Predictors of Food Insecurity in Swaziland: Lessons from the 2015/16 El Niño Induced Drought
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Abstract

The study investigates the predictors of food insecurity among households in Swaziland given the 2015/16 El Niño induced drought. To identify the geographic and socioeconomic factors that predict food insecurity during a drought in Swaziland, the study uses a logistic regression. The logistic regression results show that households that have a deteriorated health and disability status are three times more likely to be food insecure during a drought than households that have no health or disability impacts. In contrast, high quality vegetables, meat and fish can be considered luxury food items that significantly predict food security among households in the country. The study also finds that the prices of maize and rice are good predictors of food insecurity among households given that maize is a staple food in Swaziland. A major finding on the predictors of food insecurity is that all incomes above E1,000 significantly reduce the chances of food insecurity among households compared to those households that have no form of income. The regression reveals that E3,500 is the optimal level of monthly income to cushion households from severe food insecurity. Therefore, the study recommends that Government (Ministry of Labour and Social Security) should investigate the suitability and sustainability of a E3,500 monthly minimum income (wage) in Swaziland.

Keywords: Drought, Food Insecurity, Predictors, Logistic, Food Insecurity Mapping

1. Introduction

Droughts are a constant threat to food security. In developing countries like Swaziland, droughts rank as the single most common cause of severe food shortages, and the most important natural trigger of malnutrition and famine (Food and Agriculture Organization of the United Nations (FAO), 2011). Drought impacts span across all four dimensions of food security – availability, stability, access, and utilisation (FAO, 2011). Literature on drought is conclusive that drought negatively affects agricultural production, which leads to unstable agricultural incomes against rising food prices that tend to intensify the incidence of poverty and the vulnerability of the poor
Shortfalls in food production can cause a rise in prices of food products as food supply diminishes with severe ramifications on the poorest and most vulnerable. Equally, food production deficits can lead to substantial increases in imports to meet local food needs, which can result in increased fiscal pressure on national budgets (FAO, 2011).

Besides vulnerability to drought, Swaziland is prone to climate related disasters such as cyclones, flash floods, and windstorms. Of all these disasters, the highest mortality and hardship occurs during droughts (NDMA, 2016; National Disaster Management Policy (DRM), 2010). The country is still recovering from the devastating impacts of the 2015/16 El Niño induced drought which was considered one of worst and strongest since 1950. The problem is that drought is a climate phenomenon that cannot be prevented. It is a form of environmental stress caused by deficiencies in precipitation over an extended period of time such that the amount of water available in river catchments, and underground water falls below average (Botterill and Chapman, 2002). The persistent dry conditions can lead to catastrophic losses of flora and fauna, crop failures, loss of lives both human and livestock, and general human suffering (Ngaira, 2004).

Consistently, when drought hits Swaziland, it decapitates the food production system pushing a significant portion of the population into food insecurity. For example, the Swaziland Vulnerability Assessment Committee Report (VAC) (2016) found that more than half of the population became food insecure as a result of the 2015/16 El Niño induced drought. During the 2015/16 drought, the food insecure population increased by 99% from 320,973 people in July 2015 to 638,251 people in May 2016. Similarly, in 2007, the Office for the Coordination of Humanitarian Affairs (OCHA) reported that approximately 41% of the population (410,000 to 610,000 people) required food assistance through the regular programmes of the Swazi Government and World Food Program (WFP). Again in 1992 (Swaziland’s other major drought within the past two decades), saw 410,000 people or 48% of Swaziland’s population at that time requiring food relief (Herrick and Greene, 1994). On the other hand, the Intergovernmental Panel on Climate Change (IPCC) cautions that droughts will occur more frequently, hence, agriculture-based livelihood systems, such as Swaziland, that are already vulnerable to food insecurity face immediate risk (IPCC, 2007). The implication for Swaziland is that yields from rain-fed agriculture could fall by up to 50% by 2020 (IPCC, 2007).
Given these IPPC projections on extreme weather conditions into the future, and given the general state of food production deficiency in Swaziland, investments in climate change adaptation and mitigation are much needed to shield the agriculture sector and associated livelihoods from future cataclysmic drought episodes. It is against this backdrop that this study assesses the predictors of food insecurity during a drought situation across the four (4) regions in Swaziland. The study informs policy on priority geographic areas, and the socioeconomic conditions that need changing for effective drought disaster mitigation programming.

