

**EFFECT OF WOMEN EMPOWERMENT ON SUSTAINABLE HOUSEHOLD
FOOD SECURITY: A CASE OF MONDULI DISTRICT IN TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
PUBLIC HEALTH AND FOOD SAFETY OF SOKOINE UNIVERSITY OF
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EXTENDED ABSTRACT

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life. Food insecurity continues to be a significant problem for public health nutrition in developing and developed countries, and women are the most affected. Similarly, women's empowerment has been used as a strategy to improve household food security and nutrition. Women invest in household food needs, increase household consumption, and improve children's nutritional status compared to men. The objective of this study was to determine the effect of women empowerment on sustainable household food security in Monduli District in Tanzania. A cross-sectional study was conducted between March 2021 and April 2021. A total of 245 households and 491 women between 15 and 49 years of age fully participated in household survey using questionnaire about household food security and women empowerment. Data were analyzed using SPSS for windows (Version 21.0. SPSS Inc., Chicago, IL, USA). The Household Food Insecurity Access Scale (HFIAS) and Minimum Dietary Diversity-Women(MDD-W) revealed that most households were food insecure (73%) and did not reach minimum dietary diversity (95.7%). Women's Empowerment in Agriculture Index (WEAI) only categorized (16.9%) as empowered women. The low status of women's empowerment was expressed by their non-involvement in household decision matters, less control over resources, and a low level of education. The positive effect of women empowerment on sustainable household food security in Monduli District (OR=3.15; 95% CI: 1.93-5.13, $p<0.05$) was determined by using multivariate logistic regression and backward Wald methods. Government policies reinforcement on social mechanisms that allows higher percentage of women to be enrolled in education, gender equality promotion, land ownership, decision-making ,involvement in leadership and programs that access women's participation in off-

farm income-generating activities will reduce and prevent household food insecurity in Monduli.

DECLARATION

Linda-Darlene MUHOZE, at this moment, declares to the senate of Sokoine University of Agriculture that this dissertation is my original work done within the period of registration. It has neither been submitted nor concurrently submitted to any other institution.

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DEDICATION

This dissertation is dedicated to my beloved parents Kayimba Estella and Late Bukuru Cassien, who trusted me and pushed me for more remarkable achievements.

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LIST OF ABBREVIATIONS

AIC	Akaike information criterion
AIDS	Acquired Immunodeficiency Syndrome
CSI	Coping Strategies Index
DHS-MIS	Demographic and Health Survey and Malaria Indicator Survey
FAO	Food and Agriculture Organization
HFI	Household food insecurity
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
MDD-W	Minimum Dietary Diversity-Women
NGO	Non-Governmental Organization
SPSS	Statistical Package for the Social Sciences
USAID	United States Agency for International Development
WEAI	Women's Empowerment in Agriculture Index
WHO	World Health Organization

CHAPTER ONE

1.0 GENERAL INTRODUCTION

Food insecurity continues to be a significant problem for public health nutrition in developing and developed countries, and women are the most affected. Worldwide, in 2009 women represented 60% of undernourished people (FAO, 2013). Many malnourished women resulted from gender inequalities that restrained women's access to income, agricultural technology, education, credit, land, and decision-making power (SIDA, 2015). Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life (FAO, 2006). Sustainable food security is a long-term dimension in assessing food security and aims at maintaining nutritional well-being and health. In 2018, more than 820 million people in the world were still hungry, and rural women were the worst affected. Asia is severely affected by malnutrition, with more than 500 million people. Africa recorded 260 million people and 90% living in Sub-Saharan Africa. Africa and Asia accounted for more than nine out of ten stunted children globally (FAO, 2019).

In 2011, Sub-Saharan Africa was severely affected by food insecurity and indicated more than 80 million death; women and children under five represented half of the mortality rate (Rademacher, 2012). Political-economic crises, poor policy decisions, adverse weather patterns, and HIV/AIDS contribute to food insecurity in Sub-Saharan Africa, with the highest prevalence of undernourishment, which is 22.7%. Half of the population lives below the international poverty line (FAO, 2017), 9% of women infected with HIV/AIDS resulted in an increased child-headed household (Clover, 2003). More than 50% of women in Sub-Saharan Africa contribute to agricultural production, 98% in

Burundi, 96% in Malawi, and 92% in Tanzania (Cheryl, 2011). Still, the social norms constraint them to education, access, and decision-making on land, livestock, and credit (Larson *et al.*, 2019). The unemployment of women is an essential factor in food insecurity. Because of the limited access to education, many rural women do not have opportunities to have jobs and improve their home quality of life.

In Tanzania, 34% of children under five suffered from food insecurity and 45% of women of reproductive age were anemic (USAID, 2018). Monduli District is a pastoralist area where Massai represents 60% of the population. The women are responsible for farming and caring for children, while the men are in charge of the livestock and control family life. The district's literacy rate is 34% for women and 45% for men (Raymond, 2014).

Women empowerment is the process by which a woman acquires the capacity for self-determination, that is, of living the life that she has reason to value' (Galiè *et al.*, 2019). In developing countries, women's empowerment has been used to improve household food security and nutrition. Women with their income invest in household's food needs compared to men, which sometimes increases household consumption and improves children's nutritional status. In 2006, female decision-making power increased investments in children's education, especially girls (FAO, 2017). Women with financial resources ensure greater diet diversity, and in rural areas, farmers with control over resources tend to have better quality diets. Women's education is linked with higher survival rates of children and better educational outcomes for both boys and girls (FAO, 2017). Women's empowerment allows women to be more productive in protecting their family's nutrition and give future generations a better start in life (Scaling Up Nutrition, 2016).

1.1 Food Security

Food security at the individual, household, and national is achieved when all people, at all times, have social, physical, and economic access to safe, sufficient, and nutritious food to meet their dietary needs and food preferences for a healthy and active life. Sustainable food security involves the availability of food or adequate food production, determined by the level of food production, reserve stocks, and net trade. Access to food as the ability of individuals and households to purchase sufficient food. Accessibility refers to income, prices, and food markets. Utilization of food is the ability of individuals and households to maintain a healthy diet that meets human requirements in terms of nutrition, including energy and micro-nutrients. Stability, as the constant presence over long periods of all the other three dimensions (Helland and Sørbø, 2014).

1.2 Food Insecurity

Household food insecurity denotes the inability of the household to access an acceptable amount of healthy foods (Tarasuk *et al.*, 2019). Worldwide, household food insecurity is a severe public health concern and can result in malnutrition when experienced at a severe stage (Owino *et al.*, 2014).

1.3 Food insecurity Classification

According to Sen 1981, there are two kinds of food insecurity: chronic and transitory. Chronic food insecurity is a constantly inadequate diet caused by an incapacity to procure food. It affects households that persistently lack the ability either to buy or produce enough food. Transitory food insecurity is a momentary deterioration in a household's access to enough food. It may result from variability in food prices, food production, or household incomes and, in extreme cases, may result in famine (Sen, 1981).

1.4 Food Insecurity Causes and Consequences

Studies have recognized: increased population, land size, low agricultural productivity, political crisis, lack of education, unemployment, poverty, income inequality, lack of nutritional knowledge, poor infrastructure, HIV disease, climate change, and social constraints as gender inequality as factors influencing household food insecurity (Pandey & Fusaro, 2020). Household food insecurity is associated with negative impacts on health: lower nutrient intake, anemia cognitive problems, aggression and anxiety, poorer general health, asthma, depression and suicide.

1.5 Food Security Measurement at Household Level

Household food security is the primary determinant of nutrition security that can only be entirely understood through a multi-level analysis taking global, national/regional, and local, household, and individual-level factors.

