# Lincoln University Digital Thesis

# Women's empowerment, livestock and household food and nutrition security: Empirical evidence from Malawi

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A thesis
submitted in partial fulfilment
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Tamala Mataka

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# Abstract

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**Women's empowerment, livestock and household food and nutrition security: Empirical
evidence from Malawi**


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Tamala Mataka

In this study, we examine the relationship between women's empowerment in livestock and household food and nutrition security. Employing data collected from 400 randomly selected households in two major livestock producing Extension Planning Areas (EPAs) in Nsanje District, Malawi, we compute the Women's Empowerment in Livestock Index (WELI) and estimate its impact on two indicators for food and nutrition security: Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity Score (HDDS). Tobit regression results show that empowerment of women in the livestock sector, especially in decisions pertaining to agricultural production, nutrition, and income control, increases household dietary diversity. In addition, factors such as household income, household size, and main occupation of the household head also play a significant role in ensuring household dietary diversity. On the HFIAS scale, whereas the aggregate WELI measure is not statistically significant, women's agency in agricultural production decisions and household income have positive impacts on household food security. The results highlight that nutrition-sensitive programmes should target women's agency in livestock production and nutrition decisions for improved food and nutrition security in low income and lower middle-income countries in Sub-Saharan Africa.

**Keywords:** *Food and nutrition security; Women's Empowerment in Livestock Index (WELI); Tobit model; Malawi.*

## Acknowledgements

**(Jeremiah 29 vs 11)**

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**Chapter 1: Introduction**

**1.1. Background - The status and impacts of food insecurity**

Food and nutrition security is an important development priority as evidenced by its inclusion in the 2030 United Nations Agenda for Sustainable Development (United Nations (UN), 2030). However, food insecurity remains a significant challenge across the world despite efforts by countries to implement strategies to eradicate it and ensure improved nutrition (Food and Agriculture Organization of the United Nations (FAO), 2019a). The percentage of the world's population affected by severe/moderate food insecurity increased from 23.2% in 2014 to 26.4% in 2019. Furthermore, economic slowdown and interruptions in food value chains following the COVID-19 pandemic have worsened the food insecurity situation. The prevalence of undernourishment (POU) increased to 9.9% in the year 2020 compared to 8.4% in 2019, after remaining constant from 2014 to 2019 (FAO, 2021).

Malawi's food security is often associated with adequate access to staple food needed for a household to meet the caloric needs of its members (Aberman et al., 2018; International Food Policy Research Institute (IFPRI), 2019). This traditional way of measuring food and nutrition security misses the importance of quality of dietary intake because it lacks consideration of the intake of nutrient-rich foods, whose consumption are usually in small quantities or not at all, mainly in rural areas (Harris et al., 2018). Food security is an important priority area for agriculture in the country, while nutrition is still considered a health issue. Furthermore, the country's previous food security policies partly addressed food and nutrition security because of their limited focus on nutrition (Aberman et al., 2018).

Factors such as poor agricultural planning and practices, unreliable rainfall, overdependence on rain-fed agriculture, high levels of extreme poverty and gender inequalities have contributed to food insecurity in Malawi (Aberman et al., 2018). The country experienced a drop in the occurrence of severe food insecurity among its population from 53.9% in 2014 to 51.8% in 2019. Despite this drop, the figure remains the highest in Sub-Saharan Africa, surpassing the regional average of 24.6 % (Global Nutrition Report, 2020; FAO, 2019b). This situation will no doubt be exacerbated by the COVID-19 pandemic.

Malnutrition is also a major problem in Malawi. Approximately 39% of children below the age of 5 are stunted and 3% are wasted, an indication of chronic malnutrition and acute

undernutrition, respectively. The country's stunting prevalence is higher than the 29.1% for the African region (Global Nutrition Report, 2020). In addition, 63% of children are anaemic (National Statistical Office (NSO), 2017; United States Agency for International Development (USAID), 2015). These indicators show that most Malawian diets are not rich in nutrient dense foods and are lacking as regards to quality and quantity (Aberman et al., 2015; Aberman et al., 2018). Much effort is still needed to reduce the prevalence of undernourishment in the population that has been rising from, 17% in 2015 to 18.8% in 2019 (FAO, 2020).

The impacts of food insecurity are felt by people of all ages (Gundersen et al., 2011). Food insecure children have higher chances of becoming anaemic and recover slowly from illnesses (Eicher-Miller et al., 2009). Furthermore, chronic undernutrition among children is associated with cognitive development problems (FAO, 2019a; Howard, 2011). Some of the notable effects among food insecure adults are low levels of nutrient uptake and increased physical and mental health problems (Kirkpatrick & Tarasuk, 2008). Furthermore, food insecure adults have high stress levels, anxiety, depression, and higher risk of chronic diseases (Gundersen, 2011; Whitaker et al., 2006). These consequences of food insecurity raise concerns at the household and national levels.

## 1.2. Women, livestock and food & nutrition Security

Women play significant roles in ensuring food and nutrition security in most developing countries (FAO, 2011; Tsiboe et al., 2018). They are the main producers of food (60-80%) and are involved in food processing and preparation. However, women in developing countries have limited control over productive resources (land, credit, labour, and machinery) and lack decision making authority (Kerr et al., 2016). Access and control over resources by women is constrained by cultural norms particularly in Africa (Murugani & Thamaga-Chitja, 2019). This limits their ability to achieve food and nutrition security because of several reasons: (1) control of resources by men might result in lower crop diversity because of their focus on cash crops compared to women; and (2) cultural norms reduce womens decision making authority on how income is used, leaving most decisions in the hands of men who mostly spend their income on non-food crops. In addition, women have low education levels and face limited access to financial services (Mathiassen et al., 2007). This also limits their ability to procure food.

Livestock farming provides both opportunities and challenges to women in developing countries, who can more easily obtain livestock assets compared to immobile assets such as land (Galiè et al., 2015). However, women face several challenges in livestock production and

marketing. For instance, despite women managing large livestock  (2/3 more than the size managed by men), they control fewer valuable species and earn less even though they are commercially oriented (Galiè et al., 2018; Njuki & Sanginga, 2013). Furthermore, in instances where they own livestock, they face limited access to marketing opportunities. In addition, they represent the world's poorest livestock keepers despite being actively involved in livestock farming (Galiè et al., 2015; Njuki & Sanginga, 2013).

## 1.3. Food and nutrition security initiatives in Malawi

Malawi's long-term focus has been to achieve food and nutrition security. Most government programmes for food and nutrition security aim to intensify fertiliser use and adoption of improved seed varieties for increased maize production. These efforts have resulted in increased consumption of maize in the country but failed to improve nutrition, because there is still a lack of diversification in the diets (Aberman et al., 2018).  Recognising this gap, the country made several commitments to achieving food and nutrition security as reflected in its strategies and actions implemented over the past years.

In 2005, a Farm Input Subsidy programme was implemented in 28 districts, aimed at increasing food self-sufficiency for farmers who cannot afford resources and income to produce maize. The programme targeted 50% of vulnerable and marginalized smallholder farmers through the provision of input vouchers that provided farmers with an entitlement to agricultural inputs (seed and fertilizers) at subsidized prices (Dorwad & Chirwa, 2011). The disbursement of subsidized inputs contributed to food availability through increased maize production and productivity. However, due to high international fertilizer and maize prices, achieving food security was undermined in the latter years of the programme implementation which led to the programme being scaled down to benefit few households.

Malawi is involved in the Scaling up Nutrition (SUN) programme, a multi-sectoral approach to addressing malnutrition at community level (SUN, 2013; World Food Programme (WFP), 2018a). A stunting prevention programme is being implemented under this programme in the Central region. Furthermore, the country has been implementing cash transfer programmes since 2006, aimed at improving food security through the provision of cash to the poorest 10% of labour constrained households across the country (Miller et al., 2011).

Recently there has been the development of the Multisectoral Nutrition policy, which aims to promote better nutrition for the population through a multifaceted approach involving

government, private sector and civil society. The National Agriculture policy was also developed to promote food security through increased production of diversified food crops for better nutrition (Aberman et al., 2018). Furthermore, most food security interventions are being implemented in line with the Malawi Growth and Development Strategy (MGDS), which aims to achieve food security by promoting dietary diversity and reducing post-harvest losses (UNDP, 2018). All these interventions indicate the significance of food insecurity in the country.

## 1.4. Problem statement

Despite the government's food and nutrition security initiatives, there has only been limited improvements in food and nutrition security in Malawi (Aberman et al., 2018). This raises concerns, considering the detrimental effects of food insecurity. Women play a central role in food production, processing, and preparation (FAO, 2011; Jiggins, 2011). They control vital livestock products for food and nutrition security (Njuki & Sanginga, 2013). However, their ability to achieve food and nutrition security is limited by their lack of access to productive resources and decision-making. Evidence suggests that increasing women's access and control over productive resources contributes to the achievement of food and nutrition security because unlike men, women are likely to spend their resources (income) on food (Malapit & Quisumbing, 2015; Sraboni et al., 2014). Furthermore, livestock provides an opportunity to empower women because women can access and control livestock and their products compared to other productive resources (Galiè et al., 2015). In addition, several strategies have been used to empower women in agriculture. Some have focused on empowerment through resources and achievements such as education levels (Ibrahim & Alkire, 2007; Negin et al., 2009). However, an empowerment dimension that is far less studied is agency that involves decision-making processes. Therefore, this study seeks to understand how empowerment of women in livestock decision making affects household food and nutrition security.

## 1.5. Motivation for research

This research will offer insight on the role played by women's empowerment in livestock on household food and nutrition security. This will help in developing inclusive policies for women's empowerment and better food and nutrition security in Malawi and other developing countries. In addition, results will be useful inputs in future activities by private sector and international Non-Governmental Organizations (NGOs) that aim to empower women for food and nutrition security. Lastly, the empirical results obtained from this study will serve as a good source of information to various researchers of this subject. It will contribute to empirical

literature on the association of women's empowerment in livestock and household food and nutrition security.

**Chapter 2: Literature Review**

This section provides a review of the literature on food and nutrition security and women's empowerment. The first part provides a review of food and nutrition security definitions, and its determinants. Following this section is an in-depth review of indices for measuring food and nutrition security and women's empowerment as well as a review of previous studies on women's empowerment in livestock and household food and nutrition security. The last section discusses the main research gaps identified from the review of the literature.

**2.1. Definition and determinants of food household and nutrition security**

Food security is said to exist when "all people at all times have physical, social and economic access to sufficient, safe and nutritious food that is needed to achieve dietary needs and food preferences for a healthy and active life" (FAO, 1996, p.3). Under this definition, food security is said to exist in four dimensions: availability, accessibility, utilization, and stability. Food availability entails the supply of adequate food stock to meet per capita energy needs. At a household level, this food can be from own production or purchased through markets and other sources. Food accessibility refers to availability of physical and economic resources for obtaining suitable and enough quality and quantity of food for a nutritious diet. It deals with individual and household's purchasing power. The term utilization centres on the ability of people to choose nutritionally adequate food and availability of resources for preparation and storage. Finally, food stability requires a stable supply of food during a year or in the long run (FAO, 1996; Hendriks, 2015). All four dimensions of food security are important for a household to be considered food secure.

A lot of research has been done to identify the determinants of household food security in developing countries. Factors such as age of household head, access to credit, gender of household head, education of household head, marital status and assets influence household food and nutrition security status among rural households in Malawi, Ghana and Kwa-Zulu natal South Africa (Aidoo et al., 2013; Matchaya & Chilonda, 2012; Mutiah & Istigomah, 2017; Ngema et al., 2018; Ubokudom et al., 2017). In addition to these important determinants, other studies conducted in Nigeria, Ethiopia, Malawi and South Africa, found household size and income necessary for achieving household food and nutrition security (Agbola, 2014; Gebre, (2012; Kakota et al., 2015; Ngema et al., 2018).

Most of these factors are often not specific to a particular location. However, the effect of these factors on household food and nutrition security is different depending on the context in which they are studied. Some studies have demonstrated that education exposes households to

different livelihood options that might increase the means of procuring food (Makombe et al., 2010; Mensah et al., 2013). Educated household heads might have better employment opportunities and more income, thereby ensuring household food and nutrition security (Makombe, et al., 2010). Furthermore, education allows household heads to utilise agricultural information and increase their participation in agricultural activities, which increase their food production (Agbola, 2014; Mango et al., 2014; Ngema et al. 2018).

Age of the household head is considered to have a positive association with household food security (Asghar & Muhammad, 2013). The justification is that older household heads are likely to have more farming experience and own more assets essential for ensuring household food and nutrition security. They may be more knowledgeable on food and nutrition security issues and have access to farmland and more experience in farming eventually leading to diversification in food production (Agidew & Singh, 2018). However, other studies have shown that the relationship is negative. They have argued that young household heads are more productive despite having less farming experience making them less food insecure (Matchaya & Chilonda, 2012; Mutiah & Istigomah, 2017). Furthermore, older household heads might have had their income reduced due to retirement and mostly depend on remittances (Ahmed, 2015; Yousaf, 2018).

Household income is necessary for achieving food security status among households as indicated by studies conducted in Pakistan, Nigeria and South Africa (Agbola, 2014; Bashir & Schilizzi, 2013; Ngema et al., 2018). Both farm and non-farm income provides households with the ability to obtain food in the right quantities and quality thereby ensuring adequate diversity of diets (Ngema et al., 2018; Reardon & Vosti 1995). In addition, income obtained from non-farm sources diversifies livelihood strategies for most households eventually reducing the chances of food insecurity (Sharaunga et al., 2016).

Household assets have been found to play a significant role in ensuring household food security because they are used for collateral in loans and meeting food needs in times of emergency and food scarcity (Harris-Fry et al., 2015; Mango et al., 2014; Manlosa et al., 2019; Silvestri et al., 2015). Studies conducted in Zimbabwe and Uganda have emphasized the importance of livestock ownership as key for food security and dietary diversity. Assets such as land influence livelihood activities and income generation (Harris-Fry et al., 2015). Furthermore, the use of both mechanized and non-mechanized machines might result in increased food production (Silvestri et al., 2015). On the other hand, livestock assets are a socioeconomic status indicator

for a farmer because it can easily be sold during food shortages and their products provides an income source for meeting daily food requirements (Bain et al., 2020; Mango et al., 2014).

Gender of the household head is said to determine the food security status of the households according to studies conducted in Kenya, Ethiopia, Malawi, and Nigeria (Gebre, 2012; Kassie et al., 2014; Murugani et al., 2019; Ngema et al., 2018). In these studies, conducted to find the determinants of household food security, food insecurity was a more likely outcome among female-headed households than male headed-households. This is because unlike men, women lack access to productive resources and have low education levels. Furthermore, they lack access to financial services, limiting their ability to procure food in the right qualities and quantities. These make female-headed households vulnerable to food insecurity (Gebre, 2012; Kassie et al., 2014; Murugani & Thamaga-Chitja 2019; Ngema et al., 2018; World Bank, 2015).

Marital status plays a significant role in ensuring household food and nutrition security (Bogale et al., 2005; Ubokudom et al., 2017). Ubokudom et al., (2017) in a study conducted to assess the determinants of household level food security and its determinants in Nigeria concluded that married couples are likely to be food secure from resource pooling and accessibility of productive resources by men. This results in more income for the household to meet food requirements.

The size of a household, as indicated in the literature, has both positive and negative association with household food and nutrition security. Studies have demonstrated that the size of a household indicates food requirement levels by household members. Larger household size requires more food particularly with a larger number of dependents compared to smaller household size (Aidoo et al., 2013; D'Haese et al., 2013; Mkusa & Hendriks, 2021). Households with many members increase food and non-food expenditures and create pressure on household food security (Aidoo et al., 2013; Muche et al., 2014). On the contrary, larger household size might increase the availability of productive labour that is needed to achieve household food security (Murugani & Thamaga-Chitja, 2019).

## 2.2. Food and nutrition security measures

The understanding of food and nutrition security definition determines how it is measured (Coates, 2013; Hendriks, 2015). There is subjectivity and limited scope in the tools for measuring food and nutrition security because majority assesses one dimension and only a few partly covers utilization and stability dimensions (Ashby et al., 2016). Furthermore, most food and nutrition security measures that have been in use over the past decades were developed to

suit specific contexts. This created gaps in the definition of food security and its measurement (Barrett, 2010). Recently, there has been development of simplified and valid indicators of household food and nutrition security such as the Household Dietary Diversity Score (HDDS) and Household Food Insecurity Access Scale (HFIAS) (Coates et al., 2007).

The HDDS was developed in the year 2006 as part of the Food and Nutrition Technical Assistance (FANTA) project with a desired outcome of improving food access (Swindale & Bilinsky, 2006). This food and nutrition security measure captures the number of food groups consumed within a designated period (mostly 24 hours). The HDDS is an attractive indicator because knowledge of household consumption of food groups implies diversity in diets in terms of both macro and micronutrients. Furthermore, HDDS is an important measure of nutrition security because of the strong association that exists between dietary diversity and child growth (Headey & Ecker, 2013). There is a close relationship between household dietary diversity with household per capita consumption, daily caloric availability, and anthropometric indicators of nutritional outcomes. Furthermore, households that can afford nutrient rich expensive foods are regarded as having enough dietary diversity (Headey & Ecker, 2013).

Experience based food insecurity scales are a promising tool for measuring food insecurity at household level (Ashby et al., 2016; Cafiero et al., 2018). The HFIAS was developed as part of the USAID-funded Food and Nutrition Technical Assistance II project (FANTA) in collaboration with Tufts and Cornell Universities among other partners, between 2001 and 2006 (Coates et al., 2007). The indicator captures the behaviour of households and psychological actions about insecure food access such as reducing meal numbers and cutting on meal quality because of a lack of resources. The method is based on the idea that there are predictable reactions and responses caused by the experience of food insecurity that can be captured and quantified through a survey and summarized in a scale (Coates et al., 2007). Their use of this food security measure combined with other indicators of household nutrition status such as the HDDS can provide a better understanding on the food and nutrition security status of households (Cafiero et al., 2018).