Specifically, the study identifies the constituencies and socioeconomic factors that significantly predict food insecurity among households in Swaziland. The study uses data obtained from a nationwide study conducted by the National Disaster Management Agency (NDMA) and the Swaziland Economic Policy Analysis and Research Centre (SEPARC) on The Socio-Economic Impacts of the 2015/16 EL Niño Induced Drought in Swaziland. NDMA and SEPARC’s assessment confirms that Swaziland has been experiencing chronic-drought like conditions since the 1980s, with impacts intensifying in the last decade. The main issue is that, despite a solid Disaster Risk Management Policy (2010), the country is still struggling to become drought proof. Even with substantial drought experience and knowledge the country has garnered through similar droughts in 2009/10, 2007, 2001, and 1992, the country remains critically vulnerable to drought, particularly in achieving and maintaining food security.

2. Drought and Vulnerability to Food Insecurity

Generally, food insecurity in Africa and other developing countries is highly correlated with drought and extreme weather events; pest, livestock diseases and other agricultural problems; climate change; military conflicts; lack of emergency plans; corruption and political instability; cash-crops dependence; human diseases and rapid population growth (FAO, 2007; Habyarimana, 2015). As a concept, food security defines a situation when all people at all times have physical or economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996). The food security status of a household is a multi-dimensional matter that encompasses issues of food availability, accessibility, utilisation and food systems stability (FAO, 2008). Food insecurity exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development, and ability to live an active and healthy life. According to the FAO, climate change affects all four dimensions of food security leading to impacts
on human health, livelihood assets, food production and distribution channels, including food purchasing power and market flows (2008).

Within the Southern African context, food insecurity is an ongoing and persistent problem, and food production per capita is projected to diminish into the future (Rosegrant at al., 2001). In fact, food insecurity is a prevalent problem that in the past two decades has increasingly been recognised as a serious public health issue (Motbainor et al., 2016). Food security and the factors that determine it are experienced both at the household and individual level but also vary spatially across regions (Misselhorn, 2005). At the national level, food security relates to the availability of food stocks for consumption, be it from own production or from markets and food aid. At the household level, food security is about the ability to obtain sufficient and quality food to meet the nutritional needs of all household members (FAO, 1996; Endalew, Muche and Tadesse 2015; Motbainor et al., 2016).

Water is a lubricant of the economy, and without it, droughts disrupt economic activities and sever lifelines for many rural communities who depend on agriculture. Devereux (2007) argues that in rain-fed agricultural systems, erratic rainfall can lead to devastating impacts on livelihoods and local economies. Furthermore, he argues that the immediate impact on rural livelihoods is on crop production. Droughts undermine crop yields cascading to reduced national harvest, which in turn reduce national food availability, and agricultural income derived from crop sales (Devereux, 2007). The extent to which poor harvest become a threat to food security and livelihoods from the household to national level depends on the varying degrees that the family or nation depends on agriculture for food and income (Devereux, 2007).

However, households and economies that are more diversified are less likely to be vulnerable to the direct impacts of drought provided that their alternative income sources are also not correlated with rainfall nor directly or independently dependent on agriculture (Devereux, 2007).

In Swaziland, almost 80% of the Swazi population is rural-based with livelihoods predominantly dependent on rain-fed subsistence agriculture and/or livestock herding (International Funds for Agricultural Development (IFAD), 2013). Smallholder producers constitute 70% of the population and occupy 75% of the crop land, yet contribute a meagre 11% of total agricultural outputs in the country, with average cereal yields as low as 1.1 tonne/hectare (Global Agricultural Information Network (GAIN), 2016; Ministry of Agriculture (MOA), 2016). The large number of people depended on the rural economy which is dependent on rain agriculture make drought...
risk a significant contributing factor to food insecurity in the country. In the long-term, Dorward and Kydd (2002) assert that the presence of this weather/climate risk lowers the productivity of the rural economy. It does this by reducing returns on agricultural investments, distorting investments away from income-maximising activities towards risk-reduction activities, and by discouraging aggregate investments on agriculture leading to long-run stagnation and rural poverty (Dorward and Kydd, 2002).

