen the shock responsiveness of the social protection through the senior citizens grant.

73. Using the National Climate Change Policy (2018) to look broadly across a range of adaptation actions on-going (or soon to be started) within Uganda, developing climate shock responsive social protection contributes to wider policy aims. Increasing the funds available in times of climate shock contributes to different adaptation objectives by: a) providing more resources for on-farm decentralised climate risk management strategies for crops and livestock; b) facilitating better funded water management and flood early warning systems; c) encouraging sustainable fishing practices when households experience shocks and urgently need money; d) enabling households to rely less on unsustainable forestry practices and charcoal production when climate adversely effects other livelihoods; e) providing resources for sustainable wetland and watershed management practice that make experiencing a climate shock less likely.

Recommendation for addressing climate shocks to social protection eligible individuals and households

74. Following the review of evidence from the re-analysis of the OPM data, exploring the options for climate shock responsiveness, and the examining the institutional framework, we have arrived at the following recommendation for making the SAGE SCG a more effective climate shock responsive intervention.

75. Shock-responsive social protection focuses on shocks that affect a large proportion of the population simultaneously (*covariate shocks*). Shock responsiveness can be *ex-ante* by building shock-responsive systems, plans and partnerships in advance of a shock to better prepare for emergency response, or *ex-post*, to support households once the shock has occurred (O'Brien et al., 2018). Given that the survey and focus group discussions revealed that prolonged dry spells and droughts are perceived as the main climate risks by local people, it makes sense to use an ex-ante shock responsive system in this case.

76. The following recommendation includes the most appropriate set of institutions to integrate climate shocks information into social protection programming, and the basic framework to enable adjustment cash payments according to climate shocks.

77. The recommendation is to adjust the social protection programming for the SAGE SCG ahead of or at times of climate stress. Given that close to all over 60's qualify for the SCG, it is recommended that any adjustments made according to climate shocks take for the form of vertical (rather horizontal) expansion i.e. increased level of transfers to beneficiaries.

Institutions and Networks

78. The relevant institutions and networks with related functions in Uganda are the following:
    - Uganda Disaster Risk Information Centre (Department of Disaster Preparedness and Management) that produces the monthly National Integrated Multi-Hazard Early Warning Bulletin;
    - UNMA that provides the Uganda Disaster Risk Information Centre with recent historical rainfall data in addition to the forecast for the approaching season;
    - The Famine Early Warning System and World Food Programme that also partners with the Uganda Disaster Risk Information Centre, and are focused on food security and impact across Government sectors.

79. As yet there are weak linkages between UNMA and the WFP's early warning bulletin production, although UNMA normally sends climate forecasts to WFP. Stronger linkages might benefit the production and utilization of WFP's Uganda Mobile Vulnerability Analysis and Mapping (mVAM). UNMA is not directly linked to the ESP programme in the MoGLSD, but climate forecasts can be accessed through the Ministry of Local Government Finance Commission (MoLGFC).

80. Given UNMA's deep engagement with climate risk (including to farming, pastoralism and wider non-livelihood related risks), also UNMA's past and present direct collaboration with the Uganda Disaster Risk Information Centre and their monthly National Integrated Multi-Hazard Early Warning Bulletin, UNMA is the most appropriate entry point for ESP to develop climate shock responsive social protection. This will provide ESP with an institutionalised means to collaborate with UNMA and partners and thereby add shock responsive social protection to their on-going efforts to advise on current and approaching risks.

Adjusting Social Protection Programming

81. Making judgements on how to adjust targeting and levels of social protection transfers to be responsive to climate risks at the household level is a challenge, because it requires aligning socio-economic and climate data and differentiating between poor households. The former relates to feasibility, while the latter concerns the ethics of the action. In the case of the SCG the selection of beneficiaries is categoric by age. And with the type of analysis used in this case study and the climate forecasting by UNMA it is possible to develop an empirical basis for vertical expansion of the SCG that is both practical and implementable. This may require more formalised engagement and coordination with local government institutions to ensure the contextualisation of climate risk is sufficiently understood.

82. The Uganda Disaster Risk Atlas (UDRA) 2018 provides damagability and risk profiles for flood damage to buildings and crops. As such, the expertise used to develop the UDRA can be incorporated when adjusting social protection programming. The experts engage on the UDRA report graph relationships between the duration of climate hazards (floods are used to illustrate), and the extent of damage to crops and dwellings. This in-country expertise can be adapted to broader household metrics useful when guiding policymakers to make adjustments in light of expected climate hazards. The remainder of this section outlines a related methodology to integrate climate shocks into social protection programming to make policy adjustments

83. The findings from the Irish Aid-IIED study demonstrate that climate shocks are linked to poverty, consumption, and asset levels. But the findings are nuanced depending on the type of shock, the socio-economic data used and the role of social protection in mitigating the shock. Establishing a practical method to integrate shock responsive social protection can use the links between climate shocks and consumption to guide programming adjustments. The wider literature on social protection concurs that cash transfers social protection can address immediate consumption needs of households. Conversely, the links to assets protection and accumulation are sometimes present but far less clear. Therefore, the guidance uses consumption to estimate changes to the status of households when exposed to climate shocks, and from this, suggests adjustments to programming according to the level of climate shock.

84. The recommendation is presented as a stepwise approach:

Step 1: Establish livelihood-climate hazard thresholds

Data collection is needed to establish the livelihood-climate hazard thresholds in different districts. For the case study this was trialed in SCG districts of Moroto and Nakapiripirit. The sampling needs to be representative of the population to generate reliable data on: a) the types of climate hazards (prolonged dry spell, drought, flood, storms); b) types of livelihoods; c) the specific thresholds where climate variability gives rise to hazardous outcomes; and d) the proportion of the population experiencing the shock.

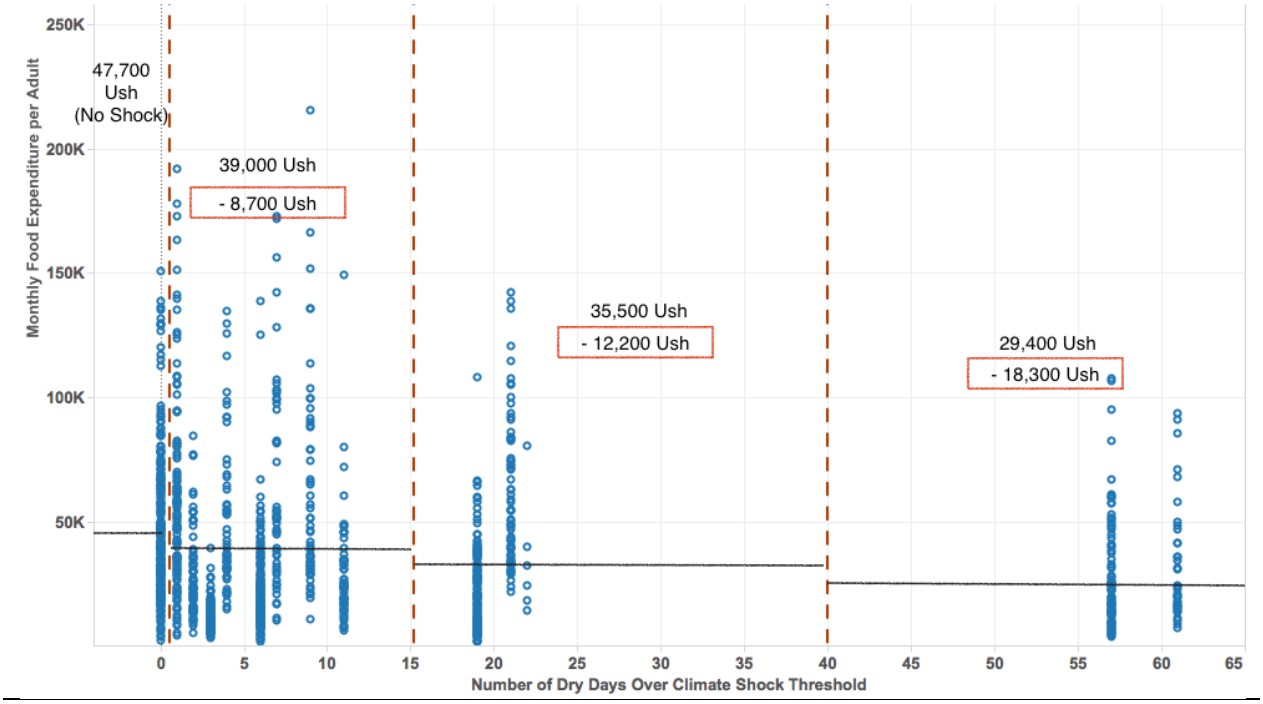
Step 2: Integrate consumption data with climate hazard thresholds