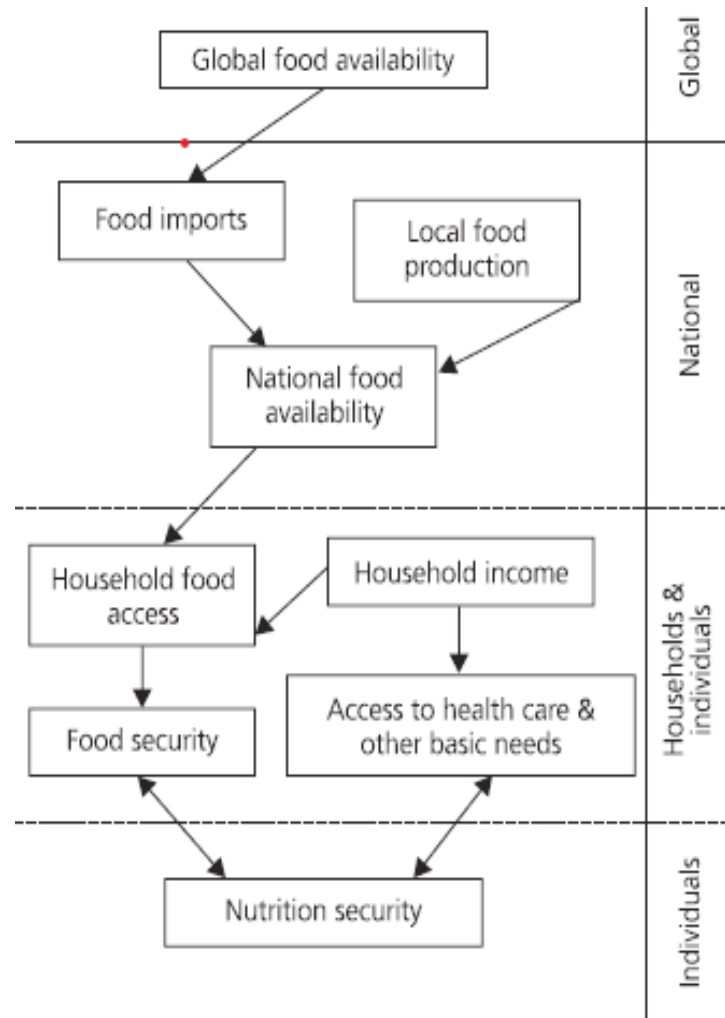


Figure 1.1: Food and nutrition security distal, intermediate and proximal determinants

Source: (Frankenberg *et al.*, 1995).

Household-level measures depend on household surveys data and give more precision about food security accessibility than national-level measures. Food access refers to physical and economic access to food; however, many of the tools used to measure food access measure food acquisition or food consumption (Jones *et al.*, 2013). Households are important representatives to consider when explaining livelihood issues and developing specific food insecurity problems.

1.6 Household Socio-Economic Characteristics as Determinants of Food

Insecurity

Socio-economics characteristics such as sex, age, marital status, household head literacy status, livestock ownership, household size, and land size have been identified as determinants of household food insecurity (Sikwela, 2008; Bogale and Shimelis, 2009; Aidoo *et al.*, 2013; Kumba, 2015).

1.7 Coping Strategies

Coping strategies are behavioral responses such as activities and techniques based on cultural practices that households implement to protect their livelihoods when facing food insecurity (Dil Farzana *et al.*, 2017). Coping strategies are meaningful responses to decrease the calamity's strength and intensify resources for sustainable livelihood security.

1.8 Women Empowerment Concept with Food Security

Women's empowerment is a multidimensional concept that has been widely recognized as an essential objective in global development. It has been linked to many dimensions of household health status through different pathways, spanning from health services, child health, and reduction in expenditure on items that lead to poor health and household food security. Women's empowerment is acquiring financial autonomy and decision-making power by their ability to participate in productive activities (Obayelu and Chime, 2020).

Women empowerment also has implications in food security and household welfare. A home's access to food depends on its real income and one who earns it. In South Asia, chronic malnutrition was linked to the low status of women and gender gaps in health and

education (Sraboni *et al.*, 2014). Women play a central role in the household and national food security. As producers, women represent a large proportion of agricultural workers compared to men. In 2012, 43 percent of all farmworkers in Asia and 47 percent in Africa were female, with percentages close to 50 or higher in Southeast and East Asia (Musemwa *et al.*, 2015). Their activities can include producing crops, tending animals, processing and preparing food, working for wages in agriculture, fetching water, engaging in trade, caring for family members, and maintaining their homes. However, women's ability to contribute effectively to agriculture depends crucially on their access to land, which is the most important productive resource for farmers. Still, they are seriously disadvantaged in this respect due to male bias in inheritance laws in social norms (Sraboni *et al.*, 2014).

Women's education has an important impact on the reduction in mortality of children; participative women in the family contribute to lower mortality rates due to malnutrition in developing countries (Pascale de Muro and Francesco Burchi, 2007). When women have more control over household resources, families are healthier, better educated, and have more access to more nutritious foods. Women's empowerment directly impacts agricultural productivity and household food security; women invest more of their earnings than men do in their family's well-being in areas including health, education (Akter *et al.*, 2017). Poverty reduction can be achieved through women's empowerment which contributes to the household's health status and education (Zereyesus *et al.*, 2017). Women's empowerment and decision-making in household matters go hand in hand. The decision-making in the household area plays a considerable role for women. Better livelihoods help women acquire ability, become more independent in making personal and household decisions (Sharma *et al.*, 2016).

1.9 Problem Statement and Study Justification

1.9.1 Problem statement

Food insecurity among women of reproductive age is a severe public health concern with adverse effects on women, pregnancy outcomes, and child survival. Women's food insecurity is associated with poor health, which negatively impacts the country's economic productivity (Zereyesus *et al.*, 2017). In developing countries, gender inequalities within the rural household and society affect many aspects of food security since rural women represent half of the agricultural labor. Gender discrimination in the family is associated with higher levels of hunger and malnutrition. Discrimination is seen in the household; cultural practices and intra- household bargaining power determine the allocation of household incomes to food and care needs. Women's weaker family and social standards that favor boys over girls lead to poorer nutrition among women and girls (Hélène and Cohen, 2019). In two-thirds of 141 countries, women were most reported than men as food insecure, especially in Sub-Saharan Africa (FAO, 2013). In Sub-Saharan Africa, malnutrition in children has increased over the past decade due to food insecurity from 5.5 million to 30 million and resulted in over 3.5 million children under age every year.

Malnutrition in children and women remains one of the significant challenges in Tanzania. Despite a remarkable amelioration in agriculture, food insecurity in childhood and pregnancy still affects human capital, economic productivity, and national development (Schindler *et al.*, 2014). The prevalence of stunted children under five years was 34%, one in six children age 24-35 months was severely stunted, and the prevalence of anemia among women of reproductive age was 45% (USAID, 2018). Maternal malnutrition, inadequate infant feeding practices, low quality of health care, and poor

hygiene are the main factors of stunting in children. According to the 2015–16 Demographic and Health Survey and Malaria Indicator Survey (DHS-MIS) in Tanzania, early childbearing contributed to malnutrition by 57% percent of age 19 adolescent girls. In 2009, only 24% of girls were enrolled in school. In the Monduli district, culture prevents women's decision-making in their families or societies, contributing to many uneducated women and girls. Only 40% of males supported girls' education, and 60% considered educating girls a loss; they associated girls' failure in education with early marriage and pregnancy (Raymond, 2014). Several governmental and non-governmental activities have recently intervened and provided training on the value of women's empowerment in the Monduli district, but the impact was not significant.

1.9.2 Justification of the study

Therefore, this dissertation contributes to the current knowledge by showing that if the primary female member of a household is empowered the household is more likely to be food secure because empowerment increases women's access to and control over productive resources, increases household livelihood diversity and decreases the barriers women face to access markets and decision making/leadership.

1.10 Research Objectives

1.10.1 General objective

The overall objective of this study was to determine the effect of women empowerment on sustainable household food security in Monduli District in Tanzania

1.10.2 Specific objectives

- i. To determine the status of household food security in Monduli district, Arusha
- ii. To identify the household coping strategies against food insecurity in Monduli
- iii. To determine the proportion of women empowerment status in relation to food security on their household in Monduli
- iv. To determine the impact of women empowerment on food security in household in Monduli

1.11 Research hypotheses

H_0 : Women empowerment has no effect on sustainable household food security in Monduli

1.12 Ethical consideration

Permission to conduct the study was granted by Sokoine University of Agriculture Research and Publication Committee reference number SUA/DRRTC/R/12, also from the Monduli district office and the head villages. Informed consents were required from all participants before the interview and confidentiality was guaranteed to them.