Maize remains the important staple food crop grown on Swazi Nation Land for subsistence purposes and food security (MOA, 2016). It is also the measure of food security in the country (FAO, 2005). However, though a substantial number of rural households produce it, the country has never produced enough maize for total domestic consumption (Magagula, Dlamini, Mkhwanazi, 2007). According to National Maize Corporation (NMC), in the past 40 years, Swaziland has never met the population’s maize requirement (NMC, 2010). The MoA’s Swaziland Market Assessment Report (2016) reveals that the country has averaged an annual cereal production of 92,000 tonnes since 2011 such that even in exceptionally good harvest years, Swaziland only produces enough to meet about 45% (110,250 tonnes) of its annual total cereal requirements of 245,000 tonnes. During the 2015/16 drought, maize production dropped by 67% forcing the country to import about 30,446 tonnes of maize from South Africa. It points to the argument that Swaziland as a country is extremely food insecure and, since the early 1990s, has shifted from being a net exporter of food to depending on food aid to feed its population (Tevera et al, 2012).

On the other hand, the FAO and the WFP (2007) argue that HIV/AIDS is also a major contributing factor to the country’s food insecurity at the household level. The United Nations organisations explain that HIV and AIDS limit the ability of households to participate in agriculture for food production and income generation by increasing the number of people that need to be taken care of, and by taking the lives of traditional caregivers. Likewise, Waal and Whiteside, (2003) found that even though droughts and famines have afflicted a large part of Africa throughout history leading to food crisis, the HIV/AIDS epidemic in Southern Africa has its own contributing complexity on why many households face food shortages with hopeless trajectories of recovery. They attribute the impact of HIV on food insecurity at the household level to adult morbidity and mortality which contribute to a rise in the number of dependents; loss of assess and skills resulting from increased adult mortality; the burden of care being large for sick
adults and children orphaned by AIDS; and to the vicious interactions that exist between malnutrition and HIV (Waal and Whiteside, 2003).

Indeed, understanding the determinants of food insecurity at the household and national level is a complex endeavour that cannot be attributed to one factor. There are synergies between a variety of factors and this study tries to identify the fundamental geographic and socioeconomic household conditions associated with food insecurity during a drought in Swaziland.

Droughts are a natural shock that heighten vulnerability to food insecurity as a majority of the population in Swaziland derive their livelihoods from rain-fed subsistence agriculture. Hence, in the event of drought, crops and livestock can be diminished or wiped out to the point that little food becomes available to provide food for smallholders and their families. In a sense, the drought exposes the underlying vulnerabilities to food insecurity, and for the 63% of population that lives under poverty in the country (Swaziland Income and Expenditure Survey, 2010), it means selling valuable household assets, changing to less preferred and less nutritious food including food aid just to survive.

The country’s National Development Strategy (NDS) and Poverty Reduction Strategy and Action Plan (PRSAP) (2006) recognise that the country has a large rural population that suffers from inadequate access to food and high unemployment. The NDS expects the agriculture sector to implement strategies for food security enhancement, drought mitigation, poverty alleviation and sustainable use of the Kingdom’s natural resources. Empowered by the NDS, the Comprehensive Agriculture Sector Policy (CASP) (2005) acknowledges the fact that the deteriorating food security and poverty dynamics in the country can largely be explained by the poor performance of the agriculture sector, and so it is important to make the appropriate interventions in this sector so that the agricultural sector contributes fully to the socioeconomic development of the country.

Accordingly, Swaziland’s Strategy for Sustainable Development and Inclusive Growth (SSDIG) stresses growth that will make significant investments in agriculture. Agriculture is uniquely positioned to reduce poverty and drive development in rural areas as most rural inhabitants depend on it for their livelihoods. Through the Swaziland National Investment Plan (SNAIP) (2014) the goal is to commercialise agriculture production in the country and in the process create jobs. All these policies play an important directive to address the threats and opportunities in relation to food security in Swaziland.

Hence, the National Food Security Policy for Swaziland (NFSP) (2005) forms the basis for priority setting and strategy development
around food security which will be integrated into an overall Integrated Agriculture and Food Security Strategy and Action Plan. The NFSP underscores the fact that recurrent droughts and the high incidence of HIV/AIDS in Swaziland are the major contributing factors towards adverse food insecurity in the country. At present, a large proportion of the country’s population face impacts of chronic drought conditions and impacts of HIV/AIDS leading to substantial declines in agricultural productivity.

Findings of this study can inform policy decision on where to target agricultural investments and drought mitigation programmes in the country focusing on the most vulnerable households. Specifically, this study contributes information on food security risk mapping for optimal distribution of food and drought mitigation programming within households, communities and regions in the country.