The OPM survey provided data on general household and food consumption, but this only covers 2012-2014. There are also other options for consumption data, such as the Uganda Bureau of Statistic's National Household Survey 2016/17. The aim is to conduct a combined analysis of consumption and climate shock data to establish the links (see Figure 10 for an example using the OPM data for SCG recipients). The higher the number of dry days over the climate shock threshold, the lower the consumption. This assessment enables ESP to estimate the 'consumption gap' associated with different levels of climate shock.

Step 3: UNMA and ESP collaborate to guide programming adjustment

Within the remit of the monthly National Integrated Multi-Hazard Early Warning Bulletin, the ESP would work with forecasters from UNMA to estimate shock severity in different districts. Once the shock severity is forecast, and the likely downward pressure on consumption estimated based on the effect of shock severity, ESP will then decide to increase money transfers at a level sufficient to address the forecast consumption gap.

Figure 10: Link Between Consumption and Climate Shocks Severity

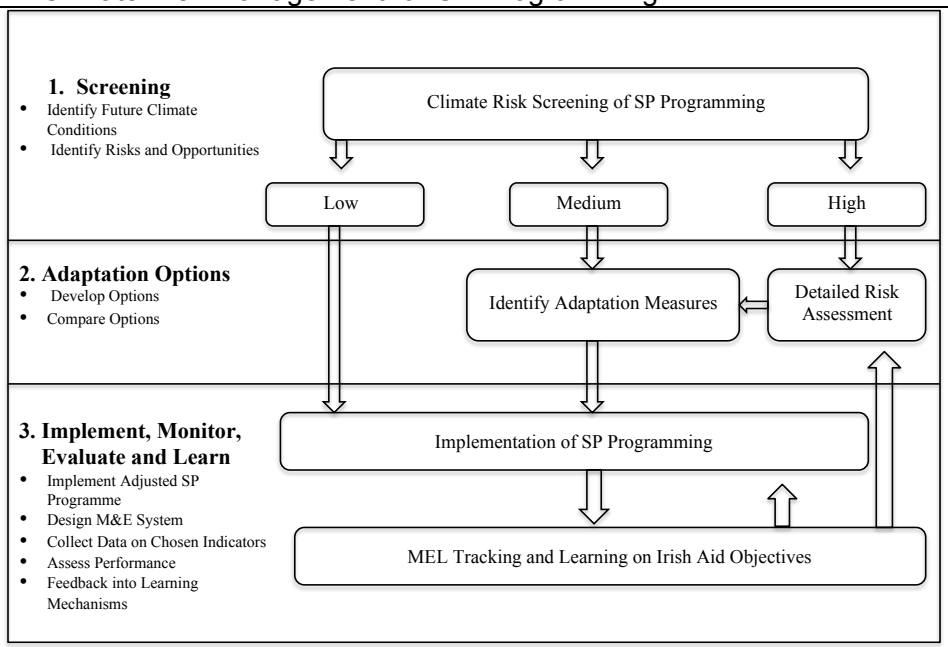


85. This recommendation would: a) develop programming action within an already established institutional set up to integrate climate shocks; b) build upon networks already in place to pre-emptively warn about hazards to agriculture and pastoralist livelihoods; and c) provide clear signals to the MoGLSD and ESP about when, and to what extent, to increase cash transfers.

86. One advantage of the system recommended is that if another social protection programme operating in the Karamoja but targeting people other than senior citizens decided to include a climate shock responsive component the same process could be followed.

87. The recommendation is in accordance Irish Aid-IIED guidance on climate risk management (see Figure 11 and https://www.climatelearningplatform.org/irish-aid-climate-change-and-development-learning-platform-guidance-note-integrating-climate-change). It uses the available data on livelihood-climate shock hazard thresholds at the district level and screens for climate risks to programming effectiveness. It brings data sources together and indicates when and where action is required to address climate risk to programming. It adjusts social protection programming by the ESP and partners as the preferred option for adaptation.

Figure 11: Climate Risk Management for SP Programming



Conclusions

88. Local people – including senior citizens – identified prolonged dry spells and droughts as the main climate risk to their livelihoods. Few effective adaptive measures were identified by them other than coping mechanisms including replanting crops, selling assets and reducing household consumption.

89. Climate risks are exacerbating poverty in the districts surveyed. The effects are location specific and geographically clustered. Households that both experience an agricultural climate shock and are in the bottom 25% in terms of the poverty gap and general consumption are geographically clustered. 36% of these 'climate shocked' and impoverished households were in receipt of cash transfers.

90. Pre-existing vulnerabilities are related to higher susceptibility to climate shocks. Poor people are more likely to experience this form of shock. 51% and 11% reside in Moroto (especially Matheniko) and Nakapiripirit (especially Pian) districts respectively. 29% of households with livestock assets experiencing shocks lived in Nebbi and just over 5% live in Apac.

91. Female headed households are experiencing downward pressure on consumption relative to male headed households whether they experienced a climate shock or not. Looking more broadly at poverty, female-headed households are also much poorer when they experience a climate shock.

92. SCG beneficiaries maintain cattle and goat keeping best under stable climate circumstances. But climate shocks reduce the effectiveness of social protection to enable beneficiary households to regulate consumption. SCG supports better consumption compared to controls when there are stable climatic conditions, but not during shocks.

93. Climate shocks are linked to lower household asset levels and climate shocks in the growing season reduce cash savings. Climate shock severity and household asset levels

are negatively corelated. Livestock ownership diversity and asset purchases both fall as shock severity rises. Thresholds are observable in the levels of shocks linked to changes in livestock diversity and asset purchases.

94. The findings under Q1 to Q4 provide an evidence base for this discussion of policy innovations. As a synopsis of the main relevant findings on Q4 we see that the current level of climate risks to which the poorest people in Karamoja are exposed challenge the effectiveness of the social protection programmes provided (particularly the senior citizen grant). Households reduce consumption and sell assets (often valuable livestock) to cope with climate shocks.
95. Social protection systems can be adjusted to better address climate risks to those people eligible to be beneficiaries through different, but not mutually exclusive, strategies. These include vertical expansion, horizontal expansion and 'piggy-backing' of interventions.
96. Options exist for aligning the SAGE intervention with others across Karamoja that despite not having social protection components have similar resilience related objectives.
97. Following the review of evidence from the re-analysis of the OPM data, exploring the options for climate shock responsiveness, and the examining the institutional framework, a recommendation is made for the SAGE SCG to be more effective climate shock responsive intervention.