CHAPTER TWO

MANUSCRIPT 1

WOMEN EMPOWERMENT AS INFLUENCING FACTOR TO SUSTAINABLE HOUSEHOLD FOOD SECURITY IN MONDULI DISTRICT, TANZANIA

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TANZANIA**

Abstract

Women's empowerment has been used as a strategy to improve household food security and nutrition. Women invest in household food needs, increase household consumption, and improve children's nutritional status compared to men. The objective of this study was to determine the effect of women empowerment on sustainable household food security in Monduli District in Tanzania. A cross-sectional study was conducted between March 2021 and April 2021. A total of 245 households and 491 women between 15 and 49 years of age fully participated in household survey using questionnaire about household food security and women empowerment. Women's Empowerment in Agriculture Index (WEAI) only categorized (16.9%) as empowered women. The low status of women's empowerment was expressed by their non-involvement in household decision matters, less control over resources, and a low level of education. The positive effect of women empowerment on sustainable household food security in Monduli District (OR=3.15; 95% CI: 1.93-5.13, $p<0.05$) was determined by using multivariate logistic regression and backward Wald methods. Gender equality promotion, women's participation in land ownership, decision-making, involvement in leadership will improve household food security in Monduli.

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INTRODUCTION

Women empowerment is the process by which a woman acquires the capacity for self-determination, that is, of living the life that she has reason to value' (Galiè *et al.*, 2019). In developing countries, women's empowerment has been used to improve household food security and nutrition. Women with their income invest in household's food needs compared to men, which sometimes increases household consumption and improves children's nutritional status. In 2006, female decision-making power increased investments in children's education, especially girls (FAO, 2017). Women with financial resources ensure greater diet diversity, and in rural areas, farmers with control over resources tend to have better quality diets. Women's education is linked with higher survival rates of children and better educational outcomes for both boys and girls (FAO, 2017). Women's empowerment allows women to be more productive in protecting their family's nutrition and give future generations a better start in life (Scaling Up Nutrition, 2016).

In Tanzania, 34% of children under five suffered from food insecurity and 45% of women of reproductive age were anemic (USAID, 2018). Monduli District is a pastoralist area where Massai represents 60% of the population. The women are responsible for farming and caring for children, while the men are in charge of the livestock and control family life. The district's literacy rate is 34% for women and 45% for men (Raymond, 2014).

The main objective of this study was therefore to determine the effect of women empowerment on sustainable household food security in Monduli District in Tanzania. This will contribute to the current knowledge by showing that if the primary female member of a household is empowered the household is more likely to be food secure

because empowerment increases women's access to and control over productive resources, increases household livelihood diversity and decreases the barriers women face to access markets and decision making/leadership.

Materials and Methods

Study area

The study was conducted in the Monduli District, one of the seven districts of the Arusha Region of Tanzania. The District is located in the northeastern section of the country. It is bordered to the north by Longido District, east by Arusha Rural District, south by the Manyara Region, and west by Ngorongoro District and Karatu District. Monduli District is divided into 20 wards; two wards, Mswakini and Esilalei, were selected as study areas. By 2016, Monduli had 177 346 of the population with different cultures; Massai people represented the majority, followed by Arusha people, pastoralism and farming are their everyday life activities. The economy of the area is contributed by agriculture, commercial, peasantry farms, and tourism. Monduli district was chosen for this study because of the widespread women's illiteracy, women's challenges in ownership, and decisions over livestock and land.

The data were geo-referenced using Geographical Information System (QGIS), and digital map files (shape files) were developed (Figure 2.1).

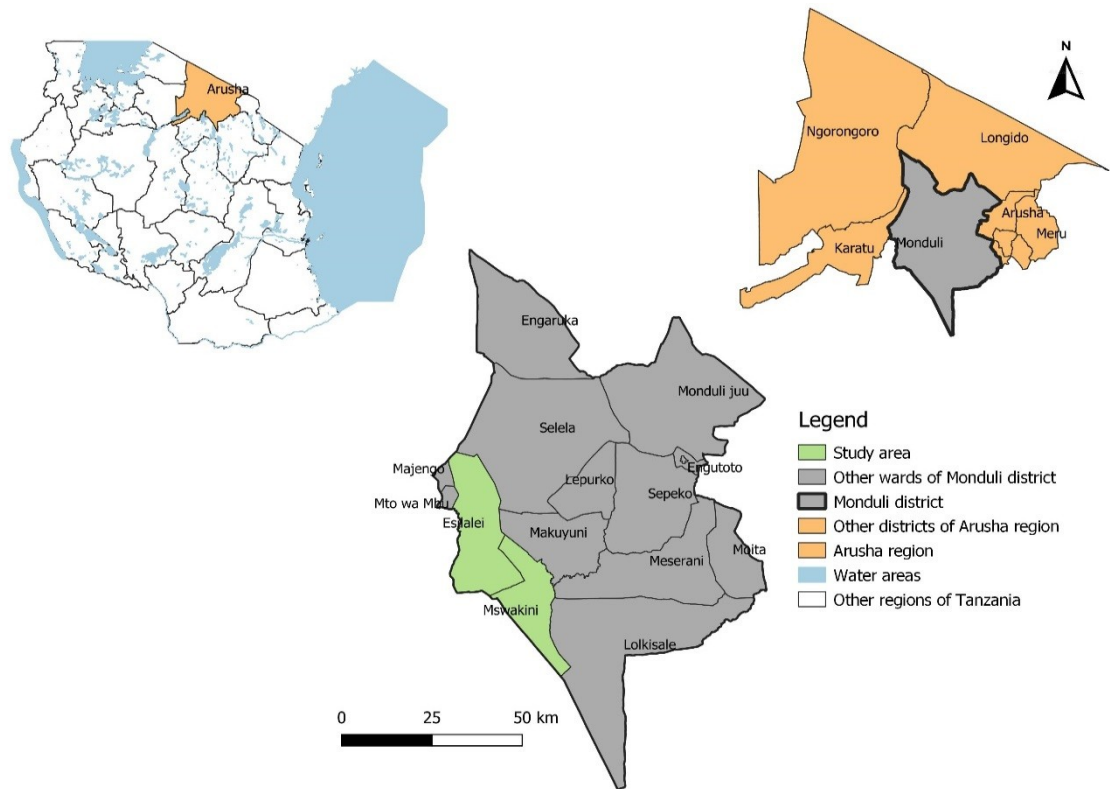


Figure 2.1: Map of Monduli district

Study and Sampling Design

This study was a cross-sectional study in which a household survey using questionnaire was conducted between March 2021 and April 2021. Purposive sampling was used to select two wards from the Monduli district, which were Mswakini and Esilalei. Households were selected from a list of households from local leaders with women of reproductive age. Inclusion criteria for the interview were women with ages of 15-49 in the household.

Sample Size

Estimation of sample size was done using a formula by Daniel (1999). A total of 245 households fully participated in the face-to-face interview. For the accuracy of the data, two women per household were chosen, which gave us a number of 491 women in the Mswakini and Esilalei wards.

Data collection methods

Data were collected through individual face-to-face interviews using a structured questionnaire with open and close-ended questions related to household characteristics, household food security status and women's capacities. Household Food security was measured using the Household Food Insecurity Access Scale (HFIAS) developed by USAID's Food and Nutrition Technical Assistance (FANTA) project. The dietary diversity was measured by using 24 hours dietary recall following the guidelines on minimum dietary variety for women (MDD-W) developed by FAO and FANTA Project. Women Empowerment in Agriculture Index (WEAI) was used to measure women's empowerment on the role of women on different levels. The questionnaire was initially prepared in English and translated to Swahili; interviewers were fluent in Kimassai and translated for the Massai people who could not interact actively in Swahili.

Data Analysis

Data was entered in MS Excel for cleaning, and analysis was done by SPSS (version 21.0. SPSS Inc., Chicago, IL, USA).

Determination of the status of household food security in Monduli district

Households were classified based on responses to the nine severity items in the HFIAS and coded "0" for "No" and "1" for "Yes." The procedure for scoring was used as follows: "0" was attributed if the event described by the question never occurred, "1" if it occurred during the previous 30 days. Concerning the occurrence, "1" was attributed if the events rarely happen, "2" sometimes, and "3" often. The respondent was first asked an occurrence question, whether the condition in the question occurred at all in the past four weeks (with the provision of 'yes' or 'no' response). If the respondent answered 'yes' to an occurrence question, a frequency-of-occurrence question was asked to determine whether

the condition rarely happened (once or twice), sometimes (three to 10 times), or often (more than ten times) in the past four weeks. The individuals were finally categorized into four levels:

- 1) Food secure: when the individual 'rarely,' in the past four weeks, worried about not having enough food and had replied 'no' to question number 2 to 9.
- 2) Mildly food insecure: the individual worried about not having enough food sometimes or often, unable to eat preferred foods, ate a more monotonous diet than desired, and ate some foods considered undesirable but only rarely.
- 3) Moderately food insecure: the individual sacrificed quality more frequently by eating a monotonous diet or undesirable foods sometimes or often, and had started to cut back on quantity by reducing the size of meals or number of meals, rarely or occasionally.
- 4) Severely food insecure: individual had to cut back on meal-size or several meals often and experienced any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating).