3. Methods

3.1 Conceptual Framework

A comparison of the socioeconomic and geographic factors of the households across the country exposes the underlying endemic vulnerabilities to food insecurity during droughts. Vulnerability describes exposure to risks, shocks and stress and difficulty in coping with them (Lawal, 2013). It can also be the factors that influence exposure to food insecurity and a household’s predisposition to the consequences (Lawal, 2013). Lovendal and Knowles (2005) developed a vulnerability framework which states that current socioeconomic characteristics and exposure to risks determine household’s future characteristics and their risk-management capacity. In terms of food insecurity, Lovendal and Knowles highlight that there are many factors that drive household food insecurity such as political, economic, environment, natural, social, infrastructural and health issues (2006), while Negatu (2006) emphasises the capability to produce one’s own food and increase in purchasing power as the major drivers of food insecurity.

The vulnerability framework explains that at every point in time, households’ current food security status is affected by their past status which in turn affects their future food security status. The study uses this framework in identifying the predictors of food insecurity among households using the 2015/16 drought as a baseline predictor for food insecurity for future droughts. Of course, household’s food insecurity status is dynamic, and future food insecurity of a household will depend on the magnitude of future droughts, and the ability of the
household to shirk or manage that risk. The implication is that livelihoods can differ between households, depending on each 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 (VAC, 2014). 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, 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).

To make a decision on which factors to include in food insecurity model of the study, the study uses the work of Misselhorn (2005) as a guiding framework. A variety of socioeconomic and geographic factors are generally found to be associated with food insecurity. Figure 3.2.1 below provides a summary of the determinants of food insecurity at the household level.
Figure 3.1.1 Determinants of Food Insecurity at the Household Level

Misselhorn (2005) identified five (5) general categories of causes (drivers) of food insecurity: socio-political; scientific and technological; cultural and religious; physical, biological and chemical; and demographic. Drivers were considered to either act over the short or long term (acute versus chronic drivers), and to act either directly, or indirectly by initiating other drivers of food insecurity. Generally, people experience food insecurity either because their access to food has been negatively affected, or because of a reduction in production of their own food resources (Misselhorn, 2005).
Based on the above theoretical framework, the study proposes that the stated food insecurity status (SFIS) of a household during the 2015/16 drought in Swaziland can be explained in a two-dimensional space by geographic (G) and socioeconomic (SE) factors. Geographic factors include the (4) regions of Swaziland divided into fifty-five (55) constituencies (Tinkhundla). Socioeconomic factors include household demographics (age and sex of household breadwinner), homestead structure, source of cooking energy, asset ownership, source of income and levels, livestock and crop production, and household budget (money spent on food, health, education, clothing, and transportation) and impacts of the drought on food production and health.

In summary,
\[ SFIS_i = f(G(\alpha), SE(\lambda)) \]  
……(1)

where the stated \( \alpha \) includes the geographic factors and \( \lambda \) includes the socioeconomic factors (see Diansariy and Nanseki (2015) on perceived food security status – a case study of households in North Luwu, Indonesia even though they use behavioural factors instead of geographic factors).

Studies that try to identify the determinants of household food insecurity either use a logit or probit model (François, 2010; Mesfin, 2014; Habyarimana, 2015). Logit and probit models resemble a sigmoid function with a domain between 0 and 1. A logit model follows a logistic distribution whilst a probit model follows a normal distribution (Green, 2000). Equation (1) above models the stated food insecurity status of a household (SFIS) as a dichotomous/binary position: a household is either food insecure or food secure and nothing in between. The study selected the logit model because the qualitative response SFIS is a dummy (0) and (1) binary variable that is not normally distributed (Greene, 2000). Hence, the binary SFIS model assumes that the probability of being either food insecure (coded as 1) or not food insecure (coded as 0) is explained by the underlying geographic and socioeconomic characteristic of the households. Therefore, the logit regression model compares the means of the G and SE variables to the control group to determine if they are significantly different (Greene, 2000; Ravallion, 2001). Variables that are significantly different are considered to have a predictive influence on the status of food insecurity in households in Swaziland. A logit model can be executed in Stata 14.0 Statistical Analysis Software as a logistic regression for ease of interpretation to give out the odds coefficient in terms of log of the odds, also known as the odds ratio. The odds ratio is
the ratio of the probability that a household would be food insecure (\( P_i \)) to the probability of a household would not be food secure (1 - \( P_i \)).

Before performing a logistic model, the study ranks the regions and the 55 constituencies in Swaziland in terms of the overall impact of the drought on food security at the household level using a 5-point scale; 1: No Impact; 2: Minimum Impact; 3: Medium Impact; 4: High Impacts; 5: Severe Impact. On this 5-point scale, households were asked during the survey to indicate the overall impact of the 2015/16 drought on food security within their households. The higher the score (1-5), the more food insecure the household became due to the drought. The mean (average) score supports the predictors of food insecurity determined by the logistic regression in identifying the regions and constituencies in Swaziland that need priority in implementing food insecurity interventions.