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Annex 1. Brief review of literature on social protection and climate resilience

The conceptual basis for physical climate hazards creating pressure on development has existed for some time (Carter et al., 2007) and the empirical evidence is beginning to accumulate (Asfaw et al, 2016a; Hallegatte *et al.*, 2017; IPCC, 2014). Poverty is a primary determinant of social vulnerability that increases exposure of the poor to climate stimuli, elevating the likelihood that variability becomes socio-economically hazardous (Winsemius et al., 2018). Poverty also increases after disasters, especially via floods and drought in LDCs (Hallegatte et al., 2018). Framed as such, climate change – especially more frequent and intense floods, droughts and extreme temperatures – combines with exacerbated structural pressures on people, land and social resources, to reduce the likelihood of poverty reduction (IPCC, 2014). Recent evidence from Zambia has revealed above and below average rainfall resulting in favourable and adverse economic outcomes respectively, especially for those situated in the bottom quartile of welfare (Asfaw et al., 2017); in Uganda, an analysis of welfare and climate variability found a relationship in only a few instances (Asfaw et al, 2016a).

Widespread and persistent changes in global temperature have occurred earlier than predicted (Li et al., 2018). Across Africa, record temperatures, flooding and drought persistence are increasingly being recorded as breaks from longer-term trends (WMO, 2017). In Uganda, temperatures have risen as much as 1.5^{o}C (1960-2009) and spring and summer rains have decreased on average over the past 25 years (FEWSNET, 2012; Funk et al., 2012). Physical climate hazards of drought and flooding are combining with structural pressures – such as population rise and land degradation – to weigh on the livelihoods of coffee growers, cereals farmers, and pastoralists (Niang et al, 2014).

Social protection takes many forms – including insurance, pensions, public works, and food relief, among others – but in the case of addressing climate risk for the poorest, it typically refers to cash transfers that provide adaptation options and increase agency (Barrett, 2013). Policymakers are increasingly interested in the climate resilience effects of development programming. Given that social protection is designed to target payments to households with the highest social vulnerability, decision-makers are searching for evidence that such transfers reduce sensitivity and exposure (Johnson et al., 2013).

In theory, increasing cash transfers to poor households in times of climate stress – either via amounts transferred, extending coverage or part of a wider programme of support – can reduce adverse effects of coping on consumption and assets (Seballos, 2012; Hallegate et al., 2016). Transfers can be pre-emptive before a climate hazard occurs, part of contingency measures post-event or else during the slow onset climate stresses (World Bank, 2011). Resources can offer support for highly decentralised decision-making on contextualised adaptation options. This represents a 'low regrets' investment by immediately improving livelihood options, poverty and longer-term risk management (Watkiss et al, 2014; Kuriakose et al., 2013), but questions remain about its utility in times of extreme climate variability and fundamental change (Carter and Janzen, 2018).

Social protection is an important component of social policy for countries within the African Union. Social protection is implemented across the Horn, East and Southern Africa; using transfers to regulate consumption, build assets, encourage schooling and medical treatment,

among other development outcomes (Castell-Branco, 2017; Evans et al., 2017; Haushofer and Shapiro, 2018). Syntheses of evidence around impact find significant benefits to consumption and moderate impact on asset protection and accumulation (Ralston et al., 2017). Yet, the poverty graduation impacts of measures are often limited, due to structural disadvantages facing the poorest households (McCord, 2017).

Some programmes are purposefully designed to address slower onset climate shocks – e.g. Ethiopia's Productive Safety Net Program. The Intergovernmental Panel on Climate Change (IPCC) links social protection with aiding disaster risk reduction and livelihood protection under climate variability (Niang et al., 2014). Though little evidence is available around protection from extreme climate shocks more likely associated with future climate changes (Carter and Janzen, 2018).

In rain-fed agricultural and livestock productive systems, precipitation is among the main determinants of production levels (Asfaw et al., 2017), but work on climate shocks in Uganda found little association with welfare (Asfaw et al, 2016a). An appeal of social protection relates to social sustainability, as transfers can be integrated into pro-poor development programming. Social protection can improve resilience outcomes for the poorest through up-scaling beneficiaries when under climate stress (Davies et al., 2012; Anderson et al., 2016; Hallegate et al., 2016), structuring risk-based transfers when climate hazards occur (Kuriakose et al., 2013). Households typically receive payments at uniform rates, and at unvarying time intervals (Oxford Policy Management, 2015). Integrating climate considerations improves the usefulness of transfers when assets become exposed to climate shocks. For example, increasing transfers before/after a shock protects household assets, reducing periodic coping, reducing the likelihood of asset stripping to smooth consumption (Devereux, 2001).

Layering and sequencing of social protection with related interventions can also benefit adaptation planning and synergistic coordination (see Anderson et al, 2016). Cash transfer schemes can complement interventions that reduce the household exposure to shocks – e.g. land management, water management, soil conservation. Through work-based schemes or flexible finance to agile local institutions, or simply considering implemented policies when designing new (Dion, 2008), can improve the governance of community asset and reduce household exposure to emerging risks.

Recognition of the association between cash transfers and the ability to absorb shocks links back to earlier research on climate shocks to development (Barrios et al. 2010). Eriksen et al. (2005) find a relationship between additional incomes source (simply livelihood diversification) and the ability to absorb drought shocks. Davies et al (2012) outline a method to integrate climate into the Tanzania Social Action Fund (TASAF III). They link social protection, climate adaptation and disaster risk reduction into a holistic approach on risks, shocks and resilience. Kaur et al. (2017) tracks changes in capitals (natural, physical, human, social, financial) to the ability to absorb and adapt to climate shocks, and graduate to a more favourable productive state.

Within Uganda, studies at the interface of climate and development have focused on resilient value chains and absorption, anticipation and adaptation capacity to climate change (3 As). In the former, climate is integrated by assessing risks (VC-ARID) to livestock value chains and identifying adaptation options (Carabine et al., 2017). In the latter, social protection payments are understood to improve the 3 capacities to buffer shocks (Ulrichs and Slater, 2016) and