## 2.3. Women's empowerment measures

The concept of empowerment is multidimensional and varies in different environments and cultures (Alkire et al., 2013). Many definitions exist in the literature (Ibrahim & Alkire, 2007). However, the most common definition regards it as the ability of people to make planned life choices, particularly in situations where this potential was not in existence (Alsop et al., 2006;

Kabeer, 1999; Narayan, 2002). The capability to make choices involves resources (land and capital), agency (decision-making processes and negotiations), and achievements such as well-being outcomes (Ibrahim & Alkire, 2007). Recent debates on empowerment focus more on agency as compared to resources and achievements.

The Women's Empowerment in Agriculture Index (WEAI) is a commonly used tool for measuring women's empowerment, agency and involvement in the agriculture sector (Alkire et al., 2013). WEAI was developed in 2012 as an initiative of USAID's Feed the Future programme. WEAI has five empowerment dimensions: (i) decisions related to agricultural production; (ii) control over the use of income; (iii) access to and decision-making power about productive resources; (iv) leadership in the community; and (v) allocation of time (Alkire et al., 2013). These dimensions and their indicators were selected based on their international comparability as evidenced from past empirical work. Furthermore, the tool has a sub-component (Gender Parity Index) which measures empowerment of women in relation to men in a household. Several improvements were made to WEAI in the ensuing period, which resulted in the development of other indices. An Abbreviated WEAI (A-WEAI) tool was developed to reduce interview length and modify questions that were challenging to implement in the field, such as those related to time use by women and public speaking. A-WEAI maintains five empowerment domains but only consists of six indicators with adjustments in their weights (Malapit et al., 2017). Further modifications resulted in the development of Project level Women's Empowerment in Agriculture Index (Pro-WEAI). This index measures empowerment of women in various agriculture and food security projects (Colverson et al., 2020; Malapit et al., 2019). The pro-WEAI has additional indicators such as intrinsic agency.

Despite the comprehensiveness of the WEAI, it has limited coverage of livestock issues because of its strong focus on crops, despite the significant role played by livestock in ensuring community livelihoods and their importance for women (Galiè et al., 2018). Recently, the International Livestock Research Institute (ILRI) and Emory University developed the Women's Empowerment in Livestock Index (WELI) to measure the empowerment of women in livestock production systems given that there is limited focus on livestock issues by WEAI at a time of rising significance of the livestock sector to women, particularly in Africa. The tool focuses on the important areas of livestock production, use of livestock products and marketing. While the focus of this tool is on livestock production, certain questions also relate to crops. The tool has the following empowerment dimensions: (i) decisions about agricultural production; (ii) nutrition related decisions; (iii) control over use of income; (iv) resources access

and control; (v) opportunities access and control (vi) workload and control over own time (Galiè et al., 2018). Improvements to the tool include an additional dimension on decisions related to nutrition. The WELI was piloted in Honduras and Tanzania (Colverson et al., 2020).

The decisions about agricultural production dimension involves women's sole or joint decision-making about agricultural production (crop farming, livestock farming, and fisheries). It also encompasses an indicator on autonomy in agricultural production (the extent to which an individual feels they can make personal decisions about certain aspects of household life). The second dimension on nutrition related decisions is concerned with women's sole or joint decision-making on the amount of output from agricultural and non-agricultural activities to keep aside for the consumption of the household. Control over use of income is a dimension that looks at women's sole or joint control on how income and expenditures are used. Women's ownership and decision-making power over crop and livestock assets as well as credit access comprises the dimension of resources access and control. The dimension of opportunities access and control is concerned with women's access to groups, training, markets and non-farm income opportunities. The last dimension on workload and control over own time is concerned with women's time allocation for productive and domestic tasks as well as satisfaction with available leisure time (Galiè et al., 2018).

## 2.4. Women's empowerment in livestock and household food and nutrition security

Livestock provides a unique opportunity for the empowerment of women as evidenced by studies conducted in Kenya (Walingo, 2009), Nicaragua (Salazar et al., 2018), and Uganda (Bain et al., 2020). Women's participation in livestock transfer projects in Nicaragua increased their monthly incomes and enhanced their household decision-making, thereby reducing the chances of them being disempowered (Salazar et al., 2018). Similar results were obtained from Uganda among dairy livestock owners. Specifically, dairy cow ownership by women resulted in them being approximately five times more empowered compared to when cow ownership was with their husbands (Bain et al., 2020). Furthermore, women who owned cows were able to provide input into dairy production, which resulted in them being more empowered, compared to those that did not make decisions on dairy production.

household food and nutrition security. Recent studies have focused on empowerment in agriculture using the WEAI. A study Price et al., (2018) found that access and control over livestock, particularly in livestock dependent communities contribute to women's empowerment. Income obtained from livestock sales, allows women to decide on the amount

and quality of food to purchase for the household thereby enhancing their empowerment (Price et al., 2018). Furthermore, a study conducted in Indonesia, Peru and Kenya showed that women's control over livestock and their products increased their bargaining power and eventually their empowerment (Valdivia, 2001). These findings show the importance of livestock on women's empowerment.

Women's empowerment is seen as a major strategy for ensuring conducted in Ghana found that empowerment of women in agriculture positively affected household nutrition measured through intake of carbohydrates, proteins, and fats (Tsiboe et al., 2018). The results further showed that women who were empowered in dimensions such as control and use of income, decisions related to agricultural production, and leadership in the community, were more likely to achieve household nutrition through increased intake of these food groups with the greatest impact observed in the income domain. These studies have indicated that income earned by a woman in the household, improves child and household nutrition since women unlike men tend to prioritize food purchase (Smith et al., 2003; Quisumbing et al.,1996). Women, empowered in income dimensions, were more likely to use expensive and more nutritious foodstuffs in the preparation of household meals (Galiè et al., 2018).

Murugani & Thamaga-Chitja (2019) proved the existence of a relationship between women's empowerment in agriculture and household dietary diversity using the WEAI in South Africa. Separating WEAI into its component indicators showed that input into production decisions significantly affected household dietary diversity, similar to results obtained by Tsiboe et al. (2018). Participation in sole or joint decision making by a female farmer, on what to be grown by the household for consumption, sale and other marketing opportunities increased the chances of consuming diverse diets because women participating in agricultural decisions select diverse crops for consumption. This gives them the ability to decide on the use of produce and income obtained from produce sale (Agarwal 1997; Aziz et al., 2021; Malapit & Quisumbing, 2015; Masuku et al., 2017). Access to credit played a significant role in ensuring household dietary diversity. Previous research that used WEAI in Nepal (Malapit et al., 2015), Ethiopia (Yimer & Tadesse, 2015), Bangladesh (Sraboni et al., 2014) and Ghana (Malapit & Quisumbing, 2015) provided support for a positive relationship between women's empowerment in agriculture and household food and nutrition security.

Women's empowerment in livestock resulted in improvements in household nutrition in a study conducted among pastoral communities in Tanzania (Galiè et al., 2019. The mixed method

study assessed women's empowerment across the dimensions of income control and asset control. Women pointed out that being able to make livestock decisions and generate income allowed them to decide on food quality and quantity to purchase for the household thereby ensuring diversity of diets. They further indicated that deciding on when to sell gives them more control over their milk and allows them to acquire nutritious foods for their children. Furthermore, they regarded control and use of income obtained from livestock sales as important to prioritise household food expenditures and ensure household nutrition (Galiè et al., 2019). In addition, results showed that women regarded control over assets as an avenue to achieve food and nutrition security by contributing to making better decisions regarding nutrition. Furthermore, they regarded control over livestock and land as essential to achieve enough food and nutritious diet even though they lacked this control in their community. The results from a cluster regression analysis showed that the scores from the income and assets domains were associated with household dietary diversity (Galiè et al., 2019).

## 2.5. Research Gaps

Although previous studies have provided evidence that empowerment of women in livestock is necessary for household food and nutrition security, no study has been conducted in a Malawian context to investigate this relationship. Furthermore, most of the studies have measured empowerment of women in agriculture sector using the WEAI. Despite its reliability in most agricultural contexts, the index pays little attention to livestock related issues and does not investigate how women's agency in nutrition affects household food and nutrition security. This study will therefore use the WELI, which has been improved to not only include livestock related issues, but also has an additional empowerment dimension on decisions related to nutrition which might offer important insights on how it is related to household food and nutrition security (Galiè et al., 2018). Finally, the results obtained from this study will provide additional literature on women's empowerment in livestock and household food and nutrition security.

**2.6. Research Questions**

This study addresses the following research questions:

1. What is the status of food and nutrition security in Malawian households?

2. What is the level of women's empowerment in livestock dependent households in rural Malawi?

3. How, and to what extent, does empowerment of women in livestock dependent households affect household food and nutrition security?

**Chapter 3: Methods**

**3.1.Introduction**

This chapter provides a description of the methods employed in this study to collect data and answer the research questions - how and to what extent empowerment of women in livestock dependent households affect household food and nutrition security. It has been divided into sections that provide an overview of the study area, sampling method, data collection methods, statistical analysis, data analysis, ethical considerations and health and safety. Furthermore, it provides an overview of how food and nutrition security and women's empowerment were measured.

**3.2. Study area**

The study was conducted in Malawi, a low-income country in Sub-Saharan Africa bordering Tanzania to its northeast, Mozambique along the southern and eastern borders and Zambia to the west. The country is divided into three regions: (i) Southern, (ii) Central and (iii) Northern with a total number of twenty-eight (28) districts. Malawi's population is around 17,563,749 (NSO, 2018). Approximately 51.5% of the population live below the $ 1.90 a day poverty line (WFP, 2020).

The focus of this study is on the Southern region, specifically in Nsanje district. This region was selected based on its high levels of food insecurity compared to other regions (FEWS NET, 2020). Nsanje district has a total population of 299,168; this includes 143,578 males and 155,590 females (NSO, 2018). The district is one that is worst hit by food insecurity because of frequent floods and droughts (MVAC, 2019).

Agriculture is a major contributor to Malawi's economy, and it accounts for 25.5% of Gross Domestic product (GDP), mostly through the smallholder sub-sector (World Bank, n.d). The livestock sector is an important sector after crop production and mainly consists of the subsistence grazing of sheep, cattle, goats, poultry, and pigs. The sector contributes about 8% to total gross domestic product (FAO, 2017). Most rural households keep livestock for food, income and as an important safety net in times of crisis, and their products offer households a source of protein. Poultry makes a vital contribution to food security, particularly among vulnerable groups such as women (Freeman et al., 2008). The second important livelihood activity and main source of income after crop production in the Nsanje district is livestock farming (Freeman et al., 2008). Figure 3.1 below shows the main study area.
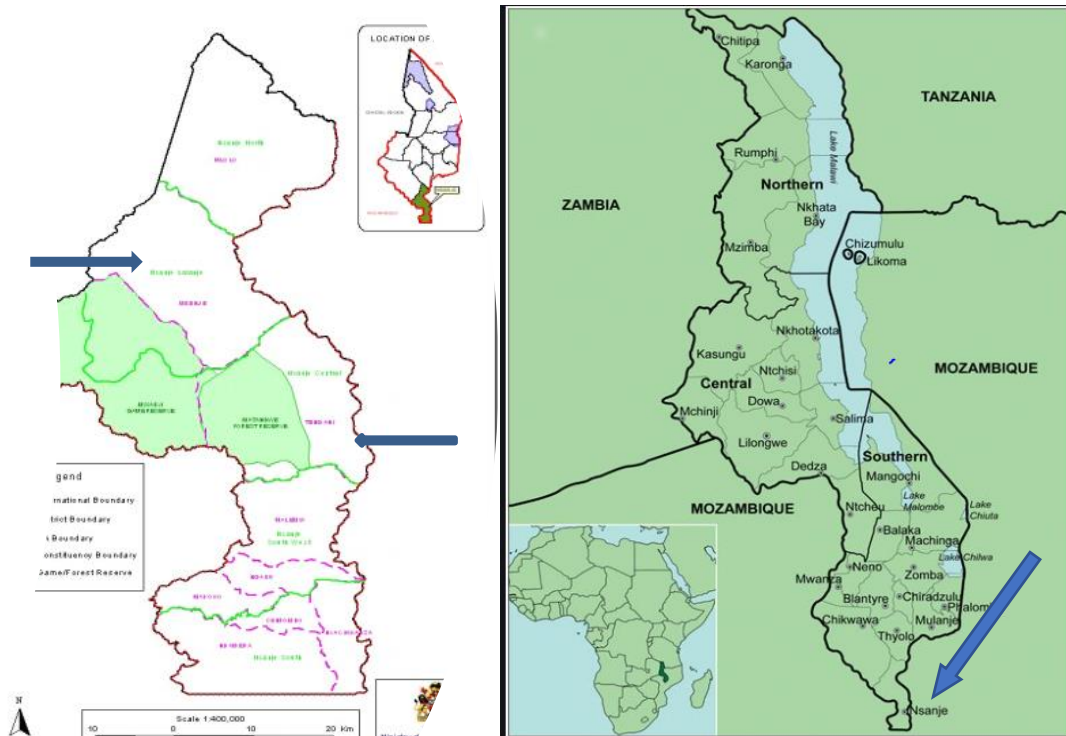
Figure 3.1: Map of Nsanje district showing two Extension Planning Areas (EPAs)

## 3.3. Sampling method and sample size

Nsanje district has five Extension Planning Areas (EPAs): (i) Makhanga, (ii) Magoti, (iii) Mpatsa, (iv) Zunde, and (v) Nyachilenda. Our study purposively selected two livestock dependent EPAs – Zunde and Mpatsa. These EPAs have a population of 20,938 and 16,277, respectively. Proportionate random sampling was used to determine the sample size within these two EPAs and households whose livelihoods depend on livestock were randomly selected. In total, 400 women were interviewed for our study (225 from Zunde and 175 Mpatsa). Government extension officers assisted us with selection of these households from the EPAs.

## 3.4. Data collection

A structured questionnaire (Appendix B) was used to collect data on social and demographic attributes of the sampled households. In addition, the following data was also collected; (i) household food and nutrition security and (ii) women's empowerment in livestock production and marketing. The study adapted the Women's Empowerment in Livestock Index (WELI) protocol that was developed by researchers from the International Livestock Research Institute and Emory University (Galiè et al., 2018). Trained enumerators conducted interviews, with oversight by a research supervisor who was employed on behalf of the researcher. The training for the enumerators was done via Zoom by the researcher who could not travel to Malawi due to Covid-19 restrictions. The survey was administered in the local language (Chichewa) and a

pre-test of the questionnaire was conducted before actual data collection commenced, to identify any inconsistencies in the tool.

## 3.5. Calculating Women's Empowerment in Livestock Index (WELI)

To understand the level of women's empowerment in livestock dependent households, the WELI tool was used. The index examined five out of six dimensions (i) agricultural production decisions; (ii) nutrition related decisions; (iii) income use and control; (iv) resources access and control; and (v) opportunities access and control. The workload and control over own time dimension was not used in the study because of time limitations.

The WELI questionnaire was administered to 400 women from households whose livelihood is derived from livestock production in Nsanje district. The index was computed from the five livestock empowerment dimensions mentioned above. Each of these dimensions has its own indicators as described in Table 3.1. The first step was to assign equal weights of 1/5 to each of the five dimensions (Alkire et al., 2013). Secondly, indicator weights were calculated by dividing the weight of the dimension by the number of indicators within each dimension. Dimensions such as income control and use and resources access and control had three indicators and received a weight of 1/15 each. Decisions related to agricultural production had a weight of 1/10 since two indicators were used. Lastly, dimensions such as nutrition related decisions and opportunities access and control received a weight of 1/5 since each had one indicator (Alkire et al., 2013).

Computation of the WELI was based on an individual's responses at question level and at the indicator level. At the question level, an individual's response was assessed to find out if they had achieved a minimum level of empowerment for that specific question. According to Galiè et al. (2018) a woman achieves minimum level of empowerment if she made the livestock decision solely or had some input into the decision. A woman was adequate on questions related to autonomy in production if they were able to act according to personal values (regarding raising livestock, marketing and income use) and were involved in activity for personal satisfaction other than avoiding punishment or trying to please others (Alkire et al., 2013). Furthermore, the minimum level of empowerment for questions related to resources access and control was based on women's sole/joint ownership and control of land, crop and livestock assets as well as access to credit. Finally, women's membership in influential groups was necessary to achieve minimum empowerment for questions related to access and control of opportunities (Alkire et al., 2013). To assess empowerment levels at the indicator level, related

dummy variables coded 1 if a woman achieves minimum level of empowerment and 0 otherwise, are summed up to arrive at the number of questions for which the woman has achieved minimum levels of empowerment. Following Galiè et al. (2018), we use the one-third threshold for empowerment at the indicator level. That is, achieving approximately one third of the questions that were included was deemed necessary for indicator adequacy. A value of 1 was then assigned for indicators for which adequacy had been achieved. The values for the indicators were then weighted and summed up to produce the WELI score which ranges from 0 (least empowered women) to 1 (most empowered women).

The WELI score is computed as below:

$$WELI_i = w_1 I_{1i} + w_2 I_{2i} + \cdots + w_d I_{di}. \tag{1}$$

$WELI_i$ is WELI score for woman $i$; $I_{di}$ is a dummy variable for adequacy, with code 1 if a woman had indicator adequacy and 0 otherwise, $w_d$ is the weight allocated to indicator $d$. The 13 indicator weights add up to 1 (Galiè et al., 2018). Table 1 shows WELI dimensions and their associated weights.

