



National Disaster Management Agency
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The Socio-Economic Impacts of the 2015/16 EL Niño Induced Drought in Swaziland

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ACRONYMS & ABBREVEATIONS

ACAT	Africa Cooperative Agricultural Trust
AIDS	Acquired Immune Deficiency Syndrome
AU	African Union
CBS	Central Bank of Swaziland
DPMO	Deputy Prime Minister's Office
EA	(Census) Enumeration Areas
EDF	European Union Development Fund
ENSO	El Niño Southern Oscillation
EU	European Union
EUR	EURO
FFP	Food for Peace
GAIN	Global Agricultural Information Network
GDP	Gross Domestic Product
GoS	Government of Swaziland
HIV	Human Immunodeficiency Virus
ID	Identification Document
IPCC	International Panel on Climate Change
KOBWA	Komati Basin Water Authority
NOAA	National Oceanic and Atmospheric Administration
NAMBOARD	National Marketing Board
NATCOM	National Commissioner of Police
NDMA	National Disaster Management Agency
NDS	National Development Strategy (2010)
NERMAP	National Emergency Response, Mitigation, and Adaptation Plan -2016-2022
NERCHA	National Emergency Response Council on HIV/AIDS
NMC	National Maize Corporation
OCHA	Office for the Coordination of Humanitarian Affairs
RSPS	Royal Swaziland Police Service
SBIS	Swaziland Broadcasting and Information Service
SEC	Swaziland Electricity Company
SERA	Swaziland Energy Regulatory Authority
SDGs	Sustainable Development Goals
SHIES	Swaziland Household Income and Expenditure Survey
STA	Swaziland Tourism Authority
SWSC	Swaziland Water Services Corporation
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VAC	Vulnerability Assessment Committee
WASH	Water Sanitation and Hygiene

Report Summary

This report provides detailed findings of an investigation into the socioeconomic impacts of the 2015/16 El Niño drought in Swaziland. It records the direct and indirect effects of the drought on the economy of Swaziland and documents how it has affected households, businesses, and the environment. The economic evaluation of drought impacts is essential in order to define efficient and sustainable management and mitigation strategies. The study documents the effects of the 2015/16 drought on the economy of Swaziland, extrapolates how it may have affected the implementation of the country's developmental mandate, and deduces the suitability of the country's disaster risk management policy to respond to natural disasters like droughts. The study concludes by quantifying the economic costs and overall effects, in monetary terms, of the drought to Swaziland.

Background

The Government of Swaziland declared the drought a natural disaster in February 18, 2016. Immediately after that, the country launched the National Emergency Response, Mitigation, and Adaptation Plan (NERMAP) (2016-2017) and rerouted funds to drought relief. The government further invited the International Community, local organisations, and businesses to assist in curbing the adverse effects of the drought. A question of strategic national importance relates to how the drought affected households, businesses, and the environment in Swaziland. Similarly, policymakers are interested to know the coping strategies employed by households, businesses, and organisations involved in the management of the environment to lessen the effects of the drought on wellbeing, profitability, and environmental resilience, respectively. The study, conducted at the request of the National Disaster Management Agency (NDMA), received financial support from the NDMA, the United Nations Development Programme (UNDP) in Swaziland and the Government of Swaziland through its annual Parliamentary Grant given to the Swaziland Economic Policy Analysis and Research Centre (SEPARC).

Methods

The study followed established methodologies for conducting studies on the socioeconomic impacts of droughts. First, the study conducted a detailed household survey covering 2,958 households in all the 55 constituencies of Swaziland. Using the 2007 Household and Housing Characteristics Census' Enumeration Areas (EA), 10 households were randomly selected from each EA and from each household, a respondent 18 years or older (ideally a breadwinner or anyone involved in food preparation or decision-making at the household) was selected to answer the questionnaire. The household surveys focussed on both rural and urban households and sought to solicit information on how the drought (may or may have not) affected Swazi households. The study supplemented the household surveys with structured interviews with business and government stakeholders who included the Municipal Council of Mbabane, Matsapha Town Board, the Swaziland Sugar Association (SSA), Swaziland Meat Industries, and the Swaziland Energy Regulatory Authority (SERA). The list of interviewed stakeholders also includes the National Maize Corporation (NMC), the Swaziland Electricity Company (SEC), the Komati Downstream Development Project (KDDP), Swaziland Water Services Corporation (SWSC), and Swaziland Environmental Authority (SEA). Among government ministries, the study interviewed the Deputy Prime Minister's Office (DPMO), Ministry of Education, Ministry of Natural Resources, Ministry of Tourism and Environment, Ministry of Finance, Ministry of Agriculture, and Royal Swaziland Police Services (RSPS). Others include the Central Bank of Swaziland (CBS), the

NDMA, the American Embassy, Delegation of the European Union to Swaziland, and private businesses such as Swazi Trails.

The study used a detailed questionnaire to collect data focusing on how the drought affected each stakeholder. Computer assisted personal interviewing was used to collect data at the household level. In addition to the survey data, the study requested extra information from stakeholders via emails and in some instances through personal communications (*Pers. Comm.*) with targeted stakeholders. Secondary data, obtained from the CBS and Central Statistical Office, was used to make economy wide inferences. The information collected from the household survey was used to quantify the economic costs of the drought on households, while the data collected from businesses was used to quantify the economic costs of the drought on business. The effects of the drought on household consumption and its effects on the economy were summed up to come up with a cost estimate for the overall effects of the 2015/16 drought on the economy of Swaziland.

Findings and Conclusions

The study estimates that the drought has cost the economy of Swaziland **E3.843 billion**. This is equivalent to **7.01% of Swaziland's Gross Domestic Product (GDP) in 2016** or 18.58% of Government expenditure in 2016. The drought diminished water supply to rural and urban households, caused a significant decline in water levels in rivers, dams, and to some extent water reservoirs dried up, destroyed wildlife (flora and fauna) and domestic livestock, disturbed the quality of life in households, and caused business activity to slow down. In particular, the drought significantly affected the agriculture sector. Crop production decreased, with maize production dropping by a staggering 67%, which caused households to be fully dependent on the cash economy for food. In turn, food inflation rose steeply from 4.3% in March 2015 to 19.0% in December 2016, a record high in three years pushing more households into food insecurity. As a consequence of the drought, total sugar sales are expected to decline by 22% in 2016/17 while in beef production over 88,000 cattle died due to the drought in 2015/16, calving rate decreased by 6% leading to a total loss of 26,000 calves and an increase of 62.4% in cattle slaughters. Cotton production decreased by 90%, from 873 tonnes in 2015 to 100 tonnes in 2016 while in the energy sector, the country stopped electricity production at Lumphohlo and Maguga Dams and resorted to import all its energy needs from South Africa.

In general, the drought affected rural households more than urban households. The study finds that a substantial number of households also had to resort to extreme coping strategies such as reducing the number of meals per day while others turned to less preferred, and less nutritious, cheap food. Household food budgets decreased by up to 75% in many parts of the country, particularly in the Hhohho region. The study estimates that because of the drought, a decrease in food consumption at the household level amounted to E650.44 million or 1.19% of GDP in 2016. The highest decreases in consumption occurred in rural households in the Manzini region, which recorded decreases in food consumption of E240.5 million followed by Hhohho at E193.4 million and Lubombo at E133.4 million. Estimates show that Shiselweni had the lowest number of households that reported a decrease in the food budget; hence, it showed a modest decrease in consumption of E83 million during the drought compared to the other regions.

The study shows that the reason the drought had such a huge effect on food consumption at the household level is because households are no longer involved in food production so much that slight increases in the cost of food have a huge effect on food security at the household level. Indeed, fewer households confirmed ownership of agricultural production assets such as hoes, ploughs, watering cans, water pumps, tractors, and planters – suggesting that

households are no longer involved in food production. The data shows that only 27.9% of the surveyed households in Shiselweni, which happened to be the highest, owned assets used in agricultural production, followed by Manzini (27.0%), Hhohho (25.2%), and Lubombo at 21.0%. Households employed different strategies to cope with the effects of the drought. A large number of households had to seek financial assistance from their friends and families in urban areas just to buy food.

The study finds that the drought affected women-headed households more than male-headed households. Women-headed households had, on average, the highest number of dependants than male-headed households did, and so experienced more food shortages than the male-headed households. Women also suffered in terms of energy and time spent finding alternative sources of wood fuel and water: women had to travel long distances to collect water from rivers and wood fuel for cooking, and for other household needs. Children suffered from drinking poor quality (dirty) water, leading to diarrhoea and other stomach illnesses. Furthermore, in rural households, children remained vulnerable as their parents and guardians migrated to urban areas in search of jobs to sustain their families. However, the results were not as envisaged, as the Royal Swaziland Police Service (RSPS) reported an increase in the number of rapes and attempted rapes in rural households. Besides the impacts on children, there was a significant rise in key populations around the Mbabane and Manzini corridor. This suggests that because of the lack of food induced by the drought, as well as the intrinsic and rampant unemployment and poverty in rural and urban households in Swaziland, some people resorted to sex work as a practical option to sustain their livelihoods during the drought.

In the 2016/17 Budget, the government of Swaziland gave considerable priority to drought relief and mitigation measures. At the onset of the drought, before it was declared a disaster, the government had already committed E45 million to assist 158,000 people with food assistance. An additional E200 million was allocated for drought mitigation in 2016/17, which went into food and water distribution to the most vulnerable communities, drilling of boreholes, dredging of Hawane Reservoir, and provision of supplementary feed for livestock and importation of power from South Africa. Development partners also followed suit and redirected development assistance toward providing drought relief. Subsequently, the study shows that because of resource redirection, the country has deflected the implementation of key development strategies and the economic consequences will linger long after the drought. By redirecting around E350 million into a supplementary budget for drought mitigation and response, government's planned activities had to take second priority. In 2015, the government put the salary review for civil servants on hold while it had to defer some ongoing capital projects. As well, the government did not pay its suppliers on time, which increased pressure on arrears. The effects of deferring payment of suppliers compromised the ability of these suppliers to pay their taxes on time. By December 2016, approximately 41% of the required (US\$96,400,000) funding had been made available for the NERMAP implementation by the government, UN agencies and other partners, with government only releasing about 39% of her share of the budget. Therefore, as of December 2016, NERMAP had used about E533,698,510.80 or US\$39,098,792 to assist 413,553 beneficiaries based on food and cash distribution statistics against an initial target of 350,000 beneficiaries.

An analysis of the economic impacts of the drought across the sectors of the economy shows that the energy, the environment, and water sector suffered major impacts following the agriculture sector. The country imported millions of Emalangeni worth of electricity from South Africa. If there was ever a time the importance of diversifying the energy sector in Swaziland became a pressing issue, the 2015/16 became that time as the drought made it clear that a hydro-based power sector cannot keep the country lit in times of extreme

drought. The drought compromised the country's flora and fauna to great limits such that rangelands completely collapsed and Swaziland had to import pasture from South Africa. Although the study was unable to assess the extent of the drought's impacts on the country's ecological infrastructure, one thing is clear: from an environmental management perspective, implications of these findings are important to develop effective mitigation strategies to reduce drought risk exposure in Swaziland.

Beyond hindrances on general development, the study finds that the drought tested the ability of the country's water harvesting and storage infrastructure, and provision of water to rural households, major towns, and agricultural estates – leading to enormous economic consequences. Normally when there is no drought, 40% of households have access to potable Swaziland Water Services Corporation (SWSC) water including public taps whilst 35% still rely on rivers, streams, lakes, and protected and unprotected springs as their primary source of drinking or cooking water. About 15% of households use boreholes as their major source of drinking water. During the 2015/16 drought, SWSC and public tap water usage dropped from 40% to 33%, and there was a slight drop (about 3%) in the number of households that used rivers for their main source of drinking water. Hhohho and Lubombo regions significantly reduced water consumption while Manzini and Shiselweni regions used more or less the same amount before and during the drought.

Conclusions

An important finding of the study from Swazi households is that they have been experiencing drought-like conditions since the 1980s, with impacts intensifying in the last decade. As a result, the 2015/16 drought negatively affected almost all (well over 80%) households in Swaziland. Urban areas, particularly Mbabane, were for the first time without water. Even though the GoS dedicated a significant budget (E350 million) to address the impact of the drought, more resources are still needed to address issues of agriculture and food security, education, urban water and sanitation, rural water and sanitation, health and nutrition, social protection, environment and energy, storm damages, and coordination in Swaziland. Households feel that their primary responsibility in preparation for, and during drought, is to save water and grow enough food to feed themselves. They believe that government should provide water and food, especially during droughts. However, the surveyed households establish that the level of involvement in food production in Swaziland is very low, at 25.3%. A bigger role that government can play in assisting food production at the household level is through the provision of farm inputs, and distribution of food parcels to the most vulnerable citizens.

Similarly, Disaster Management Policy needs to influence asset priorities in households with emphasis on establishing alternative means to extract, store, and access reliable and clean water, as well as increase household participation in agriculture, especially in the Lubombo region. The assessment found that the impact of the drought was severe especially on agriculture and availability of food at the household level. The study found that because of high unemployment (50%) among rural households and dependency of rural households on urban households for remittances, the drought exacerbated the capacity of households to sustain their livelihoods. Households had to rely on food donations from the Government, business, and development partners to ensure that they had something to eat each day during the drought.

Although the country's Disaster Risk Management Policy is comprehensive, drought-proofing Swaziland is still a question of time and investment in the programmes stipulated in the policy. Essentially, drought-proofing the country should focus on rehabilitating and strengthening the country's food production system so that it is not too dependent on direct

rainfall. This will require the inculcation of a sense of shared responsibility in establishing mechanisms that will eliminate adverse exposure to drought impacts. In order to eliminate systemic vulnerabilities and exposure to the adverse impacts of droughts, encouraging employment and income generating activities across the country, particularly in agriculture is necessary.

Recommendations

The study recommends that the Government of Swaziland should consider revising and integrating all aspects of disaster mitigation to all policies in Swaziland. The NDMA is advised to consider advocating for increased water harvesting, and storage capacities within households and at the national level. In addition, the NDMA should focus on implementing the programmes stipulated in the DRM Policy (2010) to address the endemic risks to drought in the country for improvements in preparedness, mitigation, adaptation and resilience at the household level and in all sectors of the economy. Lastly, since the NDMA's mandate is to make sure that every citizen in the country, regardless of income status, receives adequate protection in the event of a disaster, the study recommends the development of a sustainable Disaster Management Budget and Funding Model in Swaziland.

1. INTRODUCTION

1.1. Background

The 2015/2016 El Niño induced drought had massive impacts on the rural economy in Swaziland, affecting especially agriculture - forcing the government to redirect resources intended to fund the implementation of development projects and programmes to drought relief. According to the Swaziland Vulnerability Assessment Committee Report (VAC) (2016), the drought left at least 308,059 people in dire need of humanitarian assistance. The National Disaster Management Agency (NDMA) estimates that 638,251 people (or about 50% of the population of Swaziland) were affected by the drought, which caused crop failures, destroyed livestock, and induced an unending hunger-spiral prompting the government to declare it a national disaster on February 18, 2016. Consequent to government's categorisation of the drought as a national emergency, the country launched the NERMAP (2016-2022). The government further invited the international community, local organisations, and businesses to assist in curbing the adverse effects of the drought.

A question of strategic national importance relates to how the drought has affected households and businesses in Swaziland. Similarly, policymakers are interested to know the strategies used by households and businesses to lessen the effects of the drought on wellbeing and profitability, respectively. In this study, the socioeconomic impacts of the 2015/16 El Niño induced drought in Swaziland are investigated. The study recognises that, while a wealth of knowledge exists on the economic and environmental impacts of droughts (see for example Ding, Hayes, and Widham (2010) for a comprehensive review of recent studies on droughts), there is very little information on the impacts of droughts on households and the associated welfare implications in Swaziland. This is in spite of the fact that the economy of Swaziland is heavily reliant on water. As argued by Gil, Garrido, and Hernández-Mora (2013: 2679), "water-dependent activities such as agricultural production, agri-food industry, and agricultural employment are severely impacted by a reduction in water availability." Moreover, droughts also weaken the ability of households to produce food, which in turn affects household livelihood security.

In Swaziland, the Vulnerability Assessment and Analysis Report (2014:17) defines household livelihood security as "adequate and sustainable access to income and resources, meeting basic needs including adequate access to food, potable water, health facilities, education opportunities, housing, and the time for community participation and social integration." The implication is that livelihoods can differ between households, depending on the household's capacity to earn income or engage in income generating activities. It also depends on the household's ability to secure ownership or access to resources and assets in order to shirk risks, ease shocks, and meet livelihood contingencies. Therefore, the impacts of droughts can vary significantly between constituencies and regions. The determining factors are the socioeconomic conditions of the households before such shocks hit. Given that in reality, each drought is unique and presents different sets of impacts in varying intensity to an economy and households (Donald and Svoboda, 2007); the capacity of households and the economy at large to mitigate and respond to its impacts varies according to the structures created by disaster risk management policy in a country (Donal and Svoboda, 2007). In that regard, this study focuses on the socioeconomic conditions of households across the 55 constituencies in Swaziland. It investigates the fundamental socioeconomic conditions that are most likely to increase or decrease household vulnerability to drought and other climate-induced disasters as the country enters the last five years of its development vision: Vision 2022.

Conducting this investigation is crucial for numerous reasons. First, evidence is conclusive that droughts negatively influence agricultural production, which leads to unstable agricultural incomes against rising food prices that tend to intensify the incidence of poverty and vulnerability of the poor (Desai *et al.*, 1979 and Chen, 1991). As this study shows, women, people living with disabilities, and children in rural areas became the first casualties of the drought. The drought imposed modifications in the economic position of women, distressed their economic performance, and affected their productivity. In turn, this affected the performance and integrity of the rural economy. Furthermore, at the household level, women are responsible for the overall survival strategy of the family through their role in household food processing and by default, food provision (Tichagwa, 1994). Confounding the situation in Swaziland is that the Swaziland Household Income and Expenditure Survey (SHIES) (2010) reports that on average, women-headed households were poorer than male-headed households in 2010. The household drought assessment contained in this report provides a detailed assessment of the effects of the 2015/16 El Niño drought on the rural sector with a special focus on agriculture, and the welfare of women and children. This is important because if Swaziland is to end poverty and hunger, and achieve good health and wellbeing of all citizens, as per the National Development Strategy (NDS) of 1997 and the Sustainable Development Goals (SDGs), the economic performance of women should be protected at all times.

Second, studying the role of some of the recent interventions geared towards making Swaziland drought proof provides a window of opportunity to assess the extent to which such strategies are yielding the desired benefits. For example, the Poverty Reduction Strategy and Action Plan (PRSAP) prioritises poverty reduction in the NDS where the government outlines its plan of action to ensure minimal disturbances in the agricultural sector due to sporadic weather. Indeed, since the drought of 1992, the country has made great investments in improving water-harvesting infrastructure. However, the drought tested the ability of this infrastructure to store and provide water to rural households, major towns, and agricultural estates. The results have been disappointing, leading to enormous economic consequences, raising questions such as; how adequate is Swaziland's water harvesting and storage infrastructure?

Third, as the impact of climate change worsens, the International Panel on Climate Change (IPCC) has warned that droughts will occur more frequently. The IPCC projects that for some countries in Africa, yields from rain-fed agriculture could fall by up to 50% by 2020, threatening the survival of large populations who rely on subsistence farming (IPCC, 2007; IPCC, 2016). Similarly, the current drought is a manifestation of a long and prolonged drought that has persisted in southern Africa since 2002 (Maish *et al.*, 2014). A question of policy interest therefore is: How drought proof is the Kingdom of Swaziland? Alternatively, to what extent are the country's disaster management policies capable of ensuring adequate protection of vulnerable communities during natural disasters like droughts?

Fourth, the focus on the impact of droughts tends to concentrate on their short-term economic effects on agriculture and the rural economy. Yet the impacts tend to last longer. As has been seen with the drought in Swaziland, governments have to reprioritise development strategies and respond to the disasters. In Swaziland, the Government has had to reroute funds to provide relief support to affected communities and households. Likewise, development partners have also redirected development assistance towards providing drought relief in a bid to ensure that the country does not regress from the development gains achieved in the last 20 years or since the last major drought, and to prevent a humanitarian crisis. Resource redirection has deflected the implementation of key development strategies and the economic consequences will linger long after the drought.

Lastly, while the NDS is clear on where Swaziland should be by 2022, the study analyses how the drought has imposed uncertainties on the country's ability to meet the aspirations of the NDS. For example, the NDS views agriculture as holding the potential to reduce poverty and inequality, and achieving inclusive growth. A recent study conducted by the World Bank (2016) concludes that there is room for optimism as investor sentiments and export market trends suggest that agriculture has a potential of driving economic growth in Swaziland. However, for agriculture to contribute to growth there must be growth in agricultural productivity (Pardey and Craig, 1989). Water availability is an important ingredient in raising agricultural productivity. Moreover, farmers also require resources to access improved agricultural technologies including various inputs, tractors, and agricultural insurance. Given that the drought has wiped-out the savings of rural households (see DPMO, 2016) and that the country has a large number of smallholder farmers, information is required on the kind of support structures that the government could provide to farmers to ensure that they bounce back to farming when the rains return.

Against this backdrop, a detailed assessment of the socioeconomic impacts of the 2015/16 El Niño drought in Swaziland was undertaken, focusing on impacts at the household level, on business, and on the entire economy. A key contribution of this study is in documenting the coping capacity of households during natural disasters. As a socioeconomic impact assessment, the study documents the drought dynamics at the household level and highlights the coping strategies employed to address the multiple dimensions of the drought. Furthermore, the study also includes interviews with select business, government, and non-government stakeholders to make sense of the impact of the drought on the economy using a multi-sectorial approach. In conclusion, the study attaches a monetary value to the economic impacts of the drought. Knowledge gained from this assessment also serves as a foundation to prepare the nation for future disasters to minimise economic and environmental losses, and social disturbances.

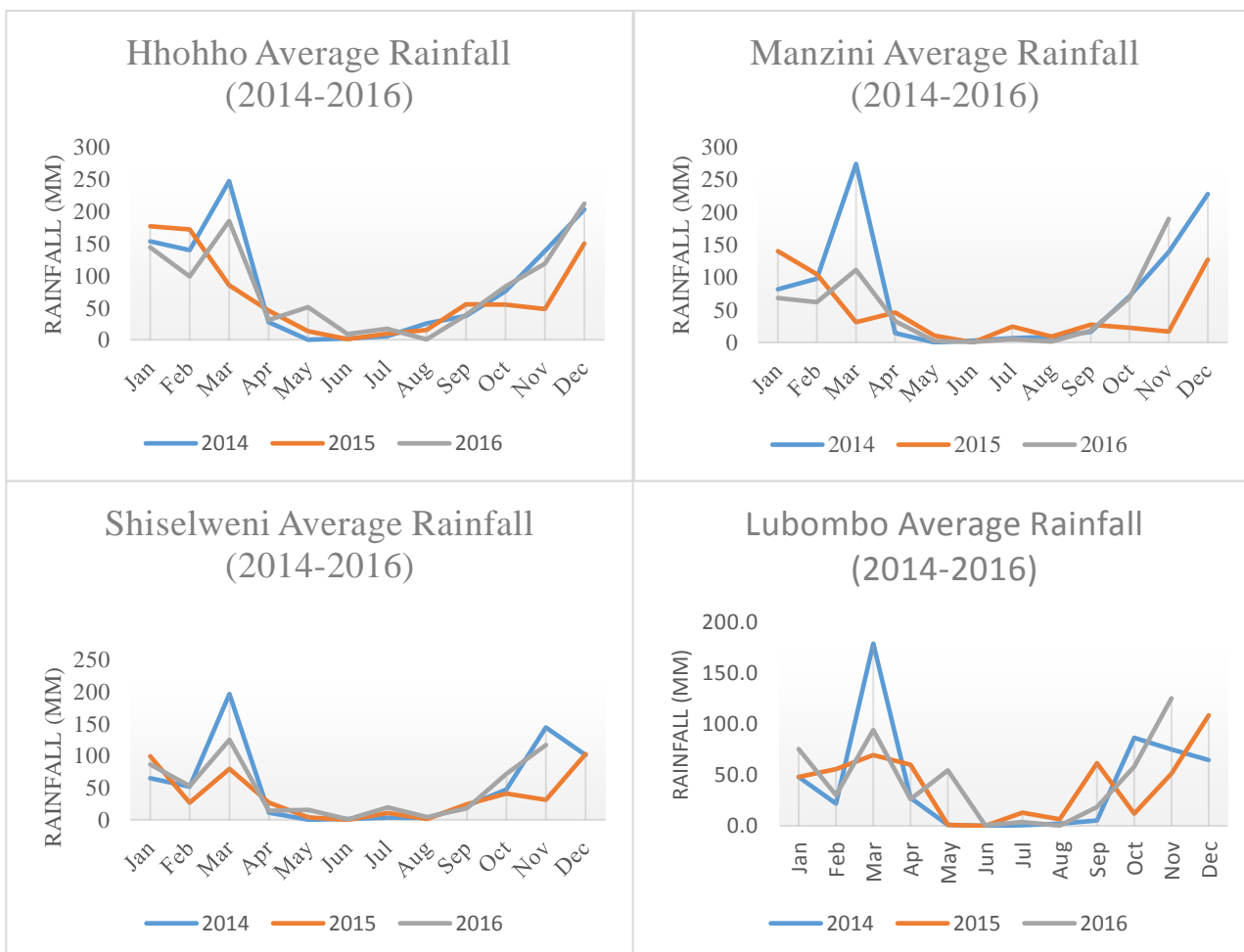
1.2. Contextualising El Niño Induced Droughts in Swaziland

The US National Oceanic and Atmospheric Administration (NOAA) describes the El Niño phenomenon as a large-scale ocean atmospheric climate condition associated with periodic warming of the sea surface temperatures. This happens across the central and east central Equatorial Pacific affecting atmospheric circulation across the world (2016). To detect the presence of El Niño, climate scientists use the Ocean Niño Index (ONI). When ONI is +0.5 or higher, it indicates a presence of El Niño conditions meaning that the east central tropical Pacific is significantly warmer than usual (NOAA, 2016). ENSO is a term used to define the El Niño/Southern Oscillation, an interaction between the atmosphere and ocean in the tropical Pacific Ocean that results in a periodic variation between below-normal and above-normal sea surface temperatures, and dry and wet conditions over the course of a few years (NOAA, 2016). Every two to seven years, the ocean currents and winds shift, causing water temperatures to warm and displace cold water (NOAA, 2016).

The 2015/16 drought in Swaziland was an El Niño induced drought driven by the warming up of the Pacific Ocean in one the strongest El Niño events ever observed (African Climate and Development Initiative, 2016). Historically, the worst El Niño event to hit Swaziland was in 1991/92, which was characterised by the most severe impacts of drought, denting livestock by 20% and leaving irremediable damage to crops. In fact, during the 2015/16 drought, rains in Swaziland decreased drastically to reach their lowest levels in more than ten years (CBS, 2016; State of Environment Report, 2001). Monthly average rainfall in each region also shows a significant dip in precipitation. In all regions, average rainfall dropped considerably in 2015 and 2016, with the driest months experienced from April to September each year. In the heat of the drought in 2016, Hhohho performed much better than all the regions, with an

annual average total of 987mm. Manzini also performed somewhat better with annual rainfall of 559mm, given the drought situation. Lubombo and Shiselweni performed much worse, recording meagre annual precipitation of 523mm and 487mm, respectively (see Figure 1.2.2 below).

Figure 1.2.2 Average Monthly Rainfall (2014-2016)



Source: Author's own representation of Swaziland Meteorological Services Data (2016)
 Notes: Figure 3.1.2 below shows average rainfall each month in the four regions in Swaziland from 2014 to 2016.

1.3. Socioeconomic Impacts of Drought

Natural disasters, prompted by weather and climate, are not preventable. Swaziland is prone to climate related disasters such as droughts, cyclones, flash floods, and windstorms. Of all the disasters, the highest mortality in Swaziland occurs during droughts (NDMA, 2016; also see National Disaster Management Policy 2010). Droughts pose serious threats in sustaining human life, natural ecosystems, and livelihoods. Indeed, without proper protection of human life and the ecological infrastructure that make Swaziland the country it is, renders all the developmental aspirations of the country futile. Drought as a climate phenomenon has several proportions: meteorological, hydrological, agricultural, ecological, and socioeconomic. When people talk of drought, they often refer to a meteorological or hydrological drought.

A *meteorological* drought is about the degree of dryness and the duration of the dry period over a given time. In effect, it entails the overall problematic and persistent dry weather patterns (Botterill and Chapman, 2002). Closely related to the meteorological drought, is a

hydrological drought. A *hydrological* drought is about the lack of rain (due to precipitation, infiltration and evaporation) (Botterill and Chapman, 2002), such that the amount of water available both in river catchments and ground water falls below the average levels. The hydrology of an area depicts the distribution of surface water after precipitation. The reason people easily identify with hydrological drought is that they get a first-hand experience of its indicators through a reduction in stream flows and diminishing water levels in dams and rivers.

An *agricultural* drought, on the other hand, is much subtler. It involves low commodity production emanating from persistent high soil moisture deficiencies that impede crop growth (Anil and Indira, 2007; Botterill and Chapman, 2002). Farmers are more likely to be in tune with this kind of drought as they monitor their crops over growing seasons. The problem with an agricultural drought is that the water demanded by crops far exceeds the water available in the natural ecosystem.

Droughts have an impact on the sustainability of natural ecosystems, and hence, the classification of an ecological drought. Over time, the tenacious dry conditions start to be a limiting factor on the health and productivity of the environment, and thus, an *ecological* drought describes the reduction of the productive capacity of natural ecosystems due to insufficient precipitation (Anil and Indira, 2007).

The aggregate effects of meteorological, hydrological, agricultural, and ecological droughts define a socioeconomic drought. Much of human livelihoods and economic activities depend on the climate and its interactions with the natural ecosystem on the planet. Therefore, a *socioeconomic* drought integrates aspects of all the types of droughts discussed above to portray a situation where precipitation is not sufficient to meet human livelihood needs (Anil and Indira, 2007). The curious consideration of disaster risk reduction, or more closely, drought policy is that it attempts to address the socioeconomic effects of droughts on human activities or livelihoods and resultant mitigation strategies needed in order to reduce their combined impacts by identifying appropriate interventions (Botteril and Chapman, 2002). Drought policy, and its accompanying drought mitigation programmes, offer countries the opportunity to establish appropriate strategies necessary to reduce the adverse impact of droughts on human and natural ecosystem well-being.

1.4. Framework for Assessing Socioeconomic Impacts of Drought

Considerations in disaster economics examine disasters in terms of the positive or negative net effects on macroeconomic indicators such as GDP, employment, inflation, etc., and the changes in the short and long-term (Baade et al. 2005). Benson and Clay (2003) argue that in the short-term, disasters like the 2015/16 drought negatively affect income generation, investment, consumption, production, employment, and financial flows.

Economists use the decline in macroeconomic indicators such as a fall in GDP or rise in unemployment to capture the negative impacts of droughts. Likewise, economists use the value of resources used or destroyed at efficient market prices (Rose and Lim, 2002) to capture changes in welfare losses due to droughts. Unlike the economic costs, which are straightforward to capture, the social costs of droughts are difficult to capture and are not quantifiable through changes in GDP and other macroeconomic indicators. Dore and Etkin (2000) explain that the social costs of disasters represent the total burden imposed by a disaster. In actual value, it is the loss to society, whether tangible or intangible, including the opportunity cost of resources deployed for reconstruction and relief.

Intangible losses are also important. They include disaster impacts related to lifestyle, health, social tension and disruption, social capital accumulation, and environmental health (Alston and Kent, 2004). Usually, the purpose of conducting a holistic socioeconomic

assessment is to shine light on the intangible, often ignored, impacts of drought. The reason is that, when compared to other disasters, droughts do not cause structural damages (e.g., damage to property) (Mysiak, 2010). To be clear, droughts cause non-structural damages such as declines in land value and agriculture yield failure. Moreover, the indirect losses of drought such as decline in investment and increase in food imports can be much more severe and spread over a long period of time. Therefore, an effective drought impact assessment exercise needs to incorporate both the tangible and non-tangible effects, as well as spell out the distributional effects of drought losses.

Disaster is not borne equally across individuals, households, and communities. A socioeconomic impact assessment examines the positive and negative effects of a process or development that introduces an element of change on people's normal way of life. In that sense, a drought is a meteorological process that has the potential to induce significant changes that pose serious threats on human livelihoods. A socioeconomic impact assessment provides a set of lens for scrutinising the whole process of drought and its effects on the day-to-day human activities to assess the drought experience through the cultural, psychological, and economic meanings people attach to the changes that develop from the drought experience (see Lockie et al., 1999). It does not only focus on how individuals experience the change; it also encompasses the likely responses of the people impacted by the change as they try to maintain some form of normalcy in their lives. The assessment of how individuals and families within their communities experience and respond to change creates an appropriate background to design effective impact mitigation strategies that minimise negative impacts of the change while maximising the positive impacts of that change. At a broad level, such studies allow for effective planning and coordination of efforts. It is, therefore, vital to determine not only the full range of impacts, such as changes to levels of income and employment, access to services, and quality of life, but also the implications of the impacts on sustaining livelihoods and the developmental goals of a country.

For the purposes of this study, an integrated socioeconomic assessment approach is preferred to provide a holistic picture on the economic impacts and the dominant social values attached to the drought dynamics that inform the attitudes and responses to the 2015/16 drought experience in Swaziland. The study follows an assessment process adapted from Taylor, Bryan, and Goodrick (1995):

- Scoping – defining the nature and boundaries of the drought impact assessment on households.
- Profiling – establishing the baseline livelihoods affected and the changes induced by the drought on the different livelihood activities.
 - Determine baseline impacts: what happened, who was affected, when, where and how?
 - Determine the extent and scale of livelihood activities affected and the ranges of attitudes and values attached to the affected activities.
 - Make considerations on the historical, regulatory, and other socioeconomic factors distressing the key livelihoods affected.
 - Mitigation and management of impacts.
- Evaluation of impacts versus management of impacts through the analysis of the overall implications of the drought on the country's development goals and disaster management policy.

1.5. Prior Studies and Mitigation Activities in Swaziland

Following the declaration of the drought disaster in February 2016, the Deputy Prime Minister's Office (DPMO) produced a drought Rapid Multi-Sectorial *Assessment Report: 2015/16 Season*, to ascertain the effects of the extreme drought impacts on the different

sectors of the economy in Swaziland. Primarily, the multi-sector rapid assessment focused on levels of chronic food insecurity, water and sanitation, nutrition, health, livelihoods vulnerability in rural and urban households across the four regions in Swaziland. In addition to the rapid drought assessment, the NDMA also released a *Swaziland National Drought Response Issue No.1*, which documents sector needs, responses, gaps and constraints pertaining to the 2015/16 drought situation. The rapid assessment provides a snapshot of the adverse effects of the drought in order to inform evidence based multi-sector preparedness and response planning under the NDMA's disaster management mandate. This socioeconomic impact report builds on the rapid assessment report, to provide more localised and much detailed assessment of the impacts of the drought. The report paints a more detailed picture on the levels of household vulnerability, resilience and recommends responses suitable for the most vulnerable groups in both rural and urban communities.

Since the drought phenomenon is mostly concerned with the mechanics of water supply and demand in the natural hydrological system for food production and general economic consumption, the drought rapid assessment provides expedient background information on the rainfall performance over the 2015/16 season. Therefore, for a complete analysis of the rainfall water situation for the 2015/16 drought, characterised by a 50% reduction in normal rainfall due to the effects of the El Niño Southern Oscillation (ENSO), the rapid assessment report is a recommended preamble to this socio-economic impact assessment report. The key themes discussed in the drought rapid assessment report include rainfall performance 2015/16 season; water, sanitation situation and the environment; crop production and food security; livestock; agribusiness; energy and the environment; health and nutrition; protection; access to information and services; and education.

On the other hand, The *Swaziland National Drought Response Issue No.1* provides a detailed overview of the drought impacts at the national level, and the interventions implemented by the NDMA and development partners. It provides excellent information on the number of people affected and budget needed to respond to the impacts under the key programme areas: health & nutrition; education; water sanitation and hygiene (WASH); agriculture & food security; protection; and coordination. The report is an arm of the NERMAP (2016 – 2022), which documents the immediate actions and planned long-term interventions that the Government of Swaziland has been able to implement in light of the 2015/16 drought.

The assessments contained in this study support findings of both the rapid 2016 Rapid Multi-Sectorial Assessment Report and the Swaziland National Drought Response *Issue No. 1*. Essentially, the idea behind this report is to expand on the drought rapid assessment and drought response reports by zooming in on the drought mechanics at the household level in Swaziland. By doing so, this report generates more evidence that documents the drought impacts and responses, and fills in the necessary household research gaps that will enhance policy and drought/disaster response programmes.

2. RESEARCH METHODS

2.1. Research Design and Methods

In order to assess the socioeconomic impact of the 2015/16 drought in the country at the household level, the study conducted a detailed Socioeconomic Drought Assessment Survey for the first time in Swaziland in November/December 2016, using a household questionnaire designed to examine:

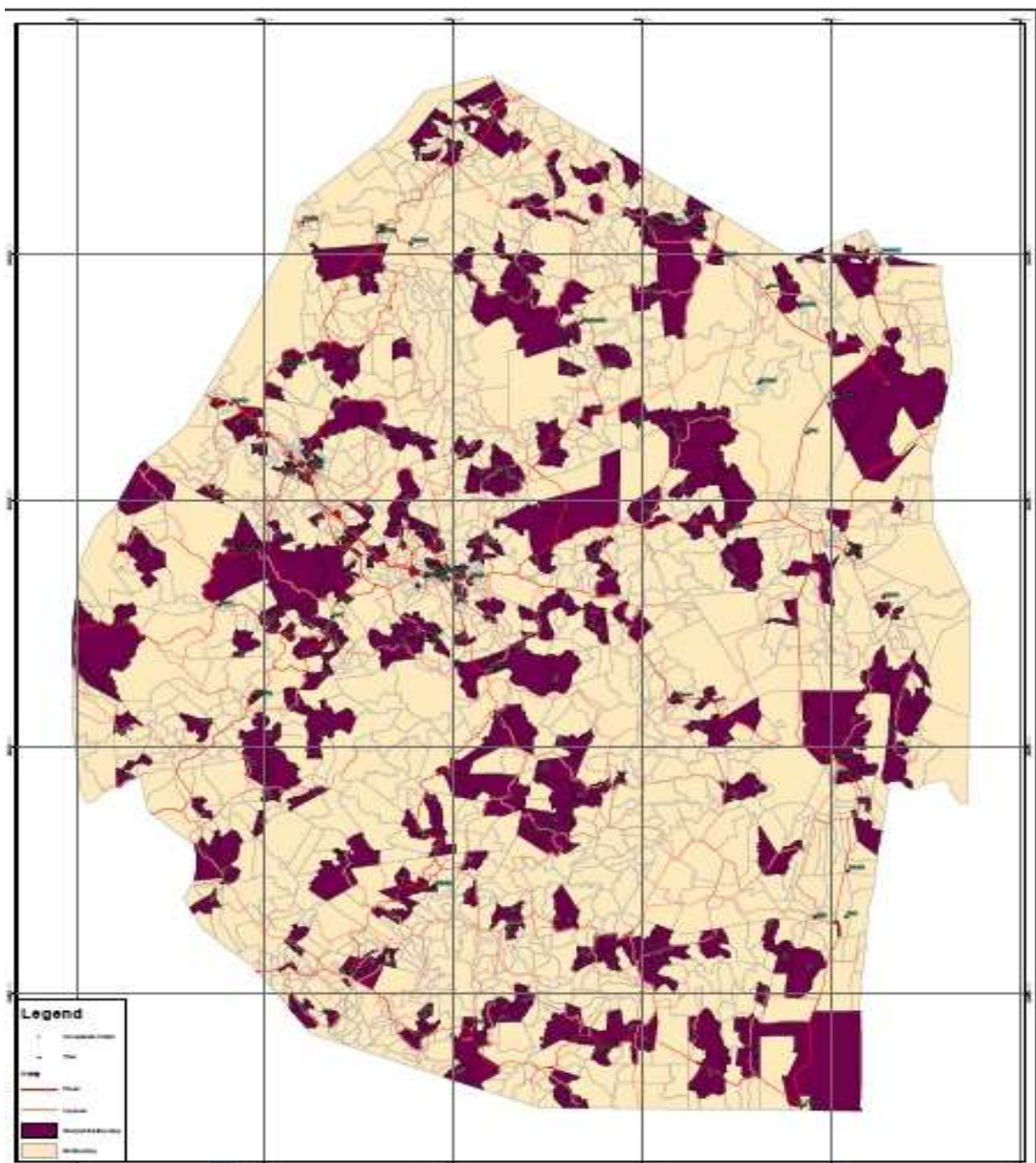
- Household Demographics;
- Asset Mapping and Risk to Poverty;
- Potable Water Availability;
- Income Availability;
- Drought Impacts and Coping Mechanisms;
- Drought Impact Significance;
- Household Networks/Social Involvement, and
- Drought Mitigation Measures and Response Behaviours.

