NUTRITIONAL HEALTH STATUS OF RURAL WOMEN PRACTISING AGRICULTURE IN BABATI DISTRICT COUNCIL

BY

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ABSTRACT

This study was carried out to evaluate the nutritional health status of rural women engaged in agriculture in three villages in Babati District, Manyara Region in Tanzania. A cross section research design using structured questionnaire was employed to collect primary and secondary data of 180 respondents. The weight and height were measured using a digital weighing scale (SECA Vogel and Halke Hamburg Germany) and a locally made device equipped with height gauges respectively. BMI was calculated using the formula: BMI= [Weight/ Height² (kg/m. Descriptive analysis of data was carried out using SPSS Windows Version 16.0. The results revealed that more than half (57.2%) of the respondents had normal body weight (BMI=18.5-24.9) of which 68.9% were males and 45.6% were females. Further, it was revealed that the average female measured the body height of 161 cm, body weight of 64.3 kg and BMI was 24.6 which is almost similar to the mean (23.5) BMI for males. The study also showed that women spent more time (five to seven hours) in the field. Moreover, the results revealed that majority (82.2%) of females respondents participated in all agricultural activities. However, statistical Chi-square test ($x^2 = 26.68$, $df = 23$ and $p = 0.256$) showed that there was no significant difference in BMI between male and female farmers. It was further revealed that the type of meal, frequency of meal, and food distribution within members in the household favoured respondents' BMI. However, household responsibilities increased women's workload. The study concludes that agricultural production is not negatively affecting women farmer's BMI. The study also recommends that women must be empowered by enhancing their awareness, knowledge, skills and appropriate technology so that agriculture production increases at a faster pace. Also, linking production goals with nutrition-related targets is something that agricultural planners and researchers are to be called upon to do more often.

DECLARATION

I, BETINA JIMMY MWAKASSANGA, do hereby declare to the Senate of Sokoine University of Agriculture that this Dissertation is my own original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

_____ _____

Betina Jimmy Mwakassanga Date

(M.A. Rural Development Candidate)

The above declaration is confirmed

_____ _____

Dr. J.S. Mbwambo, Date

(Supervisor)

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DEDICATION

To my beloved parents, Jimmy A. Mwakassanga, and Maria Zakaria, without forgetting my step mother Cecilia Magalaba and my lovely aunt Kissa Mbalekile who laid the foundation of my education, my beloved husband Japhet M. Mwachapite and my lovely children Magreth, Michael and Diana for their moral support and encouragement during the period of this study.

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1 LIST OF ABBREVIATION

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CDCP	Centre for Disease Control and Prevention
CED	Chronic Energy Deficiency
DALDO	District Agricultural and Livestock Development Officer
DSI	Development Studies Institute
FANTA	Food And Nutrition Technical Assistance
FAO	Food and Agriculture Organization
HBS	Households Budget Survey
HC	Hip Circumference
HIV	Human Immunodeficiency Virus
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
LO	Labour Organization
MDGs	Millennium Development Goals
MUAC	Mid Upper Arm Circumference
NBS	National Bureau of Statistics
NGOs	Non Governmental Organizations
PHC	Population and Housing Census
PRSP	Poverty Reduction Strategy Paper
SARDC	South Africa Research and Documentation Centre
SNAIL	Sokoine National Agricultural International Library
SPSS	Scientific Package for Social Science
SSA	Sub Sahara Africa
TGNP	Tanzania Gender Network Program
UK	United Kingdom
UNDP	United Nations Development Program
UNDW	United Nations Decade for Women
URT	United Republic of Tanzania
USAID	United State of America International Development
WACW	Women's Agriculture Community Web
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist-Hip Ratio
WIDSAA	Women in Development South Africa Awareness

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Women have long occupied a central place in agricultural production in developing countries including Tanzania, ensuring food security for their households and their communities (Chiong-Javier, 2009). In Sub-Saharan Africa (SSA), rural women are responsible for half of the world's food production and they contribute between 60% and 80% of agricultural labour to produce food for household consumption or sale (Food and Agriculture Organization (FAO), 2004).