### 3.2 Materials and Data Collection

In order to determine the predictors of food insecurity during drought at the household level, the study uses data obtained from the NDMA/SEPARC Socioeconomic Drought Assessment Survey conducted in November/December 2016. The socioeconomic impact survey uses a sample of 2,958 households clustered in 298 enumeration areas across the 55 constituencies (Tinkhundla) in Swaziland. The survey solicited responses from household breadwinners or an adult 18 years or older who is involved in decision making of the household. The survey questionnaire examines household demographics; asset ownership and risk to poverty; main sources of drinking water; main sources of income; household participation in agriculture; drought impacts and coping mechanisms; drought impact significance; household networks/social participation; drought mitigation measures; and drought response behaviours. An important variable used to assess food insecurity among the households is a binary response question which asks all households whether during the past 6 to 12 months of the drought they faced a shortage of food or money to buy food. The response from each household was either YES (coded: 1) the household faced a shortage of food or money to buy food, or NO (coded: 0) the household did not face shortage of food or money to buy food.
Table 3.2.1 Description of Variables Used for the Logistic Model

<table>
<thead>
<tr>
<th>Description of variables</th>
<th>Variable Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stated Food Insecurity Status (SFIS)</td>
<td>Food_Insecurity</td>
<td></td>
</tr>
<tr>
<td><strong>Independent</strong> (Geographic factors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constituency</td>
<td>Constituency_Code</td>
<td>Includes the 55 Tinkhundla of Swaziland</td>
</tr>
<tr>
<td>Region</td>
<td>Region1</td>
<td>Hhohho, Manzini, Shiselweni and Lubombo</td>
</tr>
<tr>
<td>Urban/Rural</td>
<td>Rural_Urban</td>
<td>Rural: 1; Urban: 0</td>
</tr>
<tr>
<td><strong>Independent</strong> (Socioeconomic factors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex of household breadwinner</td>
<td>BW_Sex</td>
<td>Male, Female</td>
</tr>
<tr>
<td>Age of household breadwinner</td>
<td>BW_Age</td>
<td>18-24; 25-34; 35-44; 45-54; 55-64; 65+</td>
</tr>
<tr>
<td>Education of household breadwinner</td>
<td>Education1</td>
<td>No Education; Primary; Secondary; High; Vocational; Non-Standard Curriculum; Diploma; Degree; Ph-D; Other</td>
</tr>
<tr>
<td>Cooking energy source</td>
<td>cooking_source</td>
<td>electricity; firewood; coal; paraffin; natural gas; solar</td>
</tr>
<tr>
<td>Homestead structure</td>
<td>rooms</td>
<td>1 room; 2-3 rooms; 4-5 rooms; &gt;5 rooms</td>
</tr>
<tr>
<td>Toilet Facility</td>
<td>Toilet_type</td>
<td>Septic tank; Pit Latrine; Community Toilet; No Facility; Other</td>
</tr>
<tr>
<td>Asset ownership</td>
<td>car</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>hoe</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>tractor</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>water_tank</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>electric_gas_stove</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>no_assets</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td>Livestock ownership</td>
<td>cattle</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>chickens</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>pigs</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td></td>
<td>goats</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td>Crop Production</td>
<td>crop_farming_yn</td>
<td>No =0; Yes=1</td>
</tr>
<tr>
<td>Source of Drinking water when there</td>
<td>NoDrought_Drink_water_source</td>
<td>SWSC (Public Utility); Public Tap; Unprotected</td>
</tr>
<tr>
<td>Main Source of Income</td>
<td>main_income</td>
<td>Food crops agriculture; Cash crops agriculture; Raising &amp; Selling livestock; Skilled/ professional worker; Trader; Construction; Transportation; Handicraft; Remittance; Mining; Pensioner; Salaried Employee; Private sector; Government employee; Other</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Drought affected Household main Income</td>
<td></td>
<td>No, 0% reduction in income; Yes, reduced income by 75%; Yes, reduced income by 50%; Yes, reduced income by 25%</td>
</tr>
<tr>
<td>Monthly Household Budget</td>
<td>Mealie_meal</td>
<td>Money spent on maize meal</td>
</tr>
<tr>
<td>Rice</td>
<td>Money spent on rice</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>Money spent on vegetables</td>
<td></td>
</tr>
<tr>
<td>Meat_Fish</td>
<td>Money spent on fish</td>
<td></td>
</tr>
<tr>
<td>Pulses</td>
<td>Money spent on pulses</td>
<td></td>
</tr>
<tr>
<td>Medicines</td>
<td>Money spent on medicines</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Money spent on education</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>Money spent on transportation</td>
<td></td>
</tr>
<tr>
<td>Monthly Savings</td>
<td>Money saved</td>
<td></td>
</tr>
<tr>
<td>Drought Impacts</td>
<td>Health_Decline</td>
<td>Household experienced health decline due to drought</td>
</tr>
<tr>
<td></td>
<td>Disabilities</td>
<td>Household affected by drought due to disabilities</td>
</tr>
<tr>
<td></td>
<td>Reduced_Agriculture_Water</td>
<td>Household experienced decline in water for agriculture</td>
</tr>
<tr>
<td></td>
<td>Reduced_Consumption_Water</td>
<td>Household experienced decline in water for household consumption</td>
</tr>
<tr>
<td></td>
<td>Exited_Agriculture</td>
<td>Household did not participate in agriculture during drought</td>
</tr>
</tbody>
</table>