Table 3.1: WELI dimensions and weights

| Empowerment dimension | Dimension weight | Indicator | Indicator weight |
|---|---|---|---|
| Agricultural production related decisions | 1/5 | a. Production decisions input | 1/10 |
| | | b. Production autonomy | 1/10 |
| Decisions related to nutrition | 1/5 | a. Nutrition related decisions | 1/5 |
| Income control and use | 1/5 | a. Farm income control | 1/15 |
| | | b. non-farm income control | 1/15 |
| | | c. Expense's control | 1/15 |
| Resources access and control | 1/5 | a. Ownership and control over land and crop assets | 1/15 |
| | | b. Ownership and control over livestock assets | 1/15 |
| | | c. Credit access | 1/15 |
| Opportunities access and control | 1/5 | a. Membership to influential groups | 1/5 |

## 3.6. Household Food Insecurity Access Scale (HFIAS)

The HFIAS was used to determine the level of food security among rural households using a 30-day recall period. Two sets of questions (occurrence and frequency of occurrence). To understand the incidence and extent of food insecurity, the respondents had to answer nine (9) questions to understand if they experienced any food insecurity condition. In instances where

the condition was experienced, a follow up question on frequency of occurrence (rarely, sometimes, and often) was presented. Each of the nine (9) frequency of occurrence questions were scored 0-3 with zero (0) as the lowest frequency of occurrence. The HFIAS score for every household was then calculated by adding up the scores for frequency of occurrence responses. The scores for all questions were summed up to give a total HFIAS score for each household, with a range of 0 to 27. Higher scores implied higher food insecurity in the household, and vice-versa (Coates et al., 2007).

To understand the severity of food insecurity in the district, households were grouped into four categories: food secure, mildly food insecure, moderately food insecure, and severely food insecure, as suggested in Coates et al. (2007). Food secure households do not experience any food insecurity or rarely worry about not having sufficient food. Households that are mildly food insecure sometimes or often worry about having inadequate food and not eating preferred foods. Furthermore, a mildly food insecure household rarely eats an undesired monotonous diet and/or some undesirable foods without cutting on the amount. On the other hand, moderately food insecure households frequently make sacrifices on the quality of food through consumption of a monotonous diet; and sometimes or often consume undesirable foods. Such households may start to cut down on the quantity through the reduction in number and meal size rarely or sometimes. Severely food insecure households often cut down meal size and number, run out of food or go to sleep without eating, and go an entire day and night without eating (rarely, sometimes, or often). Any household experiencing any of the conditions under this category even once is considered severely food insecure.

## 3.7. Household Dietary Diversity Score (HDDS)

Household Dietary diversity score (HDDS) was used as a second measure of food and nutrition security and was calculated at a household level using a 24-hour recall period. This tool measures variety in food groups consumed by a household as described in chapter 2.2 (Swindale & Bilinsky, 2006). Twelve food groups were included in the questionnaire; each group was given a score of one (1) if it was consumed by the household and zero (0) if not. The household score ranged between 0 and 12 (Swindale & Bilinsky, 2006), with higher values of HDDS representing higher nutrition security. There is no normative data on the ideal levels of household nutrition diversity (Swindale & Bilinsky, 2006). However, calculating appropriate targets for this study was based on the average consumption for our sample. Households that consumed food groups below the average were considered food insecure and those that had a consumption at or above the average were considered food secure.

## 3.8. Tobit Regression

The study's main research question was to examine how and to what extent does empowerment of women in livestock dependent households affect their food and nutrition security. In addressing this research question, it was hypothesized that higher levels of women's empowerment in livestock decision-making increase household food and nutrition security. Our study assessed how WELI, a proxy for women's empowerment influences household food and nutrition security.

The Tobit regression was used in both regressions involving HFIAS and HDDS, because of the possibility of censoring in the dependent variable. The Tobit model describes the relationship between a censored continuous variable and independent variables (Tobin, 1958). Since the dependent variables were observed on limited range (0-27 for HFIAS and 0-12 for HDDS), the model was best represented as a doubly censored regression. Both censoring from above and below were evident in our model. Following Greene (2000), we present a doubly censored Tobit regression, based on the dimensions of HFIAS as an example:

$$y^* = \beta'x + u, \tag{1}$$
$$y = 0 \ \ if \ \ y^* \leq 0, \tag{2}$$
$$y = y^* \ \ if \ 0 < y^* < 27 \tag{3}$$
$$y = 27 \ \ if \ \ y^* \geq 27,$$

where $y^*$ is the doubly censored dependent variable, $x$ is a vector of independent variables, $\beta$ is a vector of parameters and $u$ is a random error term. To estimate the Tobit model via the method of maximum likelihood, the following log-likelihood function is maximised:

$$Log \ L = \sum_{y=0} \log \Phi\left[\frac{0-\beta'x_i}{\sigma}\right] + \sum_{0<y<27} log \frac{1}{\sigma}\emptyset\left[\frac{y_i-\beta'x_i}{\sigma}\right] + \sum_{y=27} \log\left[1 - \Phi\left(\frac{27-\beta'x_i}{\sigma}\right)\right], \tag{5.}$$

where $\Phi$ is the CDF and $\phi$ is the PDF of a normal distribution. For HDDS the above model is revised using the range of $y^*$ as 0 - 12.

The dependent variables were the food security measures HFIAS and HDDS. The independent variable is the WELI score. In addition, the model included the following control variables: age of household head, education level of household head, household size, main occupation of the household head, government food and nutrition security interventions, gender of household head, marital status of women, and monthly household income. Furthermore, the following

five-empowerment dimensions were included as sub-variables in separate models; (i) agricultural production decisions, (ii) nutrition related decisions, (iii) income use and control, (iv) opportunities access and control, and (v) resources access and control.

## 3.9. Data analysis, Validity and Reliability

Data was analysed using STATA statistical software. To ensure that the results obtained were valid and reliable, a pre-test of the data collection tool was carried out with a sub-sample of the proposed respondents. This was to ensure that the questionnaire was well structured and that the collected data served the overall purpose of the research. Furthermore, it assisted in removing ambiguities. Collection of primary data from different study sites improved construct validity of the research.

In addition, a Variance Inflation Factor was conducted to test the existence of multicollinearity in the independent variables. This was important because the presence of multicollinearity in a model reduces its statistical significance (Alin, 2010). Large VIF (greater than 10) indicates presences of multicollinearity; in relatively weak models, VIF values exceeding 2.5 should be of concern to the researcher. Multicollinearity makes it difficult to estimate the relationship between each independent variable and the dependent variable. Furthermore, we conducted a pairwise correlation analysis between HDDS and HFIAS to assess their association. The values for the correlation coefficient are between +1 (perfect positive association and -1(perfect negative association). A positive correlation coefficient indicates that an increase in one variable results in an increase in the other variable while a negative correlation coefficient shows that the two variables are moving in the opposite direction (Freeman & Young, 2009). A correlation coefficient of 0 indicates no relationship between the two variables.

## 3.10. Ethical Considerations

### 3.10.1. Human Ethics and confidentiality

The survey questionnaire was submitted to Lincoln University's Human Ethics committee for review and approval, taking into consideration ethical issues that arise in data collection and sound decision-making that would represent participant's values, concerns, and interests. To ensure confidentiality, respondents were assured of voluntary participation and non-disclosure of their names in the thesis. The questionnaire had an introductory statement to seek respondents' consent (Appendix A) to participate in the survey. A consent form signed by the respondents clearly sets out the purpose, activities and research expectations. Participants were given the right to withdraw from the survey whenever they felt the need to do so.

### 3.11. Health and Safety

The main risk for the study was the COVID-19 pandemic. However, all preventative measures were followed during data collection. Such measures included, but were not limited to, wearing of protective masks by both the enumerator and respondents and observing distance during interviews.

**Chapter 4: Descriptive Statistics**

**4.1. Introduction**

This chapter provides descriptive statistics of the sample used in the study. It has been divided into three main sections. The first section presents a description of demographic characteristics such as age, education level, main occupation, gender of household head, household size, household monthly income, marital status, and asset ownership among the sampled households. The next section discusses the status of food and nutrition security in Malawian households. The last section presents a description of women's empowerment with respect to decision-making in livestock production and marketing. In addition, results from inferential statistics such as independent sample t-tests are used to compare differences in several demographic characteristics, and food and nutrition security status, between independent groups of respondents and households.

**4.2. Demographic characteristics of household heads.**

This section provides descriptive statistics of demographic characteristics for male and female headed households in Nsanje district and the existing differences between these households.

**4.2.1. Age of household heads**

The study solicited information on the age of household heads. This was important because age of household head determines the likelihood of making decisions about or participating in economic activities that determine household food and nutrition security. It has been argued that younger household heads have higher labour productivity, and consequently higher wages that contribute to household food and nutrition security in comparison to older household heads (Mutiah & Istigomah, 2017). Others have argued that increases in the age of the household head makes them less productive and more reliant on gifts and remittances (Gebre, 2012; Yousaf, 2018). Furthermore, older household heads may have retired and have low incomes thereby increasing chances of food insecurity (Ahmed, 2015). On the other hand, older household heads may be more knowledgeable on the household's food security issues. They may have access to farmland and more farming experience eventually becoming risk averse and leading to diversification in their production (Agidew & Singh, 2018). Age is therefore hypothesized to influence household food and nutrition security.

Table 4.1 shows the age distribution of male and female heads in the Nsanje district. Overall, there were more male household heads (68.75%) in comparison to female household heads (31.25%). The average age for the household head was 45 years. The mean age for the male

head (44) was lower than that of female head (49). This implies that female household heads were older compared to male household heads. The findings are not suprising considering that a majority (58.40%) of the female headed households were widowed and might not have remarried. The minimum and maximum age for the male heads were 20 and 87 years, respectively. Female heads ranged from 18 to 88 years.

Table 4.1: Average age of household heads

| Gender of household head | Age of household heads (years) | | |
|---|---|---|---|
| | Mean | Minimum | Maximum |
| Male ($n_1 = 275$) | 44 | 20 | 87 |
| Female ($n_2 = 125$) | 49 | 18 | 88 |

## 4.2.2. Education level of household heads

Education is one of the key determinants of household incomes and hence food security because it provides opportunity to access economic resources and it enhances the ability to make the right food choices (Mensah et al., 2013). Educated household heads, unlike uneducated household heads, have access to better employment opportunities and more income as a result of high productivity (Bashir et al., 2013; Mutiah & Istigomah, 2017). This ensures household food and nutrition security. In addition, education provides better management techniques for securing an all-year supply of preferred and diversified food (Makombe et al., 2010).

Table 4.2 presents the education level of male and female household heads in the Nsanje district. A majority (74%) of the household heads had at least a primary education, with only 26% of household heads having no formal education. Among the group with some level of formal education, approximately 65% had primary education, 34% had secondary education and only 1% had tertiary education. Overall, male household heads had higher levels of formal education than female household heads. For instance, among household heads with primary education approximately 69% are male; and for those with secondary education, nearly 82% are male. These findings agree with literature which shows that women have lower education levels than men, particularly in developing countries (Mathiassen et al., 2007).

Table 4.2: Education level of household heads in the Nsanje district

| Gender of Household Head | Education level of household heads | | | | |
| --- | --- | --- | --- | --- | --- |
| | No formal education | Primary education | Secondary education | Tertiary education | Total |
| Male | 56 | 132 | 84 | 3 | 275 |
| Female | 47 | 60 | 18 | 0 | 125 |
| Total | 103 | 192 | 102 | 3 | 400 |

## 4.2.3. Marital status of household heads

This section discusses the marital status of household heads in the study area. Marital status is considered a factor likely to influence household food security. Acquiring a higher level of food security is a likely outcome among married household heads because male partners have better opportunity in accessing productive assets (Bogale et al., 2005). Furthermore, households with couples might pool resources together and generate more income compared to single-headed households (Ubokudom et al., 2017).

A majority of household heads in Nsanje district were married (71.50%). Around 21.25% were widowed and only about 7% divorced/separated. There were more male household heads (94.18%%) in the married category as compared to female heads (21.6%) in the same category. Majority of the female households heads were widowed (85.9%) compared to male household heads (14.11%). Table 4.3 shows the the marital status of male and female households heads.

Table 4.3: Marital status of household heads

| Gender of household head | Marital status of household heads | | | | |
| --- | --- | --- | --- | --- | --- |
| | Unmarried | Married | Widow | Divorced/separated | Total |
| Male | 1 | 259 | 12 | 3 | 275 |
| Female | 0 | 27 | 73 | 25 | 125 |
| Total | 1 | 286 | 85 | 28 | 400 |

### 4.2.4. Livestock ownership

The study collected information on livestock ownership in Nsanje. The results show that majority of the households (69.75%) own small livestock (goats, pigs, and sheep) and poultry compared to large livestock such as cattle (30.25%). Approximately 67.27% and 75.2% of male and female-headed households, respectively, own small livestock and poultry. Among households that own large livestock, the majority are male-headed (74.4%) compared to female-headed (25.6%). In addition, most households indicated small livestock (48%) and poultry (32.75%) as the most important species for the household's livelihood. This is because small livestock and poultry can easily be sold to meet household needs such as food (Freeman et al., 2008). Large livestock are mainly kept for prestige in the district. Table 4.4 shows livestock ownership by male and female-headed households.

Table 4.4: Ownership of livestock by households

| Gender of household head | Livestock type | | |
|---|---|---|---|
| | Large livestock | Small livestock & poultry | Total |
| Male | 90 | 185 | 275 |
| Female | 31 | 94 | 125 |
| Total | 121 | 279 | 400 |

### 4.2.5. Main occupation of household heads

Table 4.5 presents the main occupation of household heads in the Nsanje district. Overall, crop farming (63.25%) was the main occupation of most household heads followed by livestock farming (23.25%). Few household heads (1.25%) were formally employed, and 7.5% depended on piecework. Out of the total number of households in the sample, the proportion of male household heads involved in crop farming whether as a main or secondary activity is approximately 65%, and those involved in livestock farming as a main activity or secondary activity is 22.5%. However a higher proportion of female-headed households (24.80%) considered livestock farming as their main occupation compared to male headed households (22.55%). Table 6 shows the main occupation of household heads. Having farm and non-farm income sources reduces the likelihood of a household becoming food insecure. In addition, non-farm income sources provides a diversified livelihood strategy thereby reducing the risk of food insecurity (Sharaunga et al., 2016).

Table 4.5. Main occupation of household heads

| Gender of Household Head | Main Occupation of household heads | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Crop Farming | Livestock farming | Trading | Formal employmnet | Pieceworks | Total |
| Male | 180 | 62 | 33 | 4 | 15 | 275 |
| Female | 73 | 31 | 21 | 1 | 15 | 125 |
| Total | 253 | 93 | 54 | 5 | 30 | 400 |

### 4.2.6. Household monthly income

The study obtained data on the monthly household income for households in the Nsanje district. Income is an important factor in ensuring household food security because it determines the amount and quality of food that a household can purchase (Ahmed et al., 2015; Mutiah & Istigomah, 2017; Ngema et al., 2018; ).The overall monthly household income for the sample is MK16,239.50 (US$20.38). This means that the average amount of money available per person to cater for the daily cost of food, clothing and shelter is approximately $0.14/person/day ($20.38/5(avg household size)/30 days). These findings show that a majority of households in the district are living well below the poverty line of $1.90 (World Bank, 2015). Overall, male-headed households had a higher total monthly (farm and non-farm) income of MK16,988.36 (US$21.32) compared to female-headed households (MK14,592.00 or US$18.31). The difference in mean income levels is not statistically significant ($p = 0.2299$) as shown in table 4.6 and indicates that male-headed households are not earning more income than female-headed households. These findings are not suprising considering that a majority of households in the district have a similar source of livelihood (crop farming and livestock farming) which might not yield significant differences in the level of income.

Table 4.6: Difference in mean household income levels by gender of household head

| Group | Mean | Mean difference | Standard error | Standard deviation | t-value | p-value |
|-------|------|-----------------|----------------|--------------------|---------|---------|
| Male | 16988.36 | 2396.36 | 1104.197 | 18311.03 | 1.2025 | 0.2299 |
| Female | 14592.00 | | 1684.276 | 18830.78 | | |

The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively.

The study also examined monthly income across households that indicated crop and livestock farming as their main occupation. Results show that average monthly income for households whose main occupation was livestock farming (MK 17,797.94/US$22.33) was higher compared to that of crop farming (Mk 14,401.95/US$ 18.07). The results of a t-test indicate the existence of a statistical difference between the mean incomes for these two sources of income ($p = 0.0767$). This shows that households that rely on livestock farming have higher monthly income compared to those that derive their livelihood from crop farming. These findings are not surprising considering that the Nsanje district is mostly prone to floods and dry spells contributing to low yields and income obtained from crop sales (Government of Malawi (GOM), 2020). In addition, in times of distress or food insecurity, households can sell livestock year-round and as the need arises, while crop farming is mostly seasonal.

### 4.2.7. Household size

This section discusses the association between household size and gender of the household head. The smallest household size comprised of a single adult female and the highest number of household members was 11. The average household size for the sample was five persons per household, which is higher than the national average (4) for rural areas in Malawi (NSO, 2017). On average, male-headed households had larger household size (5) compared to female-headed households (4). The differences in household size between male and female headed households were statistically significant ($p = 0.000$), an indication that the number of household members is larger for male-headed households compared to female headed households. Table 4.7 presents the results obtained from a t-test between gender of household head and household size.

Household size is an important determinant of household food security status because it signifies the level of food requirements by members of the household. Larger household size requires more food and this influences the choice and amount of food to be consumed in the

household (D'Haese et al., 2013). In most circumstances, pressure is created on household food security with increases on food and non-food expenditures (Muche et al., 2014). On the other hand, larger household size might indicate the availability of productive labour that can be used to achieve household food and nutrition security (Murugani & Thamaga-Chitja, 2019).

Table 4.7: Difference in mean household size by gender of household head

| Group | Mean | Mean difference | Standard error | Standard deviation | t-value | p-value |
|---|---|---|---|---|---|---|
| Male | 5.3963 | 0.4523** | 0.1130 | 1.8755 | 2.2028 | 0.0282 |
| Female | 4. 944 | | 0.1757 | 1.9646 | | |

The asterisks [***], [**], [*] imply statistical significance at 1%, 5% and 10%, respectively.