The dietary diversity scores for women were obtained to assess individual nutritional quality. The respondents were asked to recall all the foods eaten, snacks, and beverages taken in the previous 24 hours before the interview. All the food items consumed by the respondents were categorized into nine food groups: starchy staples, fruits, vegetables, milk and dairy products, vitamin A-rich foods, legumes, meat/fish/organ meat/poultry, eggs, fats/oils, and beverages. A single point was awarded to each of the food groups consumed by the individual giving a total score of 9 points for each individual given that all her responses were positive for all food groups. Mutually exclusive dietary diversity

categories were derived from the nine food groups into meeting dietary diversity if an individual score equals or is more than 5/9 and not meeting dietary diversity if a personal score is less than or equal to 4/9.

Determination of proportion of women empowerment status in relation to food security on their household in Monduli

WEAI was used at the individual level to assess the proportion of empowered and non-empowered women. The WEAI index specified that each individual should have adequate input/decision-making in at least 80% of the sub-indicators. This cut-off allowed us to develop individual-level binary variables used in the analysis: each woman was identified as empowered (=1) or not (=0).

Assessment of the impact of women empowerment on food security in household in Monduli district

Collected data were entered into a Microsoft Excel spreadsheet for cleaning and using SPSS version 21 for analysis. The selection criteria started with univariable logistic regression. The food security status (dependent variable, yes or no) was fitted against independent variables (women empowerment, marital status, household size, education level, government, and NGO training). The cut-off point for qualification into multivariable logistic regression was set at 0.2. Multivariate logistic regression analysis was used to determine the impact of women empowerment and socio-demographic factors on household food security in Monduli District by using backward Wald methods. A variable with a *p*-value less than 0.05 was considered significant, and Odds ratio with 95% confidence interval of variables in the final model were interpreted. The confounding effect was checked by assessing relative change of 25% and absolute change

of 0.1 of coefficients of remaining variables when the most insignificant variable is removed from the model. The Hosmer-Lemeshow Test tested the Goodness of model fit.

Results

Socio-demographic characteristics of participants in Monduli district

Four hundred and ninety-one women willingly participated in the study, where 246 women were from the Mswakini ward and 245 women from the Esilalei ward in the Monduli district. Among the 491 women, 64.2% were married, whereas 2.6% were divorced. The most significant percentage of women in the Monduli District (57.6%) had attained education up to the primary school level, followed by those who had attained up to secondary education (32.8%). Women who participated in government training were 57%, and 2.9 % attended none. In this study, 39.7 % of women were aged between 25-34 and 30.1% aged between 15-24, with a mean of $30.22 \pm$ standard deviation of 8.249. Approximately 65% of our respondents were from a household size of 5-10 and 0.4 % from a household size of 11-12, as shown in Table 2.1.

Table 2.1: Socio-demographic characteristics of households (n=491)

Variables	Levels	Number of women	Percentage
Ward	Mswakini	246	50.1
	Esilalei	245	49.9
Marital Status	Single	142	28.9
	Married	315	64.2
	Divorced	13	2.6
	Widowed	21	4.3
Education level	Primary education	283	57.6
	Secondary education	161	32.8
	Higher education	18	3.7
	Informal education	21	5.9
Training	NGOs training	197	40.1
	Government training	280	57
	No training	14	2.9
Age group	15 to 24	138	30.1
	25 to 34	195	39.7
	35 to 49	158	32.2
Household size	<5	148	30.1
	5 to 10	341	69.5
	11 to 12	2	0.4

The status of household food security in Monduli

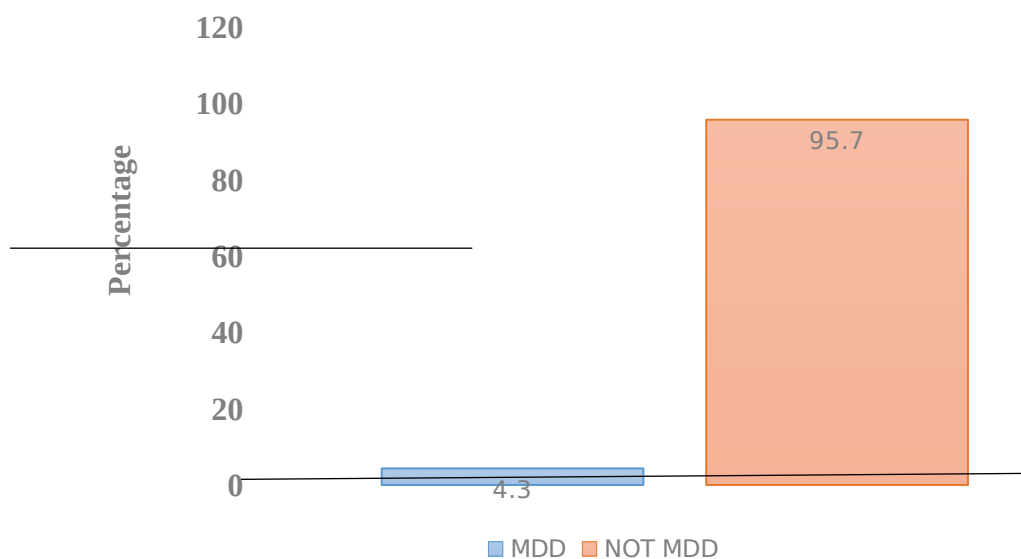
The prevalence of household food insecurity in the Monduli District was 73% with categories ranging from 4.1 % to 54.6%. In the Monduli district, 54.6% of households were severely food insecure, and 4.1% were mildly food insecure (Table 2.2). The largest population per household in Monduli was severely food insecure.

Table 2.2: Prevalence of household food insecurity (n=491)

Food security status	Number of households	Percentage
Food secure	66	27
Mildly food insecure	10	4.1
Moderately food insecure	35	14.3
Severely food insecure	134	54.6

Minimum dietary diversity for women in Monduli district

Though the Household Food Insecurity Scale (HFIS) results showed that 27 % of women in households were food secure in Monduli district, only 4.3% in a total of 491 participants in Monduli district had a good variety of food and obtained all the required nutrients per day. Their consumption of meat, vegetables, and fruits was considerably high. More than 95% of the women did not diversify their diet; their intake of legumes, fruits, fish, nuts, and seeds was too low to reach the minimum amount of nutrients per day (Figure 2.2).

**Figure 2.2: Minimum dietary diversity for women in Monduli district**

Proportion of women empowerment status in relation to food security on their household in Monduli

In the Monduli district, 16.9 % of the women interviewed were empowered, and 83.1 % were non empowered based on WEAI Index, as shown in Figure 2.3 below. The low status of women empowerment was due to numerous factors such as less control over resources, low participation in household decision-making, low level of education. Less than 15% of women were allowed by husbands or fathers to own assets. More than 80% were not involved in household decision matters; the majority of Massai women had no power to financial freedom and voice expression.

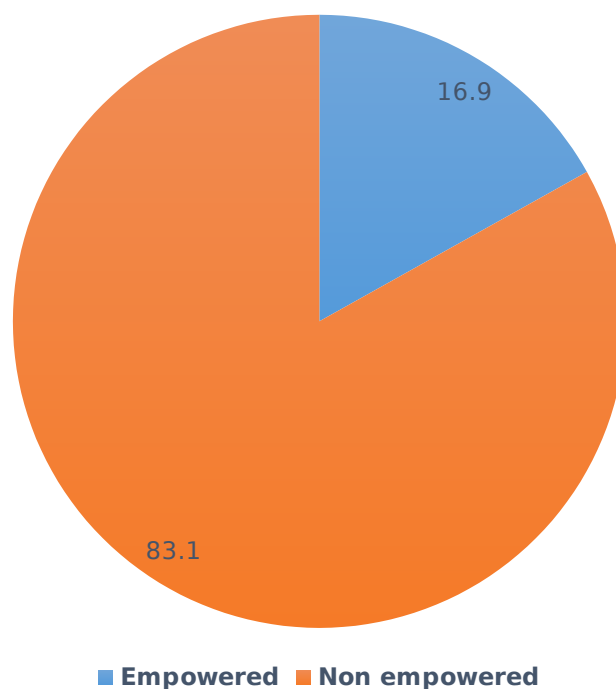


Figure 2.3: Women empowerment status in Monduli district

Women suffering from severe food insecurity were associated with 47.5% non-empowered women and 6.9% empowered women. Food secure women were linked with 8.1% of empowered women and 18.9 % of non-empowered women (Figure 2.4).