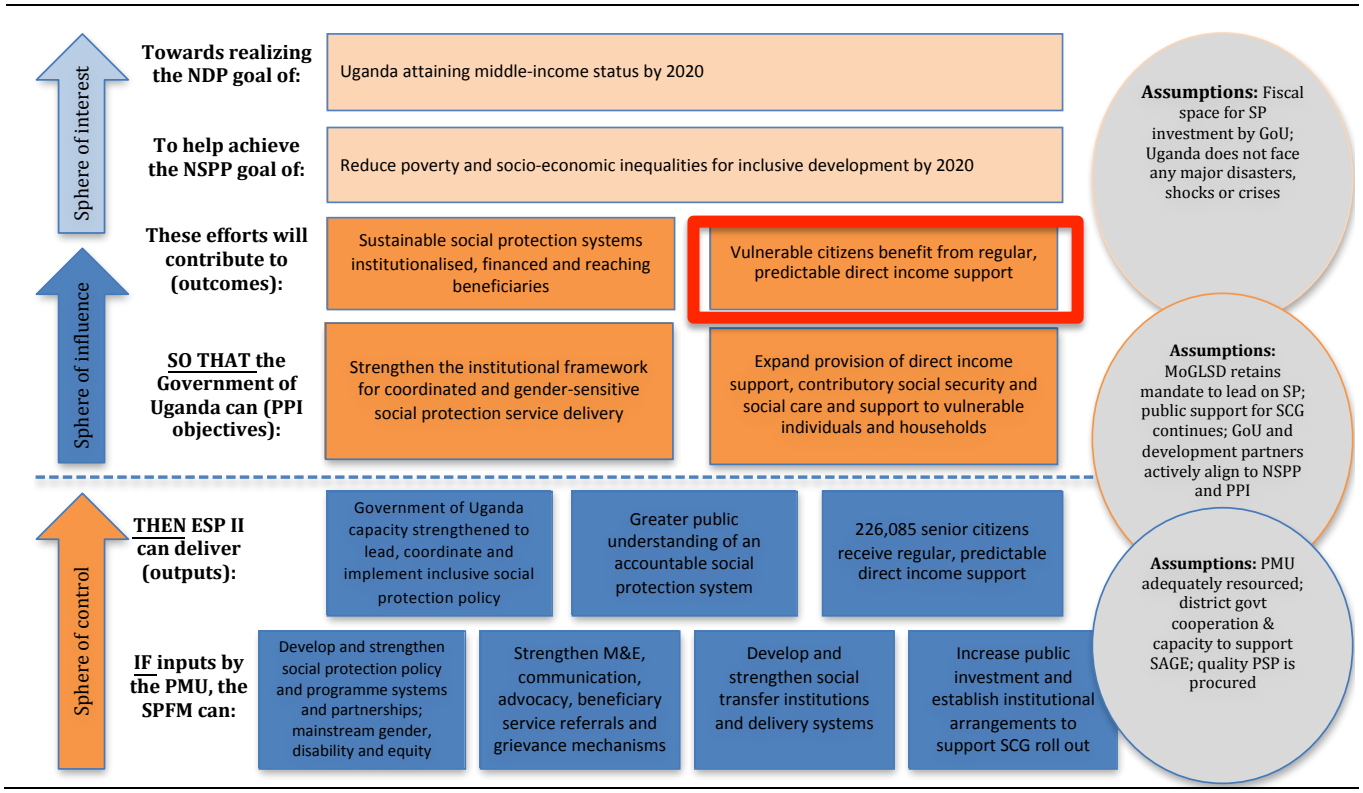
researchers document the ways social protection (i.e. SAGE and NUSAF) contribute (Ulrichs and Slater, 2016; 2017).

Annex 2. The ESP II theory of change

SAGE contributes to the achievement of poverty reduction, sustainable development and Uganda becoming a middle-income country. Figure 1 outlines the ESP II Theory-of-Change to strengthen and expand social protection policy and delivery systems in Uganda. It situates the delivery of income support in a wider set of activities and objectives of the ESP II programme, including the institutionalisation of a strong national social protection system.

SAGE is designed to encourage inclusive development by alleviating poverty, socio-economic inequality and achieving households and communities that are resilient to risks and shocks. In Figure 1, the red box signifies the area where the delivery of social protection has benefits for the poorest in Ugandan society. According to the literature presented above, any benefits as a result of the delivery of SAGE that rely on the aggregation of climate sensitive outcomes are exposed to climate risks, either through pre-existing or exacerbated social vulnerability, or else greater variability in physical hazards. When climate variability become hazards, the benefits of SAGE programme are inhibited.

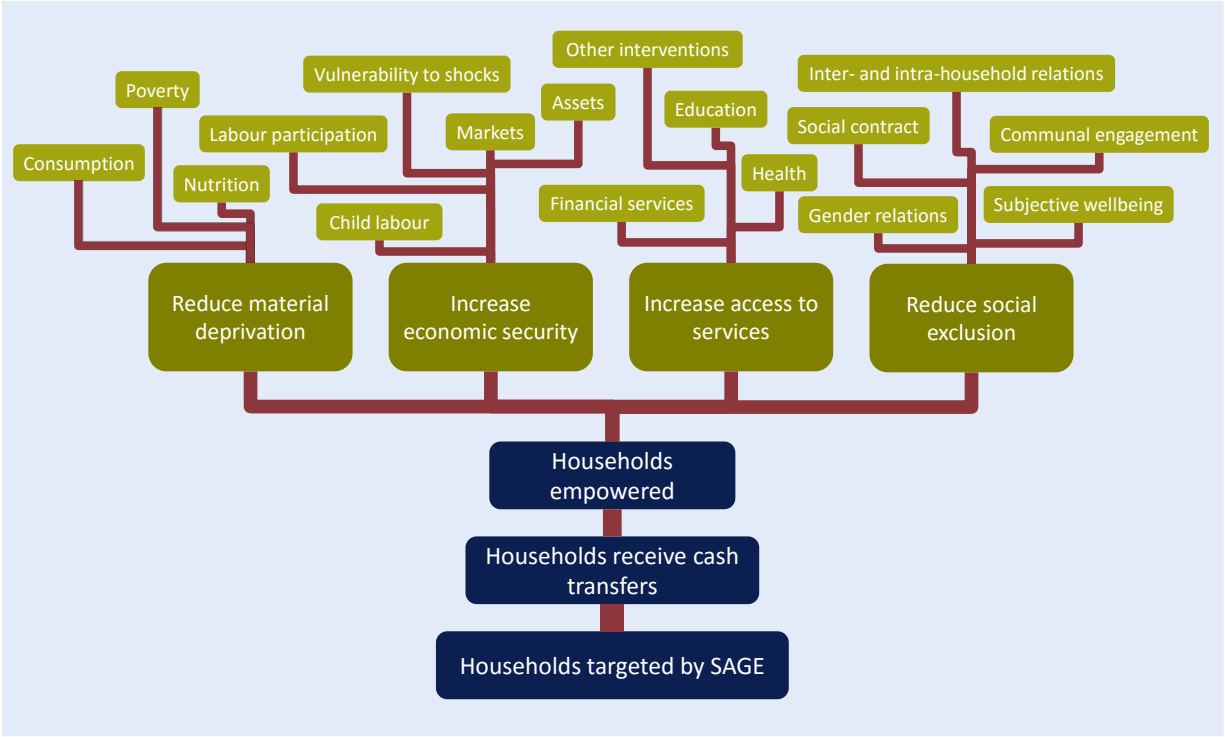
Figure 12: ESP ToC and Climate Shocks



The interconnections between climate and development are difficult to describe as a linear process. Figure 13 shows the ToC for the OPM impact evaluation of SAGE. The areas of highest climate sensitivity are situated in the branches of reduced material deprivation and increased economic security. Reduced vulnerability to shocks is depicted as an isolated

change brought about by SAGE targeting, receiving transfers and empowerment. The IIED-Irish Aid study instead conceptualized climate risk in terms of pressure on development through the interaction of vulnerability and physical hazards. Climate is an underlying stressor magnified by social vulnerability in its various forms, which threaten the achievement of development outcomes. Therefore, the analysis re-interprets the same key outcomes within the OPM data, but instead understand such outcomes in terms climate shocks as a way to re-assess the performance of SAGE on poverty alleviation and development progress.