## 4.3. Asset ownership

This section discusses assets owned by households in the Nsanje district. Households were asked if they own any of the following assets;  land (for agricultural and non-agricultural use), house or building, farm equipment (mechanized and non-mechanized), non-farm business equipment (solar panels, sewing machines etc), means of transportation (bicycle, motorcycle), large consumer durables (TV, sofa etc) and small consumer durables (radio, cookware). A majority  of the households owned agriculture land (78.75%), non-mechanized farm equipment (70.75%) and house or bulding (69.75%). A small percentage owned non-farm business equipment (8.25%) and mechanized farm equipment (0.50%).

Out of the total land owned by households in Nsanje, 70.2% and 29.8% were owned by males and female household heads, respectively. These results indicate that women are deprived in asset ownership. Similarly, a majority of houses were owned by male (68.5%) heads in comparison to female heads (31.5%).

Assets play a significant role in influencing household food security. Ownership of land has been seen to influence livelihood activities and income (Harris-Fry et al., 2015). On the other hand, domestic assets (radios, cell phones) facilitate the exchange of information useful for decision making regarding food security. Production and farm income might increase through the use of mechanized and non-mechanized farm equipment (Silvestri et al., 2015) necessary

for food security. Table 4.8 below shows these differences in asset ownership between male and female headed households.

Table 4.8: Household asset ownership by gender of household head

| Asset | Asset ownership by gender of household head | | |
| --- | --- | --- | --- |
| | Male | Female | Total |
| Agriculture land | 221 | 94 | 315 |
| Non-agriculture land | 51 | 18 | 69 |
| House or bulding | 191 | 88 | 279 |
| Means of transportation (bicycles etc) | 90 | 18 | 108 |
| Mechanized farm equipment | 1 | 1 | 2 |
| Non-mechanized farm equipment | 198 | 85 | 283 |
| Non-farm business equipment (solar panels, sewing machines, etc) | 28 | 5 | 33 |
| Large consumer durables | 14 | 7 | 21 |
| Small consumer durables | 62 | 17 | 79 |
| Cellphone | 117 | 42 | 159 |

Further information was collected on the number of assets owned by male and female-headed households in the district. The main difference in total assets owned by male and female-headed households were observed for agricultural land with male-headed households owning more land (4 acres) compared to female-headed households (1 acre). Table 4.9 shows total average assets owned by these two types of households.

Table 4.9: Differences in asset ownership for male and female-headed households

| Asset | Average assets owned | |
|---|---|---|
| | Male | Female |
| Agriculture land | 4.4 | 1 |
| Non-agriculture land | 0.2 | 0.1 |
| House or bulding | 1 | 1 |
| Non-farm business equipment (solar panels, sewing machines, brewing euipment etc) | 1 | 1 |
| Means of transportation (bicycles, motorcycles etc) | 1 | 1 |
| Mechanized farm equipment | 1 | 1 |
| Non-mechanized farm equipment | 3 | 2 |
| Large consumer durables (TVs, Sofasets, etc) | 1 | 1 |
| Small consumer durables | 2 | 1 |
| Cellphone | 1 | 1 |

## 4.4. Status of food security among households based on the HDDS scale

One of the study's objectives was to understand the status of household food security in the district. This section presents the findings using the HDDS as a measure of food security. It first discusses the percentage of food secure and food insecure households and presents some notable differences between these two types of households. These differences have been examined across the following variables: education level, marital status, household monthly income, and main occupation.

### 4.4.1. Status of household food and nutrition security

The HDDS was used to estimate the number of food groups consumed by households in the Nsanje district. This measure included 12 food groups as described in section 3.5. Households were asked if they consumed any of the 12 food groups in the 24 hours prior to data collection. There is no cut off point to achieving adequate dietary diversity (Swindale & Bilinsky, 2006). However, our study used the average number of food groups consumed by households in our sample as the cut-off point. Households that consumed food groups equal to or greater than the average consumption were considered food secure. Our results show that the average consumption for the study population was four food groups in the last 24-hours preceding our survey. Using this criterion, the results show that more than half of the households had adequate

dietary diversity (55.75%) and 44.25% of the households did not achieve adequate dietary diversity.

Further analysis was done to estimate the average, minimum and maximum number of food groups consumed by households. The results indicate that the minimum and maximum household dietary diversity scores in the sample were 0 and 11, respectively. This means that in the last 24 hours preceding the survey, some households did not consume any food group, while other households consumed up to 11 food groups. Approximately 0.25% and 0.75% of the households had a score of 0 and 11, respectively.

Table 4.10 presents the percentage of households that consumed each of the 12 food groups. Almost all households consumed cereals (98.25%), vegetables (93%), fish and fish products (56.25%) oils and fats (44.75%) and legumes and nuts (33.50%). The least consumed food groups included fruits (15.75%), white tubers (8%), and milk and milk products (6.25%). Consumption of cereals by a majority of households in Nsanje is because the country's staple diet is maize, which contributes more than two thirds of typical household diets (Harris et al., 2018; IFPRI, 2019). Interestingly, our findings indicate that fish is one of the commonly consumed food groups after cereals and vegetables, and it is the main source of protein in the Nsanje district. The district is close to the Shire River, which provides a source of cheap fish to surrounding communities. A study conducted in urban cities of Malawi, also found that cereals, vegetables, oils and fats were among the commonly consumed food groups (Mkusa & Hendriks, 2021). Similarly, a study conducted in Ethiopia found that cereals (96%), vegetables (81.6%), and oils and fats (75.4%) were commonly consumed food groups (Workicho et al., 2011).

Table 4.10: Percentage of households consuming each food group.

| Type of food group | frequency (n=400) | Percentage |
| --- | --- | --- |
| Cereals | 393 | 98.25 |
| Vegetables | 372 | 93 |
| Fish & fish products | 225 | 56.25 |
| Oils & fats | 179 | 44.75 |
| Legumes & nuts | 134 | 33.50 |
| Meat | 93 | 23.25 |
| Sugar/honey | 79 | 19.75 |
| Fruits | 63 | 15.75 |
| Eggs | 60 | 15.04 |
| Milk & milk products | 25 | 6.25 |
| White tubers | 32 | 8 |
| Miscellaneous | 11 | 2.76 |

**4.4.2. Type of food groups consumed by food secure and food insecure households.**

This section discusses the number and types of food groups consumed by food secure and food insecure households in the district. On average, food secure households consumed five food groups within 24 hours preceding the survey. On the other hand, food insecure households consumed an average of two food groups. These differences are statistically significant ($p = 0.000$), an indication that food secure households are likely to consume more food groups compared to food insecure households.

This study conducted further analysis to understand the type of food groups commonly consumed by food secure and food insecure households. Our findings indicate that food secure households consumed cereals (100%), vegetables (95.52%), fish and fish products (77.13%), oils and fats (74.89%), legumes and nuts (52.02%), meat (35.87) and sugar and honey (35.43%). The common food groups consumed by food insecure households were cereals (96.05%), vegetables (89.83%), and fish and fish products (29.94%). As observed, food secure households consume more proteins than food insecure households. These findings are consistent with the study by Desiere, Vellema & D'Haese (2015), indicating that diversity of diets is observed more among food secure households. This study also found that milk and milk products, and white tubers were the least consumed food groups by both food secure and food insecure households.

Dairy products are expensive and considered a luxury in Malawi (Mkusa & Hendriks, 2021). White tubers are not preferred by majority households despite being cheap.

### 4.4.3. Gender of household head and household food security status.

This section discusses the relationship between gender of household head and food security status of households. Most food secure households were male-headed (60.00%) compared to female-headed (40%). Results from a t-test indicate significant differences ($p = 0.0111$) in the dietary diveristy between male-headed and female headed-households as shown in Table 4.11. This shows that male-headed households are likely to consume more food groups compared to female-headed households.

Table 4.11: Mean difference in dietary diversity between male and female-headed households

| Group | Mean | Mean difference | Standard error | Standard deviation | t-value | p-value |
|-------|------|-----------------|----------------|--------------------|---------|---------|
| Male | 4.32 | 0.504** | 0.1238 | 2.0538 | 2.3430 | 0.0196 |
| Female | 3.816 | | 0.1659 | 1.8551 | | |

The asterisks $^{***}$, $^{**}$, $^{*}$ imply statistical significance at 1%, 5% and 10%, respectively.

The higher proportion of food insecure female-headed households supports literature that associates women to food insecurity as a result of a lack of access to productive resources constrained by cultural norms (Murugani & Thamanga-Chitja, 2019). Furthermore, women have low education levels and financial capacity which limits their ability to procure the right quantity and quality of food. This limits their chances of achieving household food security status (World Bank, 2015). Table 4.12 presents the food security status among male, and female headed households.

Table 4.12: Food security status by gender of household heads.

| Food security Status | Gender of Household Head | | |
|----------------------|------|--------|-------|
| | Male | Female | Total |
| Food Secure | 165 | 58 | 223 |
| Food Insecure | 110 | 67 | 177 |
| Total | 275 | 125 | 400 |

### 4.4.4. Education level of food secure and food insecure household heads

This section presents the education level of household heads from food secure and food insecure households in the Nsanje district. Overall food secure households were headed by household heads with higher education levels. The proportion of food secure households whose head had secondary education (62.75%) was higher than that of food insecure households (37.25). This shows that food secure households were headed by individuals with higher education levels compared to food insecure households. Table 4.13 presents the education levels of food secure and food insecure households.

Table 4.13: Education level of household heads from food secure and food insecure households

| Food security Status | Education level of household heads | | | | |
| | No formal education | Primary education | Secondary education | Tertiary education | Total |
|---|---|---|---|---|---|
| Food secure | 46 | 111 | 64 | 2 | 177 |
| Food insecure | 57 | 81 | 38 | 1 | 223 |
| Total | 103 | 192 | 102 | 3 | 400 |

### 4.4.5. Main occupation of household heads in food secure and food insecure households

Table 4.14 presents a summary of the relationship between main occupation of household heads and household food security status in the district. From the table, a majority of household heads in food secure households had crop farming (66.82%) as their main occupation. Furthermore, there was a higher percentage of food insecure households (13.56%) in non-farm occupations (piece works, trading, formal employment) compared to food secure households (10.31%) in the same occupation category. The higher percentage of food insecure households relying on non-farm occupation is not surprising considering that a majority of this category consisted of piece works (55.56%) compared to formal employment (9.26%) and trading (35.19%). Generally, little income is earned from piece works and a majority of poor households engages in this occupation to meet their daily food requirements. Furthermore, most households that do not have access to land and capital might resort to selling their labour for survival.

Table 4.14: Main occupation of household heads in food secure and food insecure households

| | Main occupation of household heads | | | |
|---|---|---|---|---|
| Food security status | Crop farming | Livestock farming | Non-farm | Total |
| Food Secure | 149 | 51 | 23 | 223 |
| Food Insecure | 107 | 46 | 24 | 177 |
| Total | 256 | 97 | 47 | 400 |

## 4.4.6. Monthly household income in food secure and food insecure households

This section presents monthly household income of food secure and food insecure households in the Nsanje district. On average, food secure households (MK19, 493.27/ US$24.46) had higher monthly income, compared to food insecure households (MK12, 140.11/US$15.23). The differences in household monthly income between these two households were significant ($p = 0.001$), an indication that food secure households earn higher income compared to food insecure households. These results are not surprising considering the important role played by income in ensuring food access and availability. Table 4.15 presents t-test results for household monthly income among male and female-headed households.

Table 4.15: Mean difference in monthly income between male and female-headed households

| Group | observation | Mean | Mean difference | Standard error | Standard deviation | t-value | p-value |
|---|---|---|---|---|---|---|---|
| Food insecure | 177 | 12140.11 | | 995.0933 | 13238.86 | -4.0262 | 0.0001 |
| Food secure | 223 | 19493.27 | 7,353.16*** | 1422.33 | 21239.91 | | |

The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively.

## 4.4.7. Government food and nutrition security interventions

This section discusses the proportion of households that benefited from government food security and nutrition interventions such as the Affordable Farm Input Subsidy Programme (AFIP), Scaling UP Nutrition Programme (SUN), Cash Transfer Projects and Food for Work. Overall, few households (17%) benefited from these interventions. Approximately, 10.50% of the households were beneficiaries of the AFIP. Of the total households that were beneficiaries of these interventions, approximately, 4.50% and 1.5% benefited from cash transfer and food for work programmes, respectively. A small percentage benefited from SUN (0.50%). Among

that small cohort of beneficiary households, approximately 71% were food secure. These results suggest that such programmes have worked in increasing food and nutrition security and should be targeted to households that are vulnerable to food insecurity. Table 4.16 shows the number of food secure and food insecure households that benefitted from government food and nutrition security interventions.

Table 4.16: Government food and nutrition security interventions

| Food security Status | Government food and nutrition security intervention | | |
| --- | --- | --- | --- |
| | Beneficiary | Non-beneficiary | Total |
| Food secure | 48 | 175 | 223 |
| Food insecure | 20 | 157 | 177 |
| Total | 68 | 332 | 400 |

## 4.5. The status of food security among households based on the HFIAS.

This section discusses the status of household food security in the Nsanje district using the HFIAS as a measure of food security. It presents the status of food security among livestock dependent households in the Nsanje district using the HFIAS as a second food security measure. Furthermore, these results are discussed in detail to understand the percentage and frequency of households experiencing any food insecurity conditions based on the HFIAS. The HFIAS was calculated for each household. To understand the severity of food insecurity in the district, households were grouped into four categories (food secure, mildly food insecure, moderately food insecure and severely food insecure) as per the standard guide (Coates et al., 2007).

Based on these categories our results show that only 10.25% of the households were food secure, 1.75% were mildly food insecure, 12% were moderately food insecure and 76% of the households were severely food insecure. Figure 4.1 shows the percentage of households under each of the four food security categories. More male-headed households were food secure (12% of households in the sample) compared to female headed households (6.40%). Most female-headed households fell in the category of severe food insecurity (84.80%) compared to male-headed households (72%) in the same category.
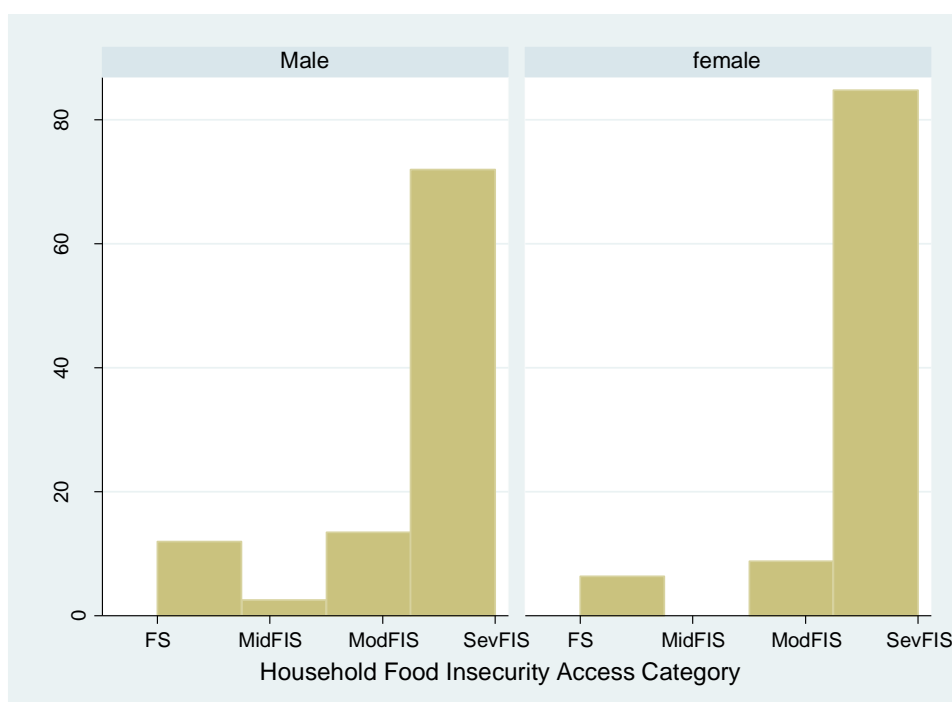
Figure 4.1: Food security status of male and female-headed households.

### 4.5.1 Percentage of households experiencing food insecurity conditions.

The survey solicited information on the occurrence and frequency of occurrence of food insecurity conditions in the past four weeks prior to the collection of data. The results indicate that the majority (81.25%) of households experienced anxiety regarding food availability. Furthermore, a higher percentage of households (80.4%) were unable to eat food they preferred due to a lack of resources for obtaining food. Approximately 81.20% reported to have consumed a limited variety of food due to resource constraints. Around 77.14% and 79.6% of the households consumed less preferred foods because of a lack of resources and consumed smaller meal sizes than they felt they needed because there was not enough to eat, respectively. More than half reported that they reduced the number of meals because there was not enough food (76.96%). Those that indicated there was no food in their household to consume because of resource constraints were 61.62%. Similarly, 66.58% of the households indicated that they went to bed without eating because there was not enough food. Nearly 42% of the households spent the day and night prior to our survey without eating any food because there was not enough food in the household. Table 4.17 presents the household experience of food insecurity conditions.

Table 4.17: Household's experience of food insecurity conditions.

| Food insecurity condition ($n = 400$) | Number of households |
|---|---|
| Food insecurity anxiety | 325 |
| Failure to eat preferred food | 320 |
| Presence of only a limited variety of food due to lack of resources | 324 |
| Inability to eat less preferred foods | 307 |
| Presence of smaller amounts of food | 316 |
| Meal number reduction | 304 |
| Household running out of food | 244 |
| Going to bed without eating | 263 |
| Spending the day and night without any food | 163 |

## 4.5.2. Frequency of food insecurity conditions

This study further examined the frequency at which households experienced each of the food insecurity conditions. This was done to understand whether a particular condition was experienced rarely, sometimes, or often. The results indicate that a high proportion of households that expressed anxiety about food insecurity experienced the condition less often (15.75%) than rarely (37.50%) and sometimes (28%). Approximately 19% of households did not experience this at all. Similar findings were observed for households that were unable to eat their preferred food (often, 15%; rarely, 34.75%; and sometimes, 30.75%). Furthermore, few households that reported having gone to bed without eating experienced it rarely (32.25%) and sometimes (30.25%) rather than often (4.50%). Lastly, households that spent the day and night without any food experienced it less often (0.75%) than rarely (27.25%) and sometimes (13.75%) respectively. Table 4.18 below shows the frequency of experiencing food insecurity conditions by households in the district.