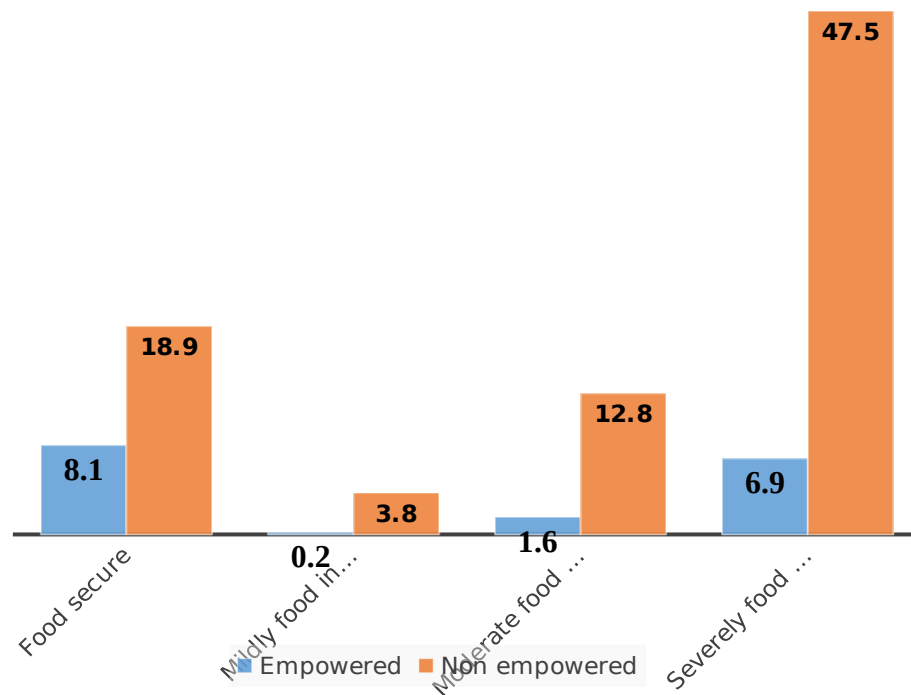


Figure 2.4: Women empowerment versus food security status

Impact of women empowerment on food security in the household in Monduli

This study was to assess the impact of women empowerment and socio-demographic variables on household food security. Food security was the outcome variable. Six independent variables qualified for multivariable logistic regression: namely; household size, marital status, level of formal education, government and NGO training, and women empowerment. The final model (Table 2.3) revealed a positive effect of women's empowerment on household food security (OR=3.15; 95% CI: 1.93-5.13, $p=0.00$). Other factors were found to influence household food security negatively. The Hosmer-Lemeshow Test tested the Goodness of model fit and explained well the data.

Table 2.3: Multivariable logistic regression of women empowerment and socio-demographic factors on sustainable household food security

Variables	Categories	Frequencies	P value	OR	95%CI
Marital status	Single	142	0.35	0.61	0.22-1.70
	Married	315	0.13	0.48	0.19-1.26
	Divorced	13	0.40	0.51	0.10-2.42
	Widowed	21	Ref		
Education level	Informal education	29	0.20	2.75	0.57-13.06
	Primary education	283	0.30	2.02	0.53-7.70
	Secondary education	161	0.13	2.74	0.72-10.31
	Higher education	18	Ref		
Government education	Yes	280	0.62	1.12	0.69-1.82
	No	211	Ref		
NGO education	Yes	197	0.88	1.03	0.64-1.67
	No	294	Ref		
Empowerment	Empowered	83	0.00	3.15	1.93-5.13
	Non empowered	408	Ref		
Household size	1 to 4	148	0.99	0.75	0.49-1.14
	5 to 10	341	0.61	0.72	0.2-1.4
	11 to 12	2	Ref		

Discussion

This cross-sectional study was conducted to determine the influence of women's empowerment on sustainable household food security in Monduli in Tanzania. Women's empowerment in our study determined a positive effect on sustainable household food security (OR=3.15; 95% CI: 1.93-5.13). Food secure women were linked with 8.1% of empowered women. Our study showed the value of women's contribution to household decision-making in improving food security. These results are consistent with the findings in Tanzania (Galiè *et al.*, 2019) and (Essilfie *et al.*, 2021) in Ghana, that portrayed women's decision-making as vital to household food security. Women with decision-

making power within their household were found more food secure compared to those who are not involved in decision matters concerning family's resources. Women with more control and allowed to participate in increased household food production resulting to have better home's nutrition.

The low level of empowerment (only 16.9%) and other factors had contributed to a high prevalence (73%) in this study:

Unemployment (on-farm income) was associated with household food insecurity. A large number of the population residing in Monduli were engaged in farming and livestock. The proportion of women in households getting resources only from farm activities was greater than 80% which led many households to have lower income and eat unpreferred foods, skip meals, or eat less. This unreachability of varieties of food resulted to 95.7% of women to have low dietary diversity due to reduced fruits, vegetables, meat, fish, and poultry. These findings are consistent with (Raj *et al.*, 2020) results that indicated 53% of women with low dietary diversity. Households with lower income were found more likely to be food insecure in our study. Similarly (Abdullah *et al.*, 2019) and (Larson *et al.*, 2019) reported unemployment as cause of household food insecurity and sufficient dietary diversity was linked with a higher income level and women's accessibility to credit.

This study showed a relationship between household size and household food insecurity ($p = <0.001$). In Monduli community, women tend to give birth to many children and we found the majority of the households (69.5%) with a household size of 5-10 members. Households with a larger size were likely to be food insecure than those with a small size cause the little they obtained have to share with a significant number. The level of

women empowerment and education in households of larger size were observed at lower percentage. Similar results were reported by (Dil Farzana *et al.*, 2017) and (Essilfie *et al.*, 2021) describing the effect of less family members declining the probability of the household to be food insecure.

Marital status played an important role in household food insecurity in our study. Divorced or widowed women in Monduli were found more experiencing severe food insecurity due to the lack of support and low income. Our findings are concurring with (Larson *et al.*, 2019) study that reported a higher prevalence of severe food insecurity in single-headed households. Women's contribution is essential to impact household food security. Women's empowerment should be prioritized to reassure women's ability for economic opportunities and decision-making position in society.

Conclusion

This study aimed to assess the effect of women's empowerment on sustainable household food security. The study indicated that a higher percentage of households in Monduli were severely food insecure. Women empowerment was observed at low level with a proportion of 83.1% of non-empowered women and only 16.9% of empowered women. Study also revealed the positive influence of women's empowerment on household food security. This shows a need of emphasizing women's empowerment in society to address household food insecurity. Promotion of gender equality to assure women's freedom and power in household 's contribution in control over assets, land ownership, decision-making and their involvement in leadership.

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CHAPTER THREE

MANUSCRIPT 2

COPING STRATEGIES EMPLOYED BY HOUSEHOLDS TO FIGHT AGAINST FOOD INSECURITY IN MONDULI DISTRICT

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HOUSEHOLDS TO FIGHT AGAINST FOOD INSECURITY IN MONDULI
DISTRICT**

Abstract

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for active and healthy life. Food insecurity continues to be a significant problem for public

health nutrition in developing and developed countries. A cross-sectional study was conducted between March 2021 and April 2021. A total of 245 households and 491 women between 15 and 49 years of age fully participated in household survey using questionnaire about household food security and women empowerment. Data were analyzed using SPSS for windows (Version 21.0. SPSS Inc., Chicago, IL, USA). The Household Food Insecurity Access Scale (HFIAS) and Minimum Dietary Diversity-Women(MDD-W) revealed that most households were food insecure (73%) and did not reach minimum dietary diversity (95.7%).the coping strategies index, was summarised manually and coded. The variables outcome were different coping strategies employed by households when they experienced food insecurity (relying on less preferred and less expensive foods, borrowing food, purchasing food on credit, skipping a meal). Coping strategies were categorized according to popularity. Interventions on programs that access involvement in off-farm income-generating activities should be encouraged to improve household food security.