The survey used a sample of 2,958 households. The sample was drawn by taking the smallest geographic units called Census Enumeration Areas (EAs) in Swaziland and stratifying all EAs across the country into regions and geographical areas (urban/rural). Two hundred and ninety-six (296) EAs (see Figure 2.1.1) were randomly sampled using the probability proportionate to its size (PPS) in the overall population as per the 2007 Swaziland Population and Housing Census. The sampling strategy randomly selected ten households within each EA. From each household, a respondent 18 years of age or older was selected to answer the questionnaire. The respondent had to be the breadwinner or an adult related to the breadwinner and be involved in decision-making in the household.

In addition to the survey, the study also interviewed select government, non-governmental organisations, and businesses to establish the intensity and constraint the drought has had on water dependent business activities, including implications on social welfare and developmental targets during the period 2015/16. The study made an effort to interview all relevant stakeholders. However, not all stakeholders were available (or agreed) for interviews. The following stakeholders agreed to be interviewed:

- Ministry of Natural Resources and Energy, Swaziland Electricity Company, Swaziland Energy Regulatory Authority;
- Department of Water Affairs, Swaziland Water Services Corporation, Swaziland National Meteorological Department;
- Ministry of Agriculture, National Maize Corporation, Swaziland Meat Industries, Swaziland Sugar Association, Komati Basin Water Authority (KOBWA);
- Municipal Council of Mbabane, Matsapha Town Council, Royal Swaziland Police Service;
- Swaziland Environmental Authority, Swaziland Tourism Authority, Swazi Trails;
- Ministry of Education, Mbabane Regional Education Officer;
- Ministry of Health, EU, American Embassy, DPMO – Social Welfare Department, Central Bank of Swaziland.

Figure 2.1.1 Swaziland EA Map



Source: SEPARC's own representation of Survey Data (2016)

2.2. Survey Data Collection

The study collected data using a questionnaire, attached in the appendices, developed in line with the thematic areas of socioeconomic assessments of drought. The NDMA was consulted to approve the appropriateness of the questionnaire.

2.2.1. Piloting

Piloting activities were conducted in Enumeration Areas (EAs) in Ezulwini for eighty (80) practice interviews. The piloting exercise was undertaken in both urban and rural areas, including formal and informal settlements. Each fieldworker conducted two practice interviews: one with an English version and another interview using a SiSwati version of the questionnaire. The instruments were pretested for language used, comprehension, and effectiveness of the questionnaire to collect the data required for the socioeconomic analysis. All processes and procedures with regards data collection were assessed, including:

- Each fieldworker conducting two interviews, one with a male, and the other with a female respondent.
- Each fieldworker conducting one interview with a siSwati questionnaire and the other in English.
- Fieldworkers testing the sampling methodology for starting points, household selection, and selection of respondents.
- Assessing how well the questionnaire worked.

2.2.2. Data Collection

Under the leadership of the field manager, a team of two field supervisors led the field process. Field teams constituted of one field supervisor and eight enumerators. Fieldwork lasted a period of 33 consecutive days. For the purposes of data collection, the study coordinator supplied each fieldworker with an ID detailing their name, and the contact names and numbers of their supervisor and research provider. In approaching respondents, included - but not limited to - were assurance of confidentiality, the general research purpose for which the data would be used for, name of the research provider, and that participation was voluntary.

2.3. Data Quality Assurance

The study maintained quality assurance through a number of quality standards and protocols. The provision of supervision ensured field workers' adherence to, and maintenance of quality standards, in (1) household entry procedures, (2) obtaining and documentation of informed consent, (3) data collection (including but not limited to completeness and accuracy of data records). Supervisors observed and recorded the field workers' adherence to procedures throughout the interview and provided feedback to the enumerators, as part of continued quality assurance upon leaving the household. Each team supervisor conducted at least one back-check in every enumeration area. The supervisor conducting the back-check informed respondents that the purpose of the post interview visit verified that interviewers asked all questions and recorded all responses correctly. This was done by randomly selecting and re-asking a few questions. Team supervisors alternated between interviewers for back-checks. Even though the study randomised the data collection process, the supervisor made sure to back-check each enumerator an equal number of times.

2.4. Data Analysis

Analysis in this study involved use of primary and secondary data. To achieve research objectives I and II, the study used the Survey to obtain primary data on the impact of the drought at the household level and the related coping mechanisms employed. The study grouped and coded the responses from the Survey into the themes discussed in the rapid drought assessment, including new themes that emerged from the data. The study used the descriptive and statistical bulletins contained in the demographics, household wealth and poverty indicators, potable water, and income indicators in Section 2.1 to ascertain the direct and indirect impacts of the drought on households. To calculate the losses in household food consumption due to the drought, the study used the reported changes in household food expenditure from the Survey. Due to a lack of baseline information on household consumption data prior to the drought, the study used data from the Swaziland Population Census (2007), which provides an estimation of total households in the four regions of Swaziland according to geographic (rural or urban) distribution. The Census data reports that there are 212,195 households, of which Hhohho constitutes 60,725 (29%), Manzini 72,108 (34%), Shiselweni 37,066 (17%), and Lubombo 42,296 (20%) households. These figures are used to base the estimations on consumption losses per region per household. The household food expenditure basket, derived by categorising food consumed in the

households into the following major food groups: mealie-meal, rice, vegetables, meat/fish, pulses, oil, sugar, and milk, was used to calculate average household food expenditure per region apportioning the calculation into rural and urban households as shown in Table 4.6.1 (on page 60). The resultant expenditures are then used to calculate food consumption losses due to the drought according to the reported food consumption losses at the household level¹, as shown in Table 4.6.1. A summation of the total losses per region and across the four regions per month provides an estimate of the total economic losses due to reduced consumption at the household level. These are multiplied over a period of 21 months to estimate the entire losses due to the drought, as shown in Table 4.6.2 on page 61. The study adopts 21 months because food inflation started increasing in March 2015 and the first rains only started falling in late November 2016, suggesting that the critical timeframe for the effects of the drought on food expenditure in households was from March 2015 to November 2016².

To achieve objective III, the analysis compared the experiences of households and sector economic activity constraints to the NDMA's disaster management legislative framework – National Disaster Management Act and Disaster Risk Management Policy. Objective III gauges the country's resilience to drought disasters. It also serves to recommend strategies necessary to ensure that the country is drought-proof both at the household and regional level. Drought proof households have security of income and livelihood, security of food, and security of water, fuel-wood and fodder. At the constituency or regional level, it speaks to stable agricultural and industrial production without any disturbances in the provision of water, as well as sustainable use of land and water without any disturbances in food and fibre production, and integration of drought prone areas into the mainstream economy. The total accounts of how households and business activity fared during what interview respondents described "the most severe drought the country has ever experienced since the 1980s", provide a platform to deduce the implications of natural disasters on the country's developmental aspirations as per the last objective (IV) of the study. The study then makes inferences on the high order implications on the dynamics, and cascading effects, of the drought on households and the economy as a whole to establish what the country stands to lose or gain in its developmental aspirations given drought shocks.

To attach a monetary value on the drought impacts, the study made a summation of all the money spent in intervention programmes, including the immediate direct losses incurred in the key sectors of the economy affected by the drought. Due to limited data, the estimation included Government and donor intervention programmes on health and nutrition, education, WASH, agriculture and food security, protection and coordination; the agriculture sector focusing on maize, sugar, beef and cotton production; and energy and water as separate sectors focusing on SEC and SWSC operations.

¹ In the questionnaire, respondents were asked to estimate the change in their monthly food expenditures. A scale comprising 0%, 25%, 50%, and 75% was used. Please see questionnaire in the appendix.

² Although increases in the cost of food (as shown by inflation) started in March 2015 and peaked in December 2016, the effects of the drought on households are not necessarily immediate. Similarly, although rains started coming back in late November 2016, changes in food costs due to the rains were also not immediate.

3. SOCIOECONOMIC IMPACTS ON HOUSEHOLDS

3.1. Profile of Sampled Households

This section discusses the demographic profile of households sampled for the drought socioeconomic impact study. The demographic profile includes information on household characteristics such as respondent's status in a household, age, marital status, education level, and number of dependents. For ease of reading, please note that all figures are in Appendix A: Figures and Tables.

Figure 3.1.1 (in the appendix) shows that approximately 80% of the survey respondents were breadwinners in their households. The study defines a breadwinner as a decision-maker responsible for overall household management including other household members and the livelihood dynamics in a family unit. Given the high number of respondents actually in charge of the households in the sampled households, the data provides a reliable representation of the experiences of households during the drought and thus makes a reliable assessment of the impacts of the drought at the household level. A further analysis of the demographic profile of respondents shows an almost even distribution between both male and female household breadwinners (Fig 3.1.2 in the Appendix). Similarly, single and widowed household breadwinners were almost the same in the sample. The age distribution (25 to 54 years) is in line with the population pyramid in Swaziland in 2007 which depicts that Swaziland has a young a population. However, there is also a sizeable (20%) number of elderly people aged 65 years and older, (Fig 3.1.4 in the Appendix). The data further show a considerable number of older people (above 65 years) who are still in charge of providing sustenance in households, especially in rural Swaziland.

In terms of education, household dependents, and gender dynamics, the data conforms to Swaziland's expected situation. Of the sampled population, 81% has primary or higher level of education with the rest of the sampled population (19%) with no formal education. For those with some form of education, two thirds have either a primary, secondary or high school education. The rest, constituting 13% of the sample, hold a degree or have some form of vocational skills (Fig 3.1.5). The education data reveals that, on average, the number of people with a primary level of education or more is greater than the number of people without any form of education. The data further evinces that females are most likely to have no formal education compared to males (two thirds of females compared to one third of males).

More males for example have vocational skills and higher-level education degrees than their female counterparts. However, there are more females with primary, secondary, and high school education than males (Fig 3.1.5 in the Appendix). In general, most household heads have between two (2) to five (5) dependants (defined as people they are directly responsible for) (Fig 3.1.6 in the appendix). Worth noting is that females have a higher number of dependents or household members they are responsible for while more than 75% of the households with a high dependency ratio are in rural areas (Figures 3.1.7 and 3.1.8 in the Appendix).

In summary, the household demographics demonstrate that Swaziland has a young population (18 – 54 years) with a considerable number of elderly and widowed people who are breadwinners. Recall that in the introduction it was argued that the extent of the drought impacts on households depend on their socioeconomic conditions or situation of individual

households at the onset of the disaster. The combination of the household characteristics in terms of size, dependents, education, age, and extent of a family's exposure to social networks, plays a crucial role in determining households' exposure to risks from climate shocks. It is also important for providing a nuanced understanding of how each household positioned itself to respond appropriately to the shocks, for example, in providing answers to the question: who among younger and elderly breadwinners is more likely to implement the most effective or sophisticated coping mechanisms to eliminate the worst impacts of the drought?

3.2. Asset Mapping and Assessment of Risk to Poverty

This section provides a description of household livelihood security based on access to income, resources, and ownership of assets. It assesses the general level of wealth versus poverty among the households. Households engaged in sustainable income generating activities, in addition to having access to wealth in the form of assets, tend to be less vulnerable to climate shocks such as drought (VAC, 2014). On the other hand, households experiencing high levels of poverty without adequate access to resources and assets to cushion exposure to disaster tend to be most vulnerable and as such are heavily affected by the adverse impacts of drought. Therefore, the study is interested in understanding the assets in households as a proxy of their socioeconomic condition at the onset of the drought. Accordingly, Table 3.2.1 lists typical household assets and makes comparisons between the four regions of Swaziland. Since droughts have a direct impact on the availability of water and therefore the level of agriculture activity in households, the survey takes keen interest on assets used in agricultural production assets such as ploughs, tractors, water pumps, water tanks, watering cans, and wheelbarrows, among other assets. Table 3.2.1 illustrates that households in Hhohho and Manzini possess a lot of agricultural production assets while households in Lubombo and Shiselweni lag behind, such that the most households without any of the typical household assets particularly used in agricultural production in rural Swaziland are found in Lubombo (3.8%). This is consistent with findings from the SHIES (2010), which revealed that the incidence of poverty is actually higher in the Lubombo and Shiselweni regions (69% and 68% respectively) compared to 61% in Hhohho and 58% in the Manzini region.

As explained in the VAC (2016), lack of asset ownership is a proxy for the likelihood of extreme poverty within a household. It can also be used as a proxy of a lack of involvement in agricultural production. The data shows that households living in the Lubombo region are three times as likely to be adversely affected by the drought than households in Hhohho and Shiselweni while Manzini households are less likely to be affected by the drought. The distribution of typical household assets per region between rural and urban households is also widely concentrated in the Hhohho and Manzini regions, although there are intra regional variations in asset ownership. For example, Figure 3.2.1 in the appendix shows that although water pumps and tanks are good assets to own for water security at the household level, households in Shiselweni (1.47%) and Lubombo (1.71%) had the least number of water pumps. During a drought, pumps and water tanks enable households to extract and store water when conventional water sources run dry. Manzini (3.3%) and Hhohho (2.5%) had the most number of water pumps (see Table 3.2.1). Still, considering that drought-like conditions have worsened in the country in the last decade, the number of water pumps and tanks at the household level is low.

Assets that are an indicator for agriculture activity within households (such as ploughs, tractors, watering cans, and hoes) are most prevalent in the Shiselweni region (27.9%) followed by Manzini (27.0%) and Hhohho (25.2%) regions, respectively. Lubombo lags behind at 21.0%. This suggests that households in Shiselweni, Manzini, and Hhohho regions

are most likely to engage in agriculture as a vehicle to sustain their livelihoods. Though households in Lubombo have these assets, they fall far below the levels in the other regions of Swaziland – suggesting that households in the Lubombo region are to some level, discouraged from agriculture production and thus more vulnerable to drought induced food insecurity. Not surprisingly, the SHIES (2010) found that extreme poverty also known as food poverty was the highest in the Lubombo region, rising from 32% in the year 2000 to 37% in 2010. In contrast, extreme poverty or food poverty in the Shiselweni region decreased from 38% to 27% between 2000 and 2010 (SHIES, 2010). Indeed, information on household farm or backyard garden ownership (see Figure 3.2.2 in the appendix) confirms that the most active fields and gardens are found in Shiselweni, Manzini, and Hhohho, respectively, while Lubombo lags behind.

Table 3.2.1. List of Household Assets in the Four Regions of Swaziland

Region (no of sampled households)	Household Assets											Average (agricultural Production Assets Only)
	No Assets	Car	Electric/ gas stove	Refrigerator	Hoe	Plough	Tractor	Water pump	Water tank	Watering can	Wheelbarrow	
	Percent of Households											
Hhohho (N = 606)	0.7%	36.1%	49.3%	79.9%	73.4%	19.1%	3.5%	2.5%	39.3%	13.7%	68.8%	25.2%
Lubombo (N = 468)	3.8%	19.4%	40.4%	53.8%	75.2%	4.3%	3.6%	1.71%	35.5%	5.8%	59.4%	21.0%
Manzini (N = 692)	2.0%	24.9%	48.4%	79.0%	80.3%	17.1%	5.5%	3.3%	42.8%	12.9%	78.3%	27.0%
Shiselweni (N = 681)	1.0%	18.8%	26.1%	48.8%	85.3%	25.6%	4.8%	1.47%	37.0%	13.1%	63.3%	27.9%

Source: Authors' own representation using survey data.

Notes: Table provides the number and percentage of each type of asset found in each region of Swaziland among the households that were sampled. The assets shaded in grey represent all assets or equipment that could be used to explain level of involvement in agriculture production at the household level. Cars and refrigerators differentiate between poor and rich households and as such ability of household to mobilise resources during a drought. Note also that households were asked to indicate whether or not they owned the listed assets.

Livestock data also paints a bleak picture on participation in agriculture to ensure food security in the Lubombo region. Even though livestock (cattle, poultry, goats, sheep, pigs, and ducks) is spread almost evenly across the four regions, Lubombo holds the least number of livestock³ (both in quantity and type of livestock) (see Figure 3.2.3 in the appendix). The data show that Swazi households have livestock assets, in decreasing order, in the form of poultry, cattle, goats, pigs, ducks, and sheep. This is not surprising as chicken and beef form part of the staple diet in most Swazi households, while pork has, in recent years, been increasing in popularity. Surprisingly, there is growing popularity of goat meat⁴ in Swazi diets.

Besides assets that are closely linked to agriculture and water management in the households, there are other important household assets and indicators that determine the overall level of livelihood security and could shield households from poverty and climate induced shocks. A positive characteristic of Swazi homes demonstrated by the data is that the majority of household heads own their houses or homes. The older the household head, the more likely they are to own their house or living quarters. In urban areas, however, the general trend is that people are renting (though there are some who own) their living establishments (see Figure 3.2.5 in appendix). There are some households that live on free rent or board, especially younger people being supported by their parents or family members. Though the majority of the surveyed households consist of modest living structures, the prevalence of stick and mud homes is very low at 21% of the total households sampled (see Figure 3.2.7). About 80% of people live in stable concrete structures with 65% of these homes using electricity as their main lighting energy source (see Figure 3.2.8 in the appendix). While electrification of rural households in Swaziland has been extensive (Swaziland electricity access index is estimated close to 70% according to SEC 2014/2015 Annual Report), 33% of households still rely on candles and oil lamps to light their households.

Remarkably, while households choose to light their homes using electricity, they use firewood for cooking purposes. Figure 3.2.9 in the appendix demonstrates that a significant number of households (70%) still use firewood for cooking. An additional 4% of households use coal or paraffin, while another 4% use natural gas (handy gas). Only 22% of households use electricity to cook their meals. The implication is that there is widespread deforestation that derives from the need to provide wood-fuel for cooking and heating purposes, particularly rural households. Deforestation for fuel-wood has a negative impact on sustaining biodiversity in natural ecosystems. What is worse is that, cutting down trees for fuel-wood during the drought, when the forest ecosystem is already fragile, can be detrimental to the regenerative capacities of forest ecosystems in the country. Moreover, the burning of fuel-wood increases air pollution and makes household members prone to respiratory diseases. Similarly, paraffin is also linked to toxic fumes and respiratory diseases in households, while candles are a known fire hazard.

Building resilience at the household level is about making sure that households have the resources, assets, and services that would allow them to appropriately reorganise their lives in the event of a disaster, so that they can maintain some normalcy in their livelihoods. The foregoing discussion demonstrates that households that are more vulnerable to droughts are found in the Lubombo and Hhohho regions. In these households, there is limited agricultural activity as shown by the number of agricultural assets such as water harvesting and water storage assets, tractors and hoes, which were in small quantities relative to the

³ Livestock (goats, cattle, and sheep) almost exclusively found in rural households.

⁴ The rise in goat meat (chevon) consumption in Swaziland probably derives from the upsurge in Asian population, especially people from Bangladesh.

other regions. Moreover, the data shows that the level of involvement in agricultural production is generally low in rural Swaziland. For instance, the number of agricultural assets in the respective households is lower than 30%, even in Shiselweni which had the highest number of agricultural assets. Since the study uses the number of agricultural assets as a proxy for the level of involvement in agricultural (food) production in households, the data shows that the level of agricultural production at the household level in rural Swaziland is on average at 25.3% (average of total agricultural assets owned in each region). Whereas the level of agricultural production in the country is generally very low, households in the Shiselweni region showed a higher propensity to participate in agriculture (or food) production than anywhere else in the country. The implication is that by simply increasing investment into water harvesting and storage infrastructure in Shiselweni, the level of agricultural production in the country could improve.

3.3. Household Expenditure and Income Availability

Income generating activities are the key drivers of livelihoods and maintenance (Hajdu *et al.*, 2011). This section discusses the general methods used by households to make money. It also discusses how households spend such annuities to sustain their livelihoods. A sustainable income, defined as proceeds that allows a family unit to meet all of its basic needs or expenses while also saving for life contingencies, is a critical component of building flexibility to cushion households against economic, lifestyle, and natural disaster shocks.

The data reveal that a large proportion of monthly incomes in Swaziland go to education (E600), transportation (E220), savings (E230), meat/fish (E220), mealie meal (E210), clothing (E180), rice (E150), and airtime (E100). Not including rent, education and food expenses take up a bulk of household budgets. Even though education is free at primary level in Swaziland, parents still have to spend money on school uniforms, bus fares, books, and pocket money for their children. The remainder of the budget goes to savings, transportation, and communication (see Figure 3.3.1 in the appendix). The data shows that households in the Hhohho and Manzini regions are top savers. Modest livelihoods, in terms of household expenses, are in the Lubombo region. The data also shows that households spend consistently higher incomes on airtime in all the four regions, suggesting a high level of mobile phone usage. The implication of this on Disaster Management Policy, especially concerning sending information, is that it is possible to deliver timely information directly to households through mobile phones.

The study examined sources of income and the levels of income between households to determine how households earn their livelihoods in Swaziland. When asked to describe their main source of income, households reported that they either were unemployed (50%), employed by private sector (21%) or employed by government (13%). There is also a relatively high number of pensioners (7%), especially in rural areas (see Figure 3.3.2 in the appendix). Households also make income from remittances from urban to rural households, professional employment, trading, and livestock and crop farming. However, as can be seen on Figure 3.3.2 in the appendix, the contribution of agriculture to income generation at the household level is very small and almost negligible. Income distribution among households is very wide. The data show that 45% of the households earn between E1,000 to E3,000 on a monthly basis (see Figure 3.3.2 in the appendix). Figure 3.3.2 shows that households earning above E6,000 constitute 15% of the sampled population, with a comparable 14% of people with no form of income. Hhohho and Manzini regions have the highest number of high-income earners – which explains why households in these regions tend to save more than those in Lubombo and Shiselweni, which show a high number of low-income earners in households.

The implication of these findings is that in rural areas a lot more people need to be engaged in income generating activities in order to restore dignity and independence in households so that they can be responsible for their own livelihoods. This is especially true for rural households, which tend to have many dependents. The interdependences between rural and urban households are also evident and seem to be one way: even though some household heads in rural areas do not have formal employment, they tend to be dependent on urban households for income support. For those that are able to earn income, the amount of disposable income they have is relatively small, leaving little room for savings or flexibility to vary or change lifestyles for the better within each family unit. Income generating activities in all forms, be it formal or informal, need to be encouraged, particularly in rural households. Secure incomes and ability to save on that income becomes the first component of insurance to shirk risks from exposure to disasters such as droughts. The majority of Swazi people responsible for their lives, and the livelihoods of others in households across the country, are unemployed. The SHIES (2010) reports that one in two Swazis are without productive employment.

3.4. Availability of Potable Water

This section assesses the availability of potable water in households across the 55 constituencies in Swaziland. Figure 3.4.1 in the appendix provides an illustration of the main sources of drinking water when there is no drought. The results show that 40% of households have access to potable SWSC or public tap water, and 15% rely on boreholes when there is no drought. A substantial number of households (35%) still rely on rivers, streams, lakes, and protected and unprotected springs as their primary source of drinking or cooking water when there is no drought. Fifteen percent (15%) of the surveyed households use boreholes as their primary source of drinking water, particularly in Lubombo and Shiselweni. Surprisingly, less than 4% of the surveyed households engage in rainwater harvesting as their main source of potable water. The use of rivers, streams, and springs is chiefly a rural phenomenon whilst most households that use tap water are mainly in urban areas. Figure 3.4.2 in the appendix describes drinking water sources when there is drought. The Figure shows that during the 2015/16 drought the use of SWSC and public tap water dropped from 40% to 33%, understandably so, since there was no water in taps due to rationing. In the same vein, rainwater harvesting also dropped to 2% during the drought because there were no rains. On the other hand, rivers, streams, boreholes, and both protected and unprotected springs sustained water supply to households during the drought. There was only a slight drop (24% to 21%) for households that used rivers for their main source of drinking water during the drought. However, rural areas saw an increase in the number of households that used rivers for drinking water (16% when there is no drought to 22% during the drought).

Having compared drinking water sources when there is no drought to when there is a drought, the section below demonstrates the average daily water consumption in households before and during the drought. This is important to determine whether the drought affected overall water consumption in households – given the extreme water shortages that were experienced throughout the whole country – particularly in Hhohho, Lubombo, and Shiselweni regions. Table 3.4.1 below and Figure 3.4.3 (in the appendix) demonstrate that households in the Hhohho and Lubombo regions significantly reduced water consumption during the drought. Manzini and Shiselweni regions used more or less the same amount of water before and during the drought. These regions were also least affected by water rationing. The household questionnaire also probed households on average monthly water costs in order to compare whether the cost has an effect on the average consumption in each household, as shown on Table 3.4.3. Shiselweni experienced the highest increase in water costs, followed by Hhohho, Manzini, and Lubombo respectively.

Table 3.4.1 Average Water Consumption (No Drought versus Drought)

REGION	NO DROUGHT DAILY LITRES	DROUGHT DAILY LITRES
Shiselweni	63	61
Hhohho	60	52
Manzini	60	57
Lubombo	50	45

Source: Authors' own representation using survey data

Notes : The table compares average water consumption in litres per day. The comparison is for when there is no drought to time when there is drought. The consumption is apportioned according to the 4 regions of Swaziland in decreasing order of water consumption.

Table 3.4.2 shows that water costs increased during the drought in all the four regions of Swaziland; by 43% in Shiselweni, 29% in Hhohho, 21% in Manzini, and 11% in Lubombo. The increase does not necessarily indicate an increase in water tariffs during the drought. Rather, it signifies the amount of added resources in terms of time and money that households had to spend to find water during the drought. Shiselweni had the most water cost increase because, on average, people in this region pay very little or close to nothing for water (public taps, boreholes, rivers, and streams), and so having to find alternative water sources during the drought was a major livelihood change for households in the region. The Hhohho region was second highest because the water reservoir in Hawane (Mbabane's main water supply) completely dried up. Households in Mbabane had to find alternative means for water harvesting and storage through the water rations that SWSC executed.

Table 3.4.2 Average Cost of Water (No Drought versus Drought)

REGION	NO DROUGHT AVERAGE MONTHLY WATER COST (E)	DROUGHT AVERAGE MONTHLY WATER COST (E)	AVERAGE CHANGE IN WATER COSTS (%)
Shiselweni	23	33	43
Hhohho	68	88	29
Manzini	66	80	21
Lubombo	46	51	11

Source: Authors' own representation using survey data

Notes: The Table compares average monthly expenditure of water in households in the four regions of Swaziland. The costs are listed in Emalangeni (E) comparing costs situations when there is no drought to situations when there is drought.

3.5. Drought Impacts and Significance

3.5.1. Direct and Indirect (direct and indirect loss or costs) of the 2015/16 drought on households

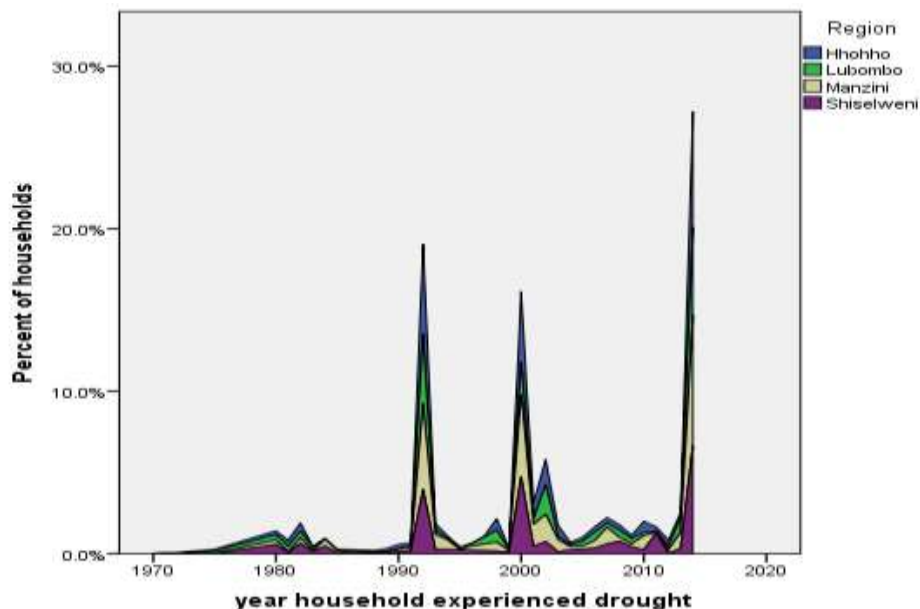
The impacts of droughts can be direct and indirect, as well as be felt immediately or start creeping in long after the drought has come and gone (Donald and Svoboda, 2007). This section discusses both the direct and indirect socioeconomic impacts of the 2015/16 drought. Careful attention is given to the drought dynamics at the household level. The direct impacts include food insecurity, crop losses, livestock losses, forced sale of land/farm⁵, increased crime rate, forced sale of household assets, depletion of water for agriculture, depletion of

⁵ Farm is loosely used – it refers to fields used for food production and largely focuses on Swazi National Land (SNL) unless otherwise stated.

water for human use, decline in health, and inconveniences and stress for women, children, the elderly and people living with disabilities. Indirect impacts are much more complex. They include the combined effects of the direct impacts on livelihood sustainability and performance of the economy as a whole (Donald and Svoboda, 2007).

During the survey, household respondents were asked to indicate the last time they experienced drought in their communities (see responses on Figure 3.5.1.1 below) in a bid to gauge the perceptions of households concerning the incidence of drought-like conditions in the different communities in the four regions of Swaziland. The results, shown in Figure 3.5.1.1, make known that households have been experiencing drought-like conditions since the 1980s, but intensified in the last decade. In terms of severity, the only other drought that households could remember as severe as the one in 2015/16 was in 1992. In general, households in Swaziland know that droughts are increasingly becoming a problem in the country. The study finds that households have a good recollection of the exact years they have experienced droughts or drought-like conditions. Some household members can go back as far as the 1950s and 1970s in their accounts of drought in the country.

Figure 3.5.1.1 Historical Drought Experience in Households



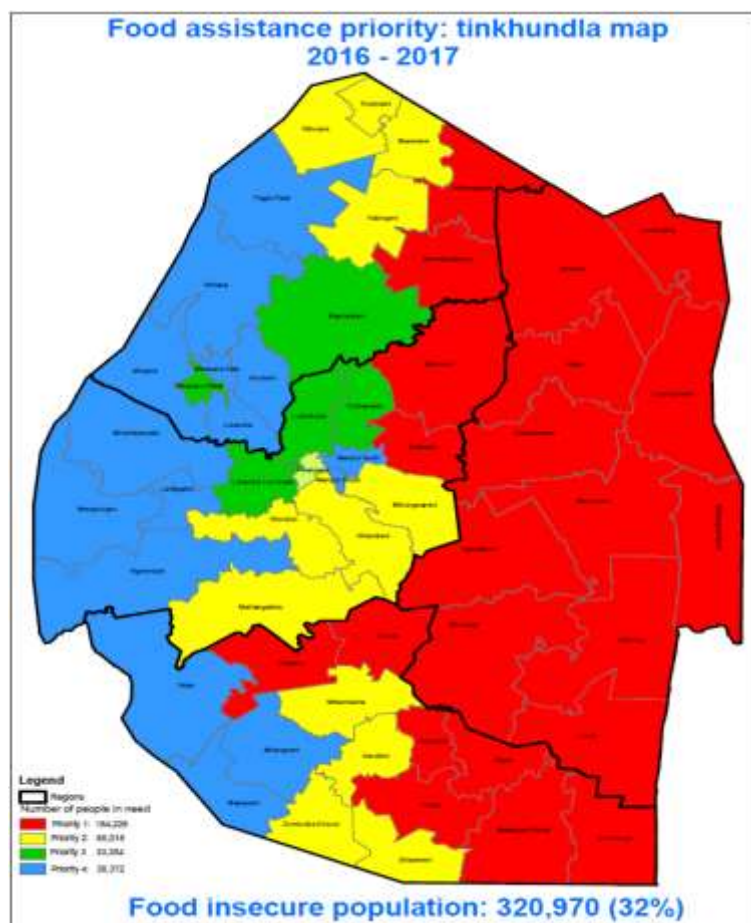
Source: Authors' own representation using survey data

Notes: The figure shows the incidence of drought in communities from 1970 to 2020. The spikes represent the percentage of households that experienced or have a recollection of drought in that year. Spikes in decreasing height are in 2016, 1992, 2000, 1980.

In 2015/16, an overwhelming 80% of households experienced negative impacts in their daily activities because of the drought. Most of the constituencies (such as Kukhanyeni, Lavumisa, Lubuli, Ngudzeni, Mtfongwaneni, Siphofaneni, Zombodze, and Somntongo, to name a few) and regions in the country experienced significant losses – see Figure 3.5.1.2 below – causing the NDMA to prioritise all the constituencies coloured in red on Plate 1 for food assistance. In total, 320,970 people became severely food insecure due to the drought. A majority of these households (57.4%) are in the Lubombo region and in some parts of the Southern part of the Shiselweni region (in constituencies such as Kubuta, Nkwene, Ngudzeni, Sigwe,

Hosea, Matsanjeni South, and Somntongo), two in the Manzini region (Mkhiweni and Mafutseni) and two in the Hhohho region (Mhlangatane and Madlangempisi).

Plate 1. Food Assistance Priority: Tinkhundla Map 2016 - 2017



Source: The National Disaster Management Agency (2016)

Notes: All constituencies marked red represent top priority for food security while yellow denotes priority two, and green and blue represent third and fourth priority.

The significant impact was that was little or nothing in terms of what households could do to avoid or cushion the adverse impacts of the drought. People, families, and communities faced hunger because of the food shortages. Close to a third of the population in Swaziland was classified food insecure (VAC, 2016). The country had to import the staple food, maize, from South Africa. Worsening the situation was the fact that maize and maize meal became very expensive for households. Maize prices escalated considerably from E3,533 per metric tonne in 2015 to E5,865 per metric tonne in January 2016 - representing a 66% increase in the price of maize (CBS, 2016). This led to a huge increase in food prices and a general increase in inflation. Food inflation increased from 4.3% in March 2015 to 13.3% in March 2016 – yielding a staggering 209.3% change in food inflation in just a year – pushing more households into food insecurity.

Sustaining the basics of human livelihoods, food security became a focal challenge for the country, aside the fact that the water shortage created its own set of complex challenges on each household. Heat waves swooped across the countryside wiping out crops for those

farmers who had attempted to farm in the 2015/16 growing season. Maize production dropped by 67%, from 101,000 tonnes in 2014/2015, to 33,000 tonnes in 2015/16 (Ministry of Agriculture, 2016; National Maize Corporation, 2016). The country lost an estimated 88,000 cattle that perished because of lack of water and fodder (Ministry of Agriculture; VAC Report 2016-2017). The country actually lost more than the cattle stock, as cows are a symbol of wealth and status in Swazi households and rightfully so. Consider the by-products of the 88,000 cattle that could have sustained families through milk products, money for sending children to school, and the calves that could have been added to increase the total livestock in the country.

Urban areas, particularly Mbabane, were for the first time without water. Inevitably, SWSC had to execute water rationing for four (4) days out of the seven (7) days in a week in the capital city. Households had to be creative about sourcing, harvesting, storing, and using water. In rural areas families had to work together to find alternative sources of water such as rivers, streams and springs. For some households that had the financial muscle, they were able to install water tanks in their homes. Those that could not afford to install such infrastructure relied on public water tanks strategically placed by SWSC and the Government (NDMA) in various locations, in addition to trucks that provided water throughout the country.

▪ **Drought Relief**

The Government of Swaziland (GoS), through the NDMA, provided E350 million for both immediate and medium-term interventions. Before the declaration, 18th February 2017 of the state of emergency, Government had already committed E45 million for food assistance and water allocations to 158,000 people (NDMA, 2016). Following the Government-led Donor Round Table 16th March 2016, Development Partners in the country like the USA, EU, and not-for-profit organisations, and the UN sprang into action to provide support to communities focusing on the most vulnerable groups. Households received food packs and cash transfers among other interventions addressing health and nutrition, education, WASH, agriculture and food security, protection and coordination.

In total, the US government provided approximately \$9.6 million (E135 million) to improve access to water, strengthen food security, protect agricultural and pastoral livelihoods, and enhance resilience among drought-affected households in Swaziland, in 2016. Pending approval by the U.S. Congress, an additional \$2.54 million (E36 million) will be utilised to support supplementary and therapeutic feeding for malnourished people living with HIV, orphans and other vulnerable children (OVC). The European Union provided direct support amounting to €2.6 million (E42 million) through the European Union Development Fund (EDF) implemented by Red Cross and €1.6 million (E26 million) implemented by UN World Food Programme. Further, the EU EDF11 committed around €30 million (E480 million) to support the agriculture sector through horticulture and water harvesting to increase the resilience and food security of the country.

▪ **Impacts on people**

Some of the key issues raised include hunger because of a breakdown or collapse of subsistence agriculture. There were no harvests, and livestock died which is compounded by the high poverty levels. Since about 63% of Swazi households live under poverty, people had to rely on donations for food, and had to consume dirty ground water from rivers.

Some of the responses generated from the household interviews that vividly describe the impacts on people include:

Some of the responses generated from the household interviews that reiterate the severe impacts of the drought on people and their communities due the extreme shortages of water include (Survey Data, 2016);

“Nothing because I don't farm crops anymore.”
“People did not even plant crops this season because it is very dry.”
“Most crops didn't grow well and the quality of the harvested crops was poor.”
“Maize crop dried and sorghum also dried and died.”
“None because we don't farm crops in our community.”
“Nothing grew the soil was very dry for crop production.”
“Hunger”
“Food shortages”
“Shortage of water and employment.”
“Hunger, shortage of water, death of livestock, and loss of jobs.”
“Community suffered of food shortage.”
“People and their animals were hungry - there was also a severe shortage of water.”

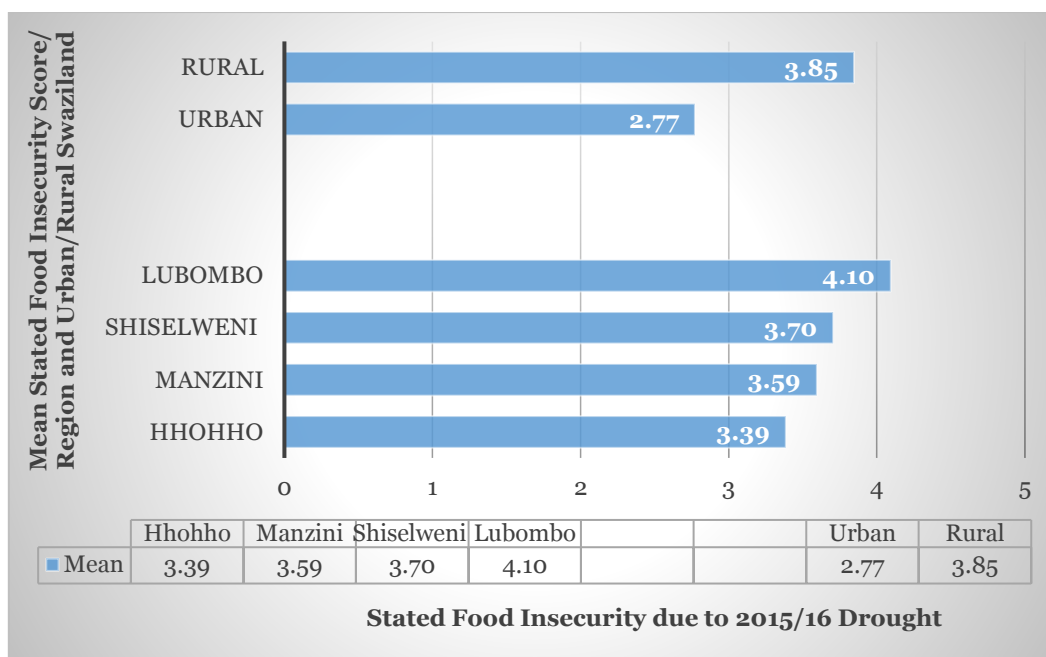
3.5.2. Impact Significance

In this section, the impacts on communities are rated on a scale of no impact, minimal impact, medium, high impact, and severe impact. Focus is on the direct impacts: food security, crop losses, livestock losses, forced sale of land/farm, increased crime rate, forced sale of household assets, depletion of water for agriculture, depletion of water for human use, decline in health, and inconveniences and stress because of disabilities.