Table 4.18: Percentage of food insecurity experiences

| Food insecurity experience | Rarely | Sometimes | Often | Not experienced |
|---|---|---|---|---|
| Food insecurity anxiety | 37.50 | 28.00 | 15.75 | 18.75 |
| Failure to eat preferred food | 34.75 | 30.75 | 15.00 | 19.50 |
| Presence of only a limited variety of food due to lack of resources | 35.50 | 30.75 | 14.50 | 19.25 |
| Inability to eat less preferred foods | 33.50 | 31.75 | 11.75 | 23.00 |
| Presence of smaller amounts of food | 35.75 | 29.25 | 14.25 | 20.75 |
| Meal number reduction | 34.75 | 30.25 | 12.25 | 22.75 |
| Household running out of food | 32.08 | 21.30 | 8.52 | 38.10 |
| Going to bed without eating | 32.25 | 30.25 | 4.50 | 33.00 |
| Spending the day and night without any food | 27.25 | 13.75 | 0.75 | 58.25 |

## 4.5.3. Food security status of crop and livestock farming households

Table 4.19 shows the food security status between households whose main occupation is livestock farming versus crop farming households, using the HFIAS as a measure of food security. Overall, households that relied on livestock farming (12.37%) were more food secure compared to households that derived their income from crop farming (7.81%). Furthermore, a majority of households that indicated crop farming (78.91) as their main occupation were severely food insecure compared to those that keep livestock (76.29%). This result is attributed to the fact that households that depend on livestock have higher monthly income compared to households in crop farming, despite crop farming being the main occupation. Livestock can be sold to meet emergency needs such as the purchase of food in times of shock (Freeman et al., 2008). Similar findings were also observed in Zambia where livestock and their products were an important source of income despite crop farming being the most important livelihood activity in a study conducted to assess livestock contribution to risk management and coping strategies in Lesotho, Malawi, and Zambia (Freeman et al., 2008).

Table 4.19: HFIA categories & main occupation of household head

| Main Occupation | HFIA categories | | | | |
|---|---|---|---|---|---|
| | Food secure | Mildly food insecure | Moderately food insecure | Severely food insecure | Total |
| Livestock farming | 12 | 3 | 8 | 74 | 97 |
| Crop farming | 20 | 4 | 30 | 202 | 256 |
| Total | 32 | 7 | 38 | 276 | 353 |

## 4.6. Women's empowerment in livestock dependent households

The second research question for the study was to understand the level of women's empowerment in livestock decision-making in Malawian households. This section discusses these findings. The first subsection provides a description of how the level of women's empowerment was calculated using the WELI. Following this is a discussion on the level of women's empowerment in Malawian households.

### 4.6.1. Level of women's empowerment in livestock dependent households

Separating the WELI into dimensions and indicators helped in understanding the percentage of households that were empowered in each indicator. The results show that a majority of the sampled women were empowered in the decisions related to nutrition (62.50%), control over use of farm income (56.50) and input into productive decisions (37%) indicators. Crookston, et al., (2021) also found that indicators such as input into productive decisions were likely to contribute to women's empowerment.

The results further reveal that few women achieved adequacy in the indicators (i) ownership and control of land and crop assets (0.50%), (ii) control over use of non-farm income (6.75%), and (iii) credit access (10.50%). Most studies have pointed out that women, unlike men, perform poorly in many indicators. A study conducted to understand the effect of women's empowerment in agriculture on household nutrition and food poverty also found that access to credit and control over resources contributed the most to women's disempowerment in Ghana (Tsiboe et al., 2018). These findings are similar to a pilot study conducted among dairy-livestock dependent communities in Tanzania that found few women to be adequate in credit access and control over use of non-farm income and ownership of land and crop assets (Galiè

et al., 2019). Table 4.20 below shows the percentage of women adequate in each of the empowerment indicators.

Table 4.20: Percentage of Women Adequate in Women's Empowerment in Livestock Indicators

| Indicator | Proportion of women achieving adequacy |
|---|---|
| Productive decisions input | 37.00 |
| Production autonomy | 20.50 |
| Nutrition decisions input | 62.50 |
| Farm income control and use | 56.50 |
| Non-farm income control and use | 6.75 |
| Expenses control | 46.00 |
| Group access (group membership) | 27.75 |
| Livestock assets ownership and control | 20.25 |
| Land & crop assets ownership and control | 0.50 |
| Credit access | 10.50 |

## 4.6.2. Contribution of WELI dimensions to Women's Empowerment.

Decisions related to nutrition (35.31%), control over use of income (24.44%) and decisions related to agricultural production (16.24%), were the main dimensions that contributed the most to women's empowerment in the Nsanje district. However, it was observed that most women failed to achieve adequacy in the resources and opportunities dimensions. The nutrition dimension was also the main contributor to WELI in four districts of dairy livestock dependent households in Tanzania (Galiè et al., 2019). Similarly, "access to and control of opportunities" contributed the lowest to WELI in one of the districts sampled in an earlier study (Galiè et al., 2019). Figure 4.2 below shows percentage contribution of WELI dimensions to women's empowerment in Nsanje district.
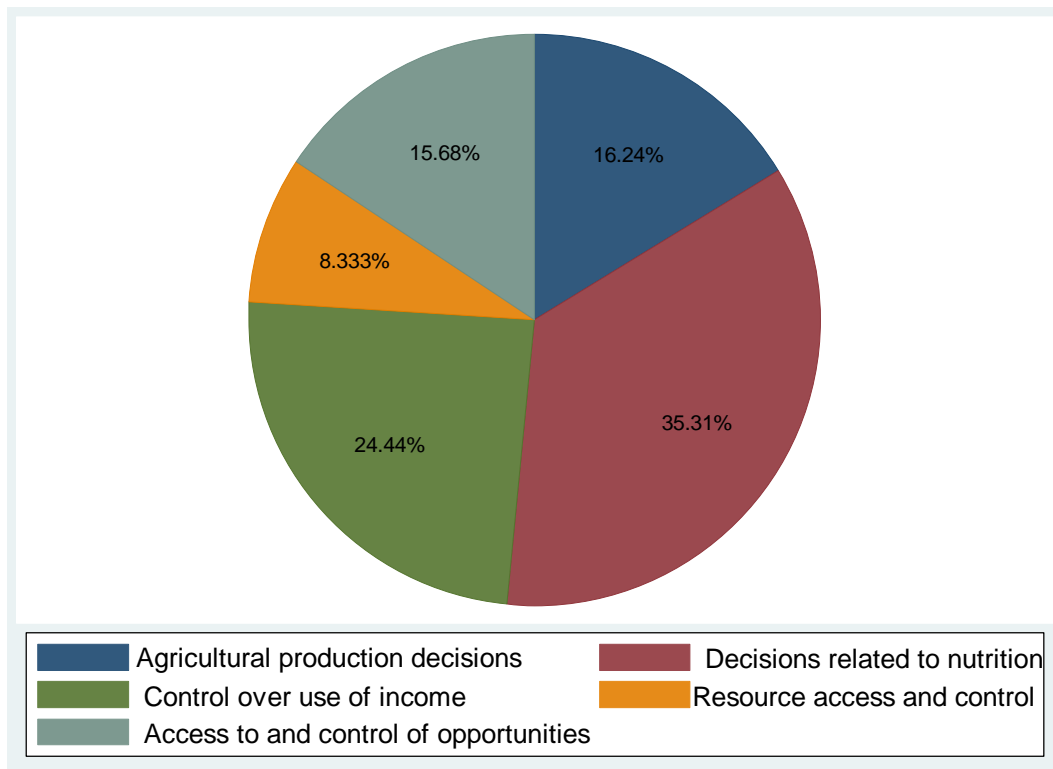
Figure 4.2. WELI dimensions contributing to women's empowerment in the Nsanje district.

### 4.6.3. Women's Empowerment in Livestock Index (WELI) score for Nsanje district

This section presents the WELI scores for women in the Nsanje district. A woman is considered to have achieved a minimum level of empowerment if she has adequacy in 80% or more of the weighted indicators (Alkire et al., 2013). The average WELI score for the women in Nsanje was 0.3. This empowerment score (ten indicators) implies that on average most women in Nsanje have achieved adequacy in only three of the ten empowerment indicators. Approximately 0.75% of women in the Nsanje district scored 0.8; i.e., were adequate in 80% of the weighted indicators. In addition, 3% had a WELI score of 0, i.e., they did not achieve adequacy in any weighted indicator. Furthermore, 17.75% of the women had a WELI score lower than 0.1. Similar observations were made in Tanzania where, only 2% of the women had a WELI score of 0.8, with a majority having a score falling between 0.3 and 0.4 (Galiè et al., 2019). These findings indicate that the empowerment levels of women in livestock dependent households are generally low. Such similarities are not surprising because Tanzania shares a border with Malawi. Figure 4.3 below shows a distribution of the WELI scores for households in the Nsanje district.
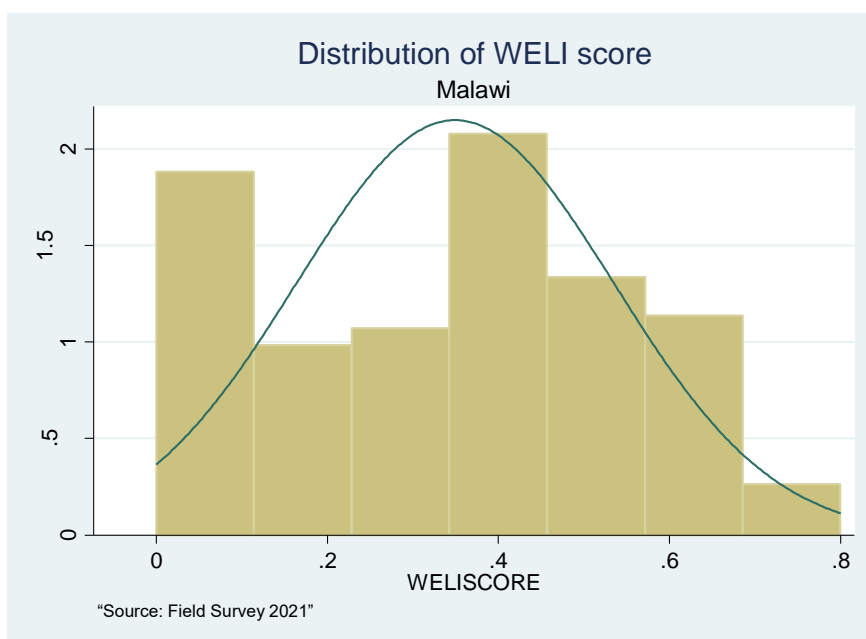
Figure 4.3. WELI score for women in Nsanje district

The study also examined the WELI score for women from households that indicated livestock and crop farming as their main occupation. The findings indicate that the average score for women from livestock occupation (0.4) was higher compared to those in crop occupation (0.3). These differences however were not statistically significant. Table 4.21 shows the t-test results showing the differences in WELI scores between households whose main occupation was crop and livestock farming.

Table 4.21: Difference in mean WELI scores by main occupation of household head

| Group | Mean | Mean difference | Standard error | Standard deviation | t-value | p-value |
|---|---|---|---|---|---|---|
| Livestock farming | 0.4 | 0.1 | 0.0176 | 0.1733 | 1.0000 | 0.3454 |
| Crop farming | 0.3 | | 0.01185 | 0.1897 | | |

The asterisks [***], [**], [*] imply statistical significance at 1%, 5% and 10%, respectively.

### 4.6.4. Association between WELI and food and nutrition security

Scatter plots were used to understand the association between the WELI score and the two food security measures, (i) HDDS and (ii) HFIAS. The results show a positive linear relationship between HDDS and the WELI score. This means that as the WELI scores increase, the HDDS also increases. On the other hand, observations from a scatter plot between HFIAS and WELI

scores show a negative linear relationship. An increase in the WELI score is accompanied by a decrease in the HFIAS. Figures 4.4 and 4.5 present these findings in a scatter plot.
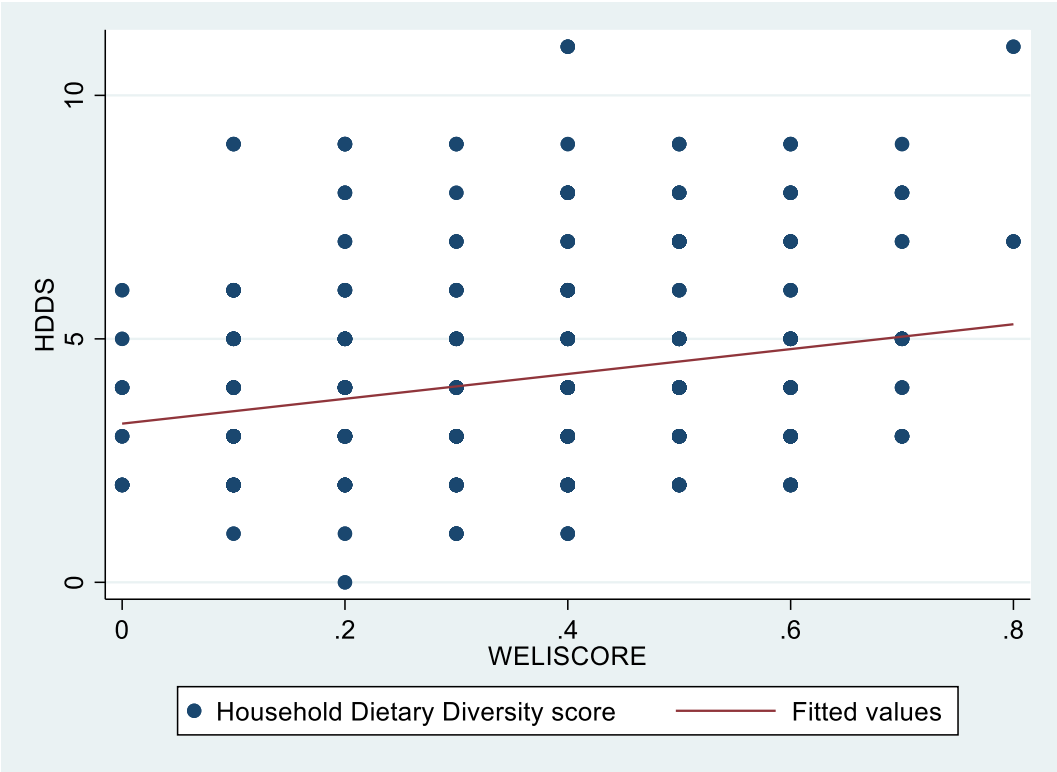


Figure 4.4: Scatter plot between HDDS and WELI
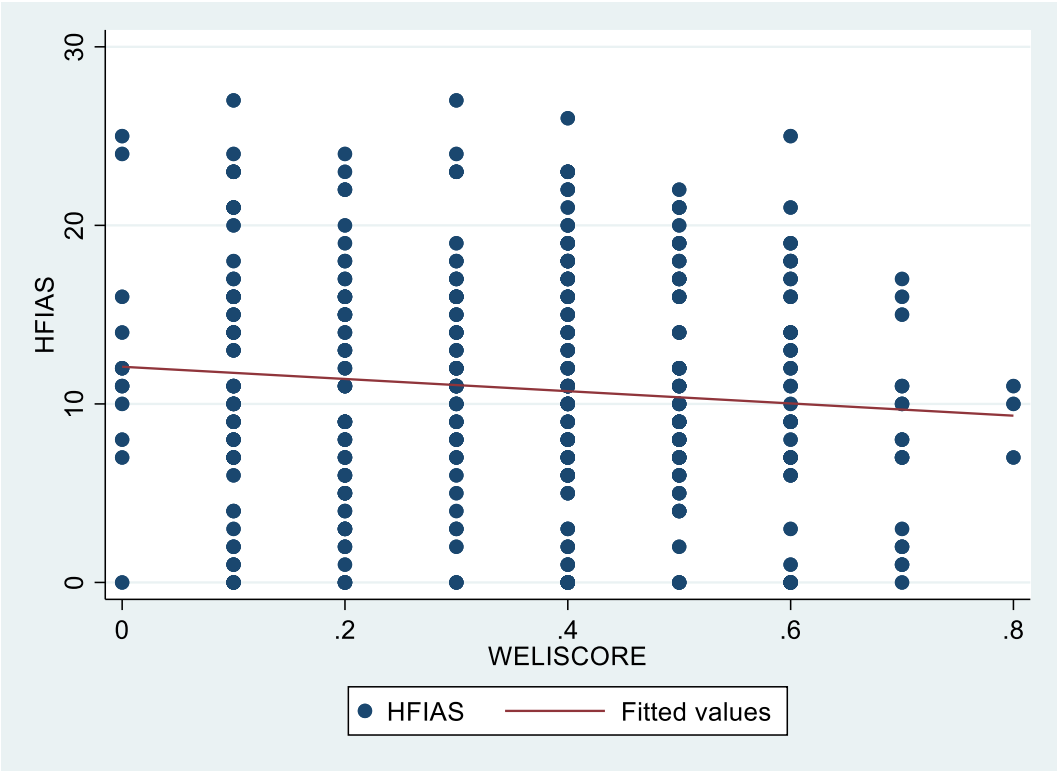


Figure 4.5: Scatter plot between HFIAS and WELI

**Chapter 5: Empirical analysis**

This chapter addresses the main research question - how, and to what extent, does empowerment of women in livestock-dependent households affect their household food and nutrition security. A Tobit regression model was used to assess the impact of women's empowerment in livestock on household food security. This chapter has been divided into three subsections. The first section presents the definition of variables used in the model. Following this is a section of results to ascertain the possible existence of multicollinearity among the independent variables. The third section examines the impact of women's empowerment in livestock on household food security using the HDDS and HFIAS as measures of food security. Furthermore, marginal effects were computed for both models.