KEY WORDS Food security, food insecurity, coping strategies viability, household food security

Acknowledgements

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Introduction

Food security refers to the availability of sufficient food supply to the entire society at all times for an active and healthy life (FAO 1986). Food insecurity is lack of access to enough food. At the household level, a state of food insecurity exists when members of a household have an inadequate diet for part or all of the year or face the possibility of an inadequate diet in the future (Philips and Taylor, 1990). Worldwide, 795 millions of families are locked in a cycle of hunger mainly in rural areas. Asia is severely affected by malnutrition, with more than 500 million people. Africa recorded 260 million people and 90% living in Sub-Saharan Africa. Africa and Asia accounted for more than nine out of ten stunted children globally (FAO, 2019).

In Tanzania, the prevalence of food insecurity was at 7.1 % that means 4 million of the population were lacking enough food, mostly in rural households with 15%. Inappropriate use of the available food, poor storage methods and facilities, small farm size, low income and use of poor technology contributed to food insecurity. Households that are exposed to shocks such as poverty and food insecurity develop different temporary or permanent measures in order to subsist in the absence of food and economic resources. These mechanisms are considered as strategies for coping with food insecurity that can go from dietary changes to permanent migration. Coping strategies are behavioral responses such as activities and techniques based on cultural practices that households implement to protect their livelihoods when facing food insecurity (Dil Farzana *et al.*, 2017).

Coping strategies are meaningful responses to decrease the calamity's strength and intensify resources for sustainable livelihood security. The main goal of this study was to identify coping strategies employed by households to fight against food insecurity in

Monduli. This will help to define better strategies for further interventions to prevent and reduce household food insecurity.

Materials and Methods

Ethical consideration

Permission to conduct the study was granted by Sokoine University of Agriculture Research and Publication Committee, also from the Monduli district office and the head villages. Informed consents were required from all participants before the interview and confidentiality was guaranteed to them.

Study Area

The study was conducted in the Monduli District, one of the seven districts of the Arusha Region of Tanzania. The District is located in the northeastern section of the country. It is bordered to the north by Longido District, east by Arusha Rural District, south by the Manyara Region, and west by Ngorongoro District and Karatu District. Monduli District is divided into 20 wards; two wards, Mswakini and Esilalei, were selected as study areas. By 2016, Monduli had 177 346 of the population with different cultures; Massai people represented the majority, followed by Arusha people, pastoralism and farming are their everyday life activities. The economy of the area is contributed by agriculture, commercial, peasantry farms, and tourism.

Study and Sampling Design

A cross-sectional study was conducted using Daniel (1999) estimation sample size formula. 491 women from 245 households participated in the face-to-face interview. Purposive sampling was used to select two wards from the Monduli district, which were Mswakini and Esilalei.

Data Collection

Household Food security was measured using the Household Food Insecurity Access Scale (HFIAS) developed by USAID's Food and Nutrition Technical Assistance (FANTA) project. The dietary diversity was measured by using 24 hours dietary recall following the guidelines on minimum dietary variety for women (MDD-W) developed by FAO and FANTA Project. Coping Strategies Index (CSI) was used to identify multiple techniques employed by households who faced food crises. The questionnaire was initially prepared in English and translated to Swahili; interviewers were fluent in Kimassai and translated for the Massai people who could not interact actively in Swahili.

Data analysis

Data was entered in MS Excel for cleaning and analysis was done by SPSS version 21 (Version 21.0. SPSS Inc., Chicago, IL, USA). HFIAS categorized individuals into four levels: food secure, mildly food insecure, moderately food insecure and severely food insecure according to their responses on the occurrence question and frequency-of-occurrence question. CSI was summarised manually and coded, coping strategies were categorized according to popularity.

Results

Socio-demographic characteristics of respondents

Four hundred and ninety-one women willingly participated in the study, where 246 women were from the Mswakini ward and 245 women from the Esilalei ward in the Monduli district. Among the 491 women, 64.2% were married, whereas 2.6% were

divorced. The most significant percentage of women in the Monduli District (57.6%) had attained education up to the primary school level, followed by those who had attained up to secondary education (32.8%). Women who participated in government training were 57%, and 2.9 % attended none. In this study, 39.7 % of women were aged between 25-34 and 30.1% aged between 15-24 , with a mean of 30.22 \pm standard deviation of 8.249. Approximately 65% of our respondents were from a household size of 5-10 and 0.4 % from a household size of 11-12, as shown in Table 3.1.

Table 3.1: Socio-demographic characteristics of households (n=491)

Variables	Levels	Number of women	Percentage
Ward	Mswakini	246	50.1
	Esilalei	245	49.9
Marital Status	Single	142	28.9
	Married	315	64.2
	Divorced	13	2.6
	Widowed	21	4.3

Education level	Primary education	283	57.6
	Secondary education	161	32.8
	Higher education	18	3.7
	Informal education	21	5.9
Training	NGOs training	197	40.1
	Government training	280	57
	No training	14	2.9
Age group	15 to 24	138	30.1
	25 to 34	195	39.7
	35 to 49	158	32.2
Household size	<5	148	30.1
	5 to 10	341	69.5
	11 to 12	2	0.4

The status of household food security in Monduli

The prevalence of household food insecurity in the Monduli District was 73% with categories ranging from 4.1 % to 54.6%. In the Monduli district, 54.6% of households were severely food insecure, and 4.1% were mildly food insecure (Table 3.2). The largest population per household in Monduli was severely food insecure.

Table 3.2: Prevalence of household food insecurity (n=491)

Food security status	Number of households	Percentage
Food secure	66	27
Mildly food insecure	10	4.1
Moderately food insecure	35	14.3
Severely food insecure	134	54.6

Minimum dietary diversity for women in Monduli district

Though the Household Food Insecurity Scale (HFIS) results showed that 27 % of women in households were food secure in Monduli district, only 4.3% in a total of 491 participants in Monduli district had a good variety of food and obtained all the required nutrients per day. Their consumption of meat, vegetables, and fruits was considerably high. More than 95% of the women did not diversify their diet; their intake of legumes, fruits, fish, nuts, and seeds was too low to reach the minimum amount of nutrients per day.

Household coping strategies against food insecurity in Monduli district

In Monduli, coping strategies helped at 62% of households to solve food shortages. The majority of the households were more disposed to adopt both several financial and diet compromise coping strategies. Figure 3.1 shows the descriptive statistics for the 13 coping strategies employed by households to handle food crises. Purchasing food on credit was the most common coping strategy used (67.90%). Followed by consumed seed stock held for the next season (62.50%), borrowed food, or relied on help from a friend or relative (58.80%). However, 26.40% skipped entire days without eating, and 17.1% of households limited portion size at mealtimes. From their own opinions, some recommendations have been suggested. Women wished to have more opportunities to be involved in business, get access to improved knowledge on farming and food storage, and have better techniques to secure farms against elephant invasion and not sell harvested food.