Figure 13: ToC for OPM SAGE Impact Evaluation



Annex 3. Cash Transfers and Climate Shocks

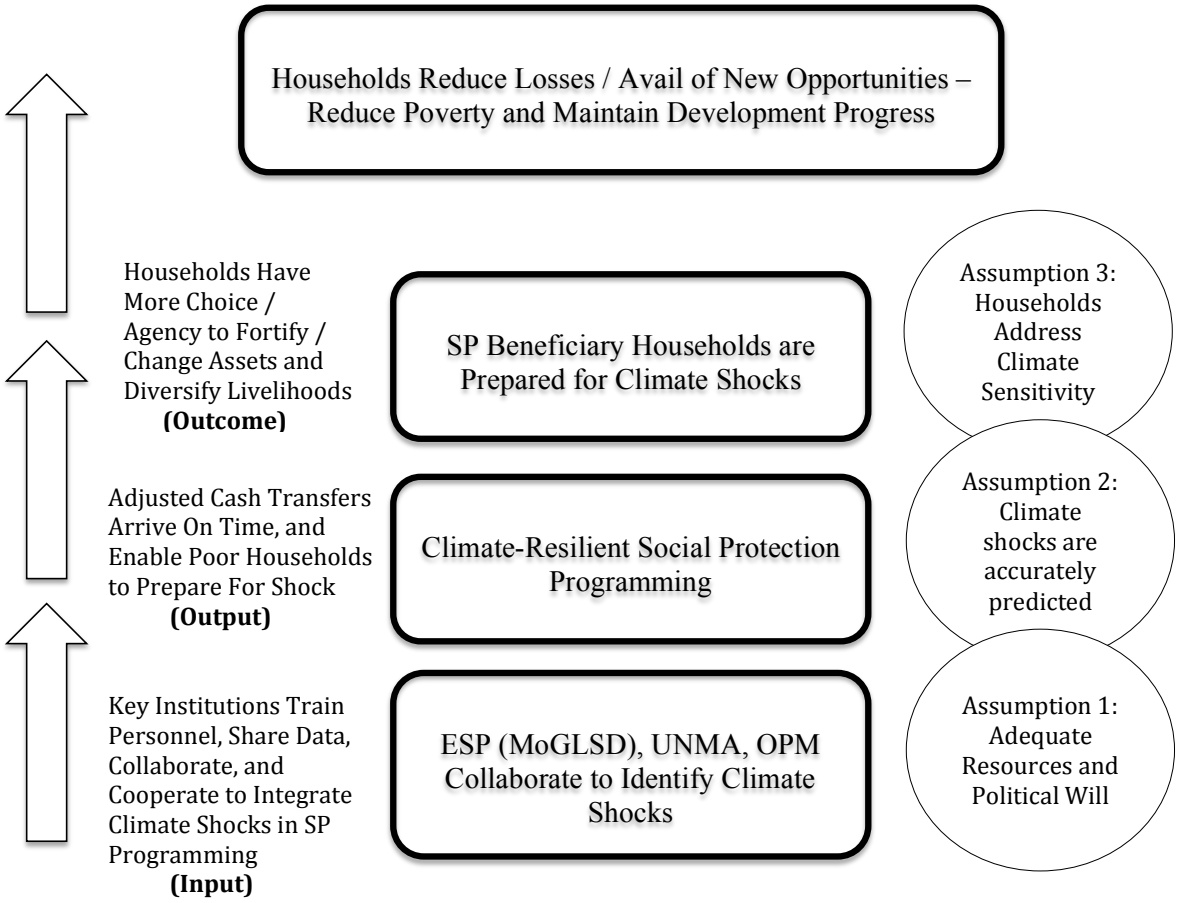
Figure 14 illustrates the ToC for how cash transfers address climate shocks for beneficiary households. The ToC for cash transfers and climate shocks begins before beneficiary households are targeted by SAGE, and receive cash transfers. When support institutions work together and correctly pre-empt climate shocks through climate forecasts, they recommend adjustments to payments based on the severity of the climate hazards (see recommendations section above). Assuming households receive adequate resources, and are in a position to identify areas of climate sensitivity in their livelihoods or physical circumstance, they can use the resources to make changes that will protect against climate shocks.

For instance, farmers will have money should they decide to purchase agricultural inputs perceived as helpful to protect crops from dry spells; farmers may also invest in basic water retention technologies when drought is expected. For pastoralists, monies can be used to build fodder storage facilitate, kept in reserve to pay for water trucks, or used to pay for

disease inoculation. Alternatively, beneficiary may choose to invest in less climate sensitive livelihoods, such as brokerage or transportation.

Assuming the right choices are made by beneficiary households the result is avoided losses from climate hazards, and availing of new opportunities. These represent the returns of investing in climate resilient social protection programming, which reduce the levels of poverty compared to that which would have been experienced in the baseline scenario, and keep development progress on track despite exacerbating climate shocks.

Figure 14: ToC for Cash Transfers Addressing Climate Shocks



Annex 4. Data and analysis methodology

This section outlines the main data used in the case study. The first sub-section explains the socio-economic data, explores its limitations, and proposes solutions; the second sub-section clarifies the climate data that is to be integrated with the socio-economic data.

Socio-economic data

The research used data collected by Oxford Policy Management (OPM, 2015) to assess the performance of the ESP Phase I and II. The OPM team surveyed households in 8 districts in

Northern, Central, Eastern, Western and Karamoja regions at three time periods – 2012, 2013, 2014. Households were either recipients or non-recipients of social protection, and structured the exercise according to propensity score matching and difference-in-differences estimation. OPM tracked the following key indicators: household consumption, expenditure on non-food items, subjective welfare, child nutrition, dwelling characteristics such as fuel, water, sanitation, labour participation rates, land ownership, livestock ownership, productive assets, migration, remittances, generic shocks, child education / labour participation rates, education expenditure, household saving, borrowing, and access to credit, informal / formal transfers, household decision-making, household demographics, perceived household agency.

The research represents a re-interpretation of the OPM data in terms of climate shocks. Scoping interviews identified some robustness challenges with OPM data (OPM, 2015a). The focus of the following research is the ability of social protection to build climate resilience and work effectively under climate shocks – rather than OPM's specific objective of developing an externally valid evaluation of the SAGE programme impact. Therefore, this provides greater options in terms of the sample size required, and methods used to analyse the data. In line with key points raised in OPM (2015a), the Irish Aid-IIED study attempted to address some issues.

The final model used 1:1 nearest neighbour propensity score matching. This enabled more straightforward comparisons across households that received social protection/not received, but also households that have experienced a climate shock. As the dataset is identical to that worked through the OPM study, this research uses the same model with some similarities and exceptions. Namely:

Difference in Age in Senior Citizen Grant Recipients and Control Households: The report raises concerns about the comparability of households receiving the Senior Citizen's Grant (SCG) and control households (OPM, 2015a). A key premise of PSM is to match households based on criteria that determine qualification for the SCG and VFSG. In the SCG sample, the average age of the household head is 63.9 and 54.7 years for recipients and non-recipients respectively. Due to greater flexibility in terms of sample size, the solution open to the Irish Aid-IIED study was to extract a smaller sub-sample that was more balanced in terms of the age of the household head. The study availed of this option to draw a smaller sample that resulted in a trade-off. Dropping numbers of off-support households enabled a balanced sample with the main programme eligibility criteria for SCG/VFSG. While this increased the internal validity of the findings, it reduced the external validity of the sample. The full population of households in these regions of Uganda are likely to have systematically different characteristics than the sample. However, as our objective is to develop scenarios for effective delivery of social protection when under climate shocks/stress, it is not as important to for our aims that we have a representative sample.