**5.1. Definition of variables**

This section describes the independent variables used in our model to understand the effect of women's empowerment on household food and nutrition security using the two measures of food security: HDDS & HFIAS. Table 5.1 below presents the model variables and their definitions.

Table 5.1. Definition of model variables

| Variable | Variable Definition |
|---|---|
| Age | Age in years of the household head |
| Education level | Level of education attained by the household head (1 = no formal education, 2 = primary education, 3 = secondary education & 4 = tertiary education) |
| Household income | Household monthly income from both farm and non-farm sources (Malawi Kwacha) |
| Occupation | Main source of income/livelihood activity for the household (1 = crop farming, 2 = livestock farming, 3 = trading; 4 = formal employment/civil service, 5 = piecework) |
| Gender of household head | Whether household head is 1 = male or 2 = female |
| Marital status | Marital status of women in livestock dependent households (1 = unmarried, 2 = married, 3 = widow/widower, 4 = divorced or separated) |
| Household size | Number of household members |
| Government food security interventions | Whether households benefited from any government food and nutrition security interventions (1 = Affordable Input subsidy programme, 2 = Scaling Up nutrition, 3 = cash transfer and 4 = food for work projects) over the past year |
| WELI score | Summation of weighted values for WELI indicators ranging from 0 to 1, indicating least and most empowered women in livestock respectively (index) |
| Decisions related to agricultural production | Women's decisions regarding agricultural production and is concerned with sole/joint decision making on food and cash crop farming, livestock and fisheries, and agricultural production autonomy |
| Nutrition-related decisions | Women's input into decision making on the quantity of food to keep aside for household consumption |
| Income control and use | Women's control over income obtained from farm and non-farm sources |
| Access and control over opportunities | Women's membership in influential economic or social groups |
| Resources access and control | Women's ownership and control over productive resources (land, livestock, agricultural equipment, consumer durables, and credit) |

## 5.2. Relationship between HDDS and HFIAS

Pairwise correlation was conducted between HDDS and HFIAS to examine their relationship. A correlation coefficient of -0.3115 was obtained. The negative correlation indicates that with the increase in dietary diversity i.e., HDDS, food insecurity i.e., HFIAS decreases and vice versa and therefore confirms the findings in Freeman & Young (2009). However, the relationship between the two measures is weaker because the correlation coefficient is lower than 0.5. Figure 5.1 below shows a scatter plot of the relationship between HDDS AND HFIAS. The downward sloping line shows that with increasing with higher food insecurity (as explained in Section 3.6), the households' dietary diversity decreases. This is not surprising as HFIAS captures three dimensions of lack of access to food:

1. anxiety and uncertainty about household food supply;
2. insufficient quality; and
3. insufficient food intake and its physical consequences

The second dimension focuses on the lack of variety and preferences of the type of food the household consumed, which is directly related to HDDS. Hence, the higher score for HFIAS implying that the households experience insufficient supply of food, in terms of quantity and quality, is likely to result into lack of diversity of food consumed.
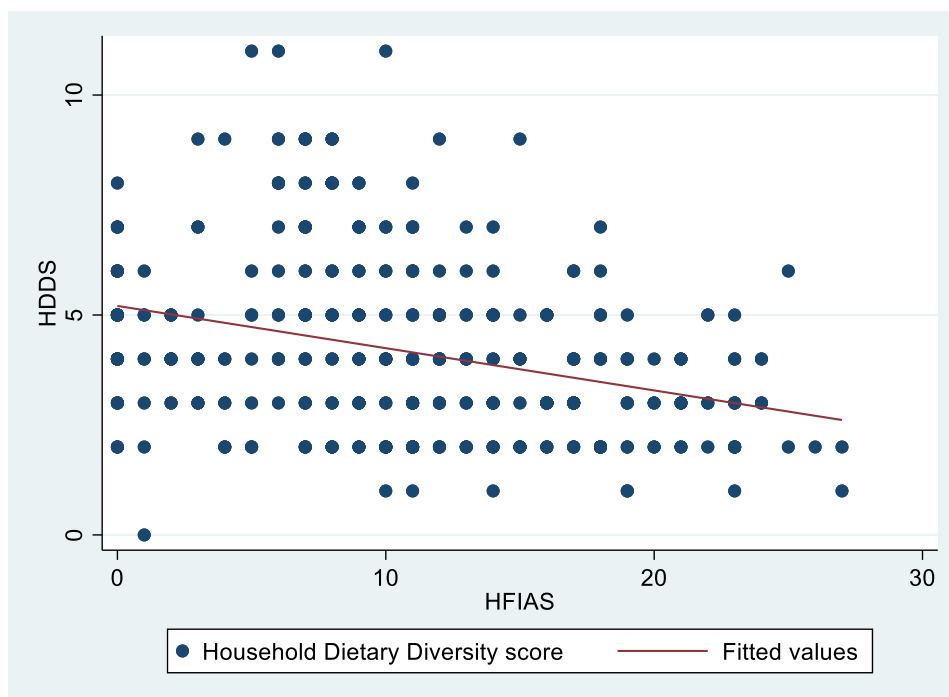


Figure 5.1: Scatter plot between HDDS and HFIAS

## 5.3. Multicollinearity test- variance inflation factor

Variance Inflation factor (VIF) was conducted for the following independent variables to test the existence of multicollinearity; WELI score, gender of household head, education of household head, main occupation of household head, Government food security interventions, household monthly income, age of household head, and marital status.  Large VIF (greater than 10) indicates the existence of multicollinearity, which might reduce the statistical significance of the independent variables. The results obtained from this test indicate that multicollinearity is not a problem in this study as all but one variable have a VIF of less than 2.5. Table 5.3 shows the results of the VIF.

Table 5.2: VIF between independent variables

| Variable | VIF | 1/VIF |
|---|---|---|
| Marital status | 2.81 | 0.3562 |
| Gender of household Head | 2.37 | 0.3562 |
| Education level of household head | 1.37 | 0.4220 |
| Age of household head | 1.25 | 0.7295 |
| Household size | 1.19 | 0.8406 |
| Monthly household income | 1.17 | 0.8546 |
| WELIscore | 1.11 | 0.9013 |
| Government food and nutrition security interventions | 1.05 | 0.9522 |
| Occupation of the household head | 1.03 | 0.9725 |
| Mean VIF | 1.48 | |

## 5.4. Women's empowerment and on household food and nutrition security-the case of HDDS

This study employed a Tobit regression model to assess the association of women's empowerment in livestock on household nutrition security. Table 5.3 presents findings from our main model which intends to address the third research question "assess the impact of women's empowerment in livestock on household food and nutrition security" conducted with HDDS as a measure of nutrition security. The results are from six separate models. The first model was conducted with the aggregate WELI score and socio-demographic variables as the independent variables. The rest of the models were conducted with each of the five dimensions of empowerment and the socio-demographic variables.

Table 5.3. women's empowerment and household nutrition security-the case of HDDS

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| WELIscore | 2.0466*** (0.5224) | | | | | |
| Agricultural production decisions | | 10.5254*** (1.5877) | | | | |
| Nutrition decisions | | | 1.7706* (1.0224) | | | |
| Income control | | | | 4.5146* (2.5669 | | |
| Resources access & control | | | | | -1.0758 (2.1686) | |
| Opportunities access & control | | | | | | 1.5062 (1.0606) |
| Education of household head | 0.0047 (0.1472) | 0.0593 (0.1413) | 0.0449 (0.1493) | 0.0637 (0.1484) | 0.0808 (0.1493) | 0.0630 (0.1487) |
| Age of household head | -0.0043 (0.0067) | -0.0028 (0.0064) | -0.0035 (0.0068) | -0.0025 (0.0067) | -0.0017 (0.0067) | -0.0017 (0.0067) |
| Household size | 0.1111** (0.0524) | 0.0709 (0.0513) | 0.1252** (0.0531) | 0.1437*** (0.0531) | 0.1323** (0.1323) | 0.1281** (0.532) |
| Marital status | 0.1081 (0.2329) | -0.0846 (0.2250) | 0.0663 (0.2365) | 0.0012 (0.2361) | 0.0032 (0.2425) | 0.0531 (0.2361) |
| Monthly income | 0.0121** (0.0055) | 0.0126** (0.0053) | 0.0129** (0.0056) | 0.0145*** (0.0056) | 0.0137** (0.0056) | 0.0132** (0.0056) |
| Govt Food security Interventions | -0.2021 (0.2521) | -0.0846 (0.2250) | -0.2931 (0.2556) | -0.3447 (0.2527) | -0.3695 (0.2539) | -0.3559 (0.2529) |
| Livestock farming | -0.4213* (0.2264) | -0.4732** (0.2191) | -0.4223* (0.2304) | -0.4170** (0.2301) | -0.3965* (0.2307) | -0.3740 (0.2303) |
| Formal employment | 2.6576** (0.8647) | 2.8861*** (0.8344) | 2.7665*** (0.8781) | 2.8660*** (0.8760) | 2.9140*** (0.8839) | 2.8620*** (0.8772) |
| Trading | -0.7553* (0.4431) | -0.5812 (0.4291) | -0.79487 (0.4509) | -0.7432* (0.4497) | -0.7402 (0.4513) | -0.72649 (0.4505) |
| Piece works | -1.1157** (0.3625) | -1.2276*** (0.3508) | -1.1606*** (0.3684) | -1.1312** (0.3679) | -1.1484*** (0.3711) | -1.1048** (0.3689) |
| Cons | 3.3199*** (0.7122) | 3.4320*** (0.6738) | 3.8219*** (0.7084) | 3.579*** (0.7390) | 4.0421*** (0.7138) | 3.9287*** (0.7041) |
| Var (e. HDDS_N) | 3.31989 (0.7122) | 3.1869 (0.2258) | 3.5141 (0.2489) | 3.5128 (0.2489) | 3.5380 (0.2506) | 3.5226 (0.2495) |
| Pseudo R2 | 0.0394 | 0.0551 | 0.0323 | 0.0323 | 0.0307 | 0.0317 |

The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively. Standard errors are in parenthesis.

The Tobit regression revealed that seven variables influence dietary diversity at varying levels of significance in the first model, Model 1. These variables include the WELI score, household monthly income, household size, livestock farming, formal employment, piecework and trading. The likelihood ratio test was statistically significant (p=0.000), implying that the model fits significantly better than an empty model. When the aggregate WELI score is disaggregated into its component dimensions in models 2 to 6, it is observed that to a large extent decisions related to agricultural production is most responsible for the impact on nutrition security. Other dimensions like decisions related to nutrition and control over use of income are marginally statistically significant. Among household socio-demographic variables, household size, monthly income, livestock farming, trading, formal employment, and piecework are statistically significant across almost all models.

The findings from model 1 show a positive and statistically significant WELI score (p = 0.000), implying that if a woman becomes empowered, the chances of a household consuming a diversified diet increase. These findings are consistent with literature that connects women's empowerment to the status of family nutrition (Price et al., 2018). In other words, a woman who has decision-making power over livestock production decisions and marketing, as well as income is likely decide on the quantity and quality of food to purchase for the household, thereby ensures household nutrition (Price et al., 2018; Tsiboe et al., 2018).

Models 2 to 6 analysed the impact of specific dimensions of WELI on the dietary diversity index. The study found that decisions related to agricultural production had a statistically significant positive effect on HDDS in the second model (p=0.000). This means that a woman with higher agency or decision-making power and autonomy in crops grown and livestock kept for household consumption and sale increased the chances of the household consuming a more diverse diet. These findings are consistent with literature which indicates that women's involvement in decisions related to agricultural production allows them to allocate land for subsistence agriculture and improve the nutrition of their families since they are mostly responsible for their household's food needs (Agarwal 1997; Malapit & Quisumbing, 2014). It further enables them to select diverse crops and livestock/products for the consumption of their household and strengthens their intra-household ability and bargaining power in deciding how to use the produce and income generated from produce sale (Agarwal 1997; Aziz et al., 2021; Malapit & Quisumbing, 2014).

Furthermore, the results show that decisions related to nutrition (p= 0.084) had a positive and statistically significant association with household dietary diversity in the third model (table 5.3, column 4). This means that a woman with sole or joint decision-making on how much output from farm and non-farm economic activities to keep aside for household consumption, was likely to increase the chances of the household consuming a diverse diet. These findings are consistent with literature that considers women to care more about the family's nutrition unlike men (Price et al., 2018).  For instance, women's concern is on making sure that there are sufficient calories consumed with adequate nutrient diversity among children, therefore any chance on deciding how much to keep aside for household consumption will favour the nutrition of family members

Lastly control over the use of income (p= 0.079) had a statistically positive effect on household dietary diversity in Model 4 (table 5.3, column 5). Women who had joint or sole control over the use of income obtained from the farm and non-farm activities had higher consumption of a diverse diet. These findings are not surprising considering that women's increased access and control over income is viewed to increase their self- esteem and increase their bargaining power, which might lead to enhancement of household food security (World Bank, 2012). Furthermore, a large proportion of a women's income is spent on food for the household, unlike men (Quisumbing et al.,1996).

As mentioned earlier, several socio-demographic characteristics are statistically significant. For example, a unit increase in the household monthly income (p= 0.000) had a significantly positive effect on HDDS, suggesting that an increase in the household income increases the likelihood of a household consuming diverse food groups. These findings are consistent with literature which considers income to be an important factor in ensuring household dietary diversity by providing households the ability to procure the right quantities and qualities of food (Agbola, 2014; Ahmed et al., 2017; Ngema et al., 2018).

Similarly, a unit increase in the household size (p=0.035) had a statistically significant positive effect on HDDS; implying that as the number of household members increases, the likelihood of the household consuming a diverse diet also increases. These findings contradict most literature that associates larger household size to food insecurity (Aidoo et al., 2013; Muche et al., 2014). However, some studies have supported these findings by indicating that if more household members are productive, larger household size might increase the availability of

productive labour, leading to improvements in household food security status (Murugani & Thamaga-Chitja, 2019).

Furthermore, formal employment (p = 0.002) had a significantly positive effect on HDDS. This means that being in formal employment increases the likelihood of a household's consumption of a diverse diet compared to crop farming. We conclude that formal employment provides a stable supply of income that can be used to procure the right quantities and qualities of food groups. Income from crop farming, on the other hand, is mostly seasonal and subject to greater uncertainty. Livestock farming (p = 0.064), trading (p = 0.089) and piecework (p = 0.002) had significant negative effects on HDDS. This implies that households that depend on these occupations reduced their chances of consuming diverse diets compared to households that depend on crop farming. These results are not surprising considering that most households that rely on livestock farming in the district are subsistence farmers and occasionally sell livestock on a need basis (such as payment of school fees) and a coping strategy in times of crisis, and rarely meet household's food requirements. Furthermore, piecework and trading do not guarantee a stable supply of income and are usually low paying compared to crop farming. In addition, landless households who exchange their labour to meet food requirements do such occupations.

### 5.4.1 Tobit regression marginal effects for HDDS model

Three types of marginal effects for the Tobit model were conducted to understand the direct effects of the changes in our independent variables on HDDS. The first type was the change on the unconditional expected value of HDDS (E ($y*$ $0 < y* < 12$)). This marginal effect measures the changes in the unobserved values of HDDS with respect to the changes in the independent variables. The second marginal effect was on the probability of the HDDS being uncensored (Pr ($0 < y* < 12$)). This marginal effect measures the changes in the independent variables on the probability that HDDS was not observed on a limited range (censored). Lastly, the marginal effects of the censored expected value of HDDS were computed (E ($y*$)), which describes changes in observed values of HDDS with respect to the independent variables. Table 5.4 below shows these three marginal effects.

Table 5.4: Marginal effects for HDDS

| Variable | M₁ | M₂ | M₃ |
|---|---|---|---|
| WELI score | 1.8663*** | 0 .0453** | 2.0090*** |
| | (0.4737) | (0.0146) | (0.5112) |
| Education of household head | 0.0043 | 0.0001 | .0046 |
| | (0.1342) | (0.0032) | (0.1445) |
| Age of household head | -0.0039 | -0.0001 | -0.0042 |
| | (0.0061) | (.0001) | (0 .0065) |
| Household size | 0.1013** | 0.0025** | 0.1090** |
| | (0.0477) | (0 .0012) | (0.0514) |
| Marital status | 0.0986 | 0 .0024 | 0.1061 |
| | (0.2124) | (0.0052) | (0.2286) |
| Monthly income | 0.01103** | 0.0003** | 0.0119** |
| | (0.0050) | (0.0001) | (0.0054) |
| Government food security interventions | -0.1843 | -0.0044 | -0.1984 |
| | (0.2298) | (0.0056) | (0.2474) |
| Livestock farming | -0.3858* | -0.0088* | -0.4144* |
| | (0.2055) | (0.0056) | (0.2221) |
| Formal employment | 2.5761** | 0.0072 | 2.6465** |
| | (0.8341) | (0.0064) | (0.8603) |
| Piecework's | -0.9863*** | -0.0351** | -1.0860** |
| | (0.3044) | (0.0178) | (0.3469) |
| Trading | -0.6809* | -0.0193 | -0.7396** |
| | (0.3862) | (0.0160) | (0.4296) |

$M_1$ (Means of marginal effect on the unconditional expected value of HDDS), $M_2$ (marginal effects of the probability of being uncensored) and $M_3$ (marginal effects of the censored expected value). The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively. Standard errors are in parenthesis.

The marginal effects of the following variables were statistically significant across all models: WELI score, household monthly income, household size, livestock farming, formal employment, piecework, and trading. The magnitude of change in food and nutrition security induced by empowering women is large. Both $M_1$ and $M_3$ suggest that a marginal increase in women's empowerment will lead households to increase dietary diversity by up to two additional food groups. Similarly, $M_2$ reveals that a one percent increase in women's empowerment will likely increase dietary diversity by 4.5 percent. Although the marginal effects are negative at the level ($M_1$ and $M_3$), the probability change shown in $M_2$ is not statistically significant. Whereas having livestock farming as the main occupation appears to lower dietary diversity relative to crop farming (as the main occupation), women are currently not empowered in livestock decision-making. In this study, only about 1 percent of women in households (3 out of 400) are empowered. As the WELI score indicates, the full positive effect of livestock farming will be realised when women are empowered in terms of decision-making related to livestock value chain. Other explanatory variables with relatively large magnitudes of change are engagement in piecework and taking on formal employment.