I. Food Security

The drought imposed big penalties on food security in all four regions in Swaziland, especially in rural areas (see Figures 3.5.2.1 and 3.5.2.2). Some households primarily in urban areas could access food through purchase, and so did not face any impacts on food availability. To determine the level of food insecurity within each household, the study used 1-5 scale/score (1: No Impact; 2: Minimum Impact; 3: Medium Impact; 4: High Impacts; 5; Severe Impact). The mean score on this scale determines the level of food insecurity within the household. The higher the score the greater the negative impacts on food security due to the drought, hence the more chances the household was food insecure as a result of the drought. Household food insecurity stated by the households is 4.10 in Lubombo, 3.70 in Shiselweni, 3.59 in Manzini and 3.39 in the Hhohho regions illustrated in Figure 3.5.2.1 below. The regional trend of the mean score of food insecurity at the household level is consistent with the poverty/wealth indicators and food production statistics discussed in the previous sections. The data reveal that Lubombo households reported to be most food insecure followed by Shiselweni, Manzini and lastly Hhohho. Within the regions, rural households reported a higher mean food insecurity score (3.85) compared to urban households (2.77) as shown in Figure 3.5.2.1 below.

Figure 3.5.2.1. Significance of Drought Impacts on Household Food Security: Mean Food Insecurity Score



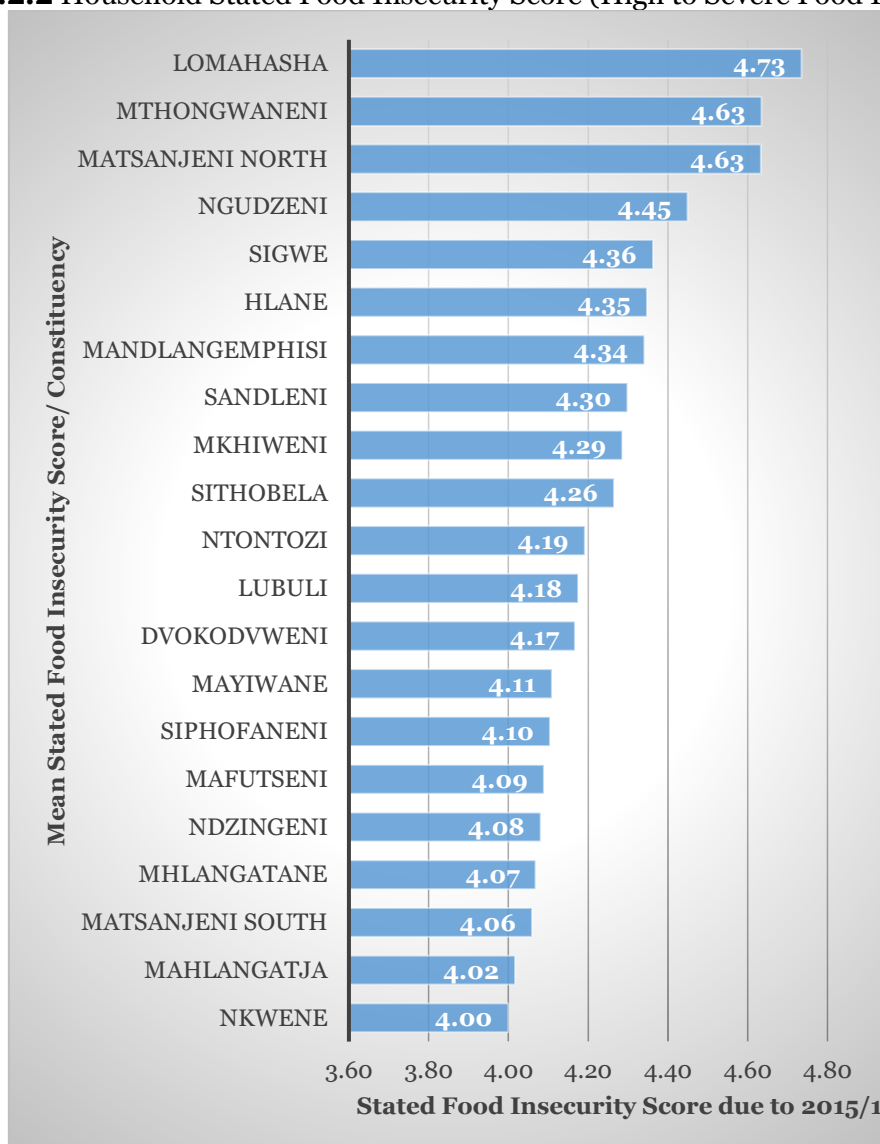
Source: Authors' own representation using survey data

Notes: The figure depicts the severity of the drought impacts on food security in households. The severity of the drought impacts is represented by the mean score: the higher the score, the higher the overall negative impacts of drought on food security at the household level.

Only few (3%) of Lubombo households did not experience impacts on food security. An estimated 51% of households in the Lubombo region stated experiencing severe impacts on food security followed by Shiselweni (39%), Manzini (38%) and Hhohho (32%). Most of the food security impacts were skewed towards on the Severe Impacts side of the scale which suggests that the drought affected household food insecurity substantially across the four regions of Swaziland.

Constituencies that experienced the most severe impacts on food insecurity include Lomahasha, Mthongwaneni, Matsanjeni North, Ngudzeni, Sigwe, Hlane, Madlangempisi, Sandleni, Mkhiweni, Sithobela, Ntontozi, Lubuli, Dvokodveni, Mayiwane, Siphofaneni, Mafutseni, Ndzingeni, Mhlangatane, Matsanjeni South, Mahlanguja, and Nkweni ranked in Figure 3.5.2.2 below.

Figure 3.5.2.2 Household Stated Food Insecurity Score (High to Severe Food Insecurity)



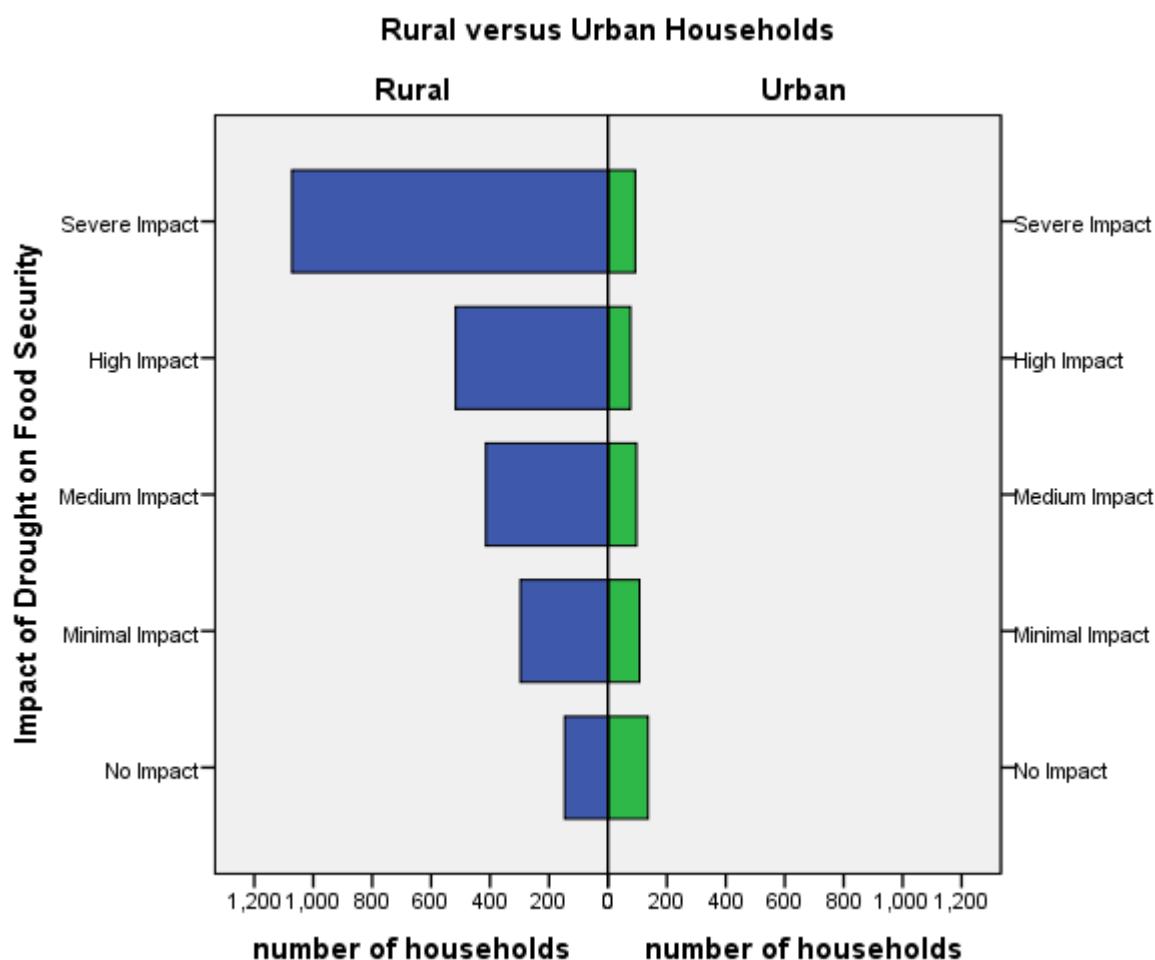
Source:

Authors' own representation using survey data

Notes:

The Figure ranks drought impacts on food security using the constituencies that reported the most high to severe impacts on the 5-point scale. At the top of this list is Lomahasha as the most affected constituency (Inkhundla) and the severity of the impacts decrease down to (Nkwene) at the least affected within this group.

Figure 3.5.2.3 Significance of Drought Impacts on Household Food Security – Rural versus Urban Households



Source: Authors' own representation using survey data

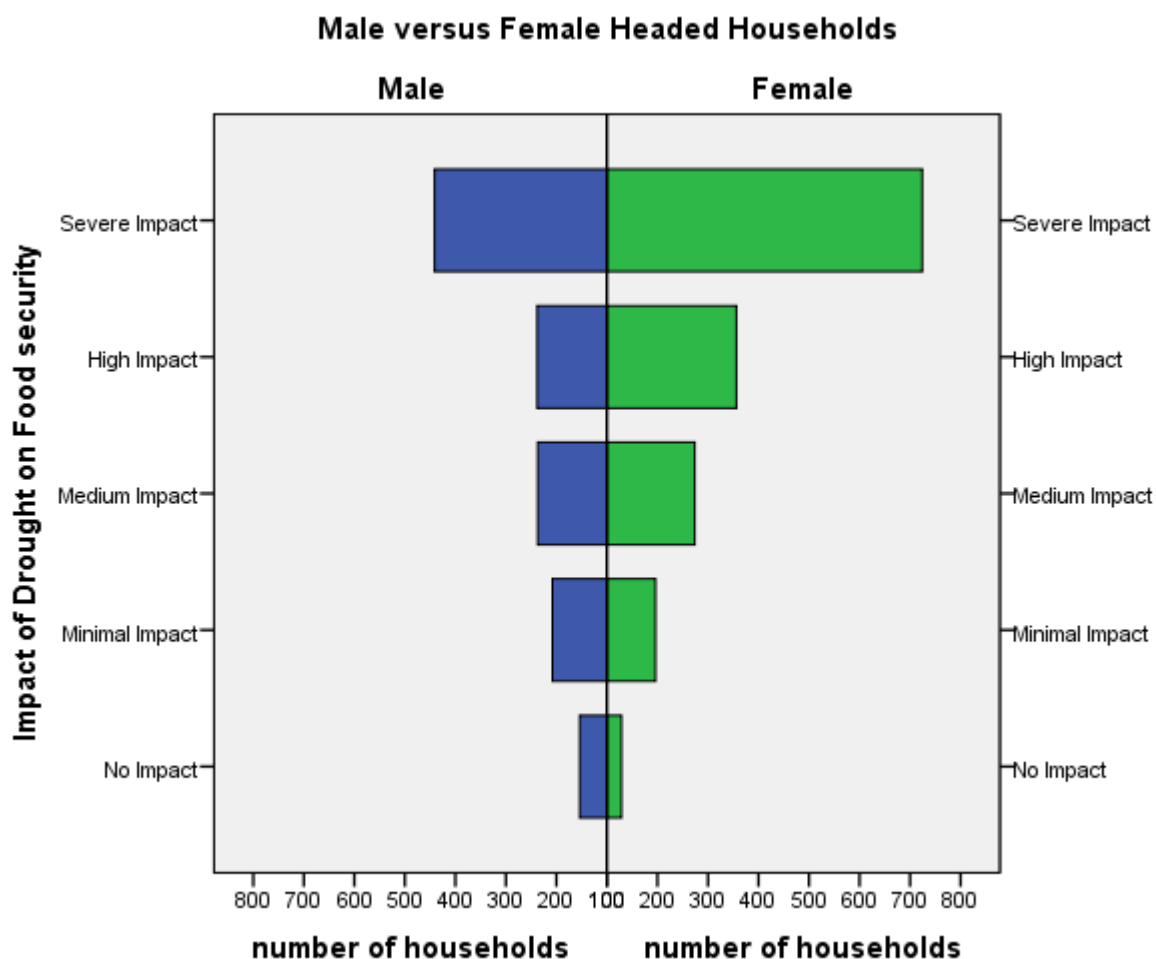
Notes: The figure uses the same scale as Figure 3.5.2.1 above to measure impacts on food security in households in the four regions of Swaziland. The households are divided into rural and urban areas, and the bars represent the proportion of households rural:urban that fall in each level of impact severity on the scale. The blue rural households dominate on severe impacts than do urban households.

Figure 3.5.2.3. illustrates the impacts of the drought on food security. It shows that the drought affected rural households more than urban households. Second, the Figure shows that a majority of urban households felt the drought had no impact on food security at the household level. Third, the Figure evinces that a majority of rural households experienced severe impacts on food security as a result of the drought. Lastly, there is an equal but small number of urban and rural households that did not face any negative impacts, food shortages or expenses due to the drought.

Figure 3.5.2.4 shows the significance of the impacts of the droughts on male versus female-headed households. In the introduction, the study draws from Tichagwa (1994) to make the point that women are the engines of growth in rural areas. Because of this, the study notes

that their economic position needs protection all the time for the integrity of the rural economy. This particular Figure provides a nuanced understanding of how the drought affected the different households based on sex of the household head. The drought had a severe impact on female-headed households than on male-headed households (Fig 3.5.2.3).

Figure 3.5.2.4 Significance of Drought Impacts on Household Food Security – Male to Female Household Breadwinners



Source: Authors' own representation using survey data

Notes: The figure compares impacts on Food Security comparing Male to Female household breadwinners. The majority of the respondents, particularly women (see Figure 3.5.2.3 above), reported having experienced severe impacts on food shortages due to the 2015/16 drought.

Less than 10% (9.57%) of the sampled households reported having experienced *No Impacts* on food security due to the drought. A majority of the households (59.49%) experienced *High to Severe Impacts* on Food Security due to the 2015/16 drought. Table 3.5.2.1 below propagates the impact of the drought on Food Security according to the different constituencies (Tinkhundla) in Swaziland.

Table 3.5.2.1 Distribution of Food Security Impacts in Swaziland Constituencies

FOOD SECURITY IMPACTS DUE TO 2015/16 DROUGHT				
NO IMPACT			SEVERE IMPACTS	
INKHUNDLA	Percent of Households in each Inkhundla		INKHUNDLA	Percent of Households in each Inkhundla
Mbabane East	49%		Matsanjeni North	80%
Mbangweni	36%		Lomahasha	78%
Mahlanya	33%		Matsanjeni South	76%
Kwaluseni	29%		Mthongwaneni	73%
LaMgabhi	27%		Mkhiweni	64%
Lavumisa	25%		Ntontozi	64%
Matsanjeni South	24%		Hlane	63%
Manzini North	22%		Sithobela	63%
Manzini South	21%		Mafutseni	62%
Mhlume	20%		Ndzingeni	58%
Pigg's Peak	19%		Ngudzeni	57%
Lobamba	18%		Dvokodweni	56%
Mbabane West	18%		Ntfonjeni	55%
Mhlambanyatsi	18%		Mayiwane	54%
Nkhaba	16%		Siphofaneni	54%
Mtsambama	16%		Sigwe	52%
Gege	12%		Sandleni	51%
Ekukhanyani	12%		Mandlangemphisi	51%
Ndzingeni	11%		Mhlangatane	51%
Mangcongco	11%		Mangcongco	47%
Shiselweni	9%		Mhlangatja	47%
Nhlambeni	8%		Nkwene	43%
Maphalaleni	7%		Mhlume	40%
Ntfonjeni	6%		Hosea	40%
Hhukwini	6%		Zombodze	39%
Maseyisini	6%		Manzini South	39%
Hosea	6%		Ekukhanyeni	39%
Mafutseni	4%		Kubuta	38%
Mayiwane	4%		Lubuli	38%
Motjane	4%		Mtsambama	36%
Nkwene	4%		Nkhaba	35%
Zombodze	4%		Nkilongo	34%
Ngwemphisi	4%		Maphalaleni	33%
Dvokodweni	4%		Maseyisini	32%
Mhlangatane	3%		Nhlambeni	31%
Sithobela	3%		Ngwemphisi	31%
Somtongo	3%		Lugongolweni	31%

Source:

Authors' own representation using survey data

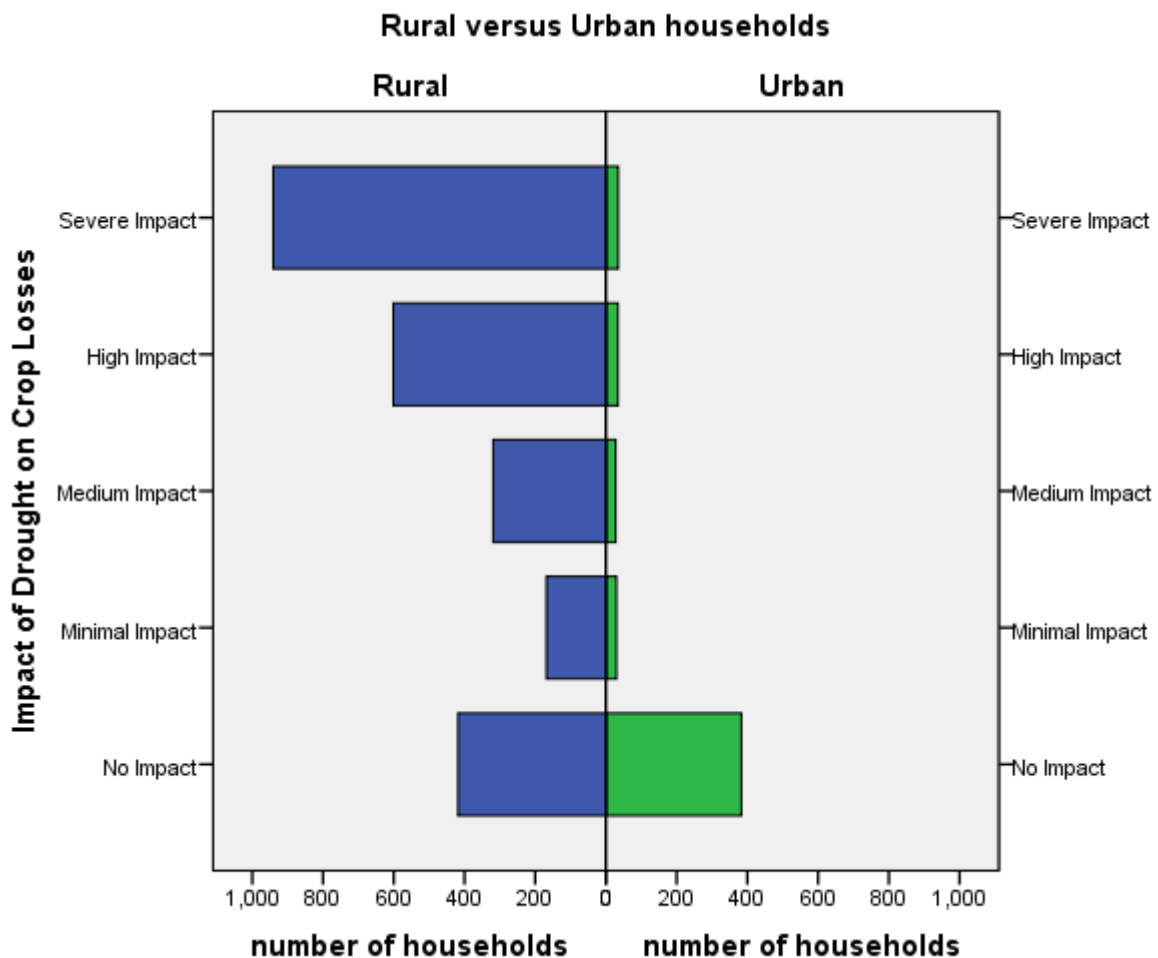
Notes:

The table compares constituencies (Tinkhundla) in Swaziland that either reported the most number of households that experienced NO IMPACTS on Food Security, and those that reported the most SEVERE IMPACTS on Food Security due to the drought. A total of 36 of the Tinkhundlas are reported in the Table out of the 55 that were compared.

II. Crop Losses

As indicated in the preceding section, rural Swaziland suffered a lot in terms of crop losses (see Figure 3.5.2.5). Crop losses translate to food unavailability in households because of failure of subsistence production. Households classified a majority of crop loss impacts as severe or tilting toward severe (high impact). Shiselweni respondents indicated suffering the most in terms of crop losses, understandably so because these are the only households that showed a higher propensity to produce. For the most part, urban areas did not face major crop losses because people source food from the cash economy instead of growing their food.

Figure 3.5.2.5 Significance of Drought Impacts on Household Crop Losses – Rural versus Urban Households



Source: Authors' own representation using survey data

Notes: The figure compares impacts on Crop Losses comparing Rural to Urban households. The significance of the drought was severe on crop losses in rural households.

Approximately a third (33.78%) of the sampled households reported *No Impacts* to *Minimal Impacts* on crop losses as a result of the 2015/16 drought. On the other hand, 54.48% of the sampled households reported *High* to *Severe Impacts* that resulted in crop losses due to the drought. Therefore, more than half of the sampled households that participate in agriculture lost their crops due to the 2015/16 El Niño induced drought. Table 3.5.2.2 below shows crop losses, comparing households that experienced no impacts to those that experienced severe impacts in the different constituencies.

Table 3.5.2.2 Distribution of Crop Losses in Swaziland Constituencies

CROP LOSSES DUE TO 2015/16 DROUGHT				
NO IMPACT			SEVERE IMPACTS	
INKHUNDLA	Percent of Households in each Inkhundla		INKHUNDLA	Percent of Households in each Inkhundla
Mhlume	82%		Ntfonjeni	80%
Mbabane West	82%		Sigwe	76%
Kwaluseni	71%		Matsanjeni South	71%
Nkilongo	64%		Zombodze	65%
Manzini North	63%		Ngudzeni	63%
Pigg's Peak	60%		Hosea	61%
Mahlanya	57%		Mkhiweni	61%
Manzini South	53%		Sandleni	53%
Lubuli	53%		Nkwene	53%
Lugongolweni	49%		Mthongwaneni	51%
Lobamba	48%		Hlane	49%
Mbangweni	44%		Mangcongco	49%
Lomahasha	39%		Mandlangemphisi	47%
Nhlambeni	38%		Ngwemphisi	46%
Hhukwini	31%		Ndzingeni	45%
Mpholonjeni	30%		Mafutseni	44%
Motjane	29%		Shiselweni	43%
Mhlambanyatsi	29%		Gege	43%
Dvokodvweni	28%		Matsanjeni North	39%
Mhlangatane	27%		Mhlangatja	38%
Hlane	24%		Ntontozi	38%
Mtsambama	24%		Maseyisini	38%
Matsanjeni South	24%		Nhlambeni	37%
Sithobela	24%		Mtsambama	36%
LaMgabhi	22%		Mayiwane	35%
Siphofaneni	21%		Motjane	35%
Maseyisini	16%		Nkhaba	33%
Ndzingeni	15%		Lomahasha	31%
Mthongwaneni	14%		Kubuta	30%
Timphisini	13%		Dvokodvweni	30%
Ekukhanyeni	13%		Sithobela	29%
Mayiwane	13%		Manzini South	29%
Mkhiweni	13%		Mhlambanyatsi	29%
Matsanjeni North	12%		Ekukhanyeni	26%
Somtongo	11%		Lubuli	25%

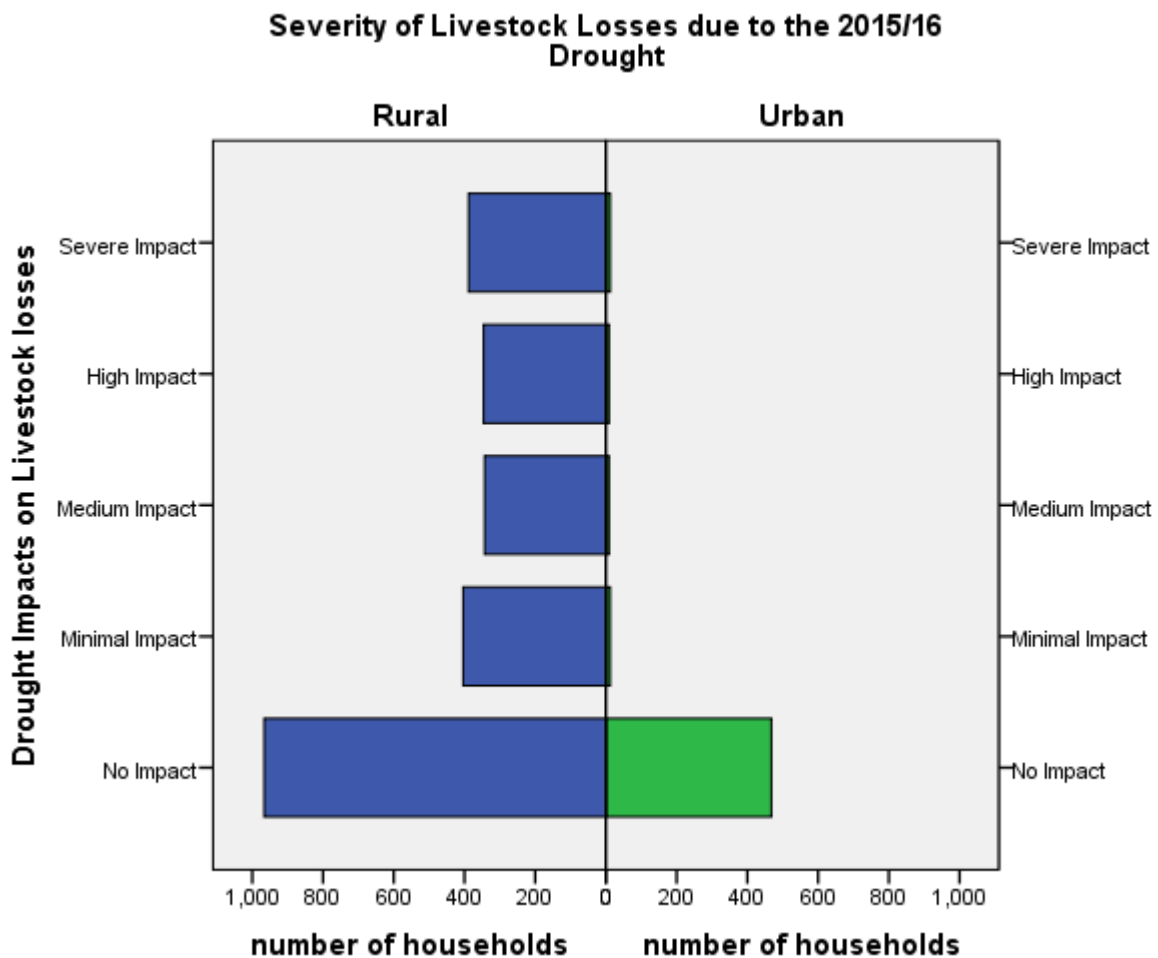
Source: Authors' own representation using survey data

Notes: The table compares constituencies (Inkhundla) in Swaziland that either reported the most number of households that experienced NO IMPACTS on Crop Losses, and those that reported the most SEVERE IMPACTS on Crop Losses due to the drought.

III. Livestock Losses

Many urban households did not incur livestock losses and so reported no impact on livestock losses (see Figure 3.5.2.6 below). However, some rural farmers reported losses because their livestock, specifically cattle, died. The impact was particularly severe on these farmers. The data suggest that livestock is held within a few households in the rural areas and, not surprisingly, little to none in urban areas. From the survey data, 48.5% (almost half) of the sampled households reported *No Impacts* or no losses to livestock due to the drought. About a quarter (25.54%) of the sampled households reported *High to Severe Impacts* on livestock losses due to the drought. The households that reported Severe Impacts or the most livestock losses as a result of the 2015/16 El Niño induced drought were 13.53% of the sampled households.

Figure 3.5.2.6 Significance of Drought Impacts on Livestock Losses: Rural versus Urban Households



Source: Authors' own representation using survey data
 Notes: The figure compares severity of impacts on Livestock Losses in Rural to Urban households.

Table 3.5.2.3 below shows the distribution of livestock losses between the different constituencies in Swaziland. The table compares No Impacts and Severe Impacts on livestock losses as a result of the drought in the different constituencies.

Table 3.5.2.3 Distribution of Livestock Losses in Swaziland Constituencies

LIVESTOCK LOSSES DUE TO 2015/16 DROUGHT				
NO IMPACT			SEVERE IMPACT	
INKHUNDLA	Percent of Households in each Inkhundla		INKHUNDLA	Percent of Households in each Inkhundla
Mhlume	100%		Mkhiweni	39%
Mbabane West	97%		Dvokodvweni	37%
Mbabane East	97%		Hlane	35%
Kwaluseni	88%		Lubuli	33%
Lugongolweni	84%		Mandlangemphisi	32%
Manzini North	83%		Nhlambeni	31%
Mahlanya	82%		Ntfonjeni	31%
Pigg's Peak	77%		Sigwe	29%
Nkilongo	74%		Mhlangatane	25%
Manzini South	67%		Ngudzeni	24%
Mbangweni	62%		Somtongo	23%
Lobamba	62%		Mthongwaneni	22%
Motjane	60%		Ndzingeni	22%
Siphofaneni	56%		Nkhaba	20%
Mtsambama	56%		Mafutseni	20%
Mpholonjeni	56%		Mahlangatja	18%
Hhukwini	55%		Shiselweni	18%
Maseyisini	54%		Manzini South	18%
Matsanjeni South	53%		Zombodze	18%
Mayiwane	52%		Matsanjeni South	18%
Kubuta	52%		Hosea	17%
Ludzeludze	50%		Lomahasha	16%
Mangcongco	49%		Sandleni	15%
Nhlambeni	48%		Ekukhanyani	13%
Sithobela	47%		Lobamba	12%
Mhlambanyatsi	47%		Timphisini	11%
Maphalaleni	44%		Mhlambanyatsi	11%
Gege	43%		Mayiwane	11%
LaMgabhi	41%		Matsanjeni North	10%
Shiselweni	41%		Gege	10%
Matsanjeni North	39%		Motjane	10%
Ntontozi	38%		Ngwemphisi	10%

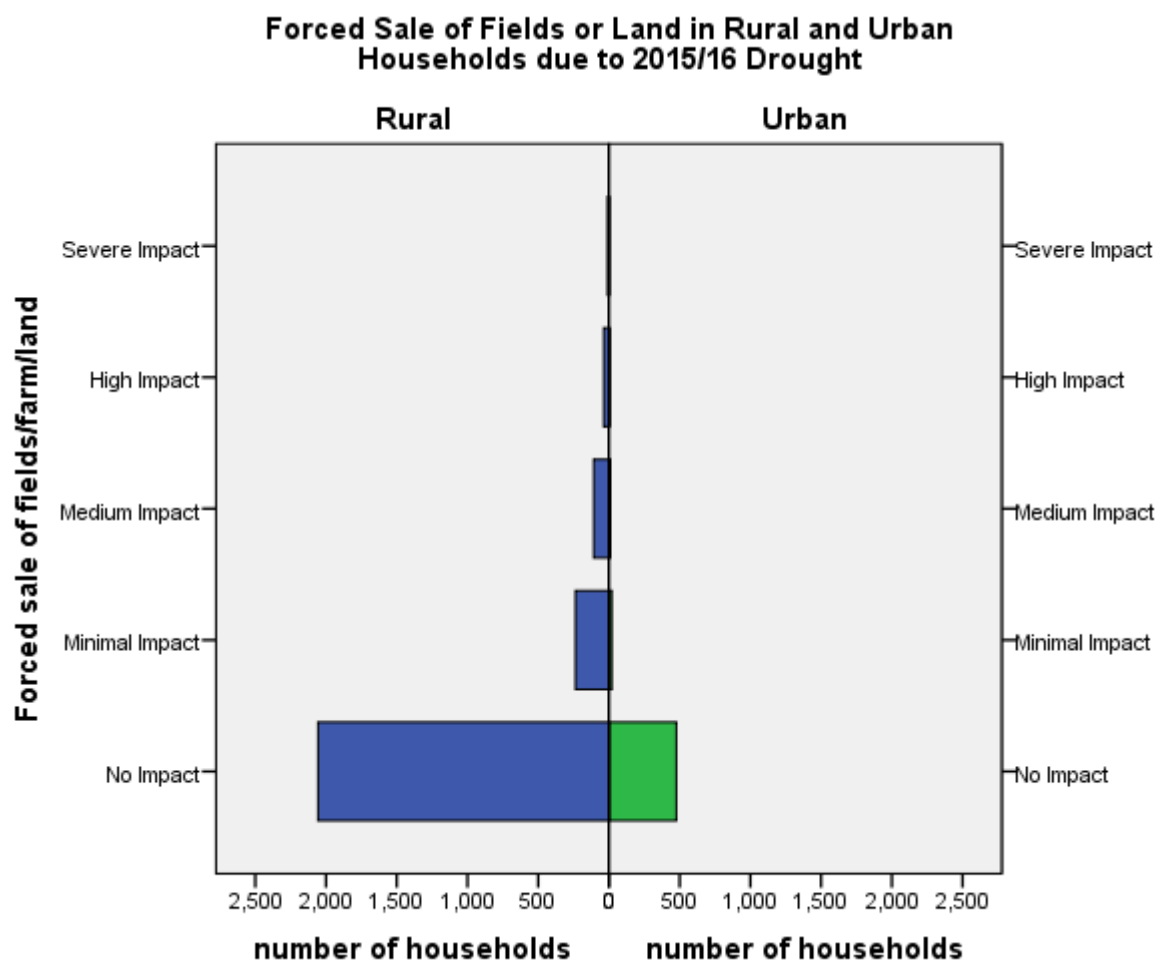
Source: Authors' own representation using survey data

Notes: The table compares constituencies (Inkhundla) in Swaziland that either reported the most number of households that experienced NO IMPACTS on Livestock Losses, and those that reported the most SEVERE IMPACTS on Livestock Losses due to the drought.

IV. Forced Sale of Land

Figure 3.5.2.7 below shows that households did not have to resort to selling their land or fields to mitigate against the impacts of the 2015/16 drought. The survey data shows that 94.32% of the sampled households reported *No Impacts* to *Minimal Impacts* on forced sale of fields/farm/land as a coping strategy to the 2015/16 drought. At least the majority, if not all households, still have their fields, which they can use to re-engage in food production, when the rains return. Less than 2% of the sampled households reported High to Severe impacts. These few instances were reported in the Mthongwaneni, Ntfontjeni, Lobamba, Kwaluseni, Sandleni, Mandlangemphisi, Mthongwaneni, Maphalaleni, Sithobela, and Lomahasha constituencies.

Figure 3.5.2.7 Significance of Drought Impacts leading to Forced Sale of Fields or Land in households



Source: Authors' own representation using survey data
 Notes: The figure compares impacts that led to forced sale of fields or land in households due to the drought. It compares severity of impacts on rural to urban households.

V. Increased Crime Rate

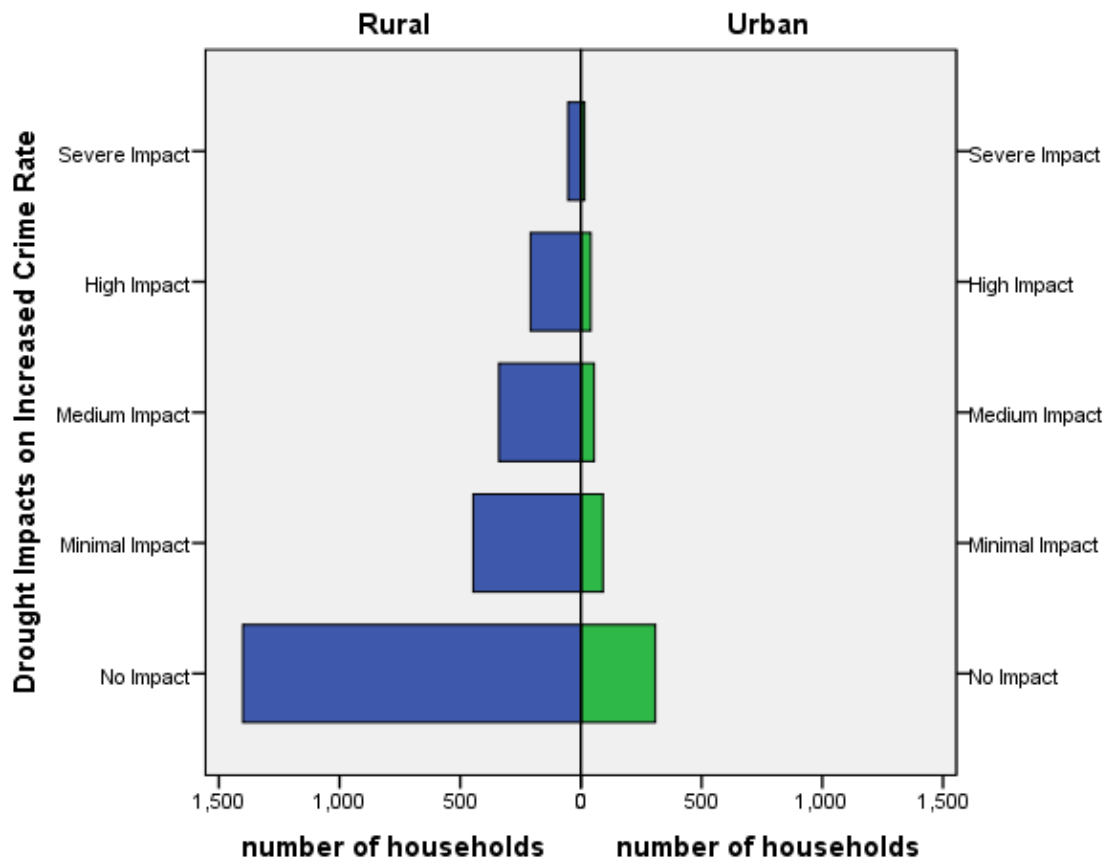
Figure 3.5.2.8 shows that criminal activities due to the drought were minimal. The survey data reveals that 75.92% of the sampled households did not experience any impacts or experienced minimal impacts on increased crime as a result of the 2015/16 drought. However, some households (about 11% of the sampled households) experienced increased crime rate both in rural and urban Swaziland. There were some reports on theft (shoplifting, stock theft, conmen, and copper wire theft), fraud, rape, and attempted rape cases increased significantly when compared to normal years when there is no drought (RSPS, 2016 *Pers. Comm.*). The Royal Swaziland Police Service (RSPS) attributed the high crime rate to rural-urban migration, which emanated from people leaving rural areas in search of job opportunities in urban areas. The police reported that as the drought intensified, able-bodied men and women left the rural areas in search of jobs in the cities, leaving the household and household chores in the hands of children and elderly people. The police narrated that because of this, children were exposed to rape. Young girls were left vulnerable as they remained without proper protection. The police indicated that rural households that opted to move children to relatives in urban households, to escape the drought, incurred socialisation incongruities. The police noted that children from rural households tended to engage in inappropriate childhood behaviour, viewed as taboo in urban areas, leading to cases of child rape, etc. The RSPS also reported that once in the urban areas, some women from rural areas became sex workers, which led to an increase in “key populations⁶” especially along the Mbabane to Manzini corridor.

This suggests that as the drought deepened and noting the already fragile nature of rural households, it forced people to resort to sex work as the most viable alternative to earn a living. The drought destroyed ability to grow food in rural areas, which meant people had to depend on the cash-economy to source food, which, as the name suggests, requires money. In particular, people who moved from rural to urban areas in search of jobs succumbed into key populations when they realised that they could not secure jobs in the city.

Overall, Dvokodveni, Lomahasha, Manzini South, Manzini North, Kwaluseni, Sandleni, Somtongo, Ntontozi, Mthongwaneni, Mhlangatane, Matsanjeni North and Mkhiweni constituencies reported the most severe impacts on increased crime rates resulting from the 2015/16 drought.

⁶ Key populations is a term used to describe female and male sex workers and have the highest risk of contracting and transmitting HIV.