Contamination: Funding parties of the study raised the issue of possible contamination (OPM, 2015a). This is when the control group is affected by, or affects, the treatment. Concerns were particularly raised about the likelihood of households sharing cash transfers with neighbours. Clearly, households with cash are more likely to pay debts, lend or even give money in gifts to neighbours. But, there is no tangible way to deal with such contamination in the OPM study. Questions could be tailored to enquire about this outcome, but would still require recall of even known direct transfers to neighbours. Less tangible indirect affects are near impossible to account for in a village setting.

Heterogeneity of impacts across beneficiaries: The point was raised that impacts of social cash transfer vary according to differences between households (OPM, 2015a). There were calls for these impacts to be investigated further through a disaggregation of households according to gender, age, location, level of education, disability status, etc.). The idea was to develop a more nuanced understanding of impact, but disaggregation of the sample size weakens the robustness of findings.

Findings – New PSM: The objective of the study reported here is not to re-run the OPM study on impacts of social cash transfer on key outcome indicators. Rather the study aims to assess linkages between poverty, social protection and climate shocks. The PSM process re-matched households at the baseline (2012) according to 1:1 nearest neighbour method, rather than the kernel or radius that provide a number of control households for each treatment (OPM, 2016).

The model is far more parsimonious to avoid overloading; and central to the choice of nearest neighbour matching, there are no location effects. This is due to the climate shock data being situated mainly at the district level, and the need to compare different households experiencing different climate shock levels in the different districts. This enables the analysis of dependent variables – poverty levels; hunger scores; consumption; expenditures; assets sold; migration; and cash savings – in light of whether households experienced a climate shock, or differing degrees of climate shocks, while controlling for alternative explanations.

All factors included were related to qualification into both treatment types, and were significant in the model. A key implication is that comparison households are likely to have similar trends as SCG and VFSG households over the period (2013 and 2014). Table 7 and 8 compare key outcome indicators between SCG/VFSG and comparison households at baseline, and tests the balance between the two groups. No indicators used have significantly different means, meaning that our findings provide some basis to claim the study has a balanced sample.

Table 7: Mean Comparison at baseline – SCG

	Original Matching		New Matching	
	SCG	Comparison	SCG	Comparison
Age HH Head	64.40***	54.74	58.22	57.75
HH Size	5.49	5.49	5.87	5.64
Female Headed HH	0.44	0.49	0.46	0.38
Land Owned	5.11	4.60	5.07	4.44
Perceived Welfare	5.81	5.89	5.98	6.11
Social Inclusion	0.31	0.29	1.72	1.70

**** p<0.01, ** p<0.05, * p<0.1* *Social inclusion subject to unspecified transformation*

A notable addition to the matching exercise conducted previously relates to the inclusion of age (age of household head) into the matching process for the SCG. Due to the significant difference (10 years) in the age of household heads receiving and not receiving SCG, matching on this characteristic using a narrow maximum tolerated level of difference (0.1) reduced the sample size from 5852 to 2485 entries. Using the same narrow maximum tolerated level of difference for the VFSG sample reduced the sample of 5845 to 2434 entries.

Table 8: Mean Comparison at baseline – VFSG

	Original Matching		New Matching	
	VFSG	Comparison	VFSG	Comparison
Proportion >65			0.12	0.10
Proportion of Disabled	0.15	0.15	0.08	0.08
Proportion Orphans	0.14	0.15	0.10	0.12
HH Size	4.87	4.83	5.80	5.87
Female Headed HH	0.56	0.54	0.36	0.40
Land Owned	2.63	2.70	3.39	3.43
Perceived Welfare	5.77	5.70	6.07	5.89
Social Inclusion	0.37	0.37	1.67	1.63

**** p<0.01, ** p<0.05, * p<0.1* *Social inclusion variable subject to unspecified transformation*

Weather and Climate Data

Integrating climate shocks and stresses into the analysis of socio-economic data is a complex and contentious process (Levine, 2014). Assessments are sometimes designed around the occurrence of a shock and compare recipients and non-recipients of an intervention (Bene et al, 2017), while others focus only on changes in socio-economic characteristics (Ulrichs and Slater, 2016). Other research that developed shock metrics in Uganda used deviations in the historical record to determine shock thresholds and reference periods (Asfaw et al., 2016a). The Irish Aid Learning Platform has been developing methods to frame development outcomes in terms of climate shocks/stresses, by using climate information to adjust indicators according to the magnitude of shocks/stress experienced (Barrett, 2017; Brooks et al., 2014). Though, given the characteristics of the analysis – propensity-score matching, difference-in-differences, district-year shock entries, and partial climate sensitive development outcomes, such as consumption – our focus was on developing shock metrics for inclusion into the analysis.

Climate shocks and stresses take on different forms depending on the context, particularly in relation to the means of production. For example, Karamoja is an arid/semi arid region subject to erratic rainfall, shifting seasons, and high temperatures. As a consequence, pastoralism is practiced in addition to settled agriculture, and other alternative livelihoods. To measure climate shocks and stresses over time, the research documented interactions between climate hazards and different livelihood practices, establishing the thresholds where climate variability becomes hazardous for livelihood activities. For instance, for agriculture, infrequent rainfall in the growing season represents the most significant threat; while for pastoralism, the main hazard is again rainfall, but over the calendar year. By recording the interactions between livelihoods and climate over time and space, the study can establish 'average' or 'normal' levels of climate variability on a household, and such benchmarks were used to understand the degree of climate shock/stress the household is experiencing at any given time.

To establish livelihood-climate hazard thresholds, a survey team worked in four (4) districts (i.e., Moroto, Nakapiripirit, Kiboga and Kyenjojo) to contextualise of climate shocks to livelihoods in these districts. Using a structured questionnaire, the aim was to establish thresholds for climate shocks that caused losses in different livelihoods types, mainly agriculture and pastoralism. Each household clearly spelt out what livelihood-climate hazard they had faced during the considered period and its duration it ought to have lasted.

This yielded multiple stated livelihood-climate hazard thresholds, ranging from high temperatures, strong winds, heavy rainfall and hailstorm to prolonged dry spells and drought, particularly in relation to the latter. These then required cross checking with the climate data in terms of the period stated, its duration and severity. The perspectives of households about when a hazard occurred, and the severity of that which transpired, were closely correlated with the climate data.

Heavy rain and flooding events are widespread across Uganda, especially in Eastern districts (UDRA, 2018). Though heavy rainfall and floods did matter to some households, it became clear that the broad pattern indicated that the number of consecutive dry days was the primary hazard to livelihoods in Northern and Eastern Uganda. To integrate with actual climate data, we started by getting the number of dry days within each month of the year. Here a dry day is defined meteorologically as any day with rainfall amount of less than 1.0mm. These dry days were later calculated and compared with those stated by the people in that particular period.

By integrating community level survey data with the historical climate record, we were able to accurately set out what constitutes a climate hazard for each household, whilst properly considering how changes in the household's context affect how they experience climate shocks.

The next step was to establish the number of consecutive dry days in each month. Considering the number of consecutive dry days aided the classification of whether the hazard was a dry spell or a prolonged dry spell turning into a drought. The number of consecutive dry days including their distribution was obtained and the maximum number of consecutive dry days was given at the end of each month. The maximum number of consecutive dry days was intended to indicate the severity of the hazard given its lasting length.