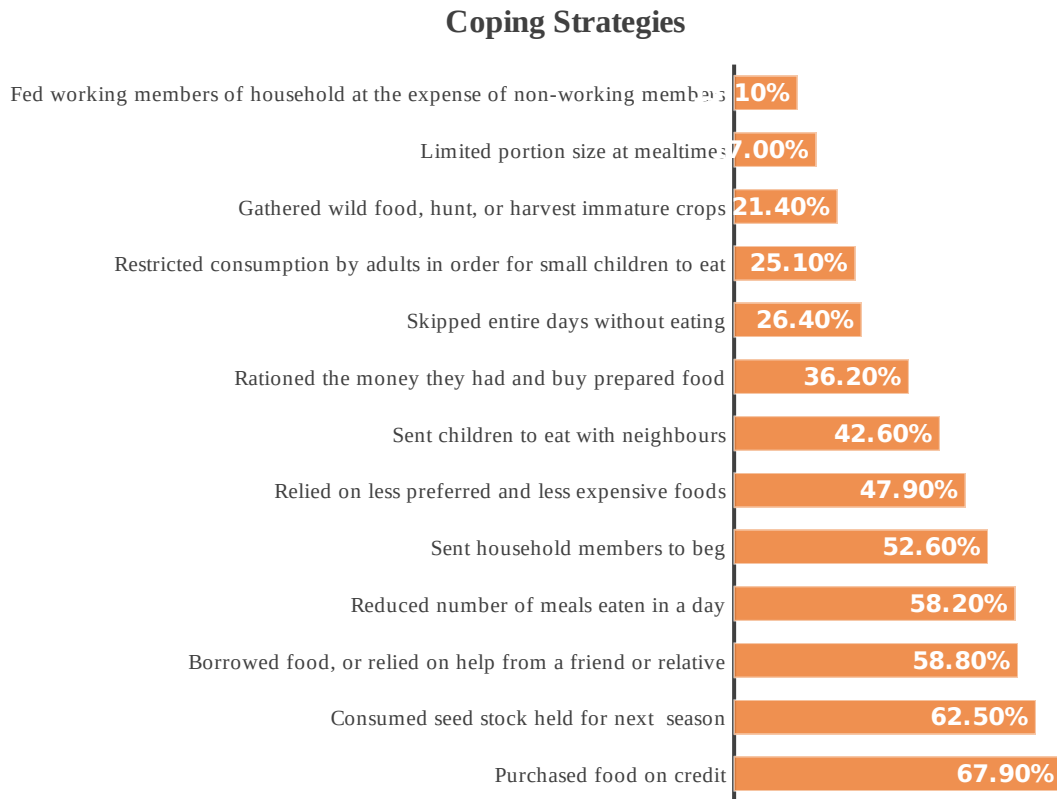


Figure 3.1: Household coping strategies against food insecurity in Monduli

Discussion

The prevalence of household food insecurity in Monduli was high (73%) and households found advantageous coping strategies to fight against food insecurity. Since many of the households were not participating in off-farm activities, choices were limited. Four coping strategies (borrow food or rely on help from a friend or relative, consume seed stock held for next season, reduce the number of meals eaten in a day and send household members to beg) influenced positively household food security (Mutea *et al.*, 2019) in Kenya also reported three coping strategies that contributed food security: purchasing food on credit was used by 54% of the households, relied on less preferred and less expensive foods (40%), and limited meal portions (35%).

Drought and wild animals' invasion had a negative impact on household food security in this study. Households in Monduli experienced poor agricultural harvests due to drought

and elephants invasion in their farms that caused starving household members to spend the whole day without food. A study conducted in Uganda revealed drought as significant factor that positioned households vulnerable to food insecurity (Twongyirwe *et al.*, 2019). Low income due to unemployment (on-farm income) was found to influence household food insecurity. Massai in Monduli are living of livestock and farming. And their productivity did not allow to access enough for their daily consumption which cause many households to be food insecure and have low dietary diversity due to reduced fruits, vegetables, meat, fish, and poultry. These findings are consistent with (Raj *et al.*, 2020) results that indicated 53% of women with low dietary diversity. Similarly, (Abdullah *et al.*, 2019) and (Larson *et al.*, 2019) reported unemployment as cause of household food insecurity and insufficient dietary diversity.

Conclusion

This study aimed to identify coping strategies employed by households to fight against food insecurity. The study found more than 70% of the households to be found insecure with 54.6% severely affected. More than 60% of households did not access enough food to fulfill their needs. Households adopted different strategies to reduce and cope with food deficit situations. Interventions on programs that access involvement in off-farm income-generating activities should be encouraged to reduce household food insecurity.

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CHAPTER FOUR

4.0 GENERAL DISCUSSION

4.1 Household food insecurity and its contributing factors

This cross-sectional study was conducted to determine the effect of women's empowerment on sustainable household food security in Monduli in Tanzania. The prevalence of food insecurity displayed in this study (73%) was higher than that reported by (Pandey & Fusaro, 2020) in Nepal with 56% of women experienced food insecurity. Multiple factors explained this high level of household food insecurity:

This study found unemployment(on-farm income) to be associated with household food insecurity. A large number of the population residing in Monduli were engaged in farming and livestock. The proportion of women in households getting resources only from farm activities was greater than 80% which led many households to have lower income and eat preferred foods, skip meals, or eat less. This unreachability of varieties of food resulted to 95.7% of women to have low dietary diversity due to reduced fruits, vegetables, meat, fish, and poultry. These findings are consistent with (Raj *et al.*, 2020) results that indicated 53% of women with low dietary diversity. Households with lower income were found more likely to be food insecure in our study. Similarly, (Abdullah *et al.*, 2019) and (Larson *et al.*, 2019) reported unemployment as cause of household food insecurity and sufficient dietary diversity was linked with a higher income level and women's accessibility to credit.

Drought and wild animals' invasion had a negative impact on household food security in this study. Households in Monduli experienced poor agricultural harvests due to drought and elephants invasion in their farms that caused starving household members to spend the whole day without food. A study conducted in Uganda revealed drought as significant factor that positioned households vulnerable to food insecurity (Twongyirwe *et al.*, 2019).

This study showed a relationship between household size and household food insecurity ($p = <0.001$). In Monduli community, women tend to give birth to many children and we found the majority of the households (69.5%) with a household size of 5-10 members. Households with a larger size were likely to be food insecure than those with a small size cause the little they obtained have to share with a significant number. The level of women empowerment and education in households of larger size were observed at lower percentage. Similar results were reported by (Dil Farzana et al., 2017) and (Essilfie et al., 2021) describing the effect of less family members declining the probability of the household to be food insecure.

Marital status played an important role in household food insecurity in our study. Divorced or widowed women in Monduli were found more experiencing severe food insecurity due to the lack of support and low income. Our findings are concurring with (Larson *et al.*, 2019) study that reported a higher prevalence of severe food insecurity in single-headed households.

4.2 Household food security and its contributing factors

The prevalence of household food insecurity in Monduli was high and households found advantageous coping strategies to fight against food insecurity. Since many of the households were not participating in off-farm activities, choices were limited. Four coping strategies (borrow food or rely on help from a friend or relative, consume seed stock held for next season, reduce the number of meals eaten in a day and send household members to beg) influenced positively household food security (Mutea *et al.*, 2019) in Kenya also reported three coping strategies that contributed food security: purchasing

food on credit was used by 54% of the households, relied on less preferred and less expensive foods (40%), and limited meal portions (35%).

Women's empowerment in our study determined a positive effect on sustainable household food security (OR=3.15; 95% CI: 1.93-5.13). This study observed only 16.9% of women in the Monduli were empowered. Households with women who owned or had control over assets and income were secured with more food and diversified nutrition. Our study showed the value of women's contribution to household decision-making in improving food security. These results are consistent with the findings in Tanzania (Galiè *et al.*, 2019; Essilfie *et al.*, 2021) in Ghana, that portrayed women's decision-making as vital to household food security. Women with decision-making power within their household were found more food secure compared to those who are not involved in decision matters concerning family's resources. Women with more control and allowed to participate in increased household food production resulting to have better home's nutrition.

Women's contribution is essential to impact household food security. Women's empowerment should be prioritized to reassure women's ability for economic opportunities and decision-making position in society.

CHAPTER FIVE

5.0 GENERAL CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study aimed to assess the effect of women's empowerment on sustainable household food security. The study indicated that a higher percentage of households in Monduli were severely food insecure. More than 60% of households did not access enough food to fulfill their needs. Households adopted different strategies to reduce and cope with food deficit situations. Women empowerment was observed at low level with a proportion of 83.1% of non-empowered women and only 16.9% of empowered women. Study also revealed the positive influence of women's empowerment on household food security.

5.2 Recommendations

To reduce and prevent household food insecurity in Monduli, some recommendations in different sectors should be addressed :

- Government policies reinforcement on social mechanisms that allows higher percentage of women's enrollment in education.
- Promotion of gender equality to assure women's freedom and power in household 's contribution in control over assets, land ownership, decision-making and their involvement in leadership.
- Interventions on strategies and programs that access women's participation in off-farm income-generating activities to enhance household food security.

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APPENDICES

Appendix 1 : Questionnaire

Identification:

District.....Ward.....

No. Of respondent.....Date.....