Figure 3.5.2.8 Significance of Drought Impacts on Crime Rate



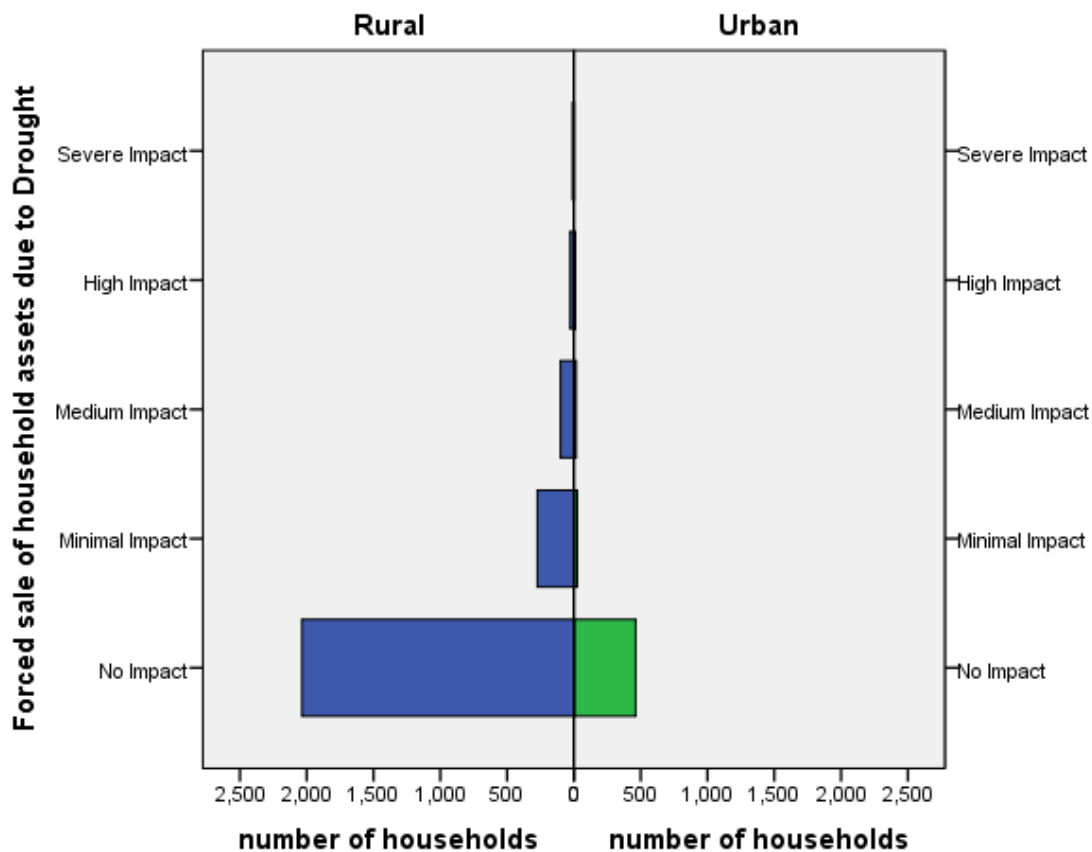
Source:
Notes:

Authors' own representation using survey data
The figure compares the severity of impacts that led to increased crime rates due to the drought. It compares the severity of impacts on Rural to Urban households.

VI. Forced Sale of Household Assets

Generally, there was minimal to no impact on household assets. Only 1.52% of the sampled households reported *High to Severe* impacts as a result of selling their assets specifically as a drought coping strategy. Households either had no assets to sell or resorted to other coping mechanisms to deal with the shortages of food and water. This argument is further discussed in Section 3.5.3 on Household's Responses and Coping Strategies to Drought Impacts.

Figure 3.5.2.9 Significance of Drought Impacts that led to Forced Sale of Household Assets because of the drought



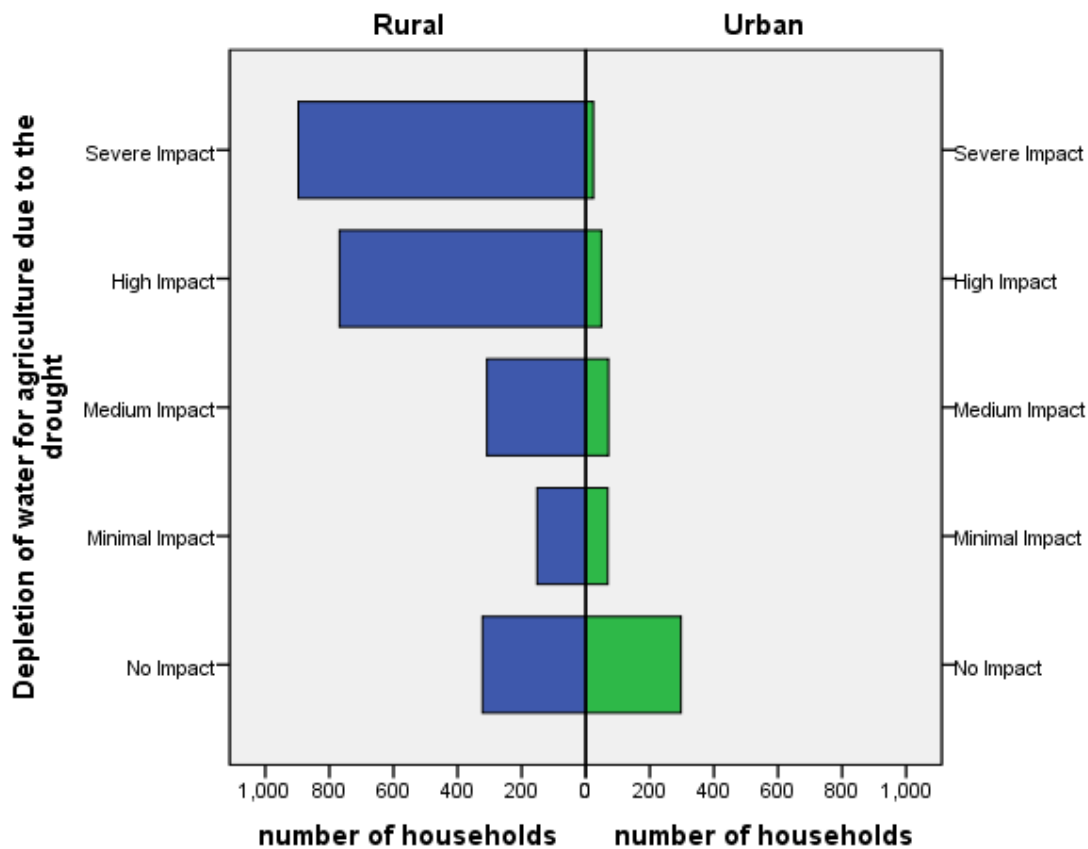
Source: Authors' own representation using survey data

Notes: The figure compares the severity of impacts that led to forced sale of household assets due to the drought. It compares the severity of this impact on Rural to Urban households.

VII. Depletion of Water for Agriculture

As discussed previously, agriculture suffered the most SEVERE IMPACTS because of the drought. The country did not receive adequate rainfalls and so there was limited or no water for agriculture. The severe impacts on agriculture were in rural areas (see Figure 3.5.2.10 below) and approximately 60% of the sampled households reported High to Severe Impacts on depleted water for agriculture. About 30% (20.41%) of the sampled households did not experience any impacts or experienced minimal impacts on reduced water for agriculture due to the 2015/16 El Niño induced drought.

Figure 3.5.2.10 Significance Drought Impacts on Depletion of Water for Agriculture



Source: Authors' own representation using survey data
 Notes: The figure compares the severity of impacts on agriculture due to the drought. It compares severity of impacts on Rural to Urban households.

Table 3.5.2.4 Depletion of Water for Agriculture in Swaziland Constituencies

DEPLETION OF WATER FOR AGRICULTURE DUE TO 2015/16 DROUGHT			
NO IMPACT		SEVERE IMPACT	
INKHUNDLA	Percent of Households in each Inkhundla	INKHUNDLA	Percent of Households in each Inkhundla
Mbabane West	76%	Sigwe	79%
Mbabane East	66%	Matsanjeni South	76%
Pigg's Peak	56%	Ntfontjeni	76%
Manzini North	55%	Ngudzeni	65%
Kwaluseni	53%	Zombodze	61%
Lugongolweni	51%	Mandlangemphisi	57%
Lavumisa	50%	Sandleni	55%
Mhlume	50%	Nkwene	51%
Mahlanya	49%	Shiselweni	50%
Manzini South	45%	Ngwemphisi	50%
Kubuta	40%	Matsanjeni North	47%
Mbangweni	38%	Ndzingeni	45%
Motjane	32%	Hosea	43%
Lobamba	32%	Mhlambanyatsi	42%
Nkilongo	29%	Mahlangatja	42%
Maseyisini	26%	Ekukhanyeni	42%
LaMgabhi	25%	Mthongwaneni	41%
Hhukwini	24%	Gege	41%
Mthongwaneni	22%	Hlane	41%
Mhlambanyatsi	22%	Ntontozi	40%
Ludzeludze	22%	Mayiwane	39%
Mafutseni	20%	Mtsambama	38%
Mtsambama	20%	Somtongo	37%
Mpholonjeni	19%	Mhlangatane	36%
Matsanjeni South	18%	Dvokodweni	33%
Lomahasha	16%	Mkhiweni	32%
Ndzingeni	15%	Mangcongco	32%
Mhlangatane	14%	LaMgabhi	29%
Siphofaneni	13%	Sithobela	29%
Timphisini	11%	Siphofaneni	29%
Mkhiweni	11%	Nhlambeni	27%
Nkhaba	10%	Manzini South	25%
Nhlambeni	10%	Timphisini	24%

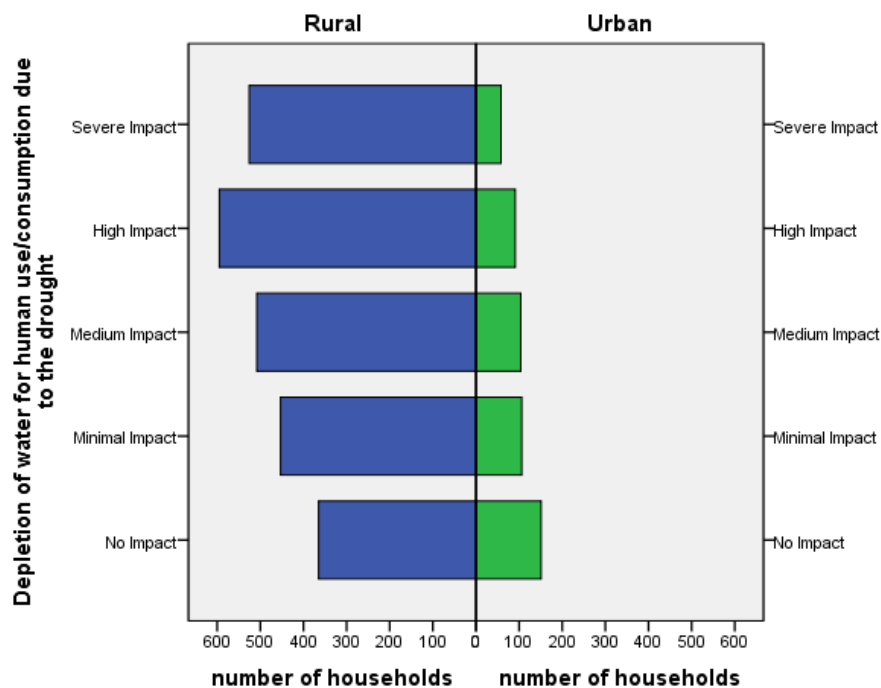
Source: Authors' own representation using survey data

Notes: The table compares constituencies (Inkhundla) in Swaziland that either reported the most number of households that experienced NO IMPACTS on Depletion of Water for Agriculture, and those that reported the most SEVERE IMPACTS on Depletion of Water for Agriculture due to the drought.

VIII. Depletion of Water for Human Use

The depletion of water for human consumption and other household needs affected both urban and rural households (see Figure 3.5.2.11 and Table 3.5.2.5 below). The impacts were mostly high to severe and prevailed more in rural than in urban households. Data from the household survey shows that 60.65% of the sampled households experienced *Moderate*, *High* and *Severe* impacts on depleted water for personal and household uses. Only 36.35% of the sampled households did not experience any impacts or experienced minimal impacts due to depleted water for personal and household uses. Recall that one of the objectives of this study was to ascertain how the drought affected women, children, and people living with disabilities. To that end, the data suggest that the drought affected females more due to losses of water for human and household uses. Households that had money bought tanks or extracted underground water through boreholes. Those that did not have money used free alternative sources like rivers and community water tanks, including public boreholes. Others used rivers and springs as their primary source of drinking water. In almost all instances, the burden of sourcing water fell in the hands of women and children. Some households did not experience any negative impact. These households either did not face water rationing or had previously installed water harvesting and storage facilities in their homes. In the same light, single people, who had no responsibility for anyone but himself or herself, did not suffer the worst of the drought impacts. This group managed to suppress the need for water usage in their households by using the flexibility in their lifestyles to buy already made food or shower, or get drinking water from their places of work and gyms, especially in Mbabane.

Figure 3.5.2.11 Significance of Drought Impacts on Depletion of Water for Human Use



Source: Authors' own representation using survey data
 Notes: The figure compares the severity of impacts on Depletion of Water for Human Use. It compares the severity of impacts on Rural to Urban households.

Table 3.5.2.5 Depletion of Water for Agriculture in Swaziland Constituencies

DEPLETION OF WATER FOR HUMAN USE DUE TO 2015/16 DROUGHT			
NO IMPACT		SEVERE IMPACT	
INKHUNDLA	Percent of Households in each Inkhundla	INKHUNDLA	Percent of Households in each Inkhundla
Matsanjeni South	53%	Mandlangemphisi	53%
Mangcongco	47%	Matsanjeni North	53%
Manzini North	46%	Hlane	47%
Mtsambama	42%	Sigwe	45%
LaMgabhi	37%	Dvokodvweni	43%
Manzini South	37%	Ntontozi	43%
Kwaluseni	37%	Ntfontjeni	41%
Shiselweni	36%	Mhlangatane	37%
Mhlambanyatsi	36%	Ndzingeni	35%
Pigg's Peak	35%	Mkhiweni	34%
Maphalaleni	31%	Sithobela	31%
Maseyisini	30%	Mbabane West	30%
Ntfontjeni	29%	Mafutseni	29%
Mhlume	28%	Mbabane East	29%
Hosea	27%	Lomahasha	29%
Lavumisa	25%	Nkhaba	27%
Mbangweni	24%	Mthongwaneni	25%
Mthongwaneni	24%	Siphofaneni	25%
Gege	24%	Mayiwane	24%
Ludzeludze	22%	Sandleni	23%
Lobamba	22%	Nhlambeni	23%
Motjane	21%	Mahlangatja	22%
Timphisini	20%	Ekukhanyani	21%
Mbabane West	20%	Zombodze	20%
Ekukhanyani	19%	Motjane	19%
Lugongolweni	18%	Mhlambanyatsi	18%
Mayiwane	17%	Mbangweni	16%
Somtongo	17%	Manzini North	15%
Ngudzeni	14%	Hhukwini	14%
Mahlanya	12%	Nkwene	14%
Hhukwini	12%	Lugongolweni	14%

Source: Authors' own representation using survey data

Notes: The table compares constituencies (Inkhundla) in Swaziland that either reported the most number of households that experienced NO IMPACTS on Depletion of Water for Human Use, and those that reported the most SEVERE IMPACTS on Depletion of Water for Human Use due to the drought.

IX. Decline in Health

About 80% (76.63%) of the sampled households reported No Impact to Minimal Impact in decline in health (malnutrition and water related diseases) due to the drought. However, the health sector documented medium to severe cases of diarrhoea and other diseases of the gut among children. These illnesses derived from the consumption of dirty water from rivers and dams. The households that did report health related impacts tilting towards *High* and *Severe* cases were 14.98% of the sampled households. The most severe impacts were reported in the Ntondozi, Sandleni, Sigwe, Ntfontjeni, Matsenjeni North, Dvokodvweni, Sithobela, Mafutseni, Zombodze, and Lugongolweni constituencies ranging from 15% to 30% of the sampled households.

Specifically, the Swaziland Comprehensive Nutrition Health Survey Report (February, 2017) indicated the most reported illnesses related to the drought as follows; diarrhoea (16.1%), skin diseases (15%), upper respiratory tract disease (14.6%) and eye disease (12.2%). According to the report, diarrhoea was prevalent in all the four regions of Swaziland with a range from 14.7% in Manzini to 17.6% in Hhohho. Skin diseases, on the other hand, were most prevalent in the Manzini (17.4%) and Lubombo (17.2%) than in Shiselweni (12.7%) and Hhohho (12.2%) regions. The Lubombo region reported the most cases of upper respiratory tract disease at 18.7% of households, and the lowest occurring in the Hhohho region (12%). Finally, eye disease was prevalent in the Manzini region in which 18.7% of households reported with the lowest incidence of eye disease reported in the Hhohho region (9.6%). Table 3.5.2.6 below provides a summary of the distribution of the drought related diseases among households in the country.

Table 3.5.2.6 Distribution of Drought Related Diseases Among Households in Swaziland

	Hhohho	Manzini	Shiselweni	Lubombo	Total
Diarrhoea	17.6%	14.7%	15.0%	17.4%	16.1%
Malaria	0.8%	0.7%	0.5%	0.6%	0.6%
Eye Disease	9.6%	17.9%	12.5%	8.0%	12.2%
Upper Respiratory Disease	12.0%	12.7%	15.0%	18.7%	14.6%
Skin Diseases	12.2%	17.4%	12.7%	17.2%	15.0%
Bilharzia and Worms	3.1%	1.7%	2.1%	2.4%	2.3%
No Disease	44.7%	35.1%	42.1%	35.8%	39.2%

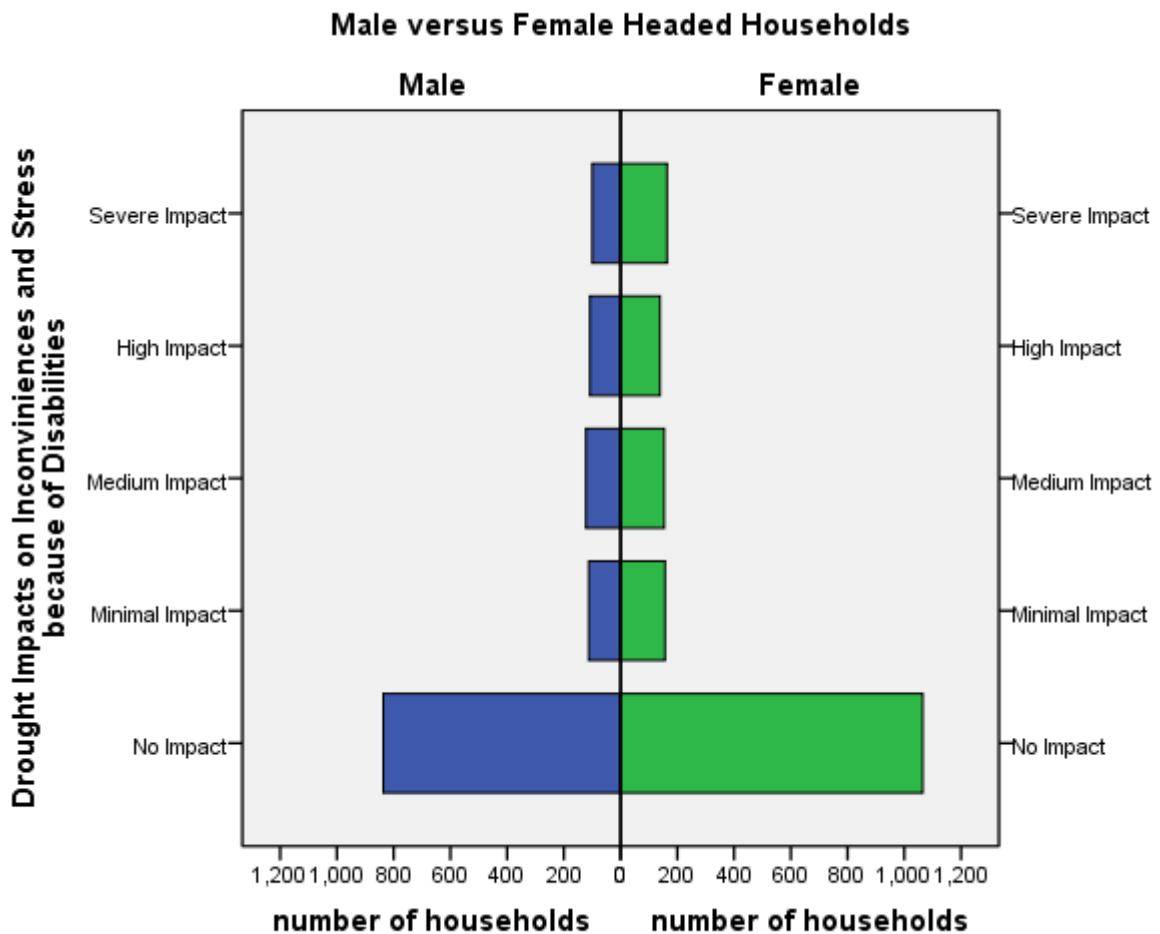
Source: Swaziland Comprehensive Health & Nutrition Survey Report (2017)

A survey of impacts on long-term/chronic diseases, the results of the Rapid Nutrition and Health Assessment (2016) revealed a gradual increase in the overall monthly number of cases of anaemia diagnosed in the health facilities during the drought period, including an increase in the number of clients admitted in the Food by Prescription Programme. The assessment revealed that adherence to anti-retroviral (ARV) among persons living with HIV in food insecure households reduced. The assessment also revealed that ART and TB treatment defaulter rate increased during the drought period. Besides the lack of access to adequate and nutritious food, some of the factors that contributed to an increased defaulter rate included limited access to health facilities as some people were unable to make the journey to the facilities due to illness, weakness or lack of finances.

X. Inconveniences and Stress because of Disabilities

The severity of impacts due to inconveniences and stresses on people living with disabilities were mostly no impact. However, there were reports of high to severe impacts particularly for disabled and elderly people who did not have the physical and social mobility to seek alternative methods to obtain water for their households. Whilst there may be relatively few people reporting disabilities, disabled people suffered greatly because of the actual physical limitations of getting water from rivers and dams. As well, some households might still be uncomfortable talking about people living with disabilities in their households, so the severity of the impacts could be far worse than the data suggests.

Figure 3.5.2.12 Significance of Drought Impacts on People Living with Disabilities



Source: Authors' own representation using survey data

Notes: The figure compares the severity of impacts on Disabilities. It compares severity of impacts on male and female headed households

3.5.3. Household's Responses and Coping Strategies to Drought Impacts

Almost every household in Swaziland incurred some form of inconvenience due to the 2015/16 drought. Drought introduces irregularities on the household's daily activities. It is vital to document the initiatives taken to address the challenges in order to advance preparedness for future disasters and reduce future loss and suffering. Challenges that were most prominent in households included food shortages and hunger; lack of water for

agriculture and human consumption; and lack of economic or financial muscle to effectively respond to the drought due to poverty and lack of employment or income generating opportunities. Consequently, households had limited capacity to implement appropriate interventions to respond to the drought. The warnings from the SWSC and Meteorological Department were a little too late for any substantial remedial activities to be implemented at the household level. Households had to scramble for water tanks, buckets, and other storage containers to save water and endure living without it through water rationing. Households had to limit their use of water and engage in water recycling. Very few households could afford to buy water tanks, so recycling and reusing became the best alternative to save water. Essentially, all households, despite the SWSC induced rations, had to ration themselves in order to survive through the drought.

Second, agriculture in Swaziland is predominantly dependent on rainfall, and so when the water vanished, households did not have alternative means to produce food. Irrigation systems, because of the associated costs, were not a viable option for a majority of the households that rely on subsistence production for their food and livelihood security. Livestock farmers made efforts to move their cattle to other communities in the country that still had grass on their grazing lands, especially in the Highveld region. Farmers faced the quandary of managing their livestock through the limited grass and water resources or selling their remaining stock to the Swaziland Meat Industries. Those who were able to sell their cattle at the onset of the drought were able to reap decent returns than those who sold their cattle later in the heat of the drought.

Consequently, a majority of people in rural Swaziland had to rely on food donations distributed by the Government through NDMA, and development partners and organisations such as World Vision and the UN World Food Programme. Families had to buy maize and mealie-meal from beyond the country's borders due to price disparities between Swaziland and South Africa. The food parcels or hampers distributed to communities (especially in the Lubombo and Shiselweni regions) played a pivotal role in rescuing households from extreme food insecurity. For instance, on the onset of the drought in 2015, some families could still afford to buy food, but by late 2016, a majority of the households had to seek food donations from the government's food distribution programmes. ***Making the situation perverse was the failure of agricultural marketing boards in the country to relax instruments meant to regulate the importation of food into Swaziland.*** Instead, it became a tug of war between desperate Swazi families and the agricultural marketing boards which were imposing all kinds of restrictions on food (processed or not) imports into the country, in spite of the fact that the country had already declared the drought a national disaster.

Figure 3.5.3.1 in the appendix shows some of the measures that households had to take in response to the drought. These include conserving and accessing water stored in underground aquifers. Households further reported the following strategies:

- “Fetching water from the river whenever the taps were dry”*
- “Fetching water from a neighbouring unprotected spring”*
- “Started fetching water from the protected spring which is far”*
- “Fetching water from another community farther away”*
- “We bought water and filled our tank”*
- “We saved water and bought it from SWSC”*
- “Drilling of water and buying water”*
- “Buying water from PnP for drinking”*
- “We did underground water extraction”*
- “Buying from water tanker”*

*“There was water tank provided for the community”
“We use rain water which we collect by our tank”
“Nothing was done, we relied on rain water whenever it rained”*

To reduce the impacts stemming from water shortages, households prioritised water conservation, water collection from rivers, and underground water extraction. Some households also tried to improve productivity efficiencies on their farms through livestock management and destocking. Since the drought affected agriculture the most, Figure 3.5.3.2 in the appendix, provides a summary of the coping mechanisms that households used during the 2015/16 drought in Swaziland. About 52% of the households exited agriculture while 32% chose to reduce the size of area they farmed or cultivated. Only 11% of the sampled households changed or diversified the crops they normally cultivate. This suggests that the severity of the drought forced households, especially subsistence producers, to resort to extreme coping mechanisms such as exiting or abandoning fields before even trying mitigating strategies such as diversifying crops, trying out drought resistant crops, and improving on-farm productivity efficiencies. While some households engaged in mitigation strategies, the number is too small. On the other hand, agriculture insurance is still an uncharted territory in the country. The data reveal that less than 1% of households insured their farming activities in the 2015/16 growing season (Fig 3.5.3.2 in the appendix).

Since all the impacts centred on agriculture and food security, the study also evaluated household drought behaviours to determine what households are likely to do in the event of drought. A large number of households sought financial assistance to buy food from their friends and families (Fig 3.5.3.3). Other households resorted to extreme behaviours such as reducing the number of meals per day and eating less expensive food. The drought pushed households to make serious compromises on the amount and quality of food they ate. Moreover, because food became too expensive, many households used informal micro lenders and increased their household debt as recourse to mitigate against food shortages and rising food expenses. Household savings in the form of livestock and cash also shrank. Some households withdrew children from school to save on household expenditures while others had to beg for help. Household vulnerability increased during the drought. Households will require assistance when the rains are back to recover the losses in terms of assets and resources lost due to the drought and to reduce risks on future disasters, such as the forecasted La Nina (which could bring flash floods).

Furthermore, the study solicited the opinions of households on the primary actions taken to reduce adverse impacts of drought disasters. Generally, households feel that their primal responsibility during droughts and in preparation for a drought is to save water and grow enough food to feed themselves. The implication of this is that on rainy days, water harvesting should be encouraged by installing water tanks in every household in Swaziland. People also realise that they have to seek employment/income generating activities to earn and own their livelihoods and save for future disasters. Households believe that government should provide water and food, especially during the drought disaster. A bigger role that government can play in assisting food production at the household level is provision of farm inputs and distribution of food parcels to the most vulnerable. Farmers require tractors for farming and see government as possessing the muscle to provide the necessary assistance.

The government could also consider focusing on building capacity to harvest and store water through building more community dams and drilling boreholes as per the aspirations of the NDS. By doing so, the government will increase provision of clean and reliable water to every household in Swaziland. Overall, households are of the view that the government could play a big role in providing support to those households involved in food production, which could go a long way in reducing exposure to future droughts and other common disasters in the country. Households identified and commended the government, World Vision, Red Cross,

4. THE MULTI-SECTORAL ECONOMIC IMPACTS OF THE 2015/16 DROUGHT

4.1. Introduction

The Food and Agriculture Organisation of the United Nations (FAO) states that disasters tend to compromise agricultural production and development, and that their impacts always have cascading negative effects on a country's economy. Specifically, the relationship between drought and agriculture is of utmost importance because 84% of the damages and losses caused by droughts are usually on agriculture (FAO, 2015). Other sectors such as health and nutrition, energy, water, and sanitation usually constitute the remaining 16% of the drought impacts. This section explores the effects of the drought in the agriculture sector to deduce the sector-wide economic impact of the 2015/16 drought in Swaziland. It further presents the key impacts of the drought on different sectors in the Swazi economy. Particular focus is on agriculture, water, energy, environment, tourism, urban development, and meteorology forecasting and early warnings. The study assesses the specific impacts of the drought on these sectors. However, long-term impacts, which matter equally, are not considered.

In Section 1, drought is defined as the manifestation of prolonged water shortages due to tenacious dry weather conditions. The results of severe drought are reduced water levels in surface and underground water storage facilities such as rivers, lakes, dams, water tables, underground aquifers, and other reservoirs. Water plays a crucial role in every part of human, plant, and animal life. As a natural resource, water is an integral part of a country's ability to produce goods and provide services (National Drought Mitigation Centre, 2013). For people, water is a necessary element in all forms of production, be it for food or non-agricultural activities. People need water to drink, to clean as well as other sanitation purposes, to grow crops, and to produce metals, among a plethora of other uses. Therefore, water is a lubricant of the economy and undeniably a major component of the socio-economic development in any country. When water is limited in quantity and quality, a complex web of impacts arise that can span across many sectors of the economy and reach well beyond the area or region experiencing the actual drought (National Drought Mitigation Centre, 2013). Hence, severe shortages of water can have direct and indirect ramifications on the economy as well as overall developmental milestones and aspirations of a country.

Unlike other disasters such as floods, hurricanes, and tornadoes, droughts do not exhibit the same immediate and dramatic effects yet they carry a huge price tag. Droughts have negative and positive net effects on macroeconomic variables such as GDP, employment/unemployment that can vary in the short-, medium-, and long-term depending on whether the impacts on the economy have a transitional or permanent effect (Benson and Clay 2003; Baade et al., 2005). Essentially, a drought's price tag or its economic cost has to do with how the drought negatively affects income generation, investment, consumption, production, employment, and financial flows (Clay, 2003). During a drought, the sectors of the economy that directly use water as an input of production such as agriculture and hydropower are likely to decrease their activities and production, make less revenue, lay-off staff, and suspend all but critical investments (Mysiak and Markandya, 2010).

4.2. Understanding the Impacts of Drought

To understand the impact of drought on the multi-sectors of the economy, consider the chronological progression of the drought provided below. Adapted from Maia et al. (2014), it provides seven possible pathways that take place following the onset of drought:

- I. At the onset of the drought, there is reduction in rainfall, which leads to reduction on soil moisture.
- II. The first impacts appear on the agriculture sector because of the soil moisture deficits, which in turn inhibits crop production, reduces pastures for livestock husbandry, and overall productivity of the ecological system (ecological infrastructure). The extent to which crop production and environmental productivity deteriorates, depends on;
 - i. Crop/vegetation patterns of the area;
 - ii. Crops developmental stage, in which the water shortage occurs;
 - iii. The existence, or lack thereof, of water to compensate moisture deficits in the form of irrigation.
- III. The reduction in water available in both surface and underground water reserves then trickles to urban and rural water supply systems. The impacts involve constrained supply periods due to limited water availability, water use restrictions (for irrigation of gardens, street cleaning, car washing), and restriction or competition for water rights between the different sectors of the economy. Additional mitigation costs may be necessary to ensure supply of water from alternative sources or through improvement of water treatment technics, as was the case in Swaziland.
- IV. Hydroelectric power generation also suffers. The main impact has to do with limited amount of water available to enable effective power generation.
- V. In the industry sector, the agro-food as well as pulp and paper industries are the main subsectors affected because of the reduction and higher costs of the available raw agro materials owing to slower development of forests vegetation.
- VI. For the tourism and recreation sectors, the extent and severity of the impacts depend on the season and area affected. For example, wildlife may be lost if its inception period is immediately before or during the peak of the drought, limitations on swimming pool fillings and golf course irrigation might be initiated to save water in the tourism industry.

Hence, the discussion of economic impacts involves the losses incurred by individuals, businesses, and the government in terms of the resources used or destroyed in the event of the drought in addition to the costs of mitigation and adaption (Rose and Lim, 2002). Table 4.2.1 below provides a classification of drought costs categorised into direct, indirect, and intangible costs. The Table further lists the losses related to each classification. Direct costs relate to those costs that impinge on resource-based sectors like agriculture, and other water dependent economic activities. Indirect costs refer to secondary costs that emanate from losses in the resource-based sectors. Intangible costs relate to the social impacts of droughts – these are seldom quantifiable, they are usually qualitative and tend to last longer.

Table 4.2.1 Classification of drought costs

Direct Costs	Indirect Costs	Intangible Costs	
Losses related to the biophysical impacts of droughts. These include losses in resource-based sectors.	Losses induced by changes in resource-based sectors on the rest of the economy.	Non-market losses associated with environmental and health effects of droughts.	
Costs of drought mitigation and adaptation can be direct, indirect and intangible			
Form of damage	Measurement		
		Market (tangible)	Non-market (intangible)
	Direct	Losses in resource based sectors like agriculture, e.g., crop failure and reduced livestock production. Reduced urban and rural water supply Reduced hydroelectric power production	Damage to wildlife and fish habitat. Loss of biodiversity, loss of wetlands. Deterioration of water and air quality Losses due to restriction of water supply in households
Indirect	Increased unemployment Changes in food prices Trade losses Reduced tax revenues Losses in sectors directly related to droughts, e.g., food processing industry	Animal diseases Reduced quality or loss of recreational sites, aesthetic impacts Increased human health costs (diseases and malnutrition) Loss of human lives.	

Source: Adapted from Penning-Rowsell et al. (2003) and Logar et al. (2011)

Over 90% of government, non-government organisations, and business rated the drought as severe. These entities described the drought as “the worst drought the country has ever experienced since the 1980s.” Even though the 1992 drought was also severe, the level of development in the country was not as extensive as it was in 2016. For example, in 1992 the water grid only covered urban households, whereas in 2016, connection had spread to other parts of the country, notably semi-urban and in some instances rural areas. Therefore, the impacts of the 2015/16 drought affected a lot more people and businesses than the 1992 drought. The major trigger of adverse impacts on the economy, especially in the agriculture sector, was poor access and poor absorption of drought early warning information and fragmented coordination of mitigation mechanisms.

Generally, there is an underestimate on the value and importance of meteorological information yet it can improve efficiencies and reduce losses not only in agriculture but also in many other sectors of the economy such as construction and health. Even on an individual level, meteorological information (weather forecasts) can improve planning of daily activities and avoid potential losses/damage to inclement weather. As an example, farmers began destocking their livestock too late and cattle either died or depreciated in value. The drought also affected the quality of beef carcasses, causing the EU to downgrade about 33% of beef exports to low quality, which adversely affected total export earnings from the beef

subsector. Had farmers used or followed meteorological forecasts, they would have started responding to the looming drought very early, which could have shielded them from any severe losses in livestock.

4.3. Composition of the Economy in Swaziland

The economy in Swaziland consists of three sectors: primary, secondary, and tertiary. Table 4.3.1 below provides a classification of Swaziland's GDP according to the three sectors. At the onset of the drought, economic indicators were showing that real GDP growth rate slowed down to 1.7% in 2015 from 2.7% in 2014. According to the Central Bank of Swaziland (2016), the slowdown in economic growth was due to slower growth in the secondary and tertiary sectors.

		2015	2016
A	Agriculture and forestry	0.73%	-0.79%
B	Mining and quarrying	-0.03%	0.01%
	Primary sector	0.71%	-0.78%
C	Manufacturing	0.34%	0.33%
D	Electricity supply	-0.26%	-0.27%
E	Water and sewerage	0.00%	-0.02%
F	Construction	0.03%	-0.87%
	Secondary sector	0.12%	-0.83%
G	Wholesale and retail trade	0.28%	0.70%
H	Transportation and storage	-0.56%	-0.07%
I,R	Tourism	-0.08%	0.03%
J	Information and communication	-0.01%	0.00%
K	Financial and insurance activities	0.15%	-0.05%
L	Real estate activities	0.29%	-0.02%
O	Public administration and defence	0.32%	0.00%
P	Education	0.12%	0.09%
Q	Human health and social work activities	0.22%	0.09%
M,N,S,T	Other service activities	0.06%	0.06%
	Tertiary sector	0.78%	0.83%
	Financial services indirectly measured	-0.05%	0.03%
	Total value added at basic prices	1.56%	-0.74%
	Taxes on products	0.30%	0.12%
	GDP at constant 2011 prices	1.87%	-0.63%

Source: Central Bank of Swaziland (2017)

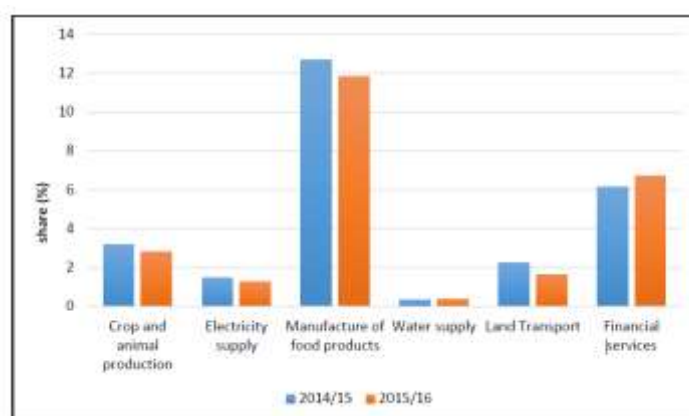
Notes: Figures in bold represent changes in the economy.

Manufacturing in the secondary sector expanded at a slow pace of 1.8% in 2015 compared to 2.9% in 2014. The slowdown in manufacturing is attributed to the poor performance of key export market destinations, that is, South Africa and Europe. Another damper on the manufacturing sector was the loss of the country's eligibility status to trade under the AGOA arrangement, affecting mainly the textile industry and parts of the food manufacturing subsectors (CBS, 2016). Therefore, nominal exports only grew by half (6.8%) of their growth rate in 2015 compared to the 12.9% growth rate in 2014. Still in the secondary sector, the drought dented performance by affecting hydropower generation and water supply subsectors. On the other hand, the construction subsector experienced positive spin-offs, which led to a 27.5% increase in quarried stone production, and 23.3% increase in building plans approved by municipal councils.

The tertiary sector incurred marginal economic growth of 1.2% in 2015 compared to 2.4% in 2014. Transport and tourism were the most negatively affected in this sector of the economy due to the shutdown of the iron ore mine, and introduction of strict immigration laws in South Africa as of June 2015. Besides the major impacts on hydropower and water subsectors, the drought had the most severe impact on the primary sector, particularly on agriculture. Agricultural production is directly dependent on the total amount of rainfall received among other inputs. With rainfall levels dropping by close to 60% (SMS, 2016), the drought had the most strain on agriculture and agro-processing industries in the country. Swaziland is especially vulnerable to drought because of its high dependency on the agricultural sector. The agricultural sector comprises of rain-fed subsistence production dominated by smallholder producers, and cash crops on large agricultural estates. Smallholders constitute 70% of the population, and occupy 75% of the cropland but only account for 11% of total agricultural outputs (GAIN, 2016). The key agriculture commodities include sugar, cotton, maize, sorghum, peanuts, tobacco, cattle, goats, pigs, pineapples, citrus fruits, grapefruit, and limes, with sugar being the largest single foreign exchange earner in the country. The value of sugar derivatives accounts for 59% of the total agriculture commodities in the country followed by beef (14%) and milk products (4%) (GAIN, 2016).

Poor performance in the different sectors of the economy affects revenue generation from taxes on services and products produced. Based on the structure of the economy in Swaziland, the drought did not directly affect all the sectors. To be clear, some sectors continued with business as usual and realised growth while other sectors were negatively affected and as such experienced negative growth. This rapid overview of the effects of the drought on the Swazi economy indicates that it mostly affected the agriculture sector, manufacturing industries dependent on water and agriculture, electricity and water supply, construction, and the tourism industry. To get a sense of the likely impact in each sector of the economy, Figure 4.3.1 below provides a classification of the sectors that are most likely to be directly or indirectly affected by the drought as a percentage of total domestic tax revenue. The figure shows that crop, animal production, and food processing, which are most susceptible to the drought, account for more than 15% of the total revenue generated from services and products in these sectors. Electricity and water supply constitute about 2% of government tax revenue.