After establishing the number of consecutive dry days, their distribution and maximum at end of each month, the focus turned to understanding whether dry spells or droughts referred to crops or livestock. For this, it was necessary to establish the reference period of likely exposure. The growing seasons for each district was the reference period for agriculture-based shocks; while the whole calendar year was the reference period for livestock.

If the experienced livelihood-hazard referred to crops and the claimed period was inside the growing season, then we made an account of the number of days they claim using climate data; however, if the claimed period was outside the growing season, then the data was omitted. Alternatively, if the said hazard affected livestock, the number of days was recorded and checked in the historical climate data once again.

The survey data used was for the years 2016 and 2017 and although these periods were much later than our target years of 2012, 2013 and 2014, they offered a contextualised insight into livelihood-climate hazards experienced in these districts. The consecutive dry days within the said hazard period were later averaged to form thresholds for each livelihood for each

district. The districts that were not surveyed where matched with a surveyed district based on key livelihood profile indicators (e.g. land under cultivation, ownership of livestock).

In terms of livelihood-shock thresholds, the number of consecutive dry days includes the meteorological definition – i.e. the number of consecutive days with rainfall amount of less than 1.0mm – but due to memory lapses in households around small showers, the analysis considered dry days with rainfall amount of less than 5.0mm. The analysis established the highest number of consecutive dry days in the growing seasons for agriculture by district per year and the highest number of consecutive dry days throughout the year by district for the years 2012, 2013 and 2014. The difference between the average agriculture/livestock livelihood-climate hazard threshold and the consecutive dry days within the district demonstrates whether, and to what extent, a shock has occurred. For further background information, please see the documents titled 'Livelihood-Hazard Shock Establishment' and 'Understanding Whether Droughts and Dry Spells Happened'.

In the development of shock metrics, we acknowledge climate to be a stressor that impacts on multiple areas (of people's livelihoods – i.e. the household system. However, to make the exercise empirically manageable, we developed shock metrics that incorporated social vulnerability as much as physical climate. This is the reason for using the physical climate-livelihood threshold approach to try and establish when climate variability becomes hazardous for these types of households (i.e. including their social vulnerability). This provided some insight into the climate-social vulnerability interactions, but without an exhaustive insight into the full range of climate impacts on development.

Households in the 8 districts experience significant climate shocks between 2012-2014. By comparing the consecutive dry days households experienced with those the households themselves consider as tolerable for their agriculture and livestock livelihoods, the analysis was able to calculate whether a household experienced a shock or not. Table 9 shows the breakdown for the different districts and by intervention type of the matched samples for the SCG and VFSG. As expected, climate shocks are clustered in particular districts, due mainly to the geographical nature of rainfall variability and the social vulnerability of livelihoods. Moroto is the only district that experienced a climate shock for all years, and under both the growing season (agriculture) and year round scenarios (livestock); Kaberamaido and Apac each had groups of households in the SCG sample that experienced no climate shocks. Depending on the sample and threshold used, approximately 50-70% of households experienced a consecutive number of dry days longer than the stated shock threshold for their livelihood.

Table 9: Agriculture and Livestock Climate Shocks by District and Intervention Type

District	Shock/Stress Metric	SCG	No SCG	VFSG	No VFSG
Kiboga	AgShock	66% (18)	69% (32)	66% (36)	66% (24)
	LiveShock	33% (18)	34% (32)	33% (36)	33% (24)
Katakwi	AgShock	100% (167)	100% (158)	100% (18)	100% (46)
	LiveShock	66% (167)	66% (158)	100% (18)	100% (46)
Kaberamaido	AgShock	0% (168)	0% (146)	67% (30)	65% (49)
	LiveShock	67% (168)	66% (146)	100% (30)	100% (49)
Apac	AgShock	0% (123)	0% (116)	33% (419)	32% (497)
	LiveShock	33% (123)	34% (116)	33% (419)	34% (497)
Moroto	AgShock	100% (290)	100% (217)		
	LiveShock	100% (290)	100% (217)		

Nebbi	AgShock	66% (151)	68% (181)	100% (324)	100% (304)
	LiveShock	68% (151)	67% (181)	100% (324)	100% (304)
Nakapiripirit	AgShock	35% (123)	34% (101)		
	LiveShock	65% (123)	66% (101)		
Kyenjojo	AgShock	33% (204)	34% (290)	66% (397)	65% (287)
	LiveShock	32% (204)	32% (290)	100% (397)	100% (287)

Figure 3 shows some examples of variation in average climate shock severity using the agriculture (top) and livestock (bottom) metric, and sectioned according to district and subcounty. The numbers represent the consecutive dry days over the climate hazard-livelihood threshold for the given district. It demonstrates that, of those shown, Katakwi experienced consistent and significant climate shocks to agriculture throughout 2012-2014. While the two subcounties in Kaberamaido experienced the worst climate shocks to livestock, while Apac only experienced a shock to livestock in 2012.

Figure 4 shows the variation in average climate shock severity for all districts, using the agriculture (top) and livestock (bottom) metrics. Numbers again represent the consecutive dry days over the climate hazard-livelihood threshold for the given district. It illustrates that, of those shown, Moroto experienced the worst shock to agriculture in 2012, and close to the worst shock to livestock in 2014. Nakapiripirit was the worst affected in terms of livestock shocks in a single year (2014), but arguably the most consistently affected district was Katakwi with annual re-occuring shocks to agriculture throughout the survey period.

Answering the key questions

The study builds upon and re-analyses a dataset established by OPM. The analysis assesses the effectiveness of SAGE social protection programme to support climate resilience of beneficiary households. The findings support Irish Aid to programme interventions that improve the living standards of poor and vulnerable families/individuals in districts of Karamoja who experience multiple shocks and stresses, particularly those relating to climate.

The following questions and analyses were conducted.

Q1: Do climate shocks push households into poverty or reduce their capability of escaping poverty?

Hypothesis 1: Climate shocks are associated with poverty.

Statistical analyses were carried out on how poverty levels are associated with physical climate hazards. The role of climate factors in exacerbating poverty levels for households in Irish Aid's and partners' target areas.

Data: The OPM data provide various socio-economic indicators that can be used to understand spatial and temporal variation in poverty. These include indirect indicators on consumption (e.g. food profiles, hunger categorisations and measures of recent hunger), and more direct measures (e.g. monthly expenditures on food, clothes, education and health)[6]. The latter are perhaps the most useful, which engage households on a monthly basis to audit expenditures. OPM data will be integrated with historical weather and climate data to contextualise the types of shocks and stressing impacting on poverty in Uganda. For instance, choices on what constitutes a shock/stress within the location between aggregate

[6] See file int_consexp.csv

rainfall, continuous dry spells, average number of dry days, instances of flooding (determined by continuous rainfall thresholds).

Methods: The objective is to test for a relationship between socio-economic indicators and weather and climate shocks/stresses. This can be conducted to varying degrees of complexity and rigour. For instance, by comparing means for households experiencing/not experiencing shocks/stresses; further, by correlation analysis to show the strength of the relationship for social protection and control households; further still, regression analysis enables a comparsion of climate with a range of other factors (e.g. conflict, governance) that are also known to determine poverty.

Q2: Do cash transfers save productive assets of households experiencing climate and other shocks?

Hypothesis 2: Cash transfers protect household assets in times of climate stress/shock.