1.0 Household Characteristics

1.1 Personal characteristics

1.1.1 Sex

1.1.2 Age..... (Years)

1.1.3 Marital status: 1. Single 2. Married 3. Divorced 4. Widowed

1.1.4 Do you have any children? Yes/No.

1.1.5 If yes in question 1.1.4 above, indicate number.....

1.1.6 Level of formal education: 1. Primary education 2. Secondary 3. Higher 4.

Informal education

1.1.7. Informal education(training):

- a. How many times and when was the last time you attended a training from Government?
- b. How many times and when was the last time you attended a training from NGO?
- c. Others(specify)

1.2 Household Food Security Status

1.2.1. Household Food Insecurity Access Scale

1. In the past four weeks, did you worry that you or any household member would not have enough food? Yes/No

1.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred? 1. Yes/No 2. If Yes, why?

2.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

3. In the past four weeks, did you or any household member have to eat a limited variety of foods? 1. Yes/No 2. If Yes, why?

3.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat? 1. Yes/No 2. If Yes, why?

4.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed? 1. Yes/No 2. If Yes, why?

5.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

6. In the past four weeks, did you or any household member have to eat fewer meals in a day? 1. Yes/No 2. If Yes, why?

6.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

7. In the past four weeks, was there ever no food to eat of any kind in your household? 1.

Yes/No 2. If Yes, Why?

7.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

8. In the past four weeks, did you or any household member go to sleep at night hungry?

1. Yes/No 2. If Yes, Why?

8.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

9. In the past four weeks, did you or any household member go a whole day and night without eating anything? 1. Yes/No 2. If Yes, Why?

9.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

1.2.2. Minimum Dietary Diversity for Women questionnaire

Now I'd like to ask you to describe everything that you ate or drank yesterday during the day or night, whether you ate it at home or anywhere else. Please include all foods and drinks, any snacks or small meals, as well as any main meals. Remember to include all foods you may have eaten while preparing meals or preparing food for others. Please also include food you ate even if it was eaten elsewhere, away from your home. Let's start with the first food or drink consumed yesterday.

Did you have anything to eat or drink when you woke? If yes, what? Anything else?

Did you have anything to eat or drink later in the morning? If yes, what? Anything else?

Did you eat or drink anything at mid-day? If yes, what? Anything else?

Did you have anything to eat or drink during the afternoon? If yes, what? Anything else?

Did you have anything to eat in the evening? If yes, what? Anything else?

Did you have anything else to eat or drink in the evening before going to bed or during the night? If yes, what? Anything else?

2. Coping Strategies

2.1. In the past 30 days, which strategies did you use during food shortages?

- a. Rely on less preferred and less expensive foods?
- b. Borrow food, or rely on help from a friend or relative?
- c. Purchase food on credit?
- d. Gather wild food, hunt, or harvest immature crops?
- e. Consume seed stock held for next season?
- f. Send children to eat with neighbours?
- g. Send household members to beg?
- h. Limit portion size at mealtimes?
- i. Restrict consumption by adults in order for small children to eat?
- j. Feed working members of household at the expense of non-working members?
- k. Ration the money you have and buy prepared food?
- l. Reduce number of meals eaten in a day?
- m. Skip entire days without eating?

2.2 Do the coping strategies helped to solve the food shortages? Yes/No

2.3 What kind of advices can you share with other farmers during food shortages to cope with the situation?

3. Women capacities

1. Input in productive decisions

In the past six months, did you participate in farming, livestock raising, non-farm economic business, wage and salary employment?

2. Ownership of assets

Who would you say owns most and can decide whether to buy/sell/give away or rent out when it comes to family assets like agricultural land, livestock, farm equipment, house, transportation?

3. Access to and decisions about credit

1. Has anyone in your household taken a loan/borrowed money in the past 12 months (for any purpose like farming, wedding, health expense etc.) from NGO, formal or informal lender, friends or relatives, women's groups?

2. Who makes the decision about what to do with the money borrowed?

4. Individual leadership and influence

1. Do you feel comfortable speaking up in public to help decide on infrastructure to be built in your community? Yes/No

2. Are you a member of any group membership in your community? Yes/No

3. In the last 2 months have you attended any meeting? Yes/No

4. Do you participate in making decision in the group membership? Yes/No

5. Decision-making

1. Who normally takes the decision regarding agricultural production, livestock raising, selling assets, your own wage/ salary employment how many children, family planning, children education, healthcare?

2. To what extent do you participate in the decision making regarding agricultural production, livestock raising, selling assets, your own wage/ salary employment how many children, family planning, children education, healthcare?

3. What are the challenges in the decision making process in your household?

6. Time allocation

1. How much time (in hours) do you spend farming, animal husbandry, gardening, processing, business work, household chores, child-care?

2. How satisfied are you with your available time for leisure activities like visiting neighbors, watching T.V., listening to the radio, ...? 1. Very satisfied 2. Satisfied 3. Not satisfied 4. Very unsatisfied

Appendix 2: Household Food Insecurity Access Scale (HFIAS)

Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide by FANTA III and USAID

The questionnaire consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity (access), and nine “frequency-of-occurrence” questions that are asked as a follow-up to each occurrence question to determine how often the condition occurred. The frequency-of-occurrence question is skipped if the respondent reports that the condition described in the corresponding occurrence question was not experienced in the previous four weeks (30 days).

1. In the past four weeks, did you worry that you or any household member would not have enough food? Yes/No

1.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred? Yes/No

2.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

3. In the past four weeks, did you or any household member have to eat a limited variety of foods? Yes/No

3.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat? Yes/No

4.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed? Yes/No

5.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

6. In the past four weeks, did you or any household member have to eat fewer meals in a day? Yes/No

6.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

7. In the past four weeks, was there ever no food to eat of any kind in your household? Yes/No

7.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

8. In the past four weeks, did you or any household member go to sleep at night hungry? Yes/No

8.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

9. In the past four weeks, did you or any household member go a whole day and night without eating anything? Yes/No

9.a. How often did this happen? 1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

3 = Often (more than ten times in the past four weeks)

Appendix 3: Minimum Dietary Diversity for Women (MDD-W).

Minimum Dietary Diversity for Women

A Guide to Measurement by FAO, USAID and FANTA III

Model questionnaire

Guiding the respondent through an open recall and recording information.

The following text can be provided to enumerators on a job aid/guidance sheet or included on the questionnaire form; the italics indicate the example script that would be spoken to the respondent: Now I'd like to ask you to describe everything that you ate or drank yesterday during the day or night, whether you ate it at home or anywhere else. Please include all foods and drinks, any snacks or small meals, as well as any main meals. Remember to include all foods you may have eaten while preparing meals or preparing food for others. Please also include food you ate even if it was eaten elsewhere, away from your home. Let's start with the first food or drink consumed yesterday.

Did you have anything to eat or drink when you woke? If yes, what? Anything else?*

Did you have anything to eat or drink later in the morning? If yes, what? Anything else?*

Did you eat or drink anything at mid-day? If yes, what? Anything else?*

Did you have anything to eat or drink during the afternoon? If yes, what? Anything else?*

Did you have anything to eat in the evening? If yes, what? Anything else?*

Did you have anything else to eat or drink in the evening before going to bed or during the night?

If yes, what? Anything else?*

Appendix 4: Women Empowerment in Agriculture Index (WEAI)

Guidelines for Assessing Women's Empowerment in Agriculture. Operational Manual for Using the Women's Empowerment in Agriculture Index (WEAI) in Field Research by TCI-TARINA.

Multi-dimensional indicators of women's empowerment

Index (Reference)	Sub-indicator	Components
Women's Empowerment in Agriculture Index (WEAI) (Alkire <i>et al.</i> , 2013)	5 domains of empowerment (5DE) Index	
	Production	- Input in productive decisions - Autonomy in production
	Resource	- Ownership of assets - Purchase/sale/transfer of assets - Access to & decision on credit
	Income	- Control over use of income
	Leadership	- Group membership - Public speaking
	Time use	- Workload Leisure

Appendix 5: Coping Strategies Index (CSI)

The CSI enumerates various consumption-related coping strategies commonly used by a population. Four general categories of coping are measured, with individual strategies defined specifically according to location and culture:

1. Dietary change (e.g. eating less preferred but less expensive food etc.);
2. Increasing short-term food access (borrowing; gifts; wild foods; consuming seed stock);
3. Decreasing numbers of people to feed (short-term migration);
4. Rationing strategies (mothers prioritizing children/men; limiting portion size; skipping meals; skipping eating for whole days).