Figure 4.3.1. Sectorial Contribution to Government Tax Revenue



Source: Central Bank of Swaziland, 2016

Notes: The Figure shows the contribution of each sector to government tax revenue. Most of the sectors that were affected by drought include crop and animal production, electricity supply, manufacture of food products and water supply.

4.4. Sectorial Impacts

So what were the impacts of the drought on the different sectors of the economy? Alternatively, how did the drought affect business activities and how did businesses respond to the drought in the country? This section discusses the impacts per sector and highlights the interventions initiated in each sector. Note that data and information provided were collected from stakeholders who agreed to be interviewed.

4.4.1. Water Sector

The biggest challenge for SWSC in its mandate to supply water to urban areas is that when the water sources shrunk, the entity still had to maintain demand. In Mbabane, the alternative was to maintain demand by executing restriction measures, that is, water rations for four days each week. Mbabane has a water demand of 26 mega litres daily and because of water rationing, the demand dropped to eight mega litres per day.

In other major urban centres like Ngwenya, demand dropped from 1.5 to 2 mega litres daily. Matsapha and Manzini, which have the highest water demand, were able to sustain 36 mega litres daily. In these two urban centres, SWSC draws water directly from the river (Lusushwana connected to Lumphohlo Dam) and so variations in water levels create challenges to sustain demand for SWSC. SEC owns and operates Lumphohlo Dam but SEC and SWSC eventually had to cooperate during the drought to accommodate electricity generation and then releasing water into Lusushwana to maintain supply in Matsapha and Manzini. Additionally, Matsapha catchment areas are also relatively huge because there are numerous rivers connected to Lusushwana, including rivers from South Africa. In Mbabane, there is no catchment area nor a strong river that feeds into Hawane reservoir. In the instances that it rained in the Mbabane area, it was raining downstream of Hawane reservoir.

The biggest effects of the water rationing by the SWSC were in the form of pipe bursts and road damages in the city. The utility provider noted that turning water on and off extensively damaged water provision infrastructure in the capital Mbabane, which will take time to fix optimally. The SWSC has experienced drought before but not to the extent of the one in 2015/16. For example, though the 1992 drought was full-blown, Hawane was able to cope with water demand. The lowest point in Mbabane in previous droughts was at 30% capacity, in 2007. During the 2015/16 drought however, Hawane Dam capacity reduced to 0%, causing a respondent to exclaim:

“It was inconceivable, a fairy tale really, that Mbabane could ever run out of water!”

SWSC was slow to respond to the drought. The Corporation only made its initial attempts in November 2015 when Hawane had already reached 10% capacity. This represented the first time that SWSC realised that the drought was taking a deeper turn and hence initiated analysis of river systems across the country.

For Ezulwini area, Nyonyane and Mkhondvolwane Rivers dried up in April 2016. According to SWSC, Nyonyane River has always been drying up. Therefore, Mcwembe and KalaMgabhi became alternative water sources to supply Ezulwini area. In the long-term, SWSC plans to link the water supply system in Mbabane with Ezulwini. In the Simunye corridor, Mbuluzi River experienced sharp declines in water and Mnjoli Dam dropped to 7% capacity. Mkhondvo River, which supplies Nhlanguano, sustained itself because it connects from South Africa and there was great cooperation between South Africa and Swaziland on water management. In Pigg’s Peak, the demand for water is not as huge compared to the Mbabane area, so the impact in the Maguga area was not as significant.

The extensive depletion of water across the country had a significant impact on school operations. The Education Sector Post Drought Assessment found that 50% of schools (of those with boreholes) had non-functional boreholes due to depleted levels of underground water. The most number of non-functional boreholes due to poor ground water yield were 29% in the Hhohho region and 27% in the Manzini region though these two regions are normally least affected during droughts in Swaziland. The Education Sector Assessment revealed that the implementation of Agriculture, Consumer Science and Natural Sciences subjects were the most affected by the drought. For example, the agricultural produce from the Agriculture subjects were low compared to previous years. Furthermore, the drought also contributed to absenteeism for both the learners and teachers in schools. Data from the Education Sector Assessment shows that 47% of the schools indicated that there were cases of learner absenteeism for reasons that can be attributed to the drought. The Lubombo and Hhohho regions reported the most number of pupils not attending school at 69% and 44% respectively. Learner absenteeism in the Shiselweni and Manzini regions were slightly lower at 43% and 34% respectively. The overall teacher absenteeism rate in the schools was in 10% of the schools sampled across the country. Of these schools, about 19% in Hhohho, 9% in Manzini, 6% in Shiselweni and 14% in the Lubombo region experienced absenteeism of teachers due to drought. Again the Lubombo and Hhohho regions experienced the most severe interruptions on school operations due to water shortages emanating from the El Niño induced drought. The drought adversely affected schools in the Highveld, particularly along the Mbabane-Ngwenya corridor as the SWSC rationed water due to the low levels of the Hawane Reservoir. Most schools in Mbabane did not have alternative WASH facilities such as Ventilation Improved Pit latrines, water-harvesting facilities and so the shortage of water led to sanitation problems for the schools. In rural areas where most families depend on subsistence agriculture for their food, there was a need to ensure that learning was not disrupted throughout the drought period through the school-feeding program. The government's school-feeding program had to be supplemented, strengthened and extended to all schools in the country by supplying food commodities for breakfast to supplement the current school feeding program.

The drought also had adverse effects on the raw water quality. Due to diminishing volumes in sources of water, there was a concentration of solutes such as trace metals and nutrients, which resulted in poor raw water quality. The water was laden with suspended and dissolved solids and in most instances, it was visibly more turbid, especially in areas where pumps were now extracting water closer to the dam or river floor. However, SWSC strived and succeeded in continuing to produce safe drinking water through process optimisation.

INTERVENTIONS

SWSC, together with the Government of Swaziland, installed 46 tanks as well as 22 boreholes around Mbabane and Ngwenya, managed by the SWSC. To supply water to the Central Business District (CBD), the SWSC constructed an emergency water treatment plant. The emergency wastewater treatment plant used water from the Mbabane River. The plant was able to supply 5-10% of the water demand in Mbabane. In addition to the water treatment plant, SWSC and the government dredged Hawane Reservoir to increase its capacity and SWSC is currently pursuing water extraction from Luphohlo to supply 10 mega litres directly to Mbabane each day. Previously planned strategies to supply emergency water to urban areas proved expensive. For example, the water utility noted that it required E3 billion to fix the water infrastructure in the country, which also includes provision for pit latrines and chemical toilets.

Through the coordinated drought intervention programmes laid out in NERMAP, the government distributed 4,141,000 million litres of water to communities, schools, cattle

troughs and health facilities through water tankers. Another 8.015 million litres of water were distributed in Mbabane and Ngwenya for a total of 12.156 million litres of water distributed during the drought. About 29 schools in the urban area providing potable water to 19,594 learners and teachers (particularly in Mbabane-Ngwenya) benefited through the installation of water tanks and filling with emergency water during the drought. Additionally, 10 schools in the Lubumbo and Shiselweni regions benefited from the establishment of rainwater harvesting systems. Only 4 of the 20 boreholes drilled in Mbabane ended up being operationalised while the remaining 16 did not meet the minimum yield requirement. In total, the government drilled and operationalised 14 new standard boreholes of which 2 were high yielding boreholes. Moreover, through NERMAP, the country rehabilitated 49 rural micro water schemes and 4 macro reticulated water schemes, developed 2 unprotected springs and cleaned up 13 vandalised boreholes. What is clear is that NERMAP enabled the deployment of substantial resources to try to ensure water security to communities; however, because of the extreme drought, water demand needs could not be met since SWSC had no alternative but to execute water rationing in Mbabane, among other water shortage incidents.

OPPORTUNITIES

Following the drought, SWSC is experienced an influx of applications for water connections because people want clean and reliable water. In addition, the drought has put the area of providing, and constructing infrastructure for harvesting and storing safe and reliable water in Swaziland under the spotlight. The drought brought entities that previously did not work together to discuss water use under the same roof. For example, SEC and SWSC ended up working together to formulate a working relationship on electricity generation and water supply using Luphohlo Dam.

4.4.2. Agriculture Sector

Subsistence agriculture in Swaziland is predominantly a rain-fed food and fibre production system while, for the most part, commercial agriculture depends on irrigation. The country relies on rainfall to produce anything and when the rains disappear, everything comes to a standstill. The major impacts in the agriculture sector were on food, fibre production and livestock husbandry.

IMPACTS

With respect to livestock farming, the impacts were most devastating. Since the drought wiped out vegetation and rangelands across the country, particularly in the Lubombo and Shiselweni regions, livestock farmers faced a grave challenge in sourcing feed for their cattle.

Livestock farming:

➤ Death of livestock

The drought affected cattle due to lack of feed (destruction of rangeland-affected pastures) and shortage of water. The Lowveld and lower Middleveld of Swaziland showed very poor range conditions and in most cases grazing lands just simply dried out. In some areas in the Lowveld and lower Middleveld, wild fires exacerbated feed shortages by destroying rangelands. Livestock survived on available browse on enclosures with grass. Farmers also provided hay bales to their cattle while those who could afford moving cattle to the Highveld and upper Middleveld of the country, wasted no time in doing so. Though the Highveld and upper Middleveld had some grass, it had unfortunately lost its nutritious value (MOAC, 2016 *pers comm*). An estimated 88,000 cattle died due to the drought. The 88,000 cattle that died during the 2015/16 drought period is more than double the number of cattle that died in

2014 or 2013. In 2014, the Ministry of Agriculture (MOA) reported that 38,899 cattle died in the whole country whilst in 2013 it recorded only 35,096 cattle deaths – suggesting that signs of livestock deaths due to the drought were already evident in the two years prior to 2016. Furthermore, whereas cattle mortality was on the rise during the drought, the total number of calve births decreased by 6% in 2016 (CBS, 2016; MOAC, 2016). Tracking calve births from 2014 just before the drought reveals that calve births recorded in 2014 were 85,000 dropping by 32% to 58,000 in late 2015 (CBS, 2016; MOAC, 2016). Using 2014 as the normal base year before the drought, the loss in calve births due to the drought in this period is equivalent to 27,000 calves.

During the drought, farmers did not have the capacity or financial muscle to relocate their entire herd to other regions of the country where grazing land was still available. Those farmers who destocked swiftly by selling some of their cattle were able to avoid losses due to death of cattle. For the other farmers that held on to their livestock, the cattle either died or deteriorated in health resulting to a much depreciated value when the cattle were eventually sold to Swaziland Meat Industries. Since most of the cattle sold to the Swaziland Meat Industries (SMI) were of low quality, the EU and Norwegian market downgraded 33% of beef exports to low quality beef, which robbed the country of potential earnings in foreign currency. In 2015, the number of commercial slaughters actually increased because many cattle livestock farmers realised that they could not sustain their stock through the drought due to lack of feed and water. However, most of the cattle in late 2015 into 2016 had deteriorated in health and hence fetched low prices at the commercial abattoirs. Interviews with Swaziland Meat Industries indicated that the most affected areas (particularly Lubombo and Shiselweni) had no choice but to sell their cattle for as little as E1,500 with a price ceiling of E4,000 for those that had managed to feed and treat their cattle during the drought. A healthy cow usually sells for E7,000 and so the losses to farmers were between 42% and 80% on each cow compared to normal market prices.

Therefore, though the meat (beef) industry performed well in 2015 in light of the sheer volumes of cattle slaughtered, the value of the stock and earnings fell. As farmers disposed of their cattle because of the persistent drought, cattle slaughters rose by 62.4% in 2015 increasing beef exports by 8.5% in 2015. Beef exports in 2015 amounted to 1,126 metric tonnes compared to the 1,038 metric tonnes in 2014 (CBS, 2016). Boneless beef destined for the EU market was well over 500 metric tonnes, increasing export receipts by 13.1% with a total export value of E83.6 million (CBS, 2016). Beyond 2016, negative growth is expected in the meat industry due to the erosion of the cattle stock that affected many farmers during the drought. The value of the beef exports especially in 2016 will also fall due to the 33% downgraded beef.

The poultry industry suffered as well. Heat stress, specifically for commercial farmers without cooling systems, killed 10,600 chickens over a period of three months during the peak months of the drought.

Overall, the drought affected subsistence farmers in that they lost their only form of savings. Areas that reported the most severe impacts on livestock losses include Somntongo, Hluti, Sithobela, Mliba, Malindza, Sgangani, Ntfontjeni, Nkambeni, Ngculwini, Dwaleni, Mpaka, Siphofaneni, Tsambomkhulu, Ka-Khuphuka, and Mlindazwe. Most of these areas particularly, Somtongo were experiencing extreme water shortages and collapse in rangelands.

INTERVENTIONS

The government and private commercial farmers sourced food supplements such as hay bales, and water outside the country. Water intervention for livestock drinking amounted to 1,368 million litres of water distributed countrywide. The MOA provided extension services to farmers on livestock management, providing destocking by selling to commercial abattoirs as a viable option. The Swaziland Meat Industries also provided a similar extension service to local farmers and smallholders on livestock management, focusing on destocking and supplementary feed options during the drought.

Crop farming:

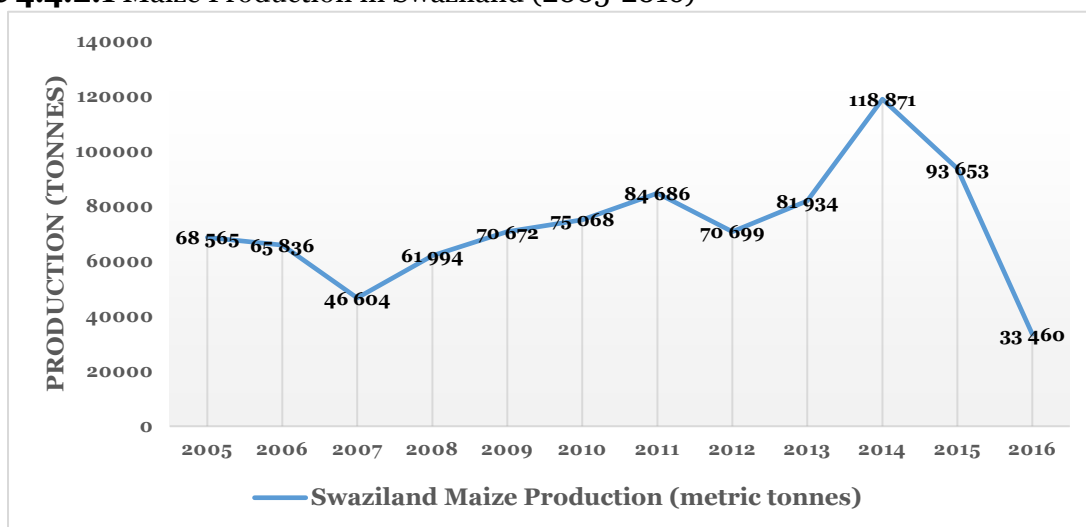
Swaziland's crop production system comprises of subsistence smallholder producers who mainly practice rain-fed agriculture, and large-scale commercial farmers who depend on irrigation and produce mainly cash crops. Smallholder producers comprise 70% of the country's population in 75% of the cropland mostly found in rural areas on Swazi Nation Land (SNL). Generally, productivity among smallholders is low, accounting for 11% of the total agricultural outputs in the country (GAIN, 2016).

There is also a cluster of farmers in the country on SNL who are smallholders but using irrigation and other agriculture technologies to improve production. Most of the crops under irrigation are the cash crops such as sugar cane that contribute significantly to the country's GDP and export receipts. Maize and cotton production are largely a smallholder SNL system that is almost entirely dependent on direct rainfall. Therefore, the drought had severe impact on maize and cotton production, given their high dependency on direct rainfall. Some significant/high impacts were also experienced by the sugar industry due to heatwaves and low levels of water in irrigation dams in the country.

➤ **Maize**

Though drought conditions were evident in the 2014/15 growing season, the total area planted for maize increased slightly from 86,800 hectares in 2013/14 to 87,200 hectares in 2014/15 (MOAC, 2016). The stimulus in maize cultivation came as a result of the promising rains experienced in the beginning of the 2014/15 season and Indian loan and government subsidies on agricultural inputs (MOAC, 2016; CBS, 2016). The Indian loan increased the fleet of tractors available to farmers on Swazi Nation Land by 100 units. Moreover, the loan also provided subsidised farm inputs, increasing the number of participation farmers from 3,000 in 2014/15 to 14,000 in 2015/16 (MOAC, 2016). However, as the drought manifested depriving the whole country from rainfall, the area planted fell by more than 44% resulting in a 64% corresponding fall in production from 93,653 tonnes in 2014/15 to 33,460 tonnes in 2015/16 (Drought Assessment Report, 2016). The drop in maize production in the 2015/16 growing season is the worst in the past 10 years, lower than the 46,604 tonnes produced in the recent 2007 drought. Figure 4.4.2.1 below provides a historical illustration of maize production in the country.

Figure 4.4.2.1 Maize Production in Swaziland (2005-2016)



Source: Ministry of Agriculture (2016)

Notes: The Figure shows maize production in metric tonnes from 2005/06 to 2015/16 growing season in Swaziland. The highest peak in 2014 is just before the drought with 118,871 metric tonnes of maize.

IMPACTS

Farmers actually attempted to plant during the planting season and because of water shortages the crops died from heat waves. In Lubombo and Shiselweni there were no crops at all, it was as if someone had lit fire on the fields. Subsistence farmers lost their money or investment on farm inputs. Therefore, yields dropped tremendously. In 2014, maize production was at 101,000 tonnes. In 2015 growing season production dropped to 81,000 tonnes, and in 2016 further dropped to 33 metric tonnes. The National Maize Corporation (NMC) had to import 30,446 tonnes of maize from South Africa and the price of maize eventually shot up. The price of mealie-meal depends on total amount of maize produced in the country (CBS, 2016). The drought affected the production of maize and vegetables, and caused livestock deaths. Maize prices in Swaziland soared by 66% from E3,533 in 2015 to E5,865 at the beginning of 2016 (CBS, 2016; NMC, 2016). Consequently, the increase in maize and wheat prices alongside the weakening of the Lilangeni against some major currencies in the world, led to a significant rise in food prices in the country. Moreover, since maize and wheat have a high weighting on the food consumption basket, the increase in their prices pushed headline inflation from 4.91% in December 2015 to 8.54% in April 2016 in a space of four months. Food inflation in the same period soared from 5.24% in December 2015 to 15.2% in April 2016. The total result was overall inflation to a 3-year high of 8.5% in April 2016 (CBS, 2016).

On a food security point of view, the total cereal requirement for the 2015/16 marketing year stood at 205,740 metric tonnes, comprising of 157,310 tonnes of maize, 43,440 tonnes of wheat, and 4,990 tonnes of rice (MOAC, 2016). Due to the drought, the country incurred an overall 59% domestic shortfall in cereal stocks equivalent to 121,170 tonnes (MOAC, 2016). The country planned cereal imports for 2015/16 period in the form of 43,810 tonnes of maize, 36,000 tonnes of wheat, and 76,000 tonnes of rice.

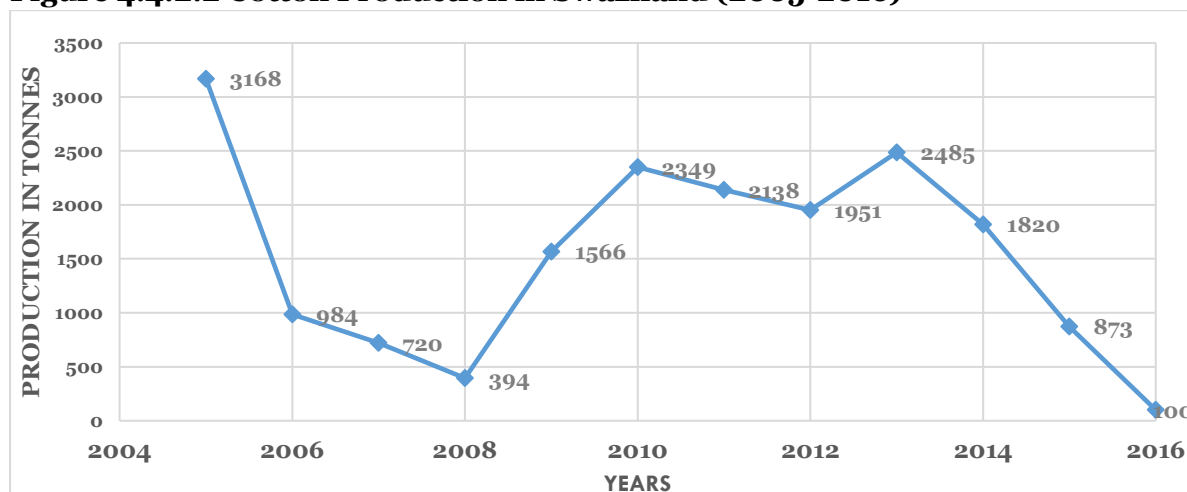
INTERVENTIONS

To encourage farmers to produce maize, NMC offered a promotional price for a tonne of E2,575 in 2014 to E2,900 in 2015 and E4,000 in 2016. The government, through the NMC tried to ensure food security by allocating some sugarcane fields into maize fields. Food distribution became a key contributor to try remediate the issue of food insecurity, especially in the Lubombo and Shiselweni regions. The government, through the NDMA, started food distribution as early as 2015 and up-scaled it after the declaration of the drought as a disaster in February 2016. Other development partners joined forces to distribute food to communities across the country in June 2016. By December 2016, the food distribution programme had reached approximately 413,553 beneficiaries (over a period of 12 months) compared to the target of 350,000 beneficiaries as planned in NERMAP. About 89,679 of the beneficiaries received cash for food (E550 per family per month) amounting to E40,160,200.00, (NERMAP MTR, 2017). Approximately 55.9% of households received food assistance in the period August 2016 – January 2017 with the highest region receiving such assistance being Lubombo (73%) and Shiselweni (71.1%) while the lowest was Hhohho (51.8%) and Manzini (34.2%). Over 13,500 households, (about 67,500 people) were supported with seed inputs to put more than 13,000ha of land back into production in the current season.

➤ Cotton

In Swaziland, cotton is the only cash crop that is completely reliant on rainfall. Due to the erratic and limited rainfall received in the period 2014 to 2016, cotton production fell by 27% in 2013/14 and 52% in 2014/16. For the 2015/16 growing season, the Swaziland Cotton Board distributed only 6.1 metric tonnes of cottonseed to farmers compared to the 23.8 metric tonnes distributed in 2014/15. Cotton production dropped by nearly 90% from 873 tonnes the previous year to 100 tonnes in 2015/16. Very few farmers actually planted cotton, and those that did could not get the seed to germinate. In total, farmers planted 612 hectares of cotton in 2015/16, almost a third of the 1,730 hectares planted in 2014/15 (Swaziland Cotton Board, 2016). Figure 4.2.2 below shows a historical overview of cotton production in the country.

Figure 4.4.2.2 Cotton Production in Swaziland (2005-2016)



Source: Swaziland Cotton Board

Notes: The figure shows cotton production in Swaziland from 2005 to 2016. The highest spike in 2005 is corresponds to 3168 metric tonnes of cotton delivered at the ginnery.

From Figure 4.4.2.2 above, it is evident that the 2015/16 drought had a devastating impact on the cotton industry. The 100 tonnes produced in 2015/16 is the lowest recorded in 10 years. The ginnery operated at a 10% capacity resulting in job losses of about 90 seasonal employees who depend on the industry for their livelihoods. In 2013/14, E9 million was paid to farmers for 1,600 metric tonnes of harvested cotton and E600,000 for 10 truck owners collecting the cotton. In 2014/15, E4.4 million was paid to farmers for 873 tonnes of cotton at an average price of E5.15/kg (Swaziland Cotton Board, 2016). The cotton industry supports many livelihoods in the rural areas, especially in Shiselweni and Lubombo where maize production does not do so well. Figure 4.4.2.2 also shows that cotton production is very dependent on rainfall. For example, the 2007/08 drought also had a debilitating impact on the cotton industry, dropping production from 3,168 tonnes in 2005 to a measly 394 tonnes in 2008.

➤ **Sugar Cane**

Approximately 24% of sugarcane grown in Swaziland relies on direct rainfall while the remainder falls under irrigation (Swaziland Sugar Association (SSA) personal communication, 2016). Irrigation depends on water stored in dams and from rivers. With less rainfall, there is limited water available for irrigation to sustain the sugar crop. The sugar industry experienced the effects of El Nino in March 2014 which became more prominent in 2015 when the dams and rivers were running very low.

IMPACTS

Low rainfall over a period of eight months affected the sugarcane crop. A total of 1,200 hectares over 60,000 hectares had to be abandoned. In addition, sugarcane producers had short and uneven sugarcane that needed extra time and water to mature physiologically. The industry had to suspend replanting. Experts from the SSA report that farmers have to replant approximately 10% of the total area planted each year. Because of the drought, the industry could not meet the 10% replanting target, which usually begins from February to April and again from July to September. In September 2016, there was zero replanting done because there was absolutely no water for irrigation.

Due to the drought, cane production dropped by 15.6% from 5,836,553 tonnes in 2015/16 to 4,928,110 in 2016/17 (SSA, 2016). Not surprisingly, yield also plummeted from 101.2 tonnes of cane/area harvested in 2015/16 to 88.4 tonnes of cane/area harvested in 2016/2017. Maybe the sucrose content will remain relatively the same at 13.9 % to 14% in 2015/16 to 2016/17 respectively because with less water, the sugar concentration per stem of cane becomes much more concentrated. However, looking at the long-term impact, the delay in replanting of sugarcane fields will induce yield penalties in many years to come.

Total sugar sales are projected to decline by 22% in the 2016/17 marketing season against a record high of 700,017 metric tonnes in 2015/16. The sugar industry further expects a 15% drop in sucrose production from 813,966 tonnes in 2015/16 to 691,777 tonnes in 2016/17 (SSA, 2016). Sales from SACU are expected to drop by 5% whilst export sales outside the SACU market are expected to drop by 45%. The industry also reported a financial loss of E120 million for the 2016/17 financial year. To explain the financial loss, the drought increased the cost of production in terms of increases in electricity for irrigation, and additional labour force and transport costs (SSA, 2016; CBS, 2016). Sugar sales improved in 2015/16 due to increased production and carried over inventories from 2014/15. The value of export receipts outside the SACU region in 2015/16 were E1.456 billion. Within the SACU region, sales amounted to E2.573 billion in 2015/16. Noting that sugar is a key foreign currency earner in the country, the 5% decline in the EUROZONE market and 45% decline in

SACU sales are a huge dent to the industry and the entire economy. Total losses to the industry due to the drought could amount to just under E1 billion.

INTERVENTIONS

In response to the drought, the sugar industry was able to implement Drought Management Guidelines at a very early stage. The industry utilised water rationing as a drought mitigation strategy. This included reducing irrigation to 30% - a minimum just enough to keep the sugar crop alive. The mitigation measures put in place worked well for the industry despite the intensity of the drought. Though production levels dropped due to water shortages, the industry did not go belly-up: it is still alive and performing through the “worst drought the country has seen since the 1980s” despite the challenges. If the drought had persisted for an additional 6 to 12 months into 2017, the extreme water shortage, perhaps, could have rendered the situation irrepressible. The drought created opportunities to learn and make sure that the entire sugarcane production system is in check. The Swaziland Sugar Association summarised the impacts as follows:

“This is the worst drought we have ever experienced as a sugar industry and because of this we have learnt to cope under arduous conditions. We have realised that climate change is real and it is here to stay. The drought was therefore a learning curve for us to check our systems and make sure that we use our resources effectively.”

“The Water Act 2003 was supposed to put a levy to encourage companies to use water sparingly but did not. Moving forward we must make sure that all the instruments that can help us conserve water and use our resources effectively are implemented.”

4.4.3. Energy – Electricity Production Sector

Electricity has become a vital part of modern societies. The use of electrical equipment in almost every aspect of life means that interruptions paralyse the daily routine. Improving electric power reliability so that more people (or customers) will have the opportunity to make use of electricity is in favour of everyone in the market. In this sense, reliable electricity can be the catalyst for the much-needed economic recovery in Swaziland. The general vulnerability to drought stems from the fact that the country is a hydro-based electricity generation system. According to SEC, the 2015/16 drought is actually a 3-year impact; SEC has been monitoring water flow rates and within the past three years, found that flow rates have been gradually decreasing in rivers. In fact, these flow rate reductions have been following an increasing trend for the past 20 years. Water flow rates and capacities have been on the decline for the past 20 years. There are gauging stations across the country (GS15 and GS2 – Matsapha). The three rivers used for the generation are Great Usuthu, Lusushwana, and Nkomati – Maguga.

IMPACTS

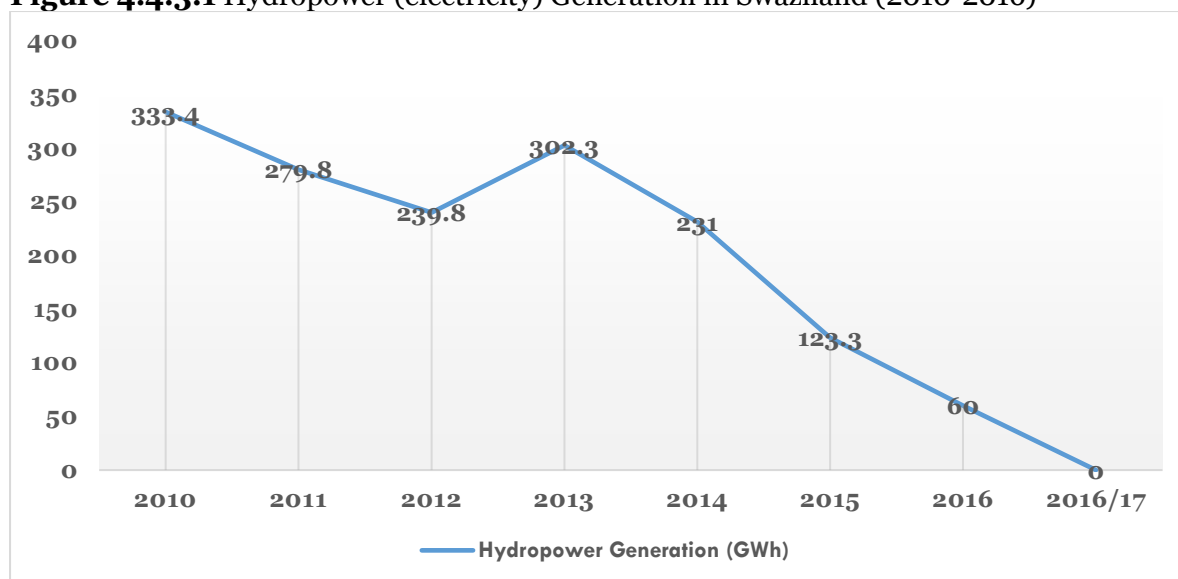
Four months elapsed with zero power generation; however, Lumphohlo Dam had water for some time during the drought, and so could subsidise generation at peak hours, sparing the country from load shedding. The price of electricity is very high at peak hours and so SEC used Lumphohlo Dam to generate electricity at peak hours in order to avoid importing expensive electricity at peak times. Another redeeming factor was the slow-down of the South African economy, which meant South African electricity consumption was also slightly lower than usual, and so load shedding to stabilise demand did not become a necessary mitigation strategy to save power. On the other hand, the country needs 40% capacity at Maguga Dam to start generating electricity. During the drought, Maguga Dam was far below this capacity. KOBWA is able to harvest water allocations not in use when there is low

demand because of slower development and SEC can use that harvested water to generate electricity. However, during the drought, this water was not available. What is more is that, Maguga presents a unique challenge in that the dam was built to support irrigation which creates demand clashes between water demand for agriculture purposes and demand for electricity generation.

The consequence of zero electricity generation was that SEC had to pay between E70 million and E75 million per month to import electricity from Eskom. This is a huge sum of money that could have been invested into Swaziland’s economy to stimulate economic activity in capital projects within SEC. The drought has muted SEC’s mitigation strategies for managing electricity demand and generation. The country had to import all electricity from South Africa. At one point, the country had to pay E110 million per month during peak season. Normal peak season cost of electricity averages E80 million per month. To import electricity, the country uses the 400 kV line. Given that the tolling fee for importing electricity is in United States of America (US) dollars and that at the time the drought intensified, exchange rates also got out of control with the Lilangeni weakening against major currencies, which added costs to SEC since the rents for using the line are calculated using spot rates.

SEC on average generates 300 GWh of power per year. However, in 2015/16 SEC was only able to generate 120GWh of power and could not even reach half of its normal annual power generation targets as shown in Figure 4.4.3.1 below. SEC had to cut operations to minimise expenditures where possible. The entity stopped hiring and froze all but critical capital projects.

Figure 4.4.3.1 Hydropower (electricity) Generation in Swaziland (2010-2016)



Source: Swaziland Electricity Company (2016)

Notes: The figure shows hydro electricity generation in Swaziland from 2010 to 2016. The drop in water levels and hence drop in hydropower generation began in 2014 dropping from 302.3 GWh (24%) in 2013/14 to 60 GWh in 2015/16 and down to 0 GWh in October 2016.

The implications of suspending capital projects will probably have long-term effects. These projects were mandatory to keep SEC’s systems viable and competitive to serve the nation and its developmental goals in the coming years. SEC had planned to move some transmission and change some wood poles to steel poles. Both projects had to be suspended. The only major project that remained running was the St Philips – KaNgcamphalala substation construction. This project continued during the drought because of the huge

development targets around Siphofaneni area. Despite cuts in operational costs and freezing of capital projects, the utility provider prioritised maintenance during the drought to avoid compounding issues on SEC's infrastructure and systems. There were minimal electricity interruptions due to relatively weaker winds and as such, no significant interruptions on electricity lines. However, the prevalence of veld fires was very high, exposing some electricity poles to fires. Usually, every winter SEC hires workers to clear overgrown grass around the electricity poles. A major impact concerning veld fires is the electricity line connecting the sugar belt industries that must always be operational.

INTERVENTIONS

The SEC ranked the drought as severe because the company had to stop generating electricity. The redeeming feature was that Swaziland has never missed its payments for electricity from ESKOM. The country is connected to the 400kV (1,000MW) line international connector which is never switched off. SEC applied for a subvention from government to meet these costs. Within the 3-month peak season SEC needed E237 million. Government allocated E80 million, of which only E20 million was disbursed to SEC and the remaining E60 million was still pending at the time of the interview. A joint venture exists between SEC and KOBWA to manage these water demand challenges. KOBWA and SEC operations coincide so that release of water at Maguga Dam goes through turbine, which generates electricity, and the water then flows through to support agriculture irrigation commitments. SEC also has agreements with all the companies to manage the potential damage on the electric line because of veld fires.

Generally, development in Swaziland, particularly in the energy- electricity sector has grown too fast. Unfortunately, this growth is not coherent to the right kind of customers that could adequately sustain SEC as a power generator. There is a lack of energy intensive industries. Over the years, the country has lost all its energy intensive industries like Dvokolwako mine, Swazi Paper Mills, Usuthu Pulp, Beral-Swaziland, to name but a few. Energy intensive industries pay competitive tariffs that enable SEC to reinvest in new technologies, including performing systems upgrades and expansions. These industries are also key players in maintaining a viable electricity system in the country. SEC made a big investment in the form of three substations at a cost of E36 million in Matsapha industrial site. With the loss of some of these industries in Matsapha, SEC has not been able to see a return on this investment (SEC, 2016: *Pers. Comm.*). Without such investments, it is impossible to supply reliable power to industry and blackouts can have rippling effects, which can cause damage to products, missed deadlines on exports, exit of factories from Matsapha industrial site, etc.

The lack of energy investment is a big issue in Swaziland. Even though the Head of State, and 2016 Budget Speech from the Throne encourage investment in energy, the actualisation of the energy plans and other development plans in the country has become a systemic problem. There is a huge gap between the developmental aspirations policy stance of the country and the actual implementation of these developmental goals. SERA is open to the diversification of energy generation in Swaziland as well as is keen to consider intelligent technologies that can contribute to energy production (SERA, 2016: *pers. comm.*).

“Nothing works without electricity. It is as good as security for the country. This 2015/16 drought has been the worst drought in the history of SEC organisation. It put a dead stop on electricity generation, which has never happened.”

4.4.4. Natural Environment & Ecosystem Productivity Sector

The environment is a gatekeeper of the natural resource base of any country. When droughts hit, the environment suffers the first set of impacts. When the climate and weather patterns

change, the environment is directly affected, which in turn limits physiological and biological processes that maintain flora and fauna as well as agriculture production systems in the country.

IMPACTS

The key issue, according to the Swaziland Environmental Authority (SEA), is the expansion of areas showing signs of desertification across the country. Areas that used to be green zones are now becoming semi-arid. Most vegetation has died and land remains bare and vulnerable to erosion. Some key areas include Somntongo and Hlatikhulu. On the same note, Hlatikhulu was previously producing a lot of food but during the 2015/16 drought there was no ploughing at all in the area. The implication is that there will be no outputs from Hlatikhulu, and in areas where they managed to plant, the crops just withered away well before maturity time. Rainfall from the year 2000 has been gradually declining. Now because of the drought, ecosystems are dry and are struggling, and in some cases failing to support the biodiversity of each habitat. There is a general shift in the ecosystem in the country due to drought and climate change: the ground is getting drier to the west of Swaziland. Vegetation is also shifting to the west and the grasslands are shrinking throughout the country. The grass in the country is also getting smaller in height (SEA, 2016: *Pers. Comm.*).

At species level, more in-depth assessments are required to determine changes to, and to ascertain how much the drought has cost the country in terms of the biodiversity of species in the different natural habitats. In terms of impacts on wetlands, SEA found that the drought did not affect protected wetlands as much because communities continued to maintain them. The drought affected unprotected wetlands. Generally, the ground remained bare and prone to erosion. The danger with this is that when the rains return, the country can expect a lot of gully erosion as a secondary impact of the drought. Trees have dried up too, leading to increases in deforestation, which in turn has decreased the rejuvenation capacity of the natural forests to flourish when rains start to fall. Deforestation and decreased capacity to regenerate natural forests further exacerbated biodiversity loss in the country.

Serious causes for concern are the opportunities the drought has created for alien invasive species. Alien invasive species are very opportunistic. They out-compete the native plant species in water, and nutrient usage. As the country started to receive patches of rain in late 2016, the alien invasive species got a greater chance to take over entire habitats across the country. Fire also became a critical issue during the drought. The incidence of veld fires during the drought was very high. Losing vegetation/forests/plant species due to fires might lead to further losses in the biodiversity of our flora in the country. Alien invasive species might also out-compete native plants post fires when vegetation starts to grow again. Water quality and quantity was a major concern during the drought because droughts introduce a diluting factor into the natural water system. They also magnify the concentration of pollutants and salts, which has an impact on the quality of water available for human use as well as the water available to sustain the various natural ecosystems in the country.

When drought intensified, SEA increased monitoring for pollution or water quality of main rivers and Transboundary Rivers. For the first time now because of the drought, SEA has also included Mbabane River in its monitoring exercise. Generally, SEA is finding that water pollution is on the rise.

INTERVENTIONS

In terms of conservation of wildlife biodiversity, the biggest challenge caused by disasters such as drought is that the laws prohibit lifting and relocating wildlife species. What could be done is to protect species by creating corridors for them to move and have the flexibility to occupy areas that are more favourable to their survival. During the course of the last two (2) years, SEA has been proactive in protecting eight wetlands that are a source of water for communities. Unfortunately, the Hawane wetland ran dry. However, other wetlands have served as a mitigation strategy for the drought by continuing to supply communities with water for domestic and livestock consumption. A total of E1.2 million went toward wetland protection. The SEA plans include to gradually mainstream climate issues/climate mitigation measures as a requirement in Environmental Impact Assessments (EIAs) for the development projects in the country. The SEA believes that EIAs can play an instrumental role in influencing developmental decisions on climate change to enable development projects to put the right structures in place to mitigate against climate change (SEA, 2016: *Pers. Comm.*). EIAs can be a powerful tool to protect the country's ecological infrastructure, rivers, forests, wetlands, flora, fauna, etc.