This component uses OPM data to focus on the role of social protection in maintaining asset levels in times of climate stress. Longitudinal data collected by OPM between 2012-2014 will be used to compare the ability of SCT and non-SCT recipients in retaining assets during times of climate stress. Historical climate information will be used to measure the magnitude of climate shocks and stresses, and compare households receiving social protection with non-recipients households based on assets purchases and holdings, such as livestock, farming equipment, and items of value within the household.

Data: The OPM data provide various indicators on asset levels and asset sales. These include indicators of livestock assets (e.g. owning cattle, goats, sheep, camels, donkeys, poultry),[7] other productive assets (e.g. value of assets sold/purchased in the past 12 months,[8] loss/migration of productive households members, and loss of land, water, tools, machinery, in addition to cash savings).[9] The next step is to adjust socio-economic indicators for historical weather and climate data, contextualised to the types of shocks and stresses impacting on the chosen outcome. For instance, in relation to loss of livestock assets, a climate shock is likely to occur when dry spells become protracted; for loss of human assets, both instances of drought and flood are likely to result in household members moving from the home to pursue alternative livelihood options.

Methods: The objective is to test if social protection is impacting on asset levels when households experience climate shocks and stresses. The propensity score matching exercise will establish households that are similar on key characteristics, and so will only vary on whether they actually received social protection. Then using historical data, indicators of assets and climate will be integrated to establish the relationship between shocks/stresses and variation in asset levels. The strength of this relationship over space will be used to determine what we would 'expect' the change in assets levels to be given the level of shocks/stresses in the present year and compare with the 'actual' level. The gap between the expected and actual levels is the measure of resilience within each asset indicator-shock context, and will be compared across the two groups.

Patterns will be observed in the data to identify the circumstances behind high/low resilience outcomes. The characteristics and circumstances of social protection that effectively saves assets in times of climate shocks/stress will be established and documented. This will

[7] See file int_welfare_hhlivestock.csv
[8] See file int_hhassets_productive.csv
[9] See file int_welfare_hh.csv

contribute to a broad set of scenarios for when social protection enables households to navigate climate shocks/stresses.

Q3: Do the assets saved via social protection enable households to regulate food and non-food consumption for the poorest households?

Hypothesis 3: Saved assets improve production and generate income.

This component measures the capacity of households to use saved assets from climate shocks to regulate consumption within the household. Longitudinal data collected by OPM between 2012-2014 will be used to compare the ability of households receiving social protection and non-recipient households to maintain consumption via assets saved in times of climate stress. Using consumption as the flipside of income, the analysis can compare estimated returns from an improved asset base with the outlays necessary to invest in social protection to households, thus providing the foundation for the business case.

Data: The OPM data provide various indicators on household consumption (as stated in Question 1 & 2). These include different indicators of various monthly household expenditures, as well as proportions spent on sub-categories, such as food, alcohol, health. Assuming social protection is relatively effective is saving assets during times of climate shocks/stresses, the levels of assets saved will be used to follow the likely positive impact on consumption.

Methods: Analysis on the linkages between assets saved and improvements in consumption provides insight into the performance of assets saved. The objective will be to calculate the per-unit impact on consumption of assets saved during times of climate shocks and stresses, and build the analysis on the functionality of assets for there. This will indicate the welfare multiplier of assets saved through social protection specifically from climate shocks/stresses. However, this approach assumed assets will be saved by receiving social protection.

Q4. What asset levels are necessary to overcome climate shocks and stresses of differing magnitudes?

Hypothesis 4: Households require X assets to avoid reductions in times of climate induced coping.

This component assesses the level of assets necessary in order for the household to avert periods of assets stripping in times of climate stress, and the resultant reductions of productive and convertible assets available. Using longitudinal data collected by OPM between 2012-2014 enables the study to establish the thresholds whereby household can avoid asset stripping and build productive and convertible assets that contribute to the regulation of consumption. Once thresholds have been empirically demonstrated over time and across space within the study area, the findings can be used to recommend adjustments in cash transfers to different types of households – depending on their circumstances and asset levels – under pressure from climate shocks/stresses.

Data: The OPM data provide various indicators and asset sales. These include indicators of livestock assets (e.g. owning cattle, goats, sheep, camels, donkeys, poultry), other productive assets (e.g. value of assets sold/purchased in the past 12 months, loss/migration of productive households members, loss of land, water, tools, machinery, in addition to current cash savings).

Methods: Identify households (social protection recipients or non-recipients) that experienced climate shocks/stresses, but endure these without significant depreciations in assets levels. This will enable the calculation of upper and lower bound figures for asset levels that policy

designers can aim for to decrease the likelihood households will require humanitarian assistance to recover from climate shocks/stresses.

Q5. How can policy innovations in social protection be layered/integrated into the broad landscape of Irish Aid policy to improve capacity to deal with climate shocks and stresses?

This component assesses the broad complementarity of on-going or proposed policy with innovations for social protection, developing options for sustainably integrating revised policy into the broader landscape of effects to improve living standards of vulnerable groups. This will provide Irish Aid practical and contextualised choices to improve programming via introducing, creating additional programmes and geographically sequencing effective social protection / cash transfer interventions to reduce risk.

Annex 4: Shocks and Adaptive Capacity

The left had column of Table 10 and 11 shows the two main climate sensitive shocks identified in the OPM survey (2012-2014): a) less income from animal husbandry, fishing or farming – lower volume of production; and b) loss of households own animals. The middle column lists the ways that households have responded to these shocks. The right hand column shows the proportion of households adopting each of the coping strategies.

Table 10: Shocks to income from farming, fishing and animal husbandry

Shock	Coping	Proportion
Less income from animal husbandry, fishing or farming – lower volume of production	01 = Mortgage assets	0.003%
	02 = Sell assets/land	3.2%
	03 = Sell livestock	10.2%
	04 = Use savings	4.4%
	05 = Withdraw children from school	2.4%
	06 = Sent children for wage employment	0.003%
	07 = Send children to live elsewhere	0.003%
	08 = Migration	0.003%
	09 = Formal borrowing	11.7%
	10 = Informal borrowing	19.7%
	11 = Reduce consumption	3.7%
	12 = Consume lower quality food/ less preferred food	2.7%
	13 = Help provided by relatives and friends	30.5%
	14 = Help provided from local governments	0.8%
	15 = More wage employment	2.2%
	16 = Change crop choices to avoid bad weather or pest attack	0.9%
	17 = Improve technology	2.7%
	18 = Work as self employed	4.2%
	19 = Increased agricultural labor supply	1.6%

Table 11: Losses of households own animals

Shock	Coping	Proportion
Loss of households own animals	01 = Mortgage assets	0%
	02 = Sell assets/land	0%
	03 = Sell livestock	28.6%
	04 = Use savings	7.4%
	05 = Withdraw children from school	0%
	06 = Sent children for wage employment	0%
	07 = Send children to live elsewhere	0%
	08 = Migration	3.7%
	09 = Formal borrowing	3.7%
	10 = Informal borrowing	10.1%
	11 = Reduce consumption	3.7%
	12 = Consume lower quality food/ less preferred food	0%
	13 = Help provided by relatives and friends	17.5%
	14 = Help provided from local governments	3.7%
	15 = More wage employment	3.7%
	16 = Change crop choices to avoid bad weather or pest attack	0%
	17 = Improve technology	0%
	18 = Work as self employed	3.7%
	19 = Increased agricultural labor supply	15.6%