**5.5. Impact of women's empowerment on household food and nutrition security-the case of HFIAS**

In addition to the HDDS as a measure of nutrition security, this study used a Tobit regression model to examine the association of women's empowerment in livestock and household food security using the HFIAS. The first model addressed the main research question "assess the impact of women's empowerment in livestock on household food and nutrition security". The variables used are similar to those mentioned in section 5.4 above. Similarly, six separate models were run. The first model was conducted with the aggregate WELI score and socio-demographic variables as the independent variables. The remaining five models were conducted with each of the five dimensions of empowerment alongside the socio-demographic variables. These results are presented in Table 5.5.

Table 5.5. Impact of Women's empowerment on household food security-the case of HFIAS

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Weliscore | -3.0599 (1.9330) | | | | | |
| Agricultural production decisions | | -10.8685* (6.0476) | | | | |
| Nutrition decisions | | | -1.6335 (3.7322) | | | |
| Income control | | | | -15.4061 (9.3544) | | |
| Resources access & control | | | | | 12.0113 (7.8696) | |
| Opportunities access & control | | | | | | -6.3344 (3.8680) |
| Education of household head | -0.4576 (0.5451) | -0.5483 (0.5402) | -0.5367 (0.5463) | -0.5294 (0.5411) | -0.6315 (0.5430) | -0.5115 (0.5417) |
| Age of household head | 0.0129 (0.0247) | 0.0102 (0.0245) | 0.0108 (0.0249) | 0.01153 (0.0246) | 0.0073 (0.0246) | 0.0083 (0.0246) |
| Household size | 0.0123 (0.1942) | 0.04301 (0.19611) | -0.0137 (0.1945) | -0.0539 (0.1938) | 0.0031 (0.1938) | 0.0047 (0.1936) |
| Marital status | -1.2323 (0.8597) | -0.9936 (0.8574) | -1.1465 (0.8622) | -1.0114 (0.8579) | -0.8094 (0.8794) | -1.1817 (0.8573) |
| Monthly income | -0.0681*** (0.02066) | -0.0695*** (0.0206) | -0.0697*** (0.02072) | -0.0736*** (0.02071) | -0.0722*** (0.0206) | -0.0683*** (0.0206) |
| Govt Food security Interventions | -0.9936 (0.9314) | -1.0213 (0.9295) | -0.8154 (0.9328) | -0.8100 (0.9189) | -0.6579 (0.9212) | -0.7749 (0.9185) |
| Livestock farming | -0.4133 (0.8369) | -0.3767 (0.8364) | -0.4301 (0.8413) | -0.3714 (0.8378) | -0.4040 (0.8377) | -0.5282 (0.8372) |
| Formal employment | 0.8839 (3.1810) | 0.5527 (3.1697) | 0.6634 (3.1914) | 0.5885 (3.1729) | 0.0706 (3.1924) | 0.5866 (3.1736) |
| Trading | -1.3035 (1.6422) | -1.4813 (1.6416) | -1.2649 (1.6500) | -1.3015 (1.6405) | -1.3097 (1.6422) | -1.3877 (1.6425) |
| Piece works | 1.7654 (1.3477) | 1.8889 (1.3461) | 1.8213 (1.3529) | 1.7986 (1.3462) | 2.0066 (1.3550) | 1.67591 (0.3492) |
| Cons | 15.7906*** (2.6360) | 15.3734*** (2.5754) | 14.9399*** (2.5893) | 16.1824*** (2.6942) | 14.1438*** (2.5947) | 15.0235 (2.5621) |
| Var (e. HDDS_N) | 6.7806 (0.2578) | 6.7702 (.2575) | 6.8005 (0.2586) | 6.7769 (0.2577) | 14.1438 (2.5947) | 6.7788 (0.2578) |
| Pseudo R2 | 0.0124 | 0.0126 | 0.0114 | 0.0124 | 0.0123 | 0.0124 |

The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively. Standard errors are in parenthesis.

The likelihood ratio test was statistically significant (p=0.0009), an indication that the model is a statistically valid model.

Although the estimated coefficient for WELI has the expected negative sign (table 5.5, column 2) indicate that the association between women's empowerment and household food security is not statistically significant. This result is not surprising as the questions under HFIAS index focus on multiple dimensions related to access to food (discussed in Section 5.2) in comparison to HDDS which focuses on the variety of food intakes only. Hence, disaggregating the WELI into different dimensions can provide better perspectives for understanding how each is likely to influence the status of household food security.

Table 5.5, column 3 indicates that the estimated coefficient for agricultural production decisions shows a negative relationship with the HFIAS. Agricultural production decisions has a statistically significant effect on household food access implying that a woman with sole or joint decision-making and autonomy in what the household grew for household consumption and sale increased the chances of the household becoming food secure. These findings are consistent with literature which shows that female's involvement in selecting various crops to be grown and livestock to keep in the household increases the chances of consuming diverse diets (Masuku et al., 2017). Furthermore, their participation in farming decisions strengthens their ability to decide how income from produce can be used (Masuku et al., 2017).

The other empowerment dimensions were not statistically significant as shown in the rest of the models and this is not surprising because the influence of empowerment dimensions on household food security may be context specific and shaped by various social-cultural systems (Malapit et al., 2015; Sraboni et al., 2014).

Table 5.5 indicates that the estimated coefficients for household monthly income is negative and statistically significant under all model specification. This implies that higher household income reduces food insecurity, irrespective of other co-variates varied in terms of empowerment dimensions. These findings are not surprising considering the important role played by income in ensuring food availability and access in a rural household

### 5.5.1. Tobit regression marginal effects for HFIAS model

Three types of marginal effects for the Tobit model were computed with HFIAS as described in section 5.4 above. Table 5.6 below shows the marginal effects for the independent variables.

Table 5.6: Marginal effects for HFIAS model

| Variable | $M_1$ | $M_2$ | $M_3$ |
|---|---|---|---|
| WELI score | -2.2225 | -0.0439 | -2.8260 |
| | (1.4015) | (0.0283) | (1.7823) |
| Education of household head | -0.3324 | -0.0066 | -0.4226 |
| | (0.3958) | (0.0078) | (0.5032) |
| Age of household head | 0. 0094 | 0.0002 | 0.0119 |
| | (0.0180) | (0.0003) | (0.0228) |
| Household size | 0.0090 | 0.0002 | 0.0114 |
| | (0 .1411) | (0 .0028) | (0.1793) |
| Marital status | -0.8950 | -0.0176 | -1.1380 |
| | (0 .6232) | (0.0126) | (0.7929) |
| Monthly income | -0.0495 *** | -0.0010** | -0.0630*** |
| | (0.0150) | (0.0003) | (0.01890 |
| Government food security interventions | -0.7217 | -0.0143 | -0.9177 |
| | (0 .6759) | (0.0135) | (0.8594) |
| Livestock farming | -0.2992 | -0.0063 | -0.3811 |
| | (0.6043) | (0.0132) | (0.7706) |
| Formal employment | 0.6509 | 0.0106 | 0.8227 |
| | (2.3636) | (0.0315) | (2.9751) |
| Piecework | 1.3112 | 0.0173 | 1.6508 |
| | (1.0137) | (0.0093) | (1.2683) |
| Trading | -0.9299 | -0.0230* | -1.1919 |
| | (1.1485) | (0.0338) | (1.4843) |

$M_1$ (Means of marginal effect on the unconditional expected value of HDDS), $M_2$ (marginal effects of the probability of being uncensored) and $M_3$ (marginal effects of the censored expected value). The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively. Standard errors are in parenthesis.

Marginal effects of household monthly income were negative and statistically significant in the three models. This suggest that a marginal increase in household monthly income will reduce the chances of households being food insecure. The marginal increase in $M_1$ and $M_3$ suggest that a marginal increase in household monthly income will reduce the chances of household food insecurity by 5.0% and 6.3% respectively. $M_2$ shows that a one percent increase in household monthly income will likely reduce household food insecurity by 0.1%. Trading as the main occupation had negative and statistically significant marginal effects in model $M_2$.

## 5.6. Post-estimation descriptive statistics

This section presents post-estimation descriptive statistics that compare nutrition security scores and women's empowerment levels between food secure and food insecure households (Table 5.7). This analysis was done for the HDDS Furthermore, t-tests were conducted among the independent variables to understand whether the existing differences were statistically significant.

Table 5.7. Mean differences in WELI and some demographic variables between food secure and food insecure households

| Variable | Food insecure | Standard deviation | Food secure | Standard deviation | Total mean | Standard deviation |
|---|---|---|---|---|---|---|
| HDDS | 2.4407 | 0.6013 | 5.5291 | 1.6434 | 4.1625 | 2.0052 |
| WELI score | 0.3158 | 0.1735 | 0.3843 | 0.1893 | **0**.354 | 0.1854 |
| Age of household head | 47.5537 | 16.5814 | 44.1479 | 14.6611 | 45.655 | 15.6122 |
| Monthly income | 12.1401 | 13.2389 | 19.4933 | 21.2399 | 16.2395 | 18.4849 |
| Household size | 5.1017 | 1.9131 | 5.3767 | 1.9082 | 5.255 | 1.9128 |

The results in Table 5.7 above show differences between food secure and food insecure households in relation to the independent variables. The average HDDS values were 5.5 and 2.4 for food secure and food insecure households, respectively. This means that food secure households consume almost three more food groups (diverse diets) than their food insecure counterparts. Furthermore, food secure households on average have a higher monthly income (MK 19,493.30) compared to food insecure households (MK 12,140.10). The average age for food insecure household heads is higher (47) than that of food secure households (45). Lastly, food secure households have a larger household size compared to food insecure households.

Table 5.8. Test of mean differences in WELI and other demographic variables for food secure and food insecure households

| Variable | Mean difference | t-values | p-values |
|---|---|---|---|
| HDDS | -3.088*** | -23.7671 | 2.31e-78 |
| WELI score | -0.0685*** | -3.7285 | 0.0002 |
| Age of household head | 3.406** | 2.1771 | 0.0300 |
| Monthly income | -7.353*** | -4.0262 | 0.0000 |
| Household size | -0.275 | -1.4299 | 0.1535 |

The asterisks ***, **, * imply statistical significance at 1%, 5% and 10%, respectively.

The results from a t-test (Table 5.8) show statistically significant differences between food secure and food insecure households among the following variables: HDDS, WELI score, age of household head, monthly household income. These findings indicate that women from food secure households are more empowered in livestock compared to those from food insecure households. Furthermore, they indicate that households that are food secure consume more diverse diets, have higher monthly income and are older household heads compared to households that are food insecure.

**Chapter 6: Study limitations, conclusions, and recommendations**

**6.1. Introduction**

The previous chapter discussed the key findings to the main research questions, how and to what extent does empowerment of women in livestock dependent households affect household food and nutrition security. This section discusses the study contributions and future research, limitations, conclusions, and recommendations.

**6.2. Study contributions and future research**

This study has contributed to the literature by providing insights into how empowerment of women in livestock influences household food and nutrition security. It has provided an understanding of the food and nutrition security status of rural Malawian households using two different measures of food and nutrition security: HFIAS and HDDS. Furthermore, the study has provided knowledge on the level of women's empowerment in Malawi using a more comprehensive measure of women's empowerment (WELI) that examines empowerment from a multi-dimensional concept involving five dimensions: agricultural production decisions, nutrition related decisions, income use and control, opportunities access and control, and resources access and control. Lastly, the study has contributed to knowledge about efforts in attaining Sustainable Development Goal number two (2) of ending hunger and achieving food security and improved nutrition (United Nations, 2015) by proposing the inclusion of women's empowerment in livestock as an important strategy.

Future research should focus on increasing our knowledge of empowerment levels of both men and women within a household. This will help in understanding the proportion of women who have managed to make similar achievements as their male counterparts (gender parity). Furthermore, such research will help in understanding the empowerment gap that needs to be closed for women to attain similar empowerment levels as men, especially for households whose women are disempowered. In addition, future research should examine how women's empowerment in the workload and control over own time dimension affects household food and nutrition security.

**6.3. Study limitations**

Despite this study's insights into women's empowerment in livestock and household food and nutrition security, a limitation existed in the research focus. The structure of the questionnaire did not allow us to investigate and compare women's empowerment to that of men in the same household (gender parity), to establish the differences that exist in the level of empowerment

between these two genders. Furthermore, our study did not examine how women's empowerment in the workload and control over own time dimension would affect household food and nutrition security due to time and budget constraints.

## 6.4. Conclusions and recommendations

The study was conducted to understand the household food and nutrition security status and women's empowerment levels among livestock dependent households in Malawi, and to examine whether women's empowerment in livestock would influence household food and nutrition security. The results show that most households consumed three or more food groups. In contrast, a higher proportion of households were included in the food insecure category when using the HFIAS as a food security measure. Overall, women in the Nsanje district are disempowered as they only managed to achieve adequacy in three out of ten WELI indicators. Empowerment of women in livestock was seen to play a significant role in ensuring household food and nutrition security. Furthermore, separating the WELI into component dimensions identified that agricultural production decisions, nutrition related decisions and income control and use played a significant role in ensuring household dietary diversity. In addition to women's empowerment dimensions, factors such as income, household size, and occupation were seen to play a significant role in ensuring household dietary diversity. Interestingly, overall women's empowerment in livestock did not play any role in ensuring household food security as evidenced from the results obtained with HFIAS as a food security measure. However, a weak negative association was obtained between women's decisions related to agricultural production and HFIAS.

Malawi might achieve the Food and Nutrition Security priority of its National Agriculture Policy (NAP) by empowering women in livestock. The National Agriculture Policy (NAP) for the country sets to achieve sustainable agriculture transformation that can result in significant agriculture sector growth, farming household's income expansion and improved food and nutrition security for all Malawians. Most government policies and programs have over the past years been emphasising on increased maize production by promoting fertilizer intensification and encouraging adoption of improved seed varieties. However, such efforts have failed to improve nutrition security as diets remain undiversified. In addition, empowering women is one of the priority areas of the NAP but is only limited to increasing their access to productive resources. The policy aspirations would be achieved through increased women's agency in agricultural production.

This study recommends that government and non-governmental aid organizations implement food and nutrition security interventions that target women's agency in livestock production and nutrition decisions; this should improve food and nutrition security in low income and lower middle-income countries in Sub-Saharan Africa. Furthermore, there is need for sensitization of households on the importance of increasing women's agricultural and nutrition decision-making. In addition, government and private sector can consider financial inclusion mechanisms for household food and nutrition security. Lastly, women's empowerment in livestock is an important policy intervention area for achieving food and nutrition security since it results in increased dietary diversity.

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**Appendix A**: **Consent Form**

**Measuring Women's Empowerment in Livestock Index (WELI) for Household Food and Nutrition Security: Empirical Evidence from Nsanje District in Malawi**

**Consent Form**

Thank you for the opportunity to speak with you. We are a local data collection team conducting this survey on behalf of Ms Tamala Mataka from Lincoln University to learn about livestock, and household food and nutrition security in your area. The interview that you have been chosen to participate in includes questions on topics such as decision-making processes in agricultural production, income and nutrition, and household food and nutrition security, as well as household demographics. Your participation is voluntary, and the questions will take approximately 1 hour to complete. Upon agreeing to participate, you have a choice of stopping at any time or skipping questions you do not want to answer. Your answers will be kept confidential, and no information collected about you or your household will be shared with anyone.

The above description of the above-named project has been read and understood. On this basis I agree to participate in the project, and consent to results publication with the understanding that anonymity will be preserved. I understand also that I may withdraw from the project, including withdrawal of any information I have provided, up to **1ˢᵗ August 2021** by contacting Tamala Mataka (Lead researcher**)** on +**265881228903** or Brian Makina (Research Supervisor) on +**265 884390128**

Name:

Signed: _____ Date:

## Appendix B: Questionnaire

**Instructions**
- Introduce yourself and explain the purpose of the research.
- Please seek consent to interview the respondent.
- Please interview a woman/female adult above the age of 18 who is responsible for decision making within the household.
- Please use the codes where they are provided.
- Fill all the details correctly.
- Respondents should sign and read the consent form.

I _____(enumerator) certify that participant have consented to the interview.