OPPORTUNITIES

A positive spin-off that the drought has brought for the environment sector is that people are now more interested in environmental issues following the scarcity of water in Mbabane. Due to the drought, the public now has a listening ear on issues concerning environmental management and stewardship. Some topical issues that have people interested now include building and protecting water catchment areas, understanding erosion issues, especially now that rains have begun. Turbidity and silt – Red River – issues are on the rise as rains wash bare soil into rivers. According to SEA, the drought was SEVERE and advised that Swazis:

“Need to conserve and protect the country’s ecological infrastructure just like the country takes care of its roads. In this 2014-2016 drought, we were more reactive rather than proactive. We need a disaster/emergency plan and an institutional will that will make these plans actionable. Most of our hydrological systems are fragile, even more fragile than we thought! The rangeland system in Swaziland collapsed completely and for the first time, there was no grass. The country had to import grass! The food production system collapsed and we lost livestock – we lost many cattle. We need to take our plans seriously because they are there for an important reason that can save many lives and keep our natural environment intact.”

4.4.5. Tourism Sector

IMPACTS

In order to assess the impact of the drought on the tourism sector, the Swaziland Tourism Authority (STA) approached some of the key establishments and found that the impacts ranged from moderate to high. Manzini, Ezulwini, and Pigg’s Peak had very low impact. There was no major water rationing in these areas and the establishments prepared for the water situation by buying tanks and generators. Tourism establishments based in Mbabane experienced the worst impacts. For instance, Mountain Inn Hotel had to use water from their pool to mitigate against the shortages. However, in terms of sale of bed space, the sector did not experience any decreases. To illustrate, visits into the country did not suffer much because of the mitigation measures put in place. Mbabane experienced most impacts on services; water shortages made it hard for businesses to operate because many of the services in the hospitality industry need water. Establishments in the Lubombo region had water generators and so water was relatively available. However, Lubombo suffered the most

on vegetation and animal (flora and fauna) impacts. Because of the scorching temperatures, a lot of the vegetation in the Lubombo region died. National Parks had to buy food/feed for the animals used to attract visitors into the country. In general, most of the tourism establishments incurred costs in procuring the infrastructure to mitigate against the drought – the water tanks, generators, etc. Now, moving forward they need assistance in maintaining this vital infrastructure and perhaps assistance in feeding the fauna.

INTERVENTIONS

The industry has minimum standards for accommodation – which enabled some significant preparedness in mitigating against the drought. There was no official communication coming from STA to the tourism industry about the drought. However, the industry was very proactive in establishing its own safeguards where possible, by purchasing tanks and generators, and other drought mitigation equipment. The STA could consider playing an advisory role to inform industry on eminent disaster or threats to the tourism industry in the future. The challenge during the drought was getting accurate, timely, and consistent information on its status/progress. Right now, inconsistencies from SWSC make it difficult to determine if the situation on water shortages will deteriorate or improve. The advisory role for STA needs strengthening because currently the organisation does not offer any financial assistance to industry except for providing information in a timely, accurate, and consistent manner to save the tourism industry a lot of money.

The challenges faced by the tourism industry led STA authorities to remark that the Authority:

“Is focused on marketing the tourism industry but sort of forgot what it was marketing in the first place. We neglected the product! We sell Swaziland as a cultural and scenic beautiful country. Yet the drought affected the scenery aspect of Swaziland as a tourism product. There has to be a lot of investment and commitment from STA on what the product we are marketing really is and how we [STA] can protect it during disasters such as drought. STA needs to look at the supply-chain and industry linkages to identify sensitivities and produce a risk analysis for stakeholder performance for different disasters to prioritise action plans.”

4.4.6. Urban Development

When the drought hit Mbabane, disaster management structures had already been developed and established within the Mbabane City Council in order to ensure resilience. However, in reality, the 2015/16 drought challenged resilience. For the first time in the history of the city, Mbabane residents felt exposed to drought - it attacked their dignity and self-worth, and threatened business activity. Once the eminent threat of water being cut down became a reality in Mbabane, businesses were very receptive and there was no blame shifting. Instead, business took the issue to task to figure out what to do to remedy the situation. Warnings to businesses about the threat of the drought went out in November 2015 - before the disaster management structures kicked in and the drought declared a national disaster. Some of the key stakeholders involved by the city for disaster risk reduction were the Police, MET, Big Business, Transport Association, etc. The city has an internal risk reduction committee that has quarterly meetings: they have a disaster risk reduction policy and operational plan and technical team of skilled people/experts in water management issues. The Risk Advisory Committee technical team ensures adequate implementation of plans.

IMPACTS

The municipality took a firm decision to stop watering city owned flora. The city could not react accordingly to predictive mechanism for species replacements - schedule of species replacement or rehabilitated under the annual operational plan was interrupted and eventually frozen due to the drought. Recreational assets like the golf course suffered greatly. Soil became very fragile/loose due to the drought and activity in the golf course had to be restricted. Road infrastructure suffered damages due to water operations on modulating pressure values across the city. Some walkways needed replacement (may not necessarily be due to drought) but the city had to spend in the ballpark of E1 million in road repairs and such during the drought. Other costs will only be determined once the drought has passed.

INTERVENTIONS

The CBD was priority for water supply and maintenance throughout the drought and this became possible through Mbabane River, which has some adequate water flow in addition to the SWSC Mbabane Water treatment plant. This is also an opportunity for the city to do a comprehensive investigation of the sources for Mbabane River and its regenerative capacities. The city isolated schools in the action plans and gave them special treatment status because schools pose major health and sanitary risks. Zone leader meetings were held to discuss mitigation strategies. The REO/Ministry of Education and Training (MOET) was asked to close schools early during the worst of the drought. However, there was tension initially between the city and the MOET stemming from coordination issues. The city also provided water to schools. The Mbabane City Council adopted an inclusive approach in alerting residents and businesses. Everyone was alerted on eminent drought. Huge strengths were the coalitions that were formed especially with NDMA, which allowed the city to map out all the schools that would need water tanks and tank filling services in the course of the drought. The city conducted water quality tests through their internal laboratory unit, and found that 30% of the water tested was safe for drinking.

Businesses and residents outside the CBD suffered the most from the 2015/16 drought. This is because these businesses and residents did not have the luxury of the water treatment plant. Moreover, residents suffered from restrictions of watering lawns, four-day general SWSC restrictions, restrictions on public gatherings – church gatherings – Good Fridays, revivals, etc. The CBD was the most prepared because of the water tanks, prioritisation from SWSC, and the water treatment plant. With these mechanisms, the CBD was the least affected by drought. In hindsight, the city was not sufficiently prepared for the drought: “Drought phenomenon was always thought of as a rural phenomenon. It was inconceivable that Mbabane could run out of water! Moving forward and working with NDMA, whether you see a cloud or not, let us operate as if we are in drought.” When there is a looming disaster, Met and NDMA play a leading role in forecasting and implementing early warning programmes. The problem is that some people, businesses and organisations do not take warnings seriously. A voice like NDMA becomes necessary back up to ensure that a majority of the country takes the message seriously.

4.5. Early Warning System

The Early Warning System (EWS) in the country focuses on agriculture. While agriculture is important on climate-induced disasters, a sector neutral EWS can be much more beneficial to disaster preparedness and management in the country. There is a need for a general platform that feeds properly to all parts of the economy. Met has a 3-month rolling format on EWS. On the public domain, there is a 4-day rolling forecast. This means the closer to the actual disaster event, the uncertainty gets smaller. Forecasting is much more accurate as the

actual disaster draws closer. This presents a challenge in the sense that forecasting for a longer timeframe makes it harder for the public to interpret and use the data appropriately. For the 2015/16 drought, indicators that the drought had started became visible by July 2015 and by September 2016, the country was experiencing a fully blown drought. Collaboration is necessary for effective early warnings. Capacitating extension officers and other relevant officers to disseminate information issued by Met to end-users such as farmers and businesses could improve early actions. While the information issued by the Met should empower farmers and smallholder producers to make informed decisions about the specific situation of their location and type of farming, the final decision on whether to farm or not, or when to start producing/farming rests with the farmer/producer.

4.6. Monetary Cost Estimation of the 2015/16 Drought on Swaziland's Economy

The foregoing discussion demonstrates that the drought negatively affected the country's main economic sectors. The impacts created a dip in economic activity and left a significant dent on economic development in the period 2014 to 2016. A majority of livelihoods, particularly rural households, depend on agriculture. The drought had a severe and crippling effect on the economy because the economy's backbone, agriculture, did not perform to a normal and acceptable level (CBS, 2016). Maize, sugar, and cotton production all decreased, and the drought eroded a substantial stock of cattle in the country. Since the economic sectors did not perform well, revenue, including potential revenue, was lost. Crop, animal production, and food manufacturing were the most affected by the drought. These sectors account for more than 15% of total domestic revenue (CBS, 2016). Sugar exports account for 22% of export earnings and with a drop in sugar production, the country's export earnings shrunk, which in turn, had a negative effect on the country's balance of payments.

On average, most of the cattle sold to the Swaziland Meat Industries were of low quality, yielding low prices to domestic livestock producers in the country. Moreover, the EU and Norwegian markets downgraded 33% of Swaziland beef exports into low quality beef (SMI, 2016: *Pers. Comm.*). A further decline in exports, as the full impacts of the drought on the economy unfolds, will impose serious reductions in the country's foreign currency earnings, which will likely have a huge effect on the balance of payments account. The drop in maize production exacerbated food insecurity in the country, particularly in the rural sector. Overall, the impacts on households and across the different sectors of the economy exerted pressure on government expenditure and revenue generation. In terms of government expenditure, top priority went into the provision of drought relief and mitigation measures. In the 2016/17 government budget, a supplementary budget of E105 million was allocated to the drought. In addition, an extra E200 million was allocated for drought mitigation and went into food and water distribution to most vulnerable communities, drilling of boreholes, dredging of Hawane Reservoir, and provision of supplementary feed for livestock, and importation of power from South Africa.

To estimate the monetary cost of the 2015/16 drought on the economy of Swaziland, the study uses the immediate quantifiable impacts highlighted in each sector of the economy. As already discussed, these effects are either due to losses in production revenues, damage to property, and money used for intervention programmes. At the time of conducting the study, the drought was still not over and some costs will manifest long after the timeframe of this study. Therefore, a real cost of the drought (EI) can only be calculated once all the direct and indirect impacts have manifested in the economy two or three years after the drought has gone.

To attach a monetary value to the drought, the study uses a summation of the nominal costs for all the direct and indirect costs as follows:

$$\text{Economic Impact} = \text{direct costs} + \text{indirect costs} \quad \dots 1$$

where direct costs represent the physical damages and indirect costs refers to the costs of interventions. Cochrane (1997) and Rose (2004) extend the definition of direct costs to include not only the physical damages but also the consequences such as business interruption and unemployment. They redefine indirect costs as arising from interactions and transactions between economic industries and sectors. Dore and Etkin (2000) explained that the total burden imposed by the drought on the country should also include the indirect costs, including the opportunity cost of resources allocated for relief and reconstruction. However, for the purposes of this study and noting that data is not available on how the drought may have affected or interrupted businesses, focus is on nominal costs of the drought at the household level and on the economy. To calculate the monetary value of the losses in household consumption due to the drought, the study used the methods discussed in Section 2.4.

The first question is; how did the drought affect aggregate demand at the household level? Table 4.6.1 below provides a summary and estimation of the 2015/16 nominal costs according to the resources spent in immediate response to the drought at the household level. The Table compares the sampled households in the four regions according to geographical location. From the sampled households, urban and rural households in Manzini spent a significant proportion of their budget on food each month (E889 and E883 respectively) compared to households in the other regions. Generally, rural households spend a bulk of their incomes on food each month in decreasing order with Manzini spending E883, Hhohho spending E875, Shiselweni spending E812, and Lubombo being the lowest food spender at E639. On average, rural households in the Lubombo region are relatively poorer than rural households in the other regions are and consume, on average, 30% less food than their counterparts in rural Manzini and Hhohho. Table 4.6.2 below calculates the actual losses in food consumption in each region according to geographical location of each household based on the percentage of households that reported reduction in their food budget by 75%, 50%, and 25% during the drought.

The calculations reveal that rural households in the Hhohho region experienced a higher proportion of households that saw a reduction in food consumption of 75%, which amounted to E4,000,464 and constituted about 15% of the total food consumption losses in all the regions each month (E26,576,985) (see Table 4.6.2). As well, rural households showed a bigger reduction in food consumption during the drought than urban households. The highest losses were seen in rural households in Manzini, which have an estimated loss of E9,048,220, followed by rural households in the Hhohho region at E8,291,561, rural Lubombo at E5,349,248 and rural Shiselweni reporting E3,887,954 food consumption loss per month during the drought (see Table 4.6.2). For urban households, the biggest drop in food expenditure budget occurred in Manzini, which reported a 27% (E2,405,669/E9,048,220) drop in total food consumption. In the Lubombo region, urban households accounted for 19% of the monthly food consumption losses while urban households in the Hhohho and Shiselweni regions accounted for 11% and 1.7% of food consumption losses, respectively (see Table 4.6.2).

Table 4.6.1 Reduction on Household Monthly Food Budget due to drought

Region	Urban Food Budget (E)	Rural Food Budget (E)
Hhohho	798	875
<i>75% reduction in food budget</i>	598.5	656.25
<i>50% reduction</i>	399	437.5
<i>25% reduction</i>	199.5	218.75
<i>0% reduction</i>	0	0
Manzini	889	883
<i>75% reduction in food budget</i>	666.75	662.25
<i>50% reduction</i>	444.5	441.5
<i>25% reduction</i>	222.25	220.75
<i>0% reduction</i>	0	0
Shiselweni	867	812
<i>75% reduction in food budget</i>	650.25	609
<i>50% reduction</i>	433.5	406
<i>25% reduction</i>	216.75	203
<i>0% reduction</i>	0	0
Lubombo	705	639
<i>75% reduction in food budget</i>	528.75	479.25
<i>50% reduction</i>	352.5	319.5
<i>25% reduction</i>	176.25	159.75
<i>0% reduction</i>	0	0
<i>Total losses/ month/ household</i>	4,888.5	4,813.5

Source: Authors' own depiction using survey data.

Notes: Note that figures in bold show reported food budgets in the regions before the drought. These figures are given per region per geographic area. The figures underneath those in bold provide food losses according to the reductions in food budget because of the drought.

Total food consumption losses per geographic area across the four regions of Swaziland amounted to E30,973,463 (urban losses of E4,396,478 plus rural losses of E26,576,985) - see Table 4.6.2. We take this E30 million-food consumption loss per month and spread it over a period of 21 months to estimate the total food consumption losses and drop in GDP due to a shrink in households spending on food during the drought (see Table 4.6.3 Household food consumption loss). The 21 months represent an estimate of the period in which the drought affected food prices in the country. The study uses 21 months because 1) food inflation increased from 4.3% in March 2015 to 19% in December 2016 while 2) the first rains fell in December 2016, which yields a period of 21 months. Adding the monthly costs for all the 21 months yields the estimate of the total losses in food consumption in households during the drought, which is E650 million (see Table 4.6.3). Note that the E650 million excludes the cost of food produced at the household level.

Table 4.6.2 Monthly Household Food Consumption Losses due to 2015/16 Drought

	Urban Consumption Loss	Rural Consumption Loss	Total Consumption Loss
Hhohho			
<i>75% reduction in food budget</i>	233,873	4 000,464	4 234,337
<i>50% reduction</i>	467,746	2 564,400	3 032,146
<i>25% reduction</i>	218,281	1 726,696	1 944,977
<i>0% reduction</i>	-	-	-
	919,901	8 291,561	9 211,462
Manzini			
<i>75% reduction in food budget</i>	1 167,457	2 951,652	4 119,109
<i>50% reduction</i>	778,304	3 794,981	4 573,286
<i>25% reduction</i>	459,907	2 301,586	2 761,493
<i>0% reduction</i>	-	-	-
	2 405,669	9 048,220	11 453,890
Shiselweni			
<i>75% reduction in food budget</i>	67,136	1 446,193	1 513,330
<i>50% reduction</i>	-	1 341,396	1 341,396
<i>25% reduction</i>	-	1 100,364	1 100,364
<i>0% reduction</i>	-	-	-
	67,136	3 887,954	3 955,091
Lubombo			
<i>75% reduction in food budget</i>	80,301	873,346	953,648
<i>50% reduction</i>	535,344	3 056,713	3 592,057
<i>25% reduction</i>	388,124	1 419,188	1 807,312
<i>0% reduction</i>	-	-	-
	E 1 003,770	E 5 349,248	E 6 353,018
Grand Total Loss	E 4 396,478	E 26 576,985	E 30 973,463

Source: Authors' own calculation using survey data

Notes: The Table shows estimated consumption losses in (E) due to the drought as per the different scales. It also provides total estimated consumption losses per geographic area per month, in each region and for all the regions.

Table 4.6.3 also presents estimates of the nominal costs of the drought to government and to the economy. First, government allocated a total of E350 million in drought response and mitigation. The money went into drought response and mitigation programmes covering health and nutrition, education, WASH, agriculture and food security, security and protection and coordination, as shown on Table 4.6.3. Second, the agriculture sector suffered huge production losses in the 2015/16 drought. Cotton production dropped by a whopping 90%, losing an estimated E4 million of potential financial capital for farmers in Lubombo and Shiselweni just on cotton farming. The sugar industry reported that during the 2015/16 season it expected a 10% drop in yields, which would result in E120 million in financial losses without including revenue losses in export markets. The country lost an estimated E702 million worth of livestock due to the death of cattle and low prices farmers fetched from the sale of low quality beef, including losses in the EU and Norwegian markets for downgraded low quality beef. Maize production dropped by 67% in the 2015/16 growing season. NMC had to import 33,446 tonnes of maize to supply the domestic market and increased the price of a tonne of maize by E2,332. In total, the decline in production and importation of maize is estimated at E467 million. The amount does not consider the cost of increased prices due to food and overall headline inflation.

Third, in the energy sector, the government together with SEC had to import E237 million worth of electricity from South Africa because of zero hydropower generation in Swaziland. Although the country imports a substantial portion of its energy needs, in the calculations, the study includes the total costs for electricity to capture the short-term effects of SEC's decision to suspend core capital projects to deliver energy in households and businesses. Finally, the SWSC had to construct an emergency water treatment plant in Mbabane at an estimated cost of E10 million to supply the CBD as well as extract water directly from Lumphohlo Dam through a pipeline to Mbabane at a cost of E110 million.

In total **nominal monetary terms**⁷, the study estimates that the 2015/16 drought cost Swaziland E3.843 billion, as shown on Table 4.6.3. This is equivalent to **7.01%** (E3.843 billion/E54.828 billion) of Swaziland's GDP in 2016 or **18.58%** (3.843 billion/E20.678 billion) of government expenditure in 2015/16. This figure is on the conservative side. First, the study could not get information from the Swaziland Dairy Board for milk production losses, National Marketing Board (NAMBoard) for vegetable production losses, banana estates for production losses, and citrus fruit producers. The forestry sector also suffered greatly, with some parts experiencing wildfires that destroyed many hectares of forests that amounted to many millions of Emalangeni. As well, the study did not assess losses to fisheries and fish stocks, especially from the total dry up of Hawane Reservoir and the reduction in water levels in many rivers and dams in the country. Other environmental losses in terms of flora and fauna could not be ascertained because of lack of data on stocks, lack of estimation on the monetary value of these wildlife stocks, and because the total monetary value/cost were not visible at the time of conducting the study and will manifest well beyond the timeframe of this study.

The E3.843 billion only accounts for the immediate short-term cost of the drought and omits the long-term benefits that could have accrued to farmers and to Swaziland due to the biological assets destroyed by the drought. It also does not account for the wildlife lost, including the costs of biodiversity shrinkages, and its long-term effect on the general state of the country's ecological infrastructure. Likewise, the study does not quantify the opportunity cost of the money diverted to drought interventions. It does not factor in the impacts of water shortages and poor water quality during the drought given lack of reliable data to

⁷ 2016 currency (Emalangeni) values.

quantify such. For example, during the drought, the mud residue accumulated in water appliances, such as geysers, could, in the long-term, be an added cost to households because the sludge will shorten the lifespan of household and industrial equipment. The calculation is by far an underestimation of the impacts of the drought in Swaziland because the country lost a lot more. To be clear, some impacts of the drought are still to manifest.

Notwithstanding the tangible benefits that may have accrued to the country due to the drought, such as improvement in the stock knowledge on water-saving techniques both at the household and national level, adding these would still not account for the losses incurred from the agricultural sector. For example, some of the biggest losses relate to the fact that the drought has wiped-off household savings, which would have long-term consequences at the household level from a human capital development point of view. In the sugar sector, replanting of rhizomes had to be suspended, would have a huge effect on yield in years to come. This speaks to some of the challenges that will linger in the economy for many years to come.

An emerging theme from the preceding discussions is that drought-like conditions are becoming increasingly common in Swaziland, which begs the question: how adequate is the country's disaster management policy? The next section attempts to answer this question.

Table 4.6.3 Monetary Cost Estimation of the 2015/16 Drought on Swaziland's Economy

SECTOR	IMPACT	NOTES	COST (E)
1. Health and Nutrition, Education, WASH, Agriculture and Food Security, Protection and Coordination	Government of Swaziland and Implementing Partners	NERMAP used about US\$39,098,792 to assist 413,553 beneficiaries based on food and cash distribution statistics over a period of 11 months. 54% of government's short-term commitment to the response had been received. In total government provided US\$8,994,000 (E122,768,100); United Nations US\$15,127,408 (E206,489,119); Partners US\$14,977,384 (E204,441,292). Use an exchange rate of 13.65 (US\$; SZL) to calculate the total response provided in these sectors of NERMAP.	533,698,510.80
	Government of Swaziland	Government had already committed E45 million to assist 158,000 people before the drought was declared a disaster.	45,000,000.00
	King's donation	His Majesty the King donated a cheque of \$150,000 to help NDMA assist drought victims	2,273,621.00
	CERF	Central Emergency Response Fund	47,000,000.00
	OCHA	Office for the Coordination and Humanitarian Affairs contribution to drought mitigation	1,125,000.00
	UN	UN contribution to drought coordination	1,500,000.00
	Swaziland Royal Insurance Corporation	Cash contribution	250,000.00
	PSPF	Cash contribution	250,000.00
	SSA	Cash contribution	120,000.00
	CBS	Cash contribution	1,000,000.00
	First National Bank	Cash contribution	570,000.00
	Taiwan Embassy	In-Kind contribution (260 tonnes of rice)	5,000,000.00
	Hlalawati Savings & Coop	Cash contribution	10,000.00

	Motor Vehicle Accident Fund (MVA)	Cash contribution	300,000.00
	Swaziland Conference of Churches	Cash contribution	111,551.91
2. Cotton Sector	Cotton production in Swaziland is 100% reliant on rainfall water. Production dropped by 90% from 873 tonnes in 2015 to 100 tonnes in 2016.	In 2013/14 E9 million was paid to farmers for 1,600 metric tonnes of harvested cotton and E600,000 for 10 truck owners collecting the cotton. In 2014/15, E4.4 million was paid to farmers for 873 tonnes of cotton at an average price of E5.15/kg. Using 2015 prices the loss is 773 tonnes*E5.15*773,000kg cotton.	3,980,950.00
3. Sugar Production	Total sugar sales are projected to decline by 22 percent in 2016/17 marketing season after recording a record high of 700,017 metric tonnes in 2015/16. For the 2016/17 season, sales from SACU are expected to drop by 5% whilst export sales outside the SACU market are expected to drop by 45%. The industry also reported a financial loss of E120 million for the 2016/17 financial year.	Sugar sales improved in 2015/16 due to increased production and carried over inventories from 2014/15. The value of export receipts outside SACU in 2015/16 were valued at E1.456 billion. The value of SACU sales was E2.573 in 2015/16. Total loss directly linked to the drought equals E120million + 0.05*2.5736billion + 0.45*1.456	903,850,000.00
4. Beef Production	88,000 cattle died due to the drought. Calve births decreased by 6% in 2016 for a total loss of 26,000 calves. Cattle slaughters increased by 62.4% in 2015 as farmers disposed their cattle due to the drought. Most affected areas sold cattle at E1,500 and not more than E4,000.	Assume the value of each cow that died at E5,000. Assume E7,000 for the price of a calve that was not born due to the drought. For the 33,000 slaughters during the 2015/16 period, assume the depreciated value on each cow of E2,250 (median of E1,500 and E4,000). A total of 33% of beef exports to Norway was downgraded to low quality beef. The value of beef exports to EU market to EU was E83,634,000 in 2015 with an average price of E74,275 per tonne. The Norwegian market has a 500 metric tonne quota. We can assume a 50% drop in price for downgraded beef.	702,377,687.50

5. Maize Production	101,000 to 33,460 tonne drop in production in the 2015/16 growing season. NMC increased price of white maize by 66% from E3,533 in 2015 to E5,865 in Jan 2016. NMC also had to import 30,446 tonnes of maize from South Africa, and in Jan 2016, the price of white maize was E4,935.	Assume E3,533/tonne for the 67,540 tonne decline in production. The increase in price of maize by NMC is equivalent to E2,332 for the 33,460 tonnes produced. For the imports on white maize, assume E4,935/tonne for 30,446 tonnes.	466,898,550.00
6. Water Supply	Weir Water treatment plant constructed in Mbabane to provided water to the CBD. The SWSC also began constructing a pipeline to supply water directly to Mbabane from Luphohlo dam.	The water treatment plant cost E10 million and the pipeline cost SWSC E110 million at the time of the interviews.	120,000,000.00
7. Electricity Generation	The drop in water levels at Luphohlo and Maguga dam forced SEC to stop generating power locally and import all electricity from South Africa from October 2016.	SEC had to get an E80 million subvention from the government to meet costs of imports with SEC topping up the rest meet the total cost of E237 million over a period of 3 months.	237,000,000.00
8. Household Food Consumption	The drought affected mostly food production leading to an increase in food inflation in the country. We estimate that on average each month, household spending on food dropped by E30,973,463.73.	Spread the reduction in food consumption over a period of 21 months (April 2015 to December 2016).	650,442,739.63
TOTAL 2015/16 ECONOMIC COST OF THE DROUGHT			3,842,758,610.84

5. DISASTER MANAGEMENT POLICY IN SWAZILAND: A REVIEW

5.1. Policy Objectives

Prior to the establishment of the National Disaster Management Agency in 2008, the National Disaster Task Force dealt with disaster on an *ad hoc* and reactive basis focusing on disaster relief and response during the actual disaster event. The Disaster Management Act of 2006, enacted by the King through Parliament, bridged the gap by providing a framework for approaching disaster management in a manner that integrates and co-ordinates disaster management programmes holistically. Accordingly, with the installation of the NDMA in 2008, the government enacted the Disaster Risk Management Policy 2010 to align disaster management in the country to focus more on prevention and minimising exposure to disaster. The agency's goal on disaster management in Swaziland is to prevent and minimise the impact of disasters on vulnerable communities and groups, develop response systems and standards, and issue timely alerts on any disaster and help protect the country's critical infrastructure.

The drought demonstrated that Swaziland has a powerful instrument and turnaround approach to disaster management from *ad hoc* relief and reactive response to preventative measures and reducing loss and damage on all aspects of livelihoods in the country. However, a question that requires an answer is: *if the country has powerful tools for disaster management, what is lacking that caused suffering and economic losses from the drought?* The short and straightforward answer is that the essence of the 2010 Disaster Management Policy is to make disaster management an integral part of the development process in the country. The policy must focus on eliminating or reducing the inherent or systemic risks to drought to reduce impacts on human livelihoods, and damage and loss of property. Furthermore, the policy needs to advocate for a shared sense of awareness in the country that is cognisant of the fact that drought is no longer a rare occurrence, and so institutional and household responsibilities need moulding to reduce endemic risks throughout the country. The fact that the country has already shifted disaster management to focus on prevention is commendable, but whether or not the institutional structures are well established and ready to eliminate or reduce risks from natural disasters is a matter of implementation of the policy.

5.2. Instruments for Drought Disaster Management

The Government of Swaziland through the NDMA uses the DRM Policy to guide all disaster management programmes in the country. The policy aligns well with the National Development Strategy (1997, 2014), a guide toward Vision 2022 and national development instruments with respect to making the country disaster proof. It offers integrated sector plans and frameworks, development planning, programming and projects toward eliminating adverse impacts of disaster in Swaziland. Indeed, in working towards attaining a disaster proof country, the GoS makes clear commitment and priority to protect its citizens and national assets by reducing the risk of losses from disaster. This involves saving lives, livelihoods, and property by being proactive in the anticipation of disaster threats and erecting all the necessary structures and plans of action to reduce the risk of impact before the events occur. Furthermore, the policy recognises the unique socio-economic challenges the country is facing in terms of extensive poverty and the high HIV pandemic that is threatening livelihood security. It is cognisant of the fact that without addressing the

systemic challenges of debilitating poverty, food insecurity, and poor participation in productive economic activities by rural households, disaster management will be an ineffective endeavour.

To create a favourable socioeconomic environment that can effectively reduce or shield households from disasters, the country needs to address and eradicate the synergistic effects of poverty, HIV, and food insecurity, among other issues facing Swaziland. The disaster management policy follows the SENDAI Framework (2015 – 2030) on disaster management by tackling the underlying disaster risk drivers such as the consequences of poverty and climate change, including the specific socioeconomic conditions that predispose households and their communities to the worst of disaster impacts. The assessment of the impacts of the 2014 – 2016 drought shows that it exacerbated the already glaring impacts of poverty and further deepened food insecurity at the household level on top of wiping out household assets and savings. The drought decapitated household livelihoods, especially in rural Swaziland where the socioeconomic conditions were already fragile and deeply vulnerable to the additional risks created by the drought.

Even with the country's solid DRM Policy, this study finds that Swaziland is struggling to become drought proof. This is because, despite the experience and knowledge in drought - the country has garnered through comparable droughts in 2009/10, 2007, 2001, and 1992 - the country's economic backbone rests on agriculture. Droughts attack and compromise the natural environment, which in turn limits the productive capacity of the economy to reap benefits from agro-industries. Therefore, on paper, the policy is solid and enshrined to the developmental process of the country; however, practical implementation needs serious firming up. To illustrate, Section 6.4 of the DRM Policy (2010) talks to the practical application of the policy to reduce the underlying risk and vulnerability factors at all institutional levels in the country. Specifically, Section 6.4.2 addresses the agriculture issue by seeking to promote "food security, protection of public facilities, safety nets, and partnerships in social and economic development practices." Yet the food production system in Swaziland is still highly dependent on rainfall. As well, many households in the rural sector are no longer involved in food production – this study finds that the level of involvement in food production in rural Swaziland stands at 21.9% at national level, making the country too dependent on the international, essentially South African, market for its food needs. Communities in Swaziland still need to organise local resources to scale up food production and increase production under irrigation even at the household level.

The problem is not with the policy *per se* but an element of time and investment in the programmes stipulated in the policy. Consistently, when droughts hit Swaziland, household savings and traditional safety nets suffer as was evidenced by the loss of 88,000 cattle, and 67% drop in staple food (maize) production in the country. Strategies for drought-proofing Swaziland should focus on rehabilitating and strengthening the food production system and the general agriculture sector so that is not too dependent on direct rainfall. In addition, a sense of shared responsibility between the government and households should be encouraged as a foundation for establishing mechanisms that will eliminate adverse exposure to drought impacts. In this sense, the government should continue playing a leading role in the provision of water harvesting and storage to allow continuous production in the agriculture sector even in times of drought. Households can work with government to ensure that water and agriculture production infrastructure in the country allows for irrigation of smallholder farms and diversification of crops that can ensure enough food and fibre is produced at all times.

Various policy instruments and institutions support the agriculture industry in Swaziland. Table 5.2.1 below provides a list of the institutional mechanisms that exist to strengthen and grow the agriculture sector in Swaziland. Key players provide services such as finance, marketing, extension, training, research, information, and humanitarian assistance. The GoS has developed national policies and strategies under the guide of the PRSAP to eliminate poverty and improve food security in the country. The agriculture sector is seen as a vehicle that ensures food security in the whole country, as well as at the household level (MOA, 2016). The 2005 Comprehensive Agriculture Sector Policy (CASP) has a target of reducing poverty by 50% by 2022 through promoting sustainable agricultural development, economic growth, poverty alleviation, food security, and sustainable natural resource management. The intentions of agricultural policies and strategies in the country are geared towards rehabilitating and strengthening the food production system in Swaziland. For instance, the MEPD through the PRSAP supports the CASP by committing to accelerate equitable agricultural production in the country, including land security and management of the environment. Furthermore, the MEPD recognises the potential of the agriculture sector towards stimulating economy growth and therefore seeks to increase its contribution to GDP.

Table 5.2.1 A Survey of the Institutional Capacity to Support Agriculture in Swaziland

ECONOMIC INSTRUMENTS	ROLE
1. Ministry of Agriculture	Policy legislation in the agriculture sector as well as ensure national food security. Responsibilities of the Ministry are quite extensive and they include veterinary and livestock services, fisheries development, land use planning and development, as well as agricultural research and specialist services.
2. National Agricultural Marketing Board (NAMBOARD)	Serves an important role in marketing agricultural products and issues import and export permits for food security instruments in the country.
3. National Maize Corporation (NMC)	Another important role specifically targeting the marketing and storage of maize to guarantee availability of staple food at reasonable prices throughout the year. The corporation also guarantees a market for local farmers so that they can sell all their maize produce each growing season.
4. Swaziland Dairy Board	Mandate is to regulate the dairy industry to ensure that sufficient dairy products are products for food security and income generating purposes.
5. Swaziland Cotton Board	Though cotton is not edible, supporting this industry ensures that farmers in the Lubombo and Shiselweni region have means for sustaining their livelihoods especially in areas where maize production does not do so well.
6. SWADE	As discussed above the parastatal under the Ministry of Agriculture empowers communities and smallholder farmers on

	SNL through water and agricultural development projects.
7. National Disaster Management Agency (NDMA)	Established institution to coordinate disaster management. The entity has a fundamental role in preventing disasters before they occur. To prevent collapse in the agriculture sector due to drought, the agency has an inherent interest to promote the implementation of the food security measures that have been put in place nationally.
8. Department of Meteorology	Issues forecasts on weather and climate patterns to prepare the agriculture sector each growing season.

Some of the mechanisms that the government commits to use to reach these goals include the commercialisation of farmers on SNL by increasing integrated irrigation development schemes in the country, deployment of extension officers, and easy access to tractor hire services for smallholder farmers (PRSAP, 2006). The PRSAP recognises that farmers suffer from delays in ploughing and planning in addition to the challenges created by erratic unfavourable rain patterns. Moreover, marketing and pricing is identified as a disincentive to increased production on SNL. This is because the price setting mechanisms used by marketing boards such as NMC and NAMBOARD is discouraging farmers from increasing agricultural production (PRSAP, 2006).

About 70% of Swaziland's 1.2 million people reside in rural areas and derive their livelihoods from subsistence agriculture on SNL. An important feature about agriculture activity on SNL is that it does not qualify for credit from financial institutions because of insecure land tenure. As a result, smallholder agriculture on SNL is characterised by low production and productivity. For example, smallholder producers occupy 75% of the cropland in Swaziland but only contribute 11% of total agricultural outputs (GAIN, 2016). However, such contribution is highly variable with some years seeing bigger contributions and some small. To illustrate, between 2011 and 2015, SNL contributed approximately 17% of agricultural GDP (CBS, 2016). During the drought in 2015/16, the contribution of these producers shrank by almost 40%. Data from the household survey reveals that on average a crop farmer can expect to earn E2,446 less than a skilled (or professional) worker, or E1,572 less for a livestock farmer, and E1,565 less for a cash crop farmer, each month respectively.

The analysis conducted in this study shows that crop farmers start making positive income on farming fields of 0.5ha to 1ha and larger. For example, maize technologies that can yield grains of up to 10t per hectare are already available in neighbouring countries. Providing these to local farmers together with the necessary inputs needed for these technologies to perform optimally could lead to an improvement of more than 2,000% in maize production, which could inspire huge gains in agricultural productivity and lay the foundation for an agro-inspired industrial revolution in Swaziland. A majority of these technologies is also transgenic or genetically modified (GMO) crops. For Swaziland to benefit from these advances in agricultural science, the country could consider harmonising its seed policies with those of neighbours, especially given that climate change and its superseding factor of unreliable rainfall and frequent droughts is going to be common going forward. For example, while Swaziland does not have a GMO Act or policy, the country imports a significant amount of its grain needs from South Africa which uses GMO seed to produce maize (see Dlamini and Liebenberg, 2015 for latest statistics on the usage of GMOs in commercial farms

in South Africa). Similarly, harmonising seed laws could give the country access to technologies such as the Agricultural Research Council released, Bill and Melinda Gates Foundation funded, Tego Variety (WE1101), which is drought-resistant.

For livestock farming, there is huge potential for income generation should investment into maize production, sunflower, and soybeans be firmed up. For example, high feed costs in pork, beef, and poultry production reduce farmer profits. As a result, a pork farmer makes E42 per month compared to E21 per month made by a beef farmer or E16 per month made by goat farmers and E11 per month made by poultry farmers. Even though production and productivity may be low on SNL, the household survey data shows that with targeted investments supporting rural farmers, significant improvements can be made by the agriculture sector. For example, as part of implementing the PRSAP, the Swaziland Water and Agricultural Development Enterprise (SWADE) has helped improve the livelihoods of a large group of farmers in Siphofaneni by assisting them establish and operate irrigated farms that cover 6,000ha. Opportunities exist for the government to replicate the successes already gleaned in Siphofaneni. Regions such as Shiselweni could do with the kind of assistance given to Siphofaneni to improve agricultural production given that households in this region demonstrate a higher affinity for agricultural production than elsewhere in the country.

With this background on the state of food production in the country, the NDMA should continue implementing disaster management programmes under the guidance of the DRM Policy already in place. Further, the policy is supported and implementable through the National Emergency Response, Mitigation, and Adaptation Plan (NERMAP) from 2016 – 2022, a document that provides an action plan for responding to the 2015/16 drought addressing both short-term and long-term needs. NERMAP is a multi-sector approach action plan where each sector of the economy has a specific role to play in addressing drought impacts now and in the coming future. Generally, people in Swaziland have access to information about drought, and the Meteorology Department released numerous warnings about the looming drought disaster. The onus is on people and their communities to absorb the information and take smart decisions to prevent droughts from becoming a disaster that threatens their livelihoods. The government has a role to play in building this capacity. The country requires resources to ensure that the implementation of the DRM policy programmes goes as planned to ensure that the country is drought proof. This is not only government or NDMA's responsibility, but also rather a multi-sectorial and multi-stakeholder responsibility.

The only glaring gap in disaster management stipulated by the national policy and NERMAP is the provision of a sustainable funding mechanism that will ensure that the country implements - as planned and without financial challenges – all identified institutional structures and programmes under each sector of the economy and household livelihoods. Even though the GoS dedicated a significant budget (E350 million) to address the impact of the drought, a lot more money is still required to address issues of agriculture and food security, education, urban water and sanitation, rural water and sanitation, health and nutrition, social protection, environment and energy, storm damages, and coordination. The total budget needed to address effectively the impact of drought well in the long-term is close to E1 billion. The core responsibility of the NDMA is to ensure the protection of every citizen in the country, regardless of income band in the event of disaster. Hence, a sustainable Disaster Management Budget is necessary as a fundamental aspect of protecting life and property. Not only will it give the country the ability to cope in shock, it will provide the necessary resources for shirking households from disaster.

Therefore, creating a practical and sustainable funding model for NDMA should become a top priority for the country moving forward. In the 2015/16 drought, many of the households

that were able to come out unscathed from the serious impacts were those that had the financial muscle to buy tanks, drill boreholes, etc., and continue to afford food despite the increases in prices.

5.3. Implications of the 2015/16 Drought on NDS, SDGs and AU 2063 Agenda

The 2015/16 drought had a severe impact on agriculture. Agriculture is still the backbone for inducing economic growth in Swaziland, especially since close to 70% of the country is rural, and depends on subsistence agriculture for food and income. The implication is that a vast majority of Swazis depend on agriculture for food security and poverty alleviation. However, agricultural production in Swaziland is still predominantly reliant on rainfall. In addition, agriculture insurance, as well as crop diversification beyond maize and sorghum is very limited among subsistence smallholder producers in Swaziland. Therefore, when the drought hit, it greatly affected the country's two regions that are still struggling with endemic poverty, Lubombo and Shiselweni. Producers in Lubombo are already discouraged from agriculture, and so the drought put an additional damper in disheartening households to grow their own food. Livestock, essentially cattle, died in serious numbers. Livestock is an important asset in rural households, not only for social status but also for sustaining livelihoods and nutrition. It is for this reason that the NDS emphasises investment in agriculture to incite growth, particularly inclusive growth in rural Swaziland. Many households in rural Swaziland are already engaged in agriculture through subsistence farming - a fundamental opportunity that the NDS and the PRSAP is trying to leverage on. However, droughts discourage subsistence producers who are the country's potential commercial farmers from making further investments into agriculture production. The 2015/16 drought destroyed the confidence that agricultural producers have on agriculture - as a viable solution for poverty reduction in Swaziland.