Source: Author’s own representation using Survey Data
4. Results and Discussion

4.1 Household Stated Food Insecurity due to 2015/16 Drought Impacts

To determine the level of food insecurity within each household, the study also used the same 1-5 scale (1: No Impact; 2: Minimum Impact; 3: Medium Impact; 4: High Impacts; 5: Severe Impact). The mean score on this scale of 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 4.3.1 below. 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 4.1.1 below.

Figure 4.1.1 Household Mean Stated Food Insecurity Score

![Chart showing mean stated food insecurity scores by region and urban/rural status.](chart.png)

Source: Author’s own representation using Survey Data.

To compare households that reported no impacts (1) on the food insecurity scale to those that reported severe impacts (5), Manzini (13%) and Hhohho (12%) of households as shown in Figure 4.1.2 below reported experiencing no impacts in overall food insecurity impacts due to the drought. Only few (3%) of Lubombo households did not experience impacts on overall food insecurity. An estimated 51% of households in the Lubombo region stated experiencing severe impacts on food insecurity followed by Shiselweni (39%), Manzini (38%) and
Hhohho (32%) (see Figure 4.1.2 below). Most of the food insecurity impacts were skewed towards the severe impacts side of the food insecurity 5-point scale which suggests that the drought affected household food insecure substantially across the four regions of Swaziland.

Figure 4.1.2 Impacts of the 2015/16 Drought on Food Insecurity at the Household Level

Constituencies that experienced the least impacts on food insecurity include Mbabane East, Mbangweni, Mahlanya, Pigg’s Peak, Mbabane West, Lavumisa, LaMgabhi, Hhukwini, and Lobamba Figure 4.1.3 below. The figure also shows other constituencies that experienced medium to high impacts on food insecurity.
Figure 4.1.3 Household Stated Food Insecurity Score (Minimum to Medium Food Insecurity)

<table>
<thead>
<tr>
<th>Constituency</th>
<th>Average Food Insecurity Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOBAMBA</td>
<td>3.00</td>
</tr>
<tr>
<td>HHIUKWINI</td>
<td>2.92</td>
</tr>
<tr>
<td>LAMGABHI</td>
<td>2.82</td>
</tr>
<tr>
<td>LAVUMISA</td>
<td>2.75</td>
</tr>
<tr>
<td>MBABANE WEST</td>
<td>2.72</td>
</tr>
<tr>
<td>PIGG’S PEAK</td>
<td>2.58</td>
</tr>
<tr>
<td>MAHLANYA</td>
<td>2.57</td>
</tr>
<tr>
<td>MBANGWENI</td>
<td>2.46</td>
</tr>
<tr>
<td>MBABANE EAST</td>
<td>2.10</td>
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Stated Food Insecurity due to 2015/16 Drought

Medium to High Food Insecurity
Source: Author’s own representation using Survey Data.

**Figure 4.1.4** Household Stated Food Insecurity Score (High to Severe Food Insecurity)
Constituencies that experienced the most severe impacts on overall food insecurity due to the 2015/16 drought include Lomahasha, Mthongwaneni, Matsanjeni North, Ngudzeni, Sigwe, Hlane, Madlangempisi, Sandleni, Mkhiweni, Sithobela, Ntontozi, Lubuli, Dvokodvweni, Mayiwane, Siphofaneni, Mafutseni, Ndzingeni, Mhlangatane, Matsanjeni South, Mahlangatja, and Nkwene as ranked in Figure 4.1.4 above.