Date: _____
EPA:_____
Time of interview commencement:_____
Time of interview ending:_____

## PART A: General information of the respondent and household head

A1. Name of respondent _____
A2. Gender of household head (1= Male, 2= female)_____
A3. Age (years) of respondent _____
A4. Age (years) of household head_____
A5. Education level of respondent (1= no formal education, 2 =primary education, 3= secondary education, 4= university education)_____
A6. Education level of household head (1= no formal education, 2 =primary education, 3= secondary education, 4= university education)_____
A7. Marital status of household head? (1) Unmarried, (2) Married, (3) widow (4) Divorced/separated_____
A8. Main occupation of household head (1) Crop farming, (2) Livestock farming, (3) trading, (4) civil service, (5) Others _____
A9. Main occupation of the respondent (1) Crop farming, (2) Livestock farming, (3) trading, (4) civil service, (5) Others _____

## Part B: Household level information

A9. Type of household (1= male and female adult, 2= Female adult only)_____
A10. Number of household members_____
A11. Did you or any household member receive any assistance (money or food/non-food items) from family friends in the last 12 months (1= Yes, 2= No). If yes, go to question A12 if No skip to A14. _____
A12. If yes, what form of assistance did you receive from friends and family? (1= Cash, 2= non-cash, 3=both) _____
A13. How much was the assistance in monetary terms?_____
A14. Did you or any household member benefit from any government food and nutrition security interventions in the past 12 months? (1=Yes, 2=No). If yes, go to question A.14, If No skip to question A15 _____
A15. Which of the following interventions did you benefit from; (1) Affordable farm input programme, (2) Scaling Up Nutrition Programme, (3) Cash Transfer Project, (4) others please specify? _____
A16. What is your total household monthly income? MK_____

**SECTION G: Household Food Insecurity Access Scale**

| No | Question | Response code |
|---|---|---|
| 1a | Did you or any household member worry that you food will not be enough in the past four weeks? (1= yes, 0=No) | |
| 1b | How often did this happen (1= rarely (once or twice in the past 4 weeks), 2=Sometimes (3 to 10 times in the past 4 weeks, 3=often (more than 10 times in the past 4 weeks) | |
| 2a | In the past four weeks, were you or any member of your household unable to eat the kind of foods you preferred because of a shortage of resources? (1= yes, 0=No) | |
| 2b | How often did this happen (**Use Codes G1b**) | |
| 3a | In the past four weeks, did you or any household member have to eat a limited food variety because you lacked resources? (1= yes, 0=No) | |
| 3b | How often did this happen (**Use Codes G1b**) | |
| 4a | In the past four weeks, did you or any household member have to unpreferred foods because you did not have resources to obtain other food types? (1= yes, 0=No) | |
| 4b | How often did this happen (**Use Codes G1b**) | |
| 5 | In the past four weeks, did you or any household member have to eat a smaller meal than was required because food was not enough? (1= yes, 0=No) | |
| 5a | How often did this happen (**Use Codes G1b**) | |
| 6 | In the past four weeks, did you or any household member have to eat fewer meals in a day because food was not enough? (1= yes, 0=No) | |
| 6a | How often did this happen (**Use Codes G1b**) | |
| 7 | In the past four weeks, was there no food to eat of any kind in your household because of a lack of resources to get food? (1= yes, 0=No) | |
| 7b | How often did this happen? (**Use Codes G1b**) | |
| 8 | In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? (1= yes, 0=No) | |
| 8a | How often did this happen? (**Use Codes G1b**) | |
| 9 | In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? (1= yes, 0=No) | |
| 9a | How often did this happen? (**Use Codes G1b**) | |

### Section I: Household Dietary Diversity Score (HDDs)-Use 24-hour recall period

These questions are on the types of foods consumed by you or anyone else in the household in the last 24 hours prior to data collection

| Questions | Coding categories (Yes=1, 2=No) |
|---|---|
| **Cereals** (Nsima, biscuits, Kondole, rice, sorghum, millet, wheat, bread) | |
| **White tubers** (Irish potatoes, sweet potatoes, cassava) | |
| **Vegetables** {Mpiru (mustard greens), Bonongwe, Nkhwani, Chigwada, Mabilinganya, Rape, Chinese} | |
| **Fruits** (plantains, bananas, apples, oranges, lemons, guavas, pineapples, avocado pears, papaya, pumpkin) | |
| **Meat** (chicken, beef, lamb, goat, pork, duck or other birds, liver, heart or other organs, flying ant, Ngumbi, Ziwala) | |
| **Eggs** | |
| **Fish and fish products** (fresh, Matemba, usipa, Makakana, Chambo, Mlamba, kampango, Batala, utaka, Mlamba, Chambo) | |
| **Legumes & Nuts** (groundnuts, beans, peas, cowpeas, soybeans, pigeon peas) | |
| **Milk and milk products** (cheese, yoghurt, Chambiko) | |
| **Oils and Fats** (fruits such as avocado peas, dried coconut, cooking oils(groundnut), margarine, animal fat (fatty meat) | |
| **Sugar/ honey** (Any sugar or honey?) | |
| **Miscellaneous** (Any other foods such as coffee, tea)? | |

**WOMEN'S EMPOWERMENT IN LIVESTOCK INDEX**
**Part C: Decision Making regarding Production, Income and Nutrition**

| Activity | C.1 | C.2 | C.3 | C.4 | C.5 | C.6 | C.7 |
|---|---|---|---|---|---|---|---|
| | Did you participate in [activity] in the past 12 months **{1=Yes, 0=No)** | Who normally makes decisions regarding [activity]?( 1=Self 2=Spouse 3=Other HH member 4=other non-HH member If response is 1→C.5 | How much input did you have in making decisions about [activity]? (1=Little to no input, 2=Input into some decisions, 3= Input into most or all decisions | To what can you participate in decisions regarding [activity] if you want(ed) to? (1=Not at all, 2=Small extend, 3= medium extend, 4= To a high extend (4) | To what extent are you able to access information necessary for making informed decisions regarding [activity]? (**1=**Not at all, 2=Small extend, 3= medium extend, 4= To a high extend) | How much Input d you have in decisions about how to use income generated From [activity) {1= Little no Input,2= input in some Decisions, 3=input in most Decisions | How much input did you have in decisions about how much of the outputs of [activity] to keep for consumption at home rather than selling? Little to no input (1) Input into some decisions (2) Input into most or all decisions (3) |
| **A.** Staple grain farming and processing of the harvest: grains that are grown | | | | | | | |

| primarily for food consumptio n (rice, maize, wheat, millet, Sorghum) {YES=1 NO=0 →to B} | | | | | | |
|---|---|---|---|---|---|---|
| **B. Ho**rticultura l (gardens) or high value crop farming and processing of the harvest {YES=1 NO=0 →to C} | | | | | | |
| **C. Lar**ge livestock raising (cattle) and processing of milk and/or meat {YES=1 NO=0 →to D} | | | | | | |
| **D.** Small livestock raising (sheep, goats, pigs) and processing of milk and/or meat {YES=1 NO=0 →to E} | | | | | | |
| **E.** Poultry and other small animals raising (chickens, ducks, | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| turkeys) and processing of eggs and/or meat {YES=1 NO=0 →to **F**} | | | | | | |
| **F.** Fishpond culture {YES=1 NO=0 →to **G**} | | | | | | |
| **G.** Non - farm economic activities (running a small business, self-employment , buy -and - sell) {YES=1 NO=0 →to **H**} | | | | | | |
| **H.** Wage and salary employment (work that is paid for in cash or in - kind, including both agriculture and other wage work) {YES=1 NO=0 →to **I**} | | | | | | |
| **I.** Large, occasional household purchases (bicycles, land, transport vehicles) {YES=1 NO=0 →to **J**} | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **J.** Routine household purchases (food for daily consumption or other household needs) {YES=1 NO=0 →**to K}** | | | | | | | |
| K. Obtaining agricultural inputs (e.g. fertilizers, feed) and services (veterinary, advisory) {YES=1 NO=0**}** | | | | | | | |

**Questions specific to decision making on aspect of household life on a range of activities with special emphasis on livestock farming.**

| QUESTION | Response |
|---|---|
| **C.8.** What livestock species are raised in your household (1= large livestock (cattle) 2= small livestock (goats, pigs, sheep), 3= poultry (chicken, ducks, turkeys) | |
| C.9. Which specie is important for the household's livelihood? | |
| **C.9A.** Reason why it is most important to your household's livelihood. | |

**The following Questions to be asked for species indicated as important to individual and household livelihood.**

| Activity | C.11 | C.12 | C.13 | C.14 | C.15 | C.16 | C.17 |
|---|---|---|---|---|---|---|---|
| | Did you participate in [activity] in the past 12 months (during the last one cropping season) | Who normally makes decisions regarding [activity]? (1=Self, 2=spouse, 3=other | How much input did you have in making decisions about [activity]? (1=Little to no input, 2=Input into some | To what extent do you feel you can participate in decisions regarding [activity] if you want(ed) to? (**1=**Not at all, 2=Small extend, 3= medium | To what extent are you able to access information that you feel is important for making informed decisions | How much inp did you have decisions abo how to u income? Generated fro [activity)]? (1=Little to no input, 2=Input into some decisions, | How much input did you have in decisions about how much of the outputs |

| | (1=Yes, 0=No) | HH member, 4=other non-HH member If response if 2→C.14 | decisions, 3= Input into most or all decisions | extend, 4= To a high extend (4), | regarding [activity]? (1=Not at all, 2=Small extend, 3= medium extend, 4= To a high extend, | 3=Input into most or all decisions, 4=Not applicable/no Decision made | of [activity] to keep for consumption at home rather than selling? Little to no input (1) Input into some decisions (2) Input into most or all decisions (3) |
|---|---|---|---|---|---|---|---|
| A. Purchasing animal (1= Yes, 0=No →to B) | | | | | | | |
| B. Animal care (feeding, watering, disease prevention, milking animals) (1= Yes, 0=No →to C | | | | | | | |
| A. Selling animal products (1= | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Yes, 0=No →**to D)** | | | | | | |
| **B.** Prepare animal meat, eggs, milk into food (1= Yes, 0=No →**to E** ) | | | | | | |
| **C.** Deciding how much product from livestock to put aside for household consumption (1= Yes, 0=No →**to F)** | | | | | | |
| **D.** Marketing of live animals and any animal products (except milk and eggs) (1= Yes, 0=No →**to G)** | | | | | | |
| E. Selectin | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| g which species and which breeds to rear (1= Yes, 0=No →**to H)** | | | | | | |
| **F.** Providing this livestock as collateral to access credit (1= Yes, 0=No) | | | | | | |

**Section D: Access to and control over resources**
**D1. Access to productive capital**

| | |
|---|---|
| D.1 Does anyone in your household own or cultivate land? (1= Yes, 2=No) | |
| D.2.Total land owned by the household (Acres)? | |
| D.3. Total land cultivated from the one owned (Acres)? | |
| D.4.Total rented land under cultivation (Acres)? | |
| D.5. Who is responsible for deciding what to plant and how output is used from this land? (Husband =1, Wife=2, adult child= 3, 4=others specify) | |
| D.6. Do you solely or jointly cultivate any land? (1= Yes Solely, 2= yes jointly, 3= solely and jointly, 4= No) | |
| D.7. Who makes decisions on what to plant on this land that is cultivated and what to do with the output from this land? (Husband =1, Wife=2, 3= children, 4=others specify) | |
| D.8. Is any of the cultivated land owned by you? (1= Yes Solely, 2= yes jointly, 3= solely and jointly, 4= No) | |

| | Does anyone in your household currently have any [ITEM]? Yes (1) No(0) | Do you own any [item]? Circle one Yes solely (1) yes jointly (2) → G3.09 yes solely and jointly (3) → | Total number owned | Number owned solely | Number owned jointly | For assets, you own (solely), which of the following can you do on your own, without consultation? **Circle all applicable** Give as a gift (1) Sell (2) Loan to someone (3) Pledge as collateral (4) Look after livestock (5) slaughter. (6) | With whom do you co-own [ITEM]? Circle all applicable Spouse (1), Other household member (2), Other non-household member (3) | For assets, you own (jointly) with someone else, which of the following can you do on your own, without consultation? **Circle all applicable** Give as a gift (1) Sell (2) Loan to someone (3) Pledge as collateral (4) Look after livestock (5) slaughter.6 =Not applicable | For all assets that you own (solely or jointly), which of the following can your spouse do on his/her own, without consulting you? **Circle all applicable** Give as a gift (1) Sell (2) Loan to someone (3) Pledge as collateral (4) Look after livestock (5) slaughter.6= Not applicable |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

|  | D.9 | D.10 | D.11 | D.12 |  | D.13 | D.14 | D.15. | D.16 |
|---|---|---|---|---|---|---|---|---|---|
| **I.** Large ruminant (dairy) |  |  |  |  |  |  |  |  |  |
| **B.** Large ruminant (beef or mixed) |  |  |  |  |  |  |  |  |  |
| **C.** Small ruminant (Sheep, goats, pigs ) |  |  |  |  |  |  |  |  |  |
| **D.** Poultry |  |  |  |  |  |  |  |  |  |
| **E.** Fish pond or fishing equipme nt |  |  |  |  |  |  |  |  |  |
| **F.** Non - mechani zed farm equipme nt (hand tools, animal - drawn plough) |  |  |  |  |  |  |  |  |  |
| **G.** Mechani zed farm equipme nt (tractor - plough, power tiller, treadle pump) |  |  |  |  |  |  |  |  |  |
| **H.** Non - farm business equipme nt (solar panels used for rechargin g, sewing machine, |  |  |  |  |  |  |  |  |  |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| brewing equipment , fryers) | | | | | | | | | |
| **I.** House or building | | | | | | | | | |
| **E.2.8** Large consumer durables (refrigerator, TV, sofa) | | | | | | | | | |
| **J.** Small consumer durables (radio, cookware | | | | | | | | | |
| **K.** Cell phone | | | | | | | | | |
| **L.** Other land not used for agricultural l purposes (pieces/plots, residential or commercial land) | | | | | | | | | |
| **M.** Means of transportation (bicycle, motorcycle, car) | | | | | | | | | |

**Part E: Access to and control over opportunities**
**E.1. Access to Financial Services**
Next I'd like to ask about your household's experience with borrowing money or other items (in-kind) in the past 12 months

| | Would you or anyone in your household be able to take a loan or borrow cash/in kind from [SOURCE] if you wanted to (1=Yes, 0=No) | Has anyone in your household taken any loans or borrowed cash/in-kind from [SOURCE] in the past 12 months? **CIRCLE ONE** Yes cash(1) In-kind (2) Yes cash and in-kind (3) No (4) Source don't know (88) | Who made the decision to borrow from [SOURCE] most of the time? ENTER UP TO THREE (3) | Do you think the decision to borrow [ITEM] was a good decision? (1=Yes, 0=No) | Who makes the decision about what to do with the money or item borrowed from [SOURCE] most of the time? {1=Husband, 2=Wife, 3= Children 4=Other non-household members, 5=Not applicable). | Who is responsible for repaying the money or item borrowed from [SOURCE]? |
|---|---|---|---|---|---|---|
| | **E.1** | **E.2** | **E.3** | **E.4.** | **E.5** | **E.6** |
| **A.** Non-governmental organization (NGO) {1= Yes , 0=No → B} | | | | | | |
| **B.** Formal lender (bank/financial institution {1= Yes , 0=No →C} | | | | | | |
| **C.** Informal lender {1= Yes , 0=No →D} | | | | | | |
| **D.** Friends or relatives {1= Yes , 0=No →E} | | | | | | |
| **E.1.4.** Group based microfinance or lending including VSLAs/ SACCOs {1= | | | | | | |

| Yes , 0=No → F} | | | | | |
|---|---|---|---|---|---|
| F. Informal credit / savings groups (. e.g., merry-go-rounds, tontines funeral societies) {1= Yes , 0=No} | | | | | 90 |

## F. GROUP MEMBERSHIP

These questions are about groups in your community (formal, non-formal/customary)

| | Is there a [GROUP] in your community? (1=yes, 0=No) | Are you an active member of this [GROUP]? (1=Yes, 0=No) | What is the groups composition? All male (1) All female (2) Mixed sex (3) Don't Know (99) | To what extent do you feel like you can influence decisions in this [GROUP]? (1=Not at all, 2= Small extend, 3= Medium extend, 4= High extend, | To what extent does this [GROUP] influence life in the community beyond the group activities? 1=Not at all, 2= Small extend, 3= Medium extend, 4= High extend |
|---|---|---|---|---|---|
| | **F.1** | **F.2** | **F.3** | **F.4** | **F.5** |
| A. Agricultural / livestock / fisheries producer's group (including marketing groups) | | | | | |
| **B.** Water users' group | | | | | |
| **C.** Forest users' group | | | | | |
| **D.** Credit or microfinance group (including SACCOs / merry grounds / VSLAs) | | | | | |
| **E.** Mutual help or insurance group (including burial societies | | | | | |
| **F.** Trade and business association group | | | | | |
| **G.** Civic group (improving community) or charitable group (helping others) | | | | | |
| **H.** Religious group | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **I.** Milk/dairy marketing group | | | | | |
| **J.** Other (specify): | | | | | |

## G. Autonomy in decision-making

Stories from different farmers will be read about their situations on various agricultural activities for you to say how much you are like or not like them. Use any female names from the local context.

| | | | Are you like this person? (YES=1 , 0=No) <br><br><br><br><br><br><br><br><br>**G.1** | Are you completely the same or somewhat the same? CIRCLE ONE {1=Completely the same, 2=somewhat the same, 3= completely different, 4=Somewhat different, <br>**G.2** |
|---|---|---|---|---|
| **A. Livestock farming** | **A.1** | "[Name of a person] Only raises livestock that she has because they do well in this community. | | |
| | **A.2** | "[Name of a person] raises the kind of breeds as directed by her spouse or another person in the community. She follows their directive. | | |
| | **A.3** | "[Name of a person] raises the kinds of livestock according to her family or community's expectations. She seeks approval of being good at raising livestock" | | |
| | **A.4** | "[Name of a person] Selects livestock types that she personally wants to raise and regards them as important for herself and family. She places value in raising them and would act differently if she changed her mind | | |
| | | | | |
| B. Taking crops or livestock (incl. eggs or milk) to the market (or not) | **B.1** | "[Name of a person] Takes the only possible amount of her livestock or crops to the market because there is no alternative | | |
| | **B.2** | "[Name of a person] Takes livestock and crops to the market as directed by her spouse or another person from her community. She does what she is told to do. | | |
| | **B.3** | "[Name of a person] takes the crops and livestock to the market according to her family/community's expectation and wants approval from them | | |
| | **B.4** | "[Name of a person] Selects livestock/crops to market that she personally wants to sell, and thinks is best for herself and family. The sale approach is valued and would act differently if she changed her mind. | | |

| C. How to use income generated from agricultural and non-agricultural activities | **C.1** | "[Name of a person] Uses her income according to need and does not have any alternative. | | |
| | **C.2** | "[Name of a person] uses her income according to her spouse/community's directive. She does as she is told. | | |
| | **C.3** | "[Name of a person] uses her income according to her family/community's expectation as she wants their approval. | | |
| | **C.4** | "[Name of a person] uses her income how she wants, and thinks will serve the interests of her family and herself. She finds value in using her income in this manner and she could act differently if she changed her mind. | | |