Consequently, the drought caused an impediment on the work the country has done to increase participation and investments in agriculture. Food security and water independence are an important component of the country's developmental goals embedded in the NDS. Through the drought, the country regressed in terms of the agriculture development initiatives that were already set in motion in the Lubombo and Shiselweni region. Boosting confidence in the food production system in Swaziland is important because agriculture can absorb a sizeable portion of the rural population that is unemployed and food insecure in productive economic activities. Furthermore, when households participate in the production of their food, it reduces their exposure to food price shocks such as the inflation increases that Swaziland experienced during the drought. While not all the food inflation is attributable to the drought, efficient food production that is not very dependent on rainfall, and driven by households in the rural sector, can shield the majority of the Swazi population from falling into the cracks of food insecurity and extreme poverty.

Swaziland had to spend money and resources to intervene and prevent a humanitarian crisis and total collapse of agriculture. A bulk of money and resources went into agriculture and food security. Specifically, it included humanitarian food assistance to the vulnerable and hungry population. On the other hand, the government dedicated funds towards domestic water supply through tanks, boreholes, and the general rehabilitation and expansion of water systems and water harvesting across the country. The energy sector also suffered immensely with E80 million having to be immediately set aside to import electricity from South Africa, because the water levels had fallen far below the minimum requirements for hydropower generation in Swaziland.

The drought cost the country a lot concerning getting closer to attaining its developmental goals, particularly Vision 2022. The drought situation came at the back of mounting cash

flow challenges for the government. By redirecting the E350 million into a supplementary budget for drought mitigation and response, government's planned activities were affected. The curious question therefore is; how would government have used the E350 million? Firstly, the government had to postpone the implementation of a salary review. Secondly, even though it cannot be said that the government stopped its capital projects, activities of the ongoing capital projects were deferred to a later date. Thirdly, the government would have tried by all means to pay government suppliers, and as a result of that, it would have lessened the pressure on the arrears transferred to the next financial year (Ministry of Finance 2017: *Pers. Comm.*). Unfortunately, the drought pushed government further into a crisis such that it could not adequately meet its financial commitments to its creditors.

In addition to the supplementary budget that financed the drought programmes, Government had to request financial support from donors and development partners such as the African Development Bank with its food assistance programme (Ministry of Finance, 2017: *Pers. comm.*). Therefore, the government and its development partners, business, and households, diverted money and resources intended for development projects to address the immediate and long-term impacts of the drought. That money and resources could have gone into the economy to incite economic activity and hence growth and boom that people, business, and government yearn for. While these monies played an important role in saving lives and restoring dignity in households, that money has little spill-over effects on the economy in igniting economic activity and wealth creation. Rather, such monies and resources could have gone directly to implement the economic activities stipulated in the NDS for wealth creation and inclusive growth in the country. In doing so, Swaziland would have been able to work towards attaining the SDGs and complying with the 2063 African Union Agenda. Empowering the NDMA to implement all the structures that need to be in place to avoid huge losses in events of disaster should be the focus. So that by 2022, the country will not have to divert money and abandon its developmental targets when disaster strikes.

6. CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The purpose of this study was to quantify the socioeconomic impacts of the 2015/16 El Niño drought on the economy of Swaziland. It specifically analysed the impacts of the droughts on households and on businesses, with a focus on (1) the extent to which the 2015/16 drought has affected rural and urban households; (2) the economic impacts of the drought across the different sectors of the economy of Swaziland; (3) the kind of coping mechanisms employed by households in response to multi-faceted ramifications of drought; (4) whether Swaziland's drought and disaster management policy allows for sufficient response to the multiple dimensions of drought; and 5) the kind of measures necessary to shield rural households and industry from drought.

With respect to the extent to which the drought has affected rural and urban households, the assessment found that the impact of the drought was severe especially on agriculture and availability of food. The study found that because of high unemployment (50%) among households and dependency of rural households on urban households for remittances, the drought exacerbated the capacity of households to sustain their livelihoods. Employment contributes a great deal in reducing vulnerability, poverty, as well as food insecurity. Subsistence production suffered because of low yields and livestock died because of extreme temperatures and lack of water. Agriculture production in Swaziland is heavily dependent on rainfall. Moreover, the study finds that the involvement of households in agricultural production is very low. As a result, households had to rely on food donations from the Government, business, and development partners to ensure that they had something to eat each day during the drought. What is worse is that the National Maize Corporation, whose mandate is to ensure maize availability, had no option but to import from South Africa and sell it locally. For some households that could still afford to buy food, prices soared from 4.3% in March 2015 to 19% in December 2016, further pushing more households into food insecurity.

The study also found that the impacts of the drought affected women-headed households more than men-headed households. Women had the most number of dependants and so experienced more food shortages than men did. In terms of energy and time-spent finding alternative sources of water, women also suffered the most, having to travel long distances to collect water from rivers, to cook and for other household needs. Children were affected by drinking poor quality (dirty) water, leading to diarrhoea and other stomach illnesses. Furthermore, children were left unprotected in rural households as their parents and guardians had to migrate to urban areas (which increased rural-urban migration) in search of jobs to sustain their lives. Consequently, the RSPS reported an increase in the number of rapes and attempted rapes in rural households. Besides the impacts on children, there was a significant rise in key populations around the Mbabane and Manzini corridor. This suggests that because of the lack of food induced by the drought, as well as the intrinsic and rampant unemployment and poverty in rural and urban households in Swaziland, some people resorted to sex work as a practical option to sustain their livelihoods.

In terms of the economic impacts of the drought across the sectors, the study found that the greatest impacts occurred in the agriculture sector followed by the energy sector, and all other sectors of the economy that are dependent on water, such as the environment. The

country experienced a deep decline in agricultural production due to the effects of the drought on maize, sugar cane, citrus, and livestock production. As well, when the drought hit, it compromised the country's flora and fauna to great limits such that the rangelands completely collapsed and Swaziland had to import grass from South Africa. The country had to import millions of Emalangenis worth of electricity from South Africa, suggesting that Swaziland is overly dependent on hydroelectricity, which is not sustainable during droughts. The conclusion is that there is a strong need for the country to diversify its energy sources. The 2015/16 drought made it clear that a hydro-based power sector cannot keep the country lit in times of extreme drought.

Confounding the situation for Swaziland is that the drought came at a time the country was still reigniting economic growth following persistent stagnation. Though the relief provided to households was necessary and important, the country lost in terms of its developmental targets. The funds the government and development partners had to divert into food assistance and other humanitarian needs in the country could have further propelled Swaziland closer to attaining Vision 2022 given that only five (5) years remain for the country to make the necessary development changes to reach that goal. Overall, the study finds that Swaziland has regressed in its goal to use agriculture as an engine for economic growth and poverty reduction. Farmers and agricultural producers have lost confidence in the benefits of investing in agriculture because of the huge losses incurred in the 2015/16 season.

Yet, in all the challenges caused by the 2015/16 drought, Swaziland has come out a better country than it was before the 2015/16 drought. The country has garnered very important lessons regarding the state of its water harvesting and storage infrastructure. The drought has shown the ability of the country's water harvesting and storage infrastructure, and the ability of the country to respond to and manage severe disasters. The biggest lesson is that the country needs to develop its water harvesting and storage infrastructure to make sure that it can harvest and store enough water to see the country through any subsequent droughts in the future. This is particularly the case given that climate change is real, and its effects are already showing face in Swaziland. It is important that the country makes serious investments in protecting all the developmental strides it has taken since the establishment of the National Development Strategy in 1997 or even since independence, in 1968. Though the drought was extreme and painful on many levels, it also presented an opportunity to take the necessary measures to make the country resilient to climate-induced shocks and other disasters that are frequent in Swaziland.

The country has spent a lot of time and resources formulating policies to direct development in Swaziland. However, policy implementation has been Swaziland's greatest weakness. To illustrate, whereas the Disaster Risk Management Policy (2010) is robust and more than capable of addressing the country's vulnerability to disasters, there is clear lack of commitment on the action plans and programmes laid out in the policy for 2016 – 2022 in terms of financial commitments. Disaster Risk Management is yet to be included in the country's policies in spite of the fact that this should have been done by now. As a result, this study estimates that the drought has cost the economy of Swaziland E3.843 billion in monetary terms. This estimation is on the downside for so many reasons. In the rural sector, the drought has wiped-off household savings in the form of livestock, hindered agricultural production, and caused innumerable suffering to women, children, and people living with disabilities that will take some time before they manifest on the economy. Livestock (cattle) is important in human capital development (sending children to school) and in ensuring equality of opportunities and outcomes. The drought deepened gender and income

inequality in Swaziland, causing women headed households to regress. These impacts are long-term and the study did not attempt to quantify them. To avoid further losses in the future, financial commitments should form a crucial component of disaster risk reduction policy.

6.2. Recommendations

Given the findings, the study proposes the following set of recommendations:

- ✓ Revise and integrate all aspects of disaster mitigation to all policies in Swaziland.
- ✓ Encourage employment and income generating activities across the four regions of Swaziland to enable the majority, if not all households, to earn their livelihoods and restore dignity. Focus on increasing investments into income generating activities, especially in agriculture, agro-processing, agri-information communications technology (agri-ICT), and firming up the extension system.
- ✓ Strengthen and expand the implementation of the Poverty Reduction Strategy and Action Plan to other regions through supporting the development of income generating activities among the poorest in Swaziland.
- ✓ Develop plans to reduce urban poverty to deal with the myth that cities are only for rich people.
- ✓ Encourage business ownership/entrepreneurial activities among the youth in lieu of formal office employment.
- ✓ Deliberately target women in all agricultural and rural development programmes especially in rural areas where women take care of children, people living with disabilities, and the elderly.
- ✓ Encourage commercialisation and value-addition in rural households.
- ✓ Enable development of smallholder agriculture production by addressing issues of land under-utilisation, inappropriate land use and management of rangelands.
- ✓ Develop solid strategies for offloading the outputs of rural households in urban markets, and revisit the country's empowerment laws with a focus on pushing local supermarkets to source agricultural produce from local producers.
- ✓ Use the drought as an opportunity to learn and grow. The country could consider taking stock of its resource-base and use it to make the appropriate adjustments to make the best use of all available resources. Use lessons learnt from the 2015/16 drought as a springboard for further action, including revolutionalising the food production system and fast tracking the commercialisation of subsistence producers. Recovery should also be an important aspect of disaster management to restore life to what it was before the drought.
- ✓ Conduct a comprehensive investigation of the sources of water and their regenerative capacities, particularly sources of water like the Mbabane River that were able to sustain themselves throughout the drought.

- ✓ Increase investment into a dam that will supply Mbabane with water. Such a dam should have a water storage capacity that will enable supply for a minimum of three years to Mbabane during a drought event. It is no longer sustainable to supply water to a big and a growing city like Mbabane and Ezulwini using a reservoir like Hawane. Mbabane and the rest of cities and towns in Swaziland need sustainable water infrastructure that will efficiently harvest, store, and distribute water in all climatic seasons. Urban and rural developers in the country should consider exploring underground water extraction to supply water to entire cities and towns especially in areas with abundant underground water aquifers.
- ✓ Increase water storage/harvesting between rivers and dams in Swaziland.
- ✓ Re-visit existing water treaties on Transboundary Rivers and dams to encourage water harvesting for storage purposes at the local level and to put the interests of Swaziland first, especially in the wake of the 2015/16 drought.
- ✓ Encourage water harvesting in cities and provide incentives for economic agents who comply.
- ✓ Enact legislation that encourages the creation or construction of disaster resilient buildings.
- ✓ Impose penalties on people who misuse water. Consider equipping the Water Act of 2003 and other legal instruments that give rights to access to water resources in the country with penalties. That at the helm of the drought some households and businesses were using SWSC water to wash cars, and for irrigating landscapes is an insignia that the current water policies leave it to the consumer to police its usage.
- ✓ Consider options for viable energy options/power plants that can make Swaziland energy independent. It takes 5 – 10 years to set up cost-effective and efficient power plants, so the time to act is now so that by 2025, when Eskom's contract to supply the country with electricity ends – Swaziland has the necessary plans already set and in motion.
- ✓ Form a consultative group on weather and climate forecasting at the national level so that information on the probability of disasters is developed on time and shared widely in the economy to reduce shocks in capital projects and operating costs.
- ✓ Emphasise and promote coordinated planning among all stakeholders in order to enable a proactive disaster mitigation and response environment in all levels of disaster management in the country.
- ✓ Establish a consultative group on environmental (flora and fauna) management during a drought with a focus on issues of protection, maintenance, disasters, and state of emergencies.

- ✓ Consider strengthening and expanding the minimum standards for establishments operating in the tourism sector to address issues of disaster preparedness and adaptation, especially since climate change is here to stay.
- ✓ Upgrade the Meteorology Department in terms of human resources, equipment/up-to-date software, and infra- and techno-structure. Institutional capacity to deal with droughts, hailstorms, and floods is lacking. The continuation of high frequency weather updates in all local media platforms, especially on the Swaziland Broadcasting and Information Service (SBIS) are important. In addition, system upgrades are required for a broader forecast to strengthen developmental plans. The department needs specialised computer infrastructure to perform this kind of work.
- ✓ Develop policies that encourage the use of agricultural biotechnology and the harmonisation of policies between Swaziland and neighbouring countries to enable the country to have access to drought-tolerant germplasm developed elsewhere in the region and beyond.
- ✓ Capacitate Agricultural Marketing Boards on their role during state of emergencies.
- ✓ Revisit all instruments meant to regulate the importation of food with a focus on making it clear as to what happens during national disasters like droughts, floods, etc.

6.2.1. Further Research

It is important to conduct a study on the long-term impacts of the drought on the economy to understand the multiple synergistic effects on the developmental aspirations of the country. Primarily, a study that quantifies and qualifies how much of the economy and household livelihoods in Swaziland are vulnerable to disaster shocks is necessary. This type of study will give a clear picture to the nation on how much the country stands to lose when disasters like droughts hit. It will help in the alignment of policies in the country to respond appropriately to the most vulnerable sectors and households.

For the 2015/16 drought, only the short-term immediate impacts were analysed. It is also imperative to study the long-term impact on farmer's investments, loss of soil moisture and decline in land productivity, low agriculture growth and low development of the country because most of the impact of the drought will be experienced far beyond the current 2015/16 timeframe. Swaziland boasts of a very rich and vibrant tourism industry, and so it might be worthwhile for the country to quantify and qualify the changes in the industry linked to natural disasters. The proposed study needs to quantify and qualify the degradation of natural ecosystems in the country due to climate-induced disasters.

The impacts of droughts are not even throughout the country and across households. It is important to identify Swaziland's vulnerability to frequent disasters like drought according to the specific vulnerabilities that different groups in the population face. Droughts usually have the greatest impact on certain groups like women, children, and people living with disabilities. A special study that identifies the most vulnerable groups, their experiences of disasters, and the needed responses is crucial.

Finally, there is a need to investigate alternative and sustainable funding models for the NDMA as the guardian of national disaster management programmes in the country. A viable and practical funding structure for disaster management will ensure that the country protects life and property without losing progress on its developmental aspirations. In the event of disaster, the country should already have savings in place to manage the impacts of disasters instead of redirecting funds that would have been committed elsewhere.

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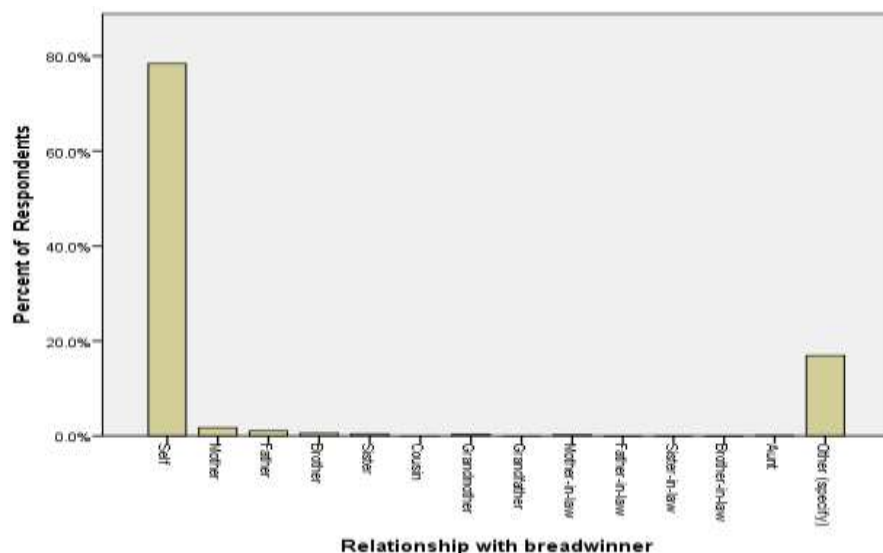
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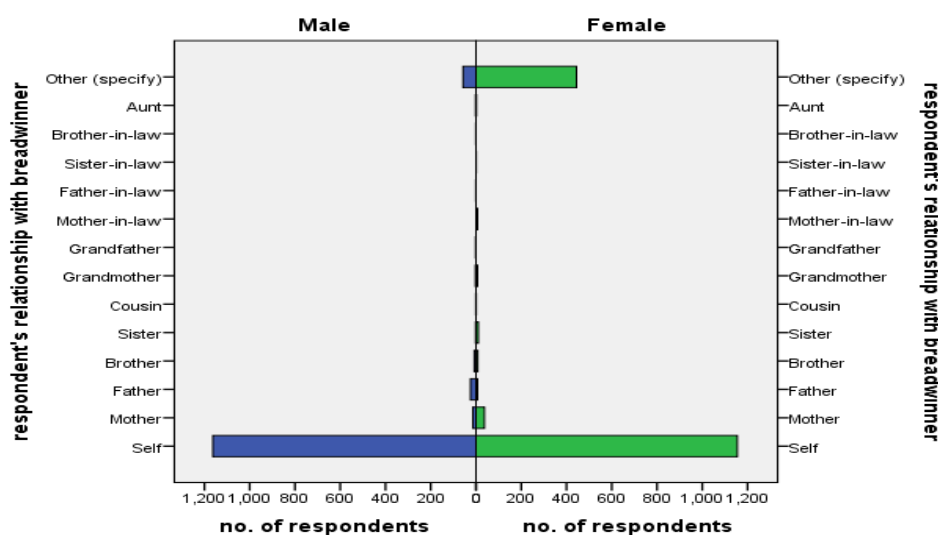
8. APPENDIX

Figure 3.1.1. Household Respondent's Relationship with Household Breadwinner



Source: Authors' own representation using survey data
 Notes: The relationship to breadwinner is the respondent's relationship to the person in charge of the household. The percent of respondents is the proportion of respondents who fall under each relation category - self (the actual breadwinner), mother, father, brother, sister, etc.

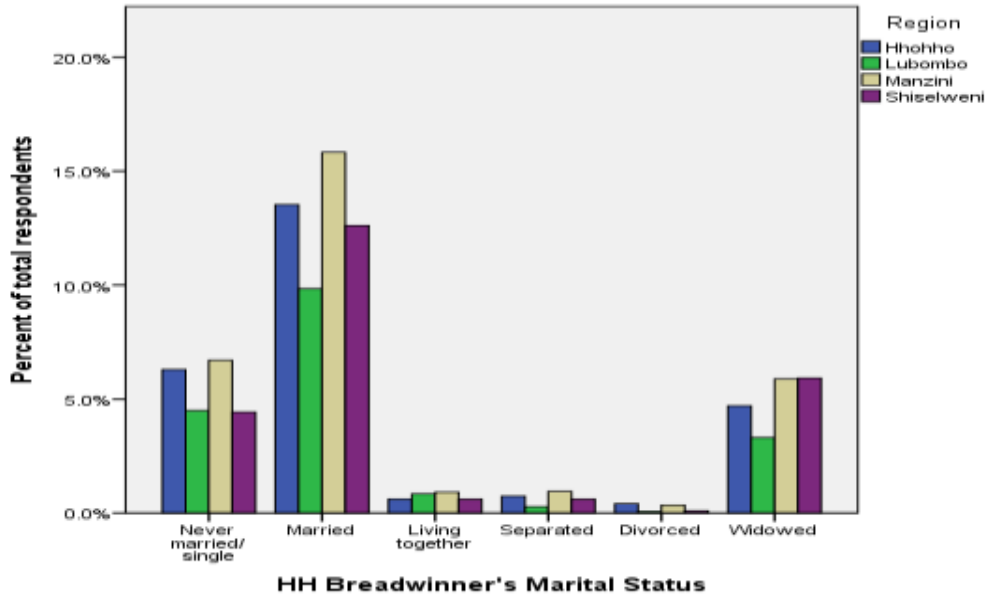
Figure 3.1.2 Gender Distribution of Survey Respondents



Source: Authors' own representation using survey data
 Notes: The figure compares the distribution of the number of female to male respondents. The no. of respondents is the number of males or females of the total 2750 people sampled. Figure 3.1.2 shows that 1,150 of the respondents were female breadwinners whilst another 1,150 of the respondents were male

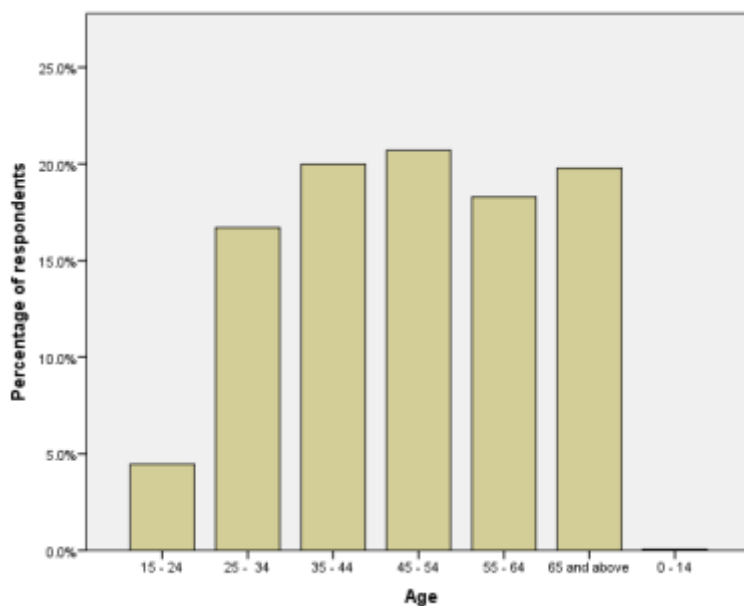
breadwinners. There is a slightly larger number of female respondents than male respondents when the other relationship categories are included. This is acceptable because Swaziland's actual population has more females than males. Also, the data from this study shows that gender distribution in Swaziland tends to be 56 females to every 44 males in Swaziland.

Figure 3.1.3 Household Breadwinner's Marital Status



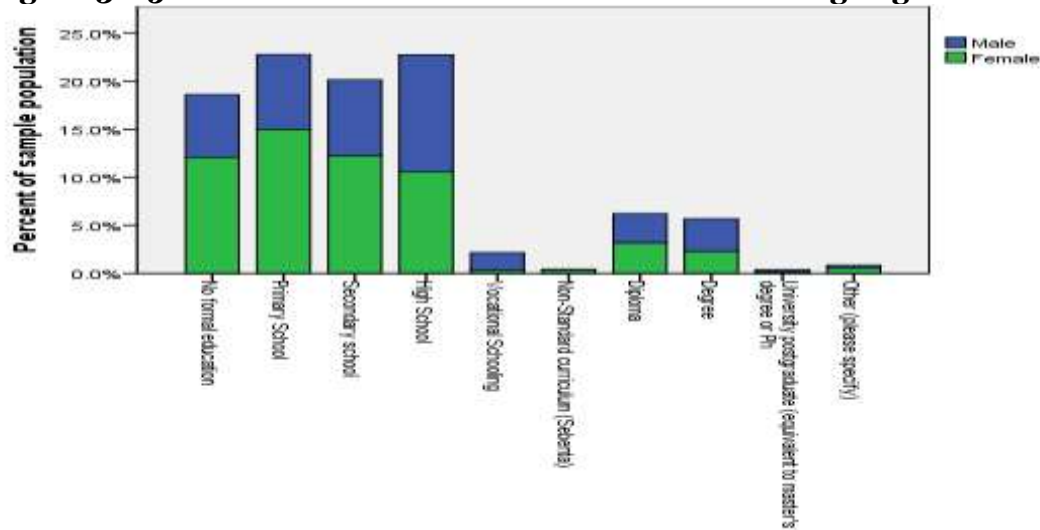
Source: Authors' own representation using survey data
 Notes: Most of the households are led by a married couple. About 53% of the household breadwinners are married, particularly, in Manzini, Hhohho and Shiselweni.

Figure 3.1.4 Age Distribution of Household Respondents



Source: Authors' own representation using survey data
 Notes: Figure 3.1.4 shows age distribution of the survey respondents broken into age categories. The most number of respondents (71%) are aged between 25 to 54 years.

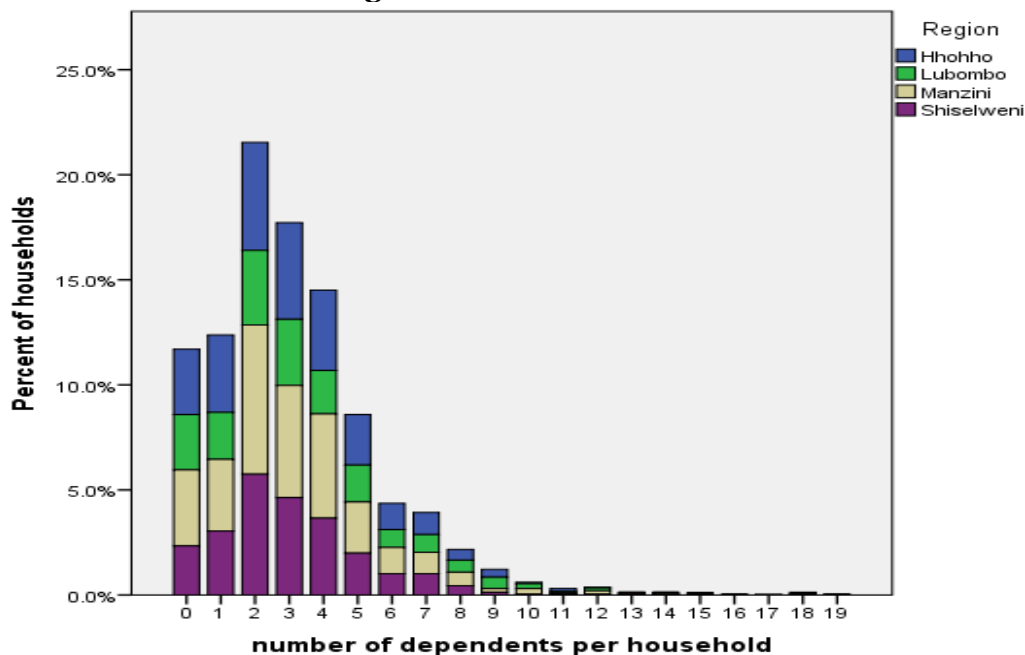
Figure 3.1.5 Distribution of Education Level according to gender



Source: Authors' own representation using survey data

Notes: The figure provides a distribution of the respondents' education level at the time of the survey. Each bar represents the proportion of males and females within each education level. For example, 19% of the respondents have no formal education. Of those 19% respondents, 12% are females while 7% are males with no formal education.

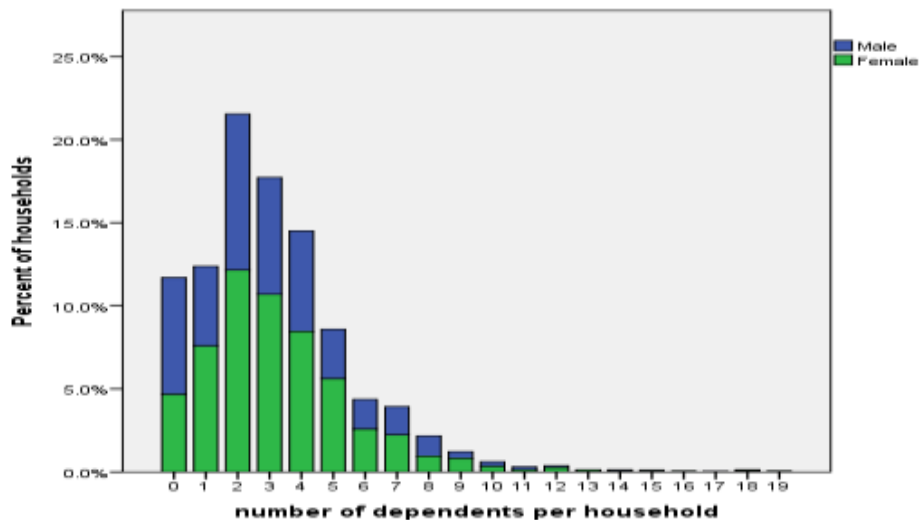
Figure 3.1.6 Distribution of household dependents per households and across the four regions of Swaziland



Source: Authors' own representation using survey data

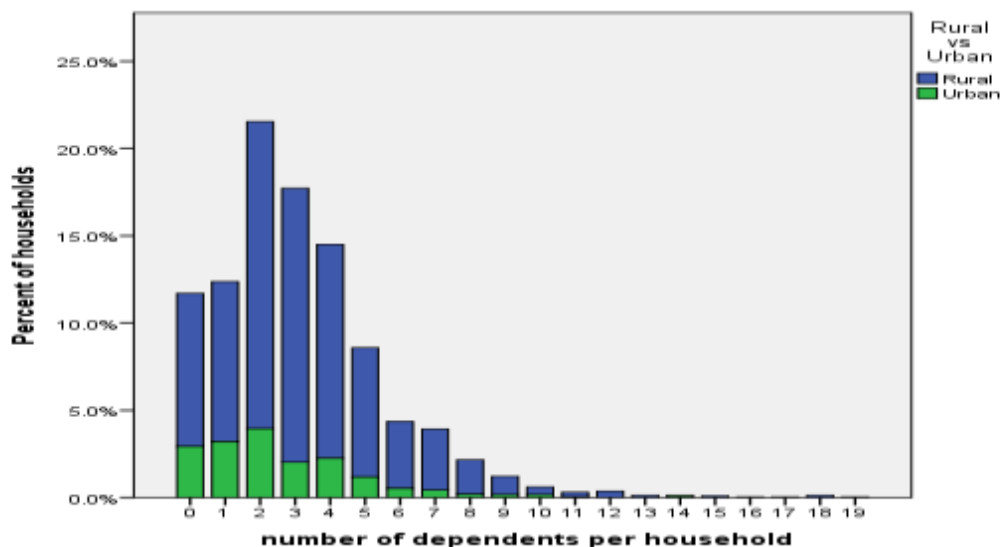
Notes: The Figure shows the total number of dependants each household is responsible for. A total of 12% of the households have no (zero) dependants and these households are found mostly in Hhohho and Manzini. The highest spike on the graph (2 dependants for a corresponding 22% of the sampled households) means that households typical have minimum of two people or more that they are directly responsible for. Of course, as the graph shows, there are some single-dweller households (zero dependants) while some households can be as large as nineteen (19) in total household members.

Figure 3.1.7 Number of Household Dependents for Males and Female Breadwinners



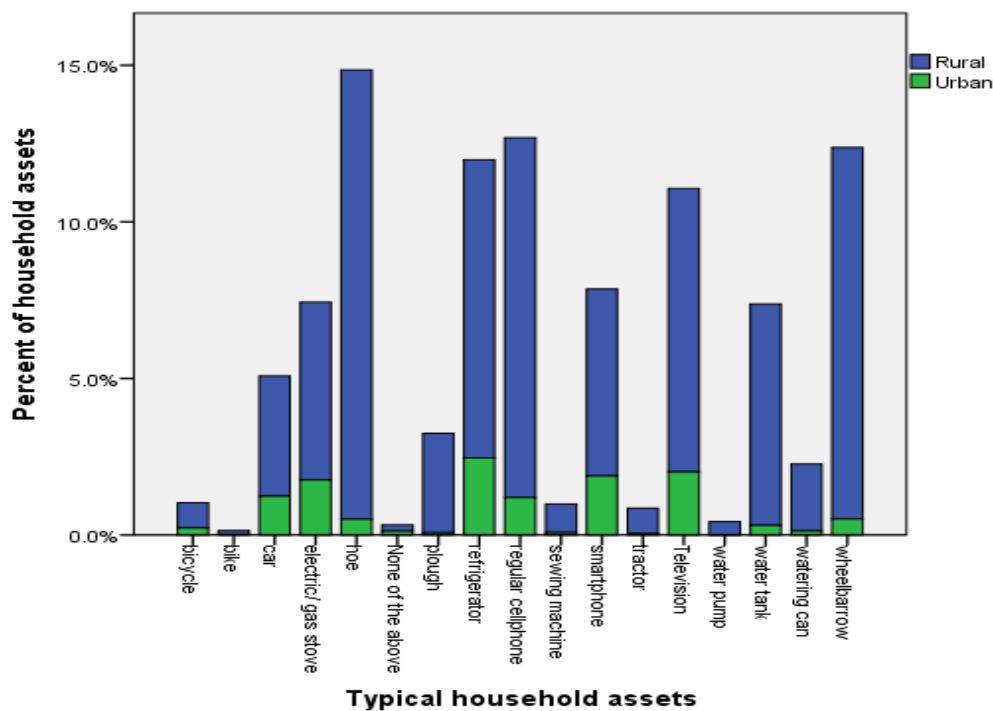
Source: Authors' own representation using survey data
 Notes: Figure provides distribution of household dependents per household and compares the number of dependents between the male and female breadwinners. The number of female breadwinners (green) is greater than the number of male breadwinners (blue) who are responsible for 0 to 19 dependants. It means females are responsible for a lot more dependants than males.

Figure 3.1.8 Household Dependents for Breadwinners in Rural and Urban Households



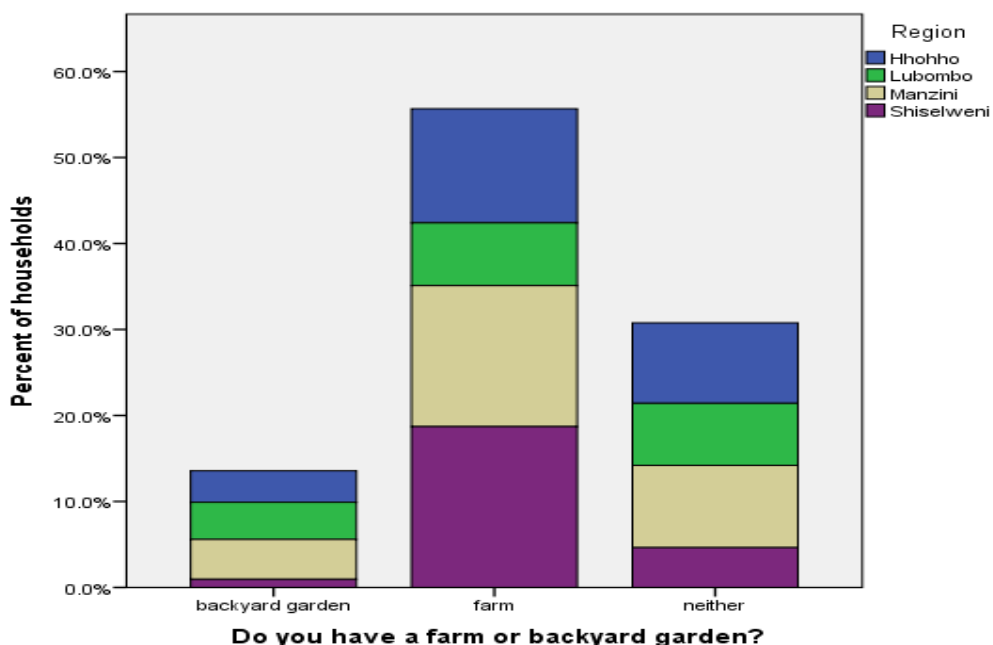
Source: Authors' own representation using survey data
 Notes: Figure provides distribution of household dependents by comparing rural households to urban households of the sampled households. Urban households in green are smaller than the rural households in blue.

Figure 3.2.1 Distribution of Typical Household Assets comparing rural and urban households



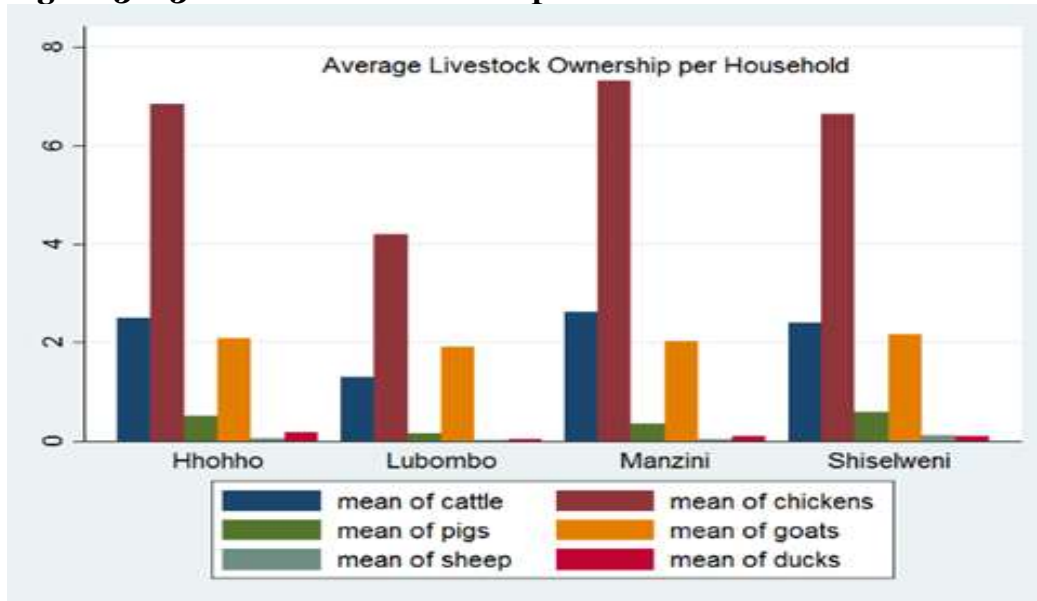
Source: Authors' own representation using survey data
 Notes: The typical household assets is a combination of household assets that are likely to be found in households in Swaziland as discussed in Table 3.2.1 above.

Figure 3.2.2 Farm and Backyard Ownership in Swaziland's Four Regions



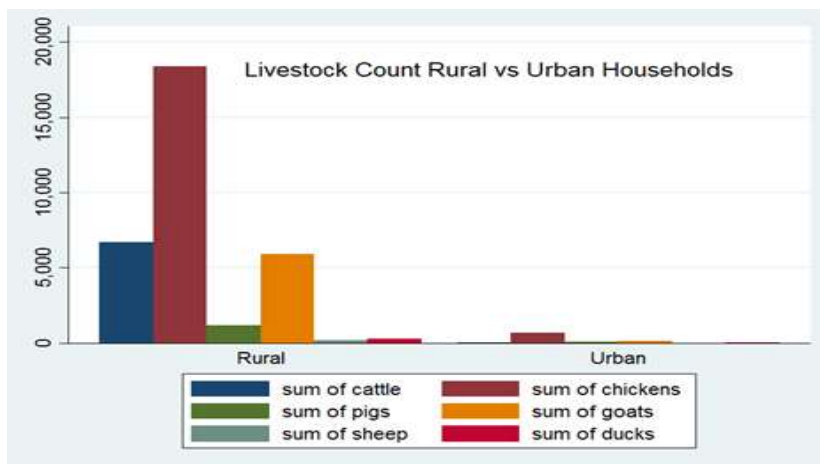
Source: Authors' own representation using survey data
 Notes: The figure shows a regional division of farm or backyard garden ownership. A total of 55% households own farms, 15% own backyard gardens, and 30% neither own a farm nor backyard garden. The majority of the sampled households engage in some form of subsistence agriculture.