4.2 Logistic Model
The logistic model used in the study investigates the predictors of household food insecurity. Instead of the 5-point scale, the model uses a two level scale; 1: Food Insecure and 0: Not food insecure (food secure) Figure 4.2.1 below shows the mean SFIS score comparing the 4 regions of Swaziland. Lubombo reported 72.9% of households that were food insecure followed by Shiselweni (58.1%), Manzini (56.4%) and Hhohho at 50.1%. The percent of food insecure households were greater than the percent of food secure households in all four regions.

**Figure 4.2.1 Regional Mean Stated Food Insecurity Score**

Source: Author’s own representation using Survey Data.

The components of the SFIS model include geographic (regional factor) and socioeconomic factors that predict household level food insecurity in a drought situation (refer to the appendix section for the full logistic regression model). The log likelihood chi-square tests whether the whole logistic model is significant. The probability of chi-square is 0.0000 which indicates the model is significant as a whole. Using McFadden’s pseudo r-squared ($\rho^2$) to gauge the predictive strength of the model, the model gives a pseudo r-squared of 0.380. McFadden suggested $\rho^2$ values of between 0.2 and 0.4 should be taken to represent a very good fit of the model (Louviere et al., 2000), hence the SFIS logistic model of this study can be considered a good model.

Geographically, the odds of being food insecure are 1.67 times greater in the Lubombo region significant at the 1% (***) level or $p < 0.01$ when compared to the Hhohho region. Manzini region has a food insecurity odds ratio 1.3 times greater than Hhohho region but only significant at the 10% (*) level or $p < 0.1$. When the odds ratio is
greater than 1, it describes a positive relationship, whilst an odds ratio less than 1 implies a negative relationship.

Within each region, the larger the household’s house, the less likely the household will experience drought induced food insecurity. Households that depend on oil lamps/lanterns for lighting are 1.7996** more likely to be food insecure during a similar drought than households that use electricity as their main lighting source and is significant at the 5% (**) level or p < 0.05. In contrast, the few households in the country that have installed solar panels for electricity to light their homes are less likely to be food insecure compared to those that use conventional grid electricity.

Looking at other amenities/facilities in the home, households that depend on rainwater collection as their main source of drinking water are 3.1906*** times more likely to be food insecure than those who rely on the country’s water utility company, Swaziland Water Services Corporation (SWSC). Those that depend on boreholes are 1.6619** times more likely to be food insecure during a drought than those households that are connected to SWSC.

Toilet facilities are also a good predictor of food insecurity within a household. Households that rely on their neighbours, and public toilet facilities compared to households that have septic sewer systems in their homes are 3.3930* times more likely to experience drought induced food insecurity.

Single room home structures also predict food insecurity as the model revealed that home structures above 2 rooms, the odds of being food insecure decrease by half (0.5275***). Wealthier households can afford to build larger houses, and so can typically afford to buy food as one of the basic necessities of a household even during shocks such as the 2015/16 drought. A surprising finding is that households that rent their homes are less likely to be food insecure by 0.4479*** odds compared to households that own their structures. This can be explained by the fact that renting in Swaziland is generally an urban phenomenon, and so urban households are richer than rural households, and rural households form the majority households in Swaziland.

An analysis of the typical household assets reveals that cars (0.6553***), ploughs (0.5086*), water pumps (0.3193**), water tanks (0.7907*) are significant predictors of drought induced food security at the household level. Households that own these assets are less likely to be food insecure by the odds indicated in parenthesis. These agricultural production and water harvesting and storage equipment are expensive to buy. In contrast, households that own tractors (2.0693**)
and hoes (1.3787**) are more likely to be food insecure. Similarly, the logistic model reveals that the odds of a household that depends on crop farming for food is one and half times (1.5567***) greater to be food insecure during a drought than the odds of a household that does not depend on crop farming to sustain its livelihood.

Comparing the levels of income regardless of income source, the model reveals that all incomes above E1,000 increase a household’s chances of being food secure significantly compared to households that do not have any form of income. The greatest impact in reducing food insecurity within a household is observed between the E3,001 and E4,001 level of income. This suggests that households should at least earn an average of E3,500 to suitably shirk risk against extreme forms of food insecurity. Households whose incomes were not affected by the drought were indeed 36% less likely to be food insecure (0.3663***) than households whose incomes reduced by 75% as a result of the 2015/16 drought.