Figure 3.2.3 Livestock Ownership in Swazi Households



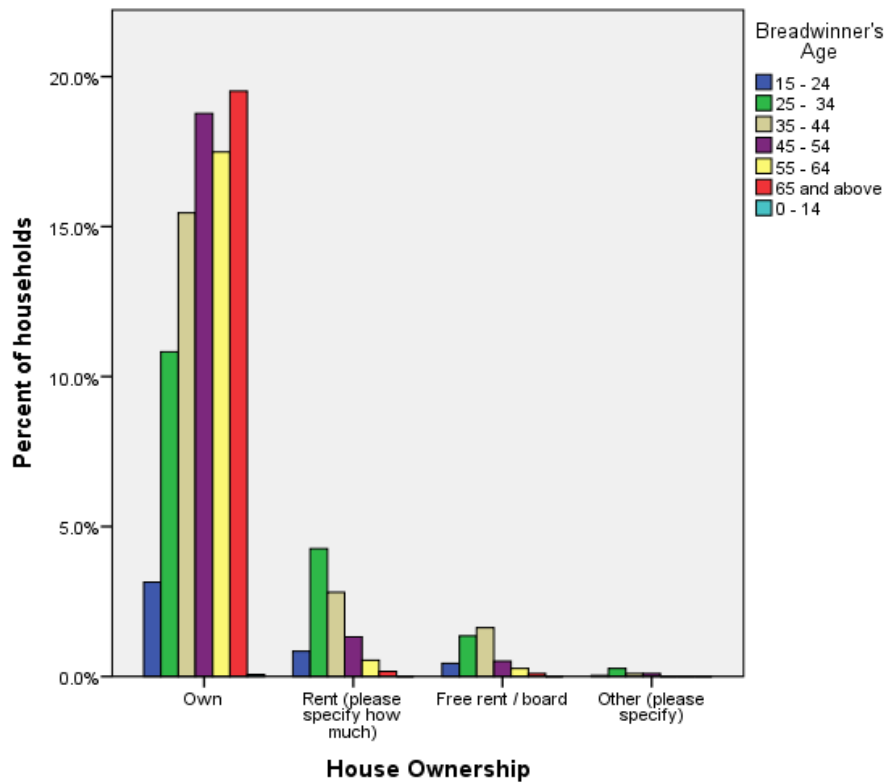
Source: Authors' own representation using survey data
 Notes: Livestock ownership for the purposes of the survey only included cattle, pigs, sheep, chickens, goats and ducks. The Livestock Ownership is the average number of each type of livestock per household sampled.

Figure 3.2.4 Total Livestock Ownship in Sampled Households



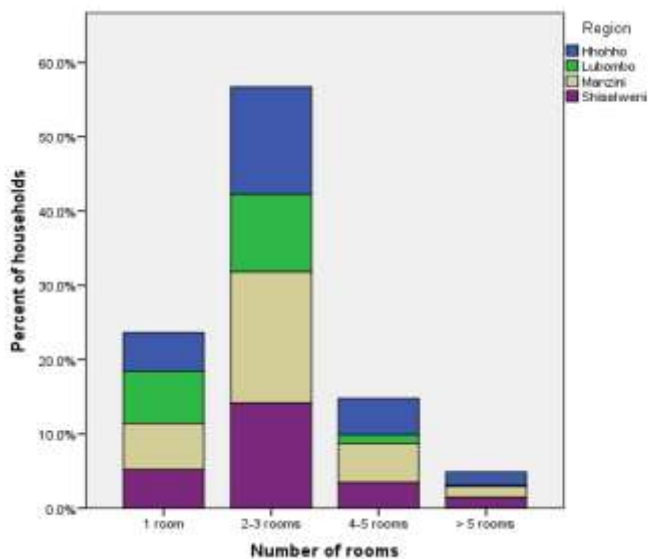
Source: Authors' own representation using survey data
 Notes: The figure provides a sum of all the livestock counted in the sampled households. Of the households sampled, 18,000 chickens, 7,000 cattle, 6,000 goats, 1,000 pigs, and less than 500 sheep and ducks were counted.

Figure 3.2.5 Household Ownership of Sampled Households



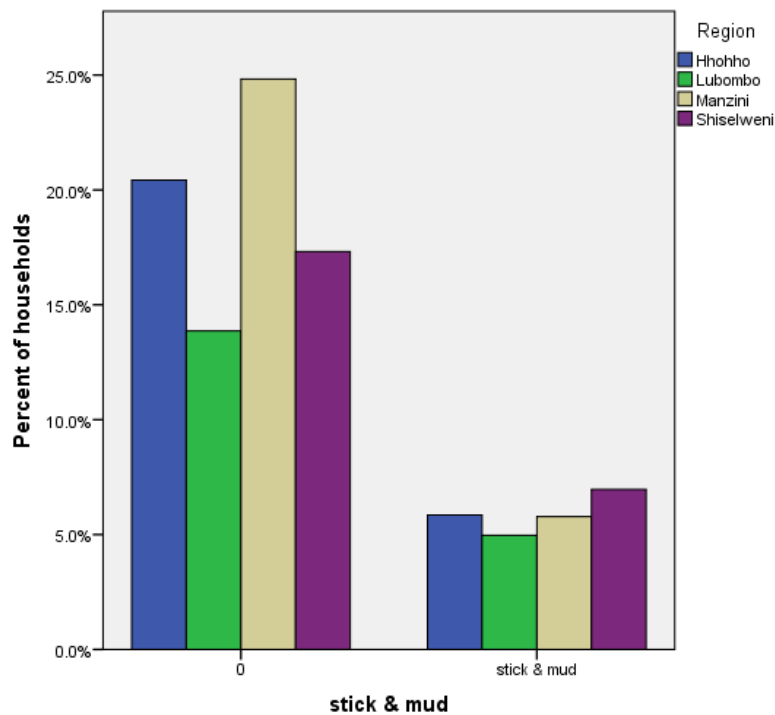
Source: Authors' own representation using survey data
 Notes: The figure groups household ownership according to the different age groups of household breadwinners.

Figure 3.2.6 Household Living Structure: Number of Rooms



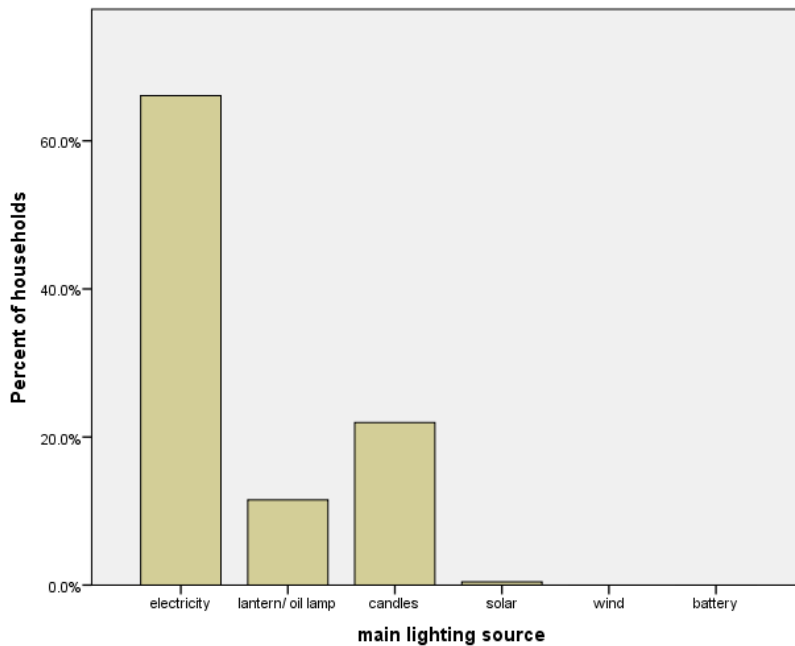
Source: Authors' own representation using survey data
 Notes: Number of rooms is the size of the household's house in total number of rooms. Swazi homes consist of 58% two-to-three room structures, 35% one room structures and 7% four-and-larger room structures (see Figure 3.2.6).

Figure 3.2.7 Prevalence of Stick and Mud houses in Sampled Households



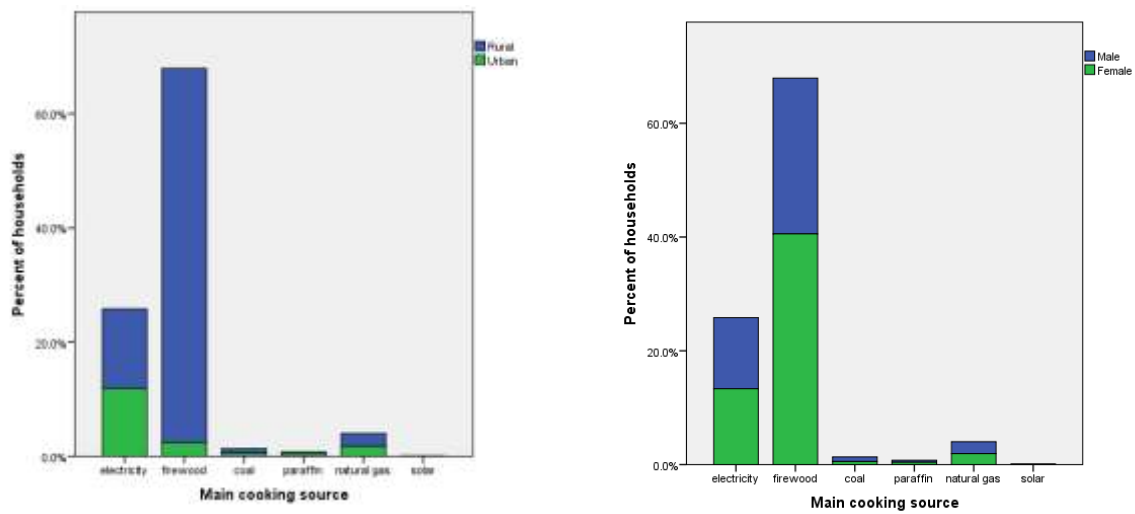
Source: Authors' own representation using survey data
 Notes: The figure gives a percentage of stick and mud houses in each region. "Stick & mud" represents the actual stick and mud homes while '0' represents houses that are not stick and mud – concrete and other more stable building material.

Figure 3.2.8 Household's Main Lighting Source



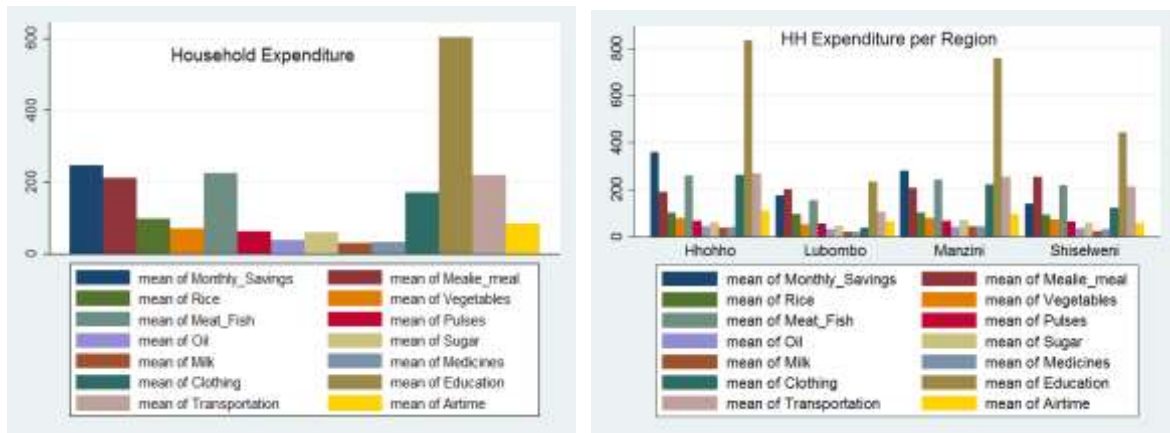
Source: Authors' own representation using survey data
 Notes: The figures shows the percentage usage of the different types of lighting mechanisms such as electricity, lamps, candles, solar, wind, and batteries.

Figure 3.2.9 Household's Main Energy Cooking Source



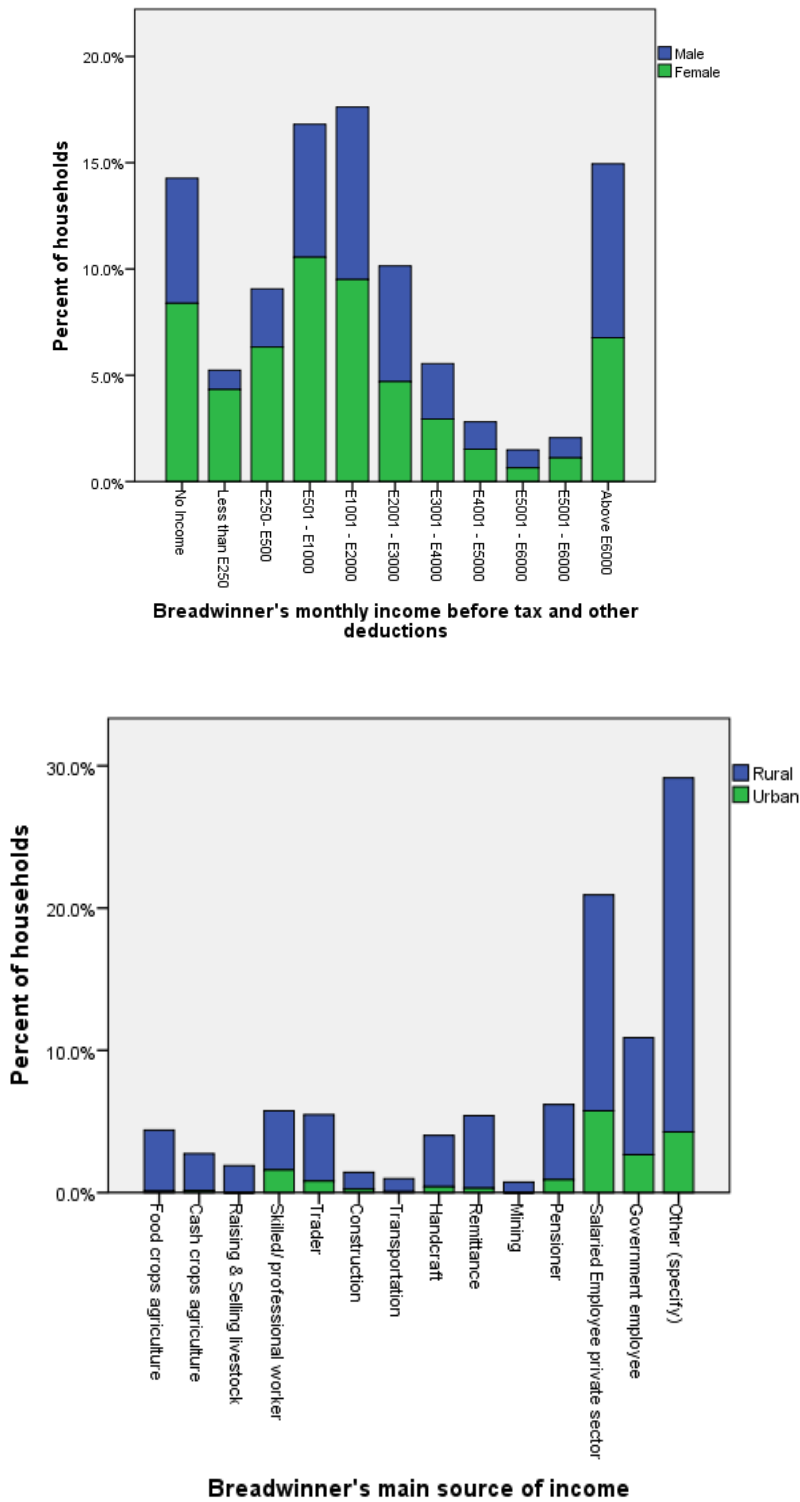
Source: Authors' own representation using survey data
 Notes: The figure provides a distribution of household cooking energy sources. On the one hand it compared rural to urban households while on the other hand it compares female to male energy cooking sources.

Figure 3.3.1 Household Expenditure of Sampled Households



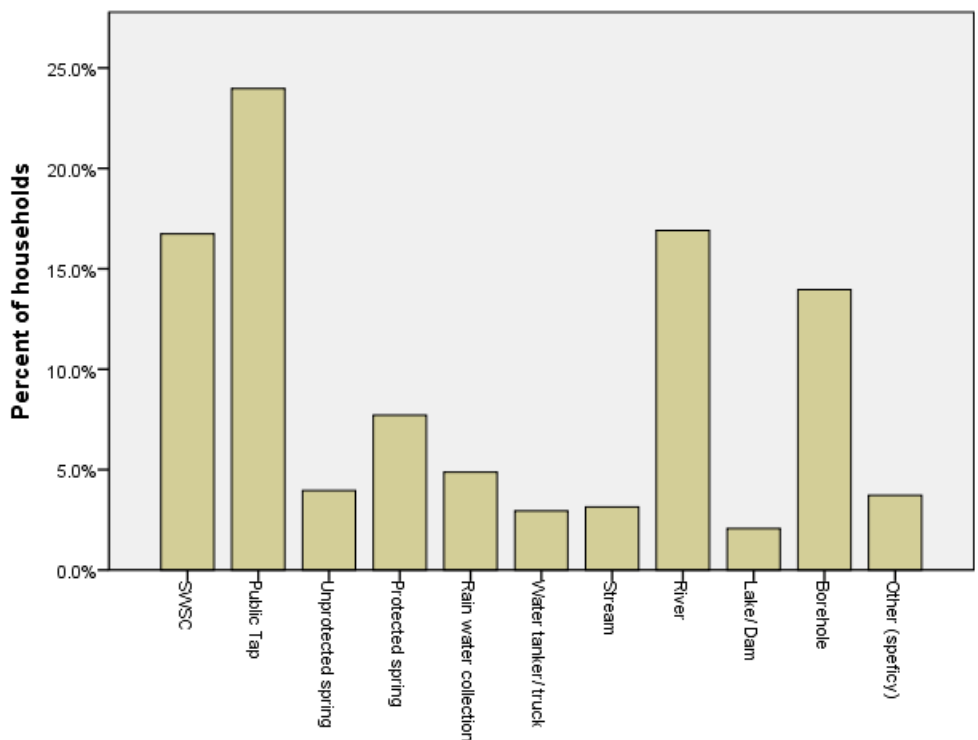
Source: Authors' own representation using survey data
 Notes: The proportion of items that constitute household expenditures of the sampled households. On the lefthand side, the figure shows the average cost and list of the items per household in Emalangeni. On the other side, the figure compares the average cost and list of items on household expenditure across the four regions of Swaziland.

Figure 3.3.2 Household's Main Sources of Income and Income Level

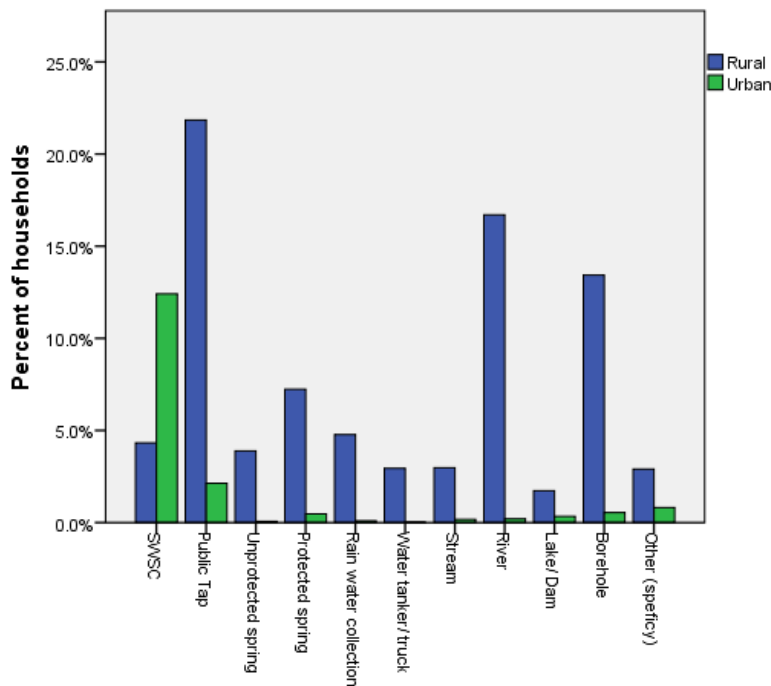


Source: Authors' own representation using survey data
 Notes: The figure compares sources of incomes between rural and urban households and the level of income per female and male household breadwinner.

Figure 3.4.1 Potable Water Sources: NORMAL YEAR NO DROUGHT



normal drinking/cooking water source when there is NO DROUGHT

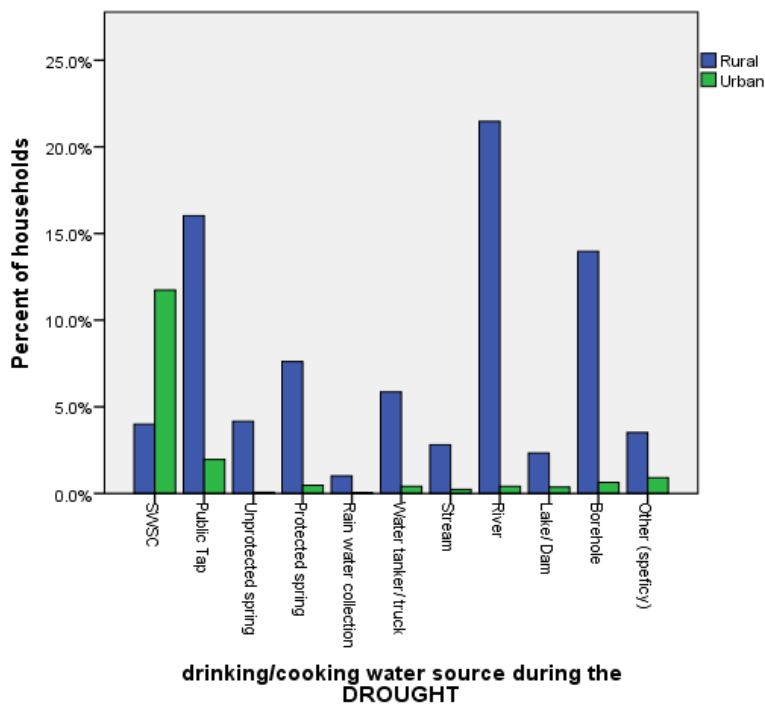
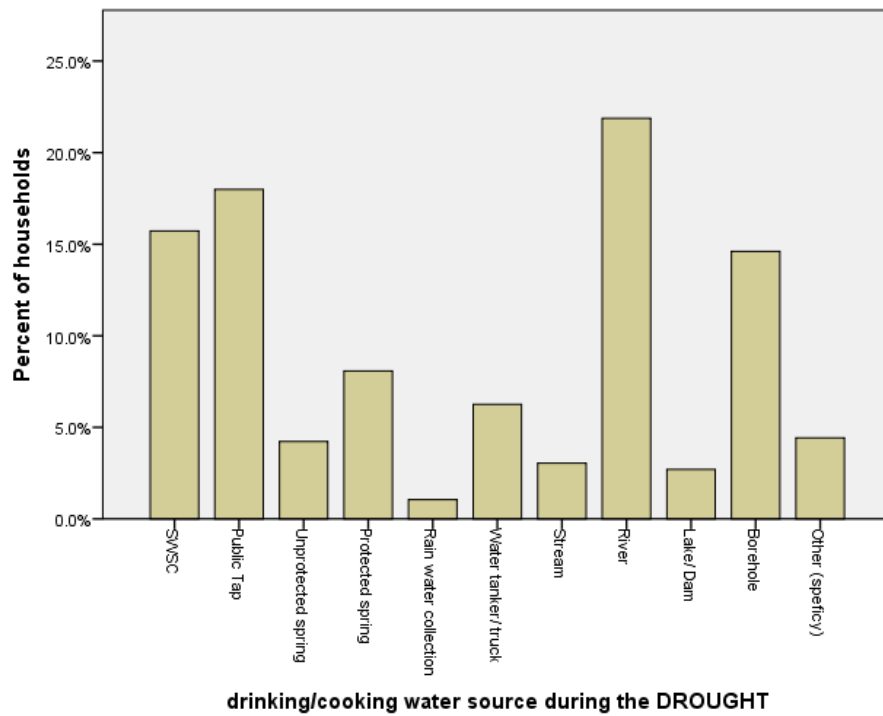


normal drinking/cooking water source when there is NO DROUGHT

Source:
Notes:

Authors' own representation using survey data
The figure compares main sources of drinking/cooking water in the sampled households when there is no drought. One side compares all the household drinking water sources, while the other side of the Figure proportions the household water sources according to urban and rural areas.

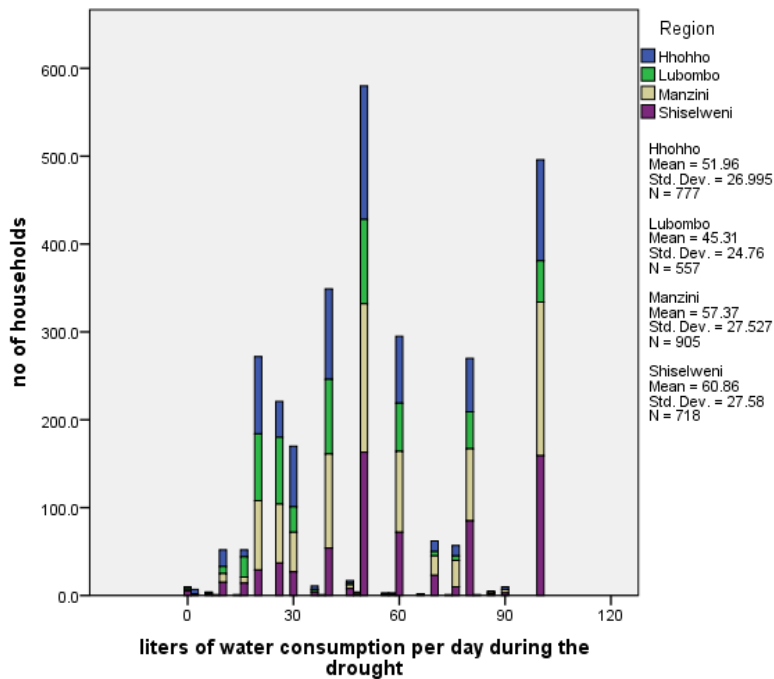
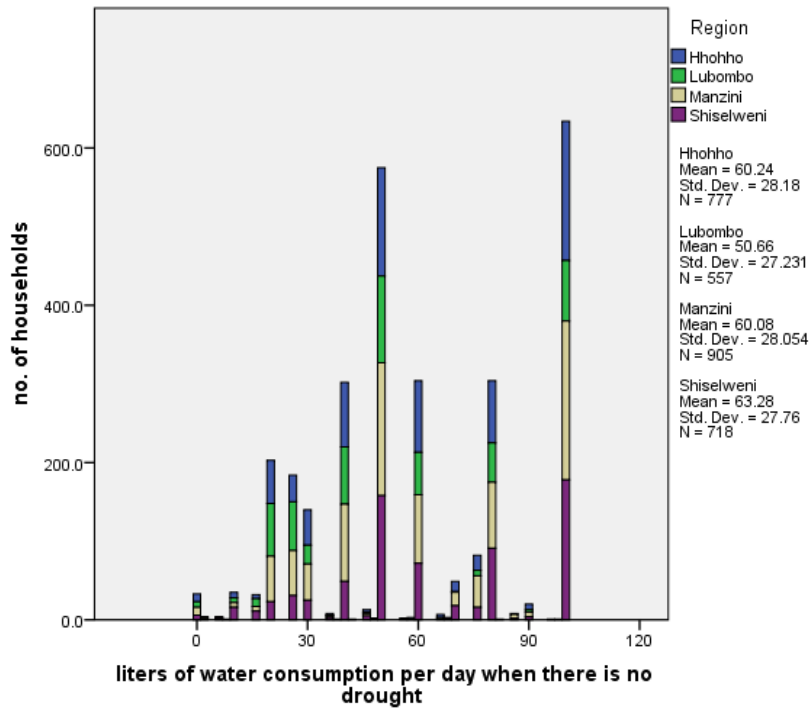
Figure 3.4.2 Potable Water Sources: DURING THE DROUGHT



Source: Authors' own representation using survey data

Notes: The figure compares drinking/cooking water sources during the drought. One side compares the general distribution of the sources in all sampled households. The other side shows a divide of the water sources in rural and urban households. The differences between percentage of households that use sources in Figure 3.4.1 and Figure 3.4.2 signifies the changes in the main potable water sources in households from when there is no drought to when there is drought.

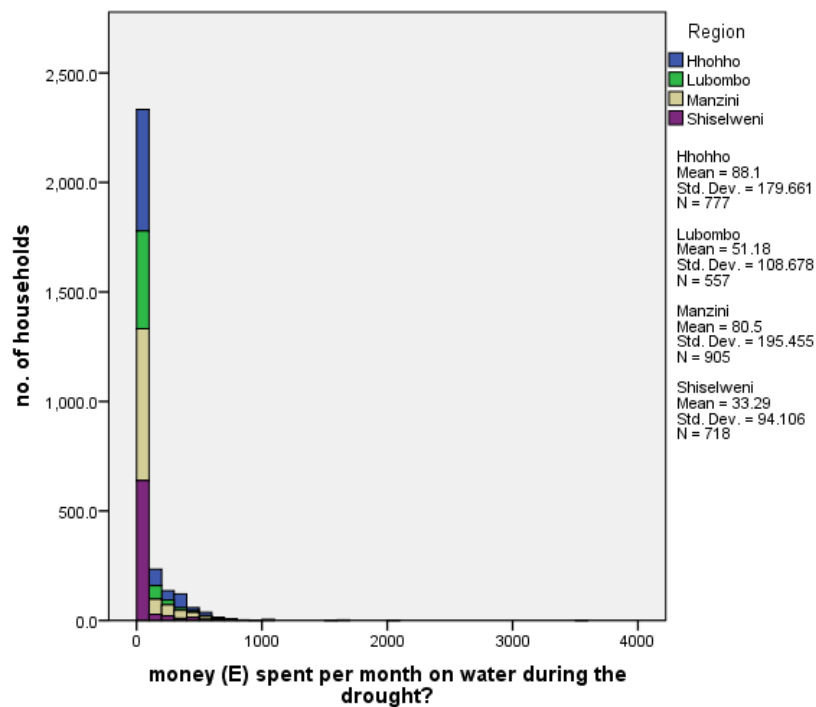
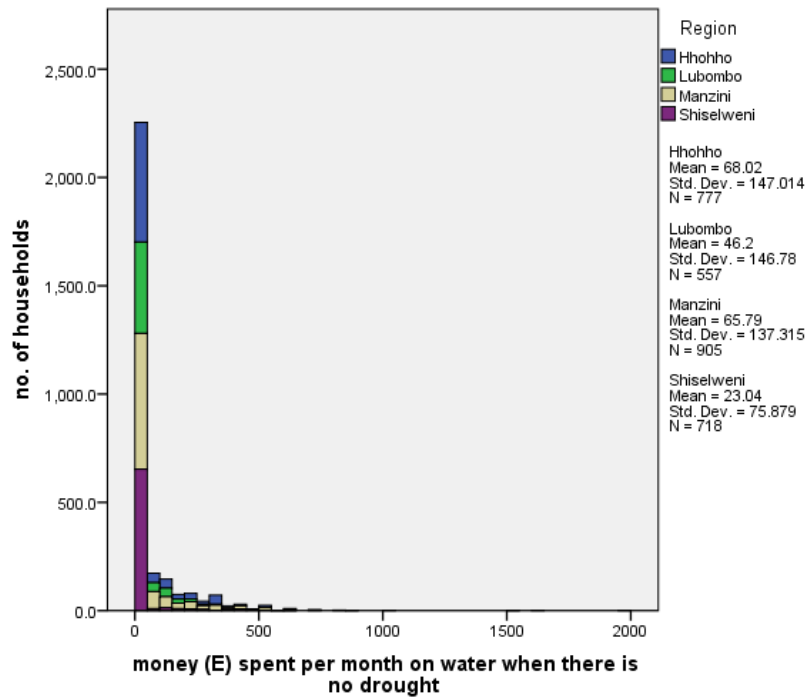
Figure 3.4.3 Average Water Consumption (No Drought versus Drought)



Source: Authors' own representation using survey data

Notes: The figures provide details on the average water consumption when there is no drought compared to when there is drought. The "mean" is the average water consumption per day in each region.

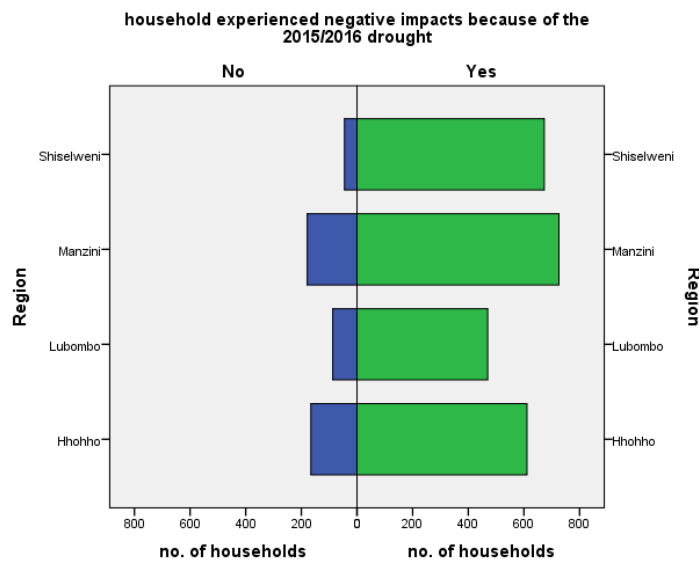
Figure 3.4.4 Average Monthly Water Costs (No Drought versus Drought)



Source:
Notes:

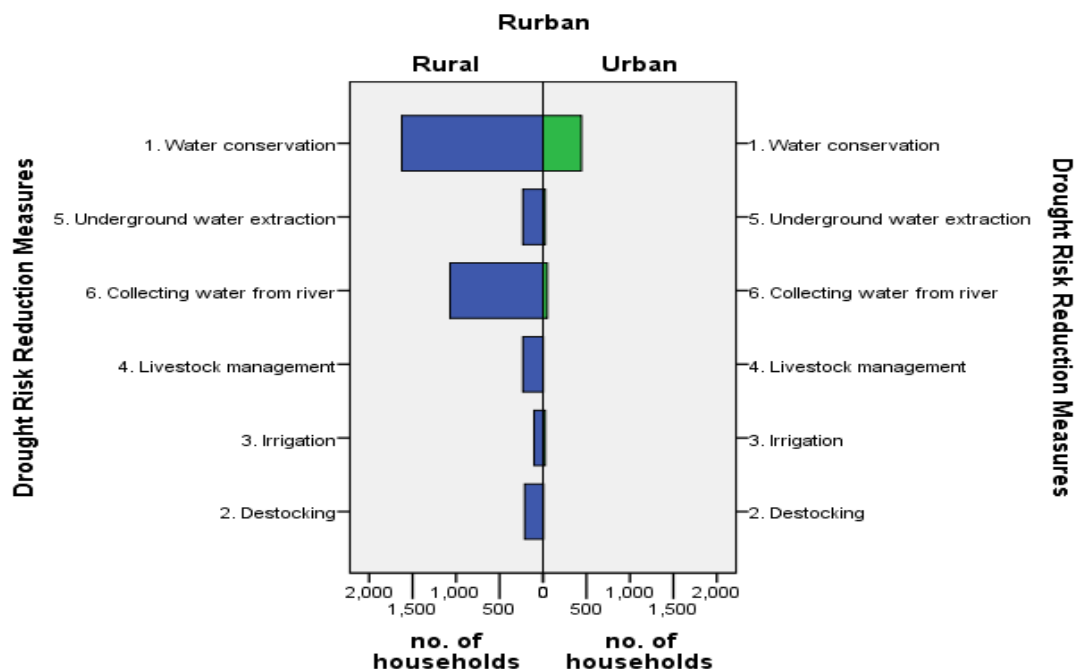
Authors' own representation using survey data
The figures gives the average water expenditure per household in each region of Swaziland. It compares montly water costs when there is no drought to when there is drought. The mean is the average money in Emalangeneni spent per month to pay for water in each region.

Figure 3.5.1.2 Experience of Negative Impacts due to the 2015/16 Drought



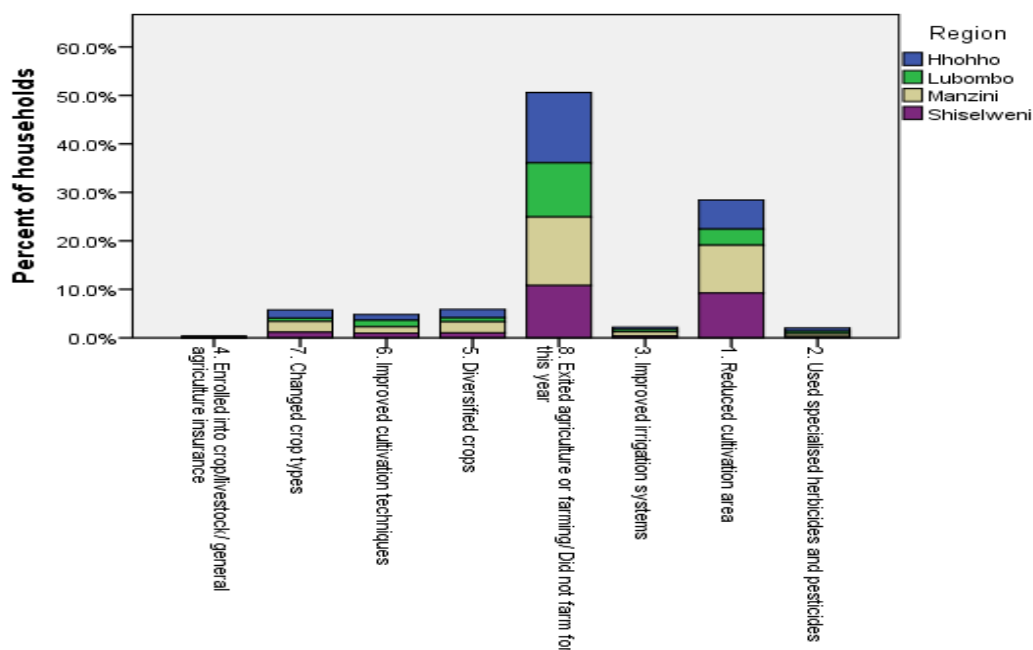
Source: Authors' own representation using survey data
 Notes: Households are split into the four regions in the figure. The number of households that experienced negative impacts because of the 2015/16 drought are in green. These are compared to the households in blue that did not experience negative impacts of the drought. The green households, that indeed experienced negative impacts due to the drought, are greater than the blue households that did not experience any negative impacts because of the drought. Essentially, most households suffered because of the 2015/16 drought.

Figure 3.5.3.1 Drought Risk Reduction Measures



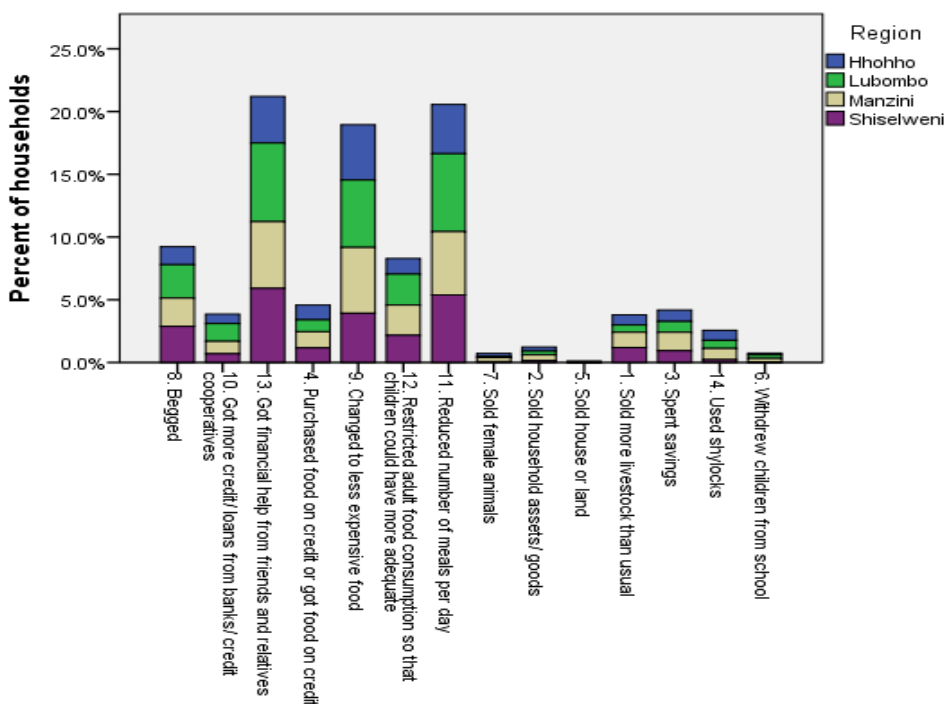
Source: Authors' own representation using survey data
 Notes: The figure demonstrates the risk reduction measures that households engaged in during the 2015/16 drought. It compares these measures on rural and urban communities.

Figure 3.5.3.2 Drought Coping Mechanisms - Agriculture



Source: Authors' own representation using survey data
 Notes: The figure demonstrates the drought coping mechanisms that households engaged in during the 2015/16 drought.

Figure 3.5.3.3 Household Drought Response Behaviours



Source: Authors' own representation using survey data
 Notes: The figure demonstrates the behaviours that households engaged in during the 2015/16 drought.