Food budgets also prove to be a good predictor of food insecurity among the sampled households. The results of the model show that households that spend more on mealie-meal and rice as a proportion of their total income are likely to be food insecure than those household that spend less on these items as a share of their total income. Maize is a staple food in Swaziland, therefore an increase in the price of maize and hence maize-meal increases the odds of a household being food insecure by 1.0017** odds compared to households that spend less of their food budgets maize-meal. The results also suggest that rice is also increasingly becoming a staple food in the country. However, on the other hand, high spenders on vegetables, meat, and fish are less likely to be food insecure. Households that pay a premium on these food items (assuming premium quality of vegetables, meat, and fish) are less likely to be food insecure that those households that spend less of their food budgets on these items.

The ratio of money spent on transportation also predicts household food insecurity. Households that spend a lot on commuting costs are 1.0007** times more likely to be food insecure than households that spend less of their total incomes on transportation costs. The regression suggests that transportation costs now so significant across the country such that they now have a huge bearing on the status of food insecurity among households. Wealthier households that do not feel the pinch of spending a significant portion of their total incomes are able to save, and as well, are less likely to be food insecure. Households that are able to save are almost 100% less likely to be food insecure (0.9996***) compared to households that are unable to save.
Finally, the logistic model demonstrates that high/severe health declines and severe impacts on disabilities associated with the drought contribute significantly to food insecurity within a household. Households that experienced high/severe impacts on health and disabilities as a result of the 2015/16 drought were 2.5 to 3 times more likely to be food insecure than households that did not experience deterioration in health or inconveniences from disabilities due to the drought. High to severe deterioration in health increases the household’s odd to food insecurity by 2.55513*** to 2.9997*** while high and severe disabilities increase a household’s food insecurity by 2.3966*** to 3.3119*** odds.

5. Conclusion and Recommendations

5.1 Conclusion

The intent of the study was to determine the geographic and socioeconomic factors that predict food insecurity among households in Swaziland. The study used a logistic regression model to determine the significance of these factors in predicting food insecurity among households in a drought situation using data collected during the 2015/16 drought. The study finds that most significant predictors of food insecurity, that is, factors associated with increased food insecurity odds at the household level include households in the Lubombo region because the region is the poorest among the four regions in the country and was worst affected by the drought in terms of overall food security. Households that do not have toilet facilities in their homesteads, households that depend on rainwater and boreholes as their main source of drinking water, and households that use lanterns or oil lamps as their main source of lighting are more likely to be food insecure. Other important factors associated with increased food insecurity at the household level include households that depend on crop production as one of the main sources of food, and can use the ownership of tractors and hoes within these households as a good predictor of food insecurity during a drought. The study also finds that the price of maize and rice is a good predictor of food insecurity among households given that maize is a staple food in Swaziland. Finally, health decline and disabilities within a household were correlated with high incidence of food insecurity in a household. If the price becomes too high due to food inflation during a drought, many rural households become significantly vulnerable to food insecurity. Besides the factors associated with increased food insecurity, the study finds that households that spend more on vegetables, meat and fish were less likely to be food insecure. Vegetables, meat and fish at a premium price
can be considered luxury items in Swaziland. A major finding that cuts across all households in the country is that all incomes above E1,000 significantly reduce the chances of food insecurity among households with E3,500 being the optimal level of income for a household to shirk against extreme levels of food insecurity.

Therefore, to contribute towards food security risk mapping for optimal distribution of food and drought mitigation programming the study finds that Lomahasha, Mthongwaneni, Matsanjeni North, Ngudzeni, Sigwe, Hlane, Madlangempisi, Sandleni, Mkhiweni, Sithobela, Ntontozi, Lubuli, Dvokodyweni, Mayiwane, Siphofaneni, Mafutseni, Ndzingeni, Mhlantatane, Matsanjeni South, Mahlangatja, and Nkwene ranked as the top constituencies that suffered the worst impacts on food insecurity during the 2015/16 drought in the country.

### 5.2 Recommendations

Based on the findings, the study proposes the following set of recommendations:


- In the event of drought, prioritise intervention programmes such as food distribution on households living with disabilities and those with deteriorated health status.

- 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 within these targeted constituencies.

- Focus the implementation of the PRSAP in the Lubombo region especially in investments in agriculture to increase the level of food production in this region.

- Encourage commercialisation and value-addition in rural households to increase national food production and incomes in households paying special attention to the Lubombo and Shiselweni regions.

- Investigate the suitability and sustainability of E3,500 minimum wage in Swaziland.
6. References


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