The International Labour Organization (ILO) (2000) report stated that approximately 98% of rural women classified as economically active are engaged in agriculture for which they contribute substantially to both commercial and subsistence agriculture as casual labourers and unpaid family workers.

Historically, in SSA, engagement of rural women in a wide range of agricultural work, especially in subsistence farming is due to migration of male to wage labourers in town (Ibnouf, 2009). Large numbers of male labour force migrated to the urban areas, while other family members including women and children remained in the villages. The existing literature reveals that the increase of male out–migration in

most African countries increased the role of women in farming production and in the household economy (Guvele *et al*., 2003).

FAO (2004) reported that Tanzania is one of the least developed countries in SSA whose economy depends on agriculture that accounts for about 50% of the national economy. According to United Republic of Tanzania (URT) (2000), over 80% of the Tanzanian population lives in rural areas of which 90% are engaged in agriculture. Farming is a means of income earning in many Tanzanian societies. These include crop production and livestock keeping. Women carry the major responsibility for both subsistence agriculture, especially food crop production, and domestic work. Many researchers reported that women spend more hours per day than men in both productive and reproductive activities. For example, a report by Lukmanji (1992) revealed that in Tanzania, women work 11 hours during the non farming season and almost 14 hours during the farming season. Women are continually missing from the available data, and are overlooked and ignored in agricultural development strategies. According to Tanzania Gender Network Program (TGNP) (1999), most farmers especially women use only physical labour and the hand hoe, only 10% of the farm work is done by animal power and 6% use mechanical power. This may results to poor nutritional health status. A report by National Bureau of Statistics (NBS) (2005) revealed that overall, 10% of Tanzanian women are considered too thin (i.e. their Body Mass Index (BMI) is less than 18.5). The types of work women do and the number of hours spent affect their food intake. Lukmanji (1992) also noted that during the rainy season heavy agricultural work, low energy intakes among

female farmers was observed probably due to skipping of meals and consuming low quality diet which led to weight loss.

Babati district is among in other areas of Tanzania where agriculture is the main economic activity and it is still dominant in rural areas. Women carry out most of the work in small-scale agriculture and provide food for their families (URT, 2005). They are mostly doing planting, weeding, harvesting, processing and livestock management such as grazing and milking. Despite this substantial contribution of women to agriculture and food security in Tanzania, consideration of their nutritional health status is not taken into account.

However, findings from different studies reported the crucial role held by these women in Tanzania in securing food for their families and communities (IFPRI, 2001; Quisumbing *et al.,* 2001; FAO, 2004; Hyder *et al.*, 2005). However, there is lack of information on the relationship between agricultural activities done by women and their nutritional status. Wandel and Homboe-Ottessen (1992) reported on women's work load in agriculture and its impact on child nutrition. In their findings; they revealed that agriculture has a negative impact on children's health and their mother's nutritional status. Although Ejembe *et al.* (2006) reported on women's important role in food chain on nutrition status of their family, they did not report on the impact of the food chain on their nutritional health status. As women engage in agriculture, more time and energy is spent in the field, resulting into little or no time of food preparation and thus leading into skipping of meals. This has also

been confirmed by Chiong-Javier (2009) in Philippine who observed that in doing agricultural activities; women farmers face many health problems such as nutritional deficiencies and loss of body weight, reproductive health, physical injuries, respiratory system infection diseases and others. Women contribute extensively and quantitatively to agricultural production. However, few studies have been done on women farmers' nutrition status because the latter is one of the major links to their health and level of productivity. This current study is intended to address this problem.

1.2 Problem Statement

Women are the most important work force in agriculture and related activities. Their contribution in Tanzanian agriculture is estimated to be 60-80% (FAO, 2004). Women's participation in agricultural production and other related activities in order to earn income may be important in association to nutrition in the household. As it has been reported by Hyder *et al*. (2005), women are generally responsible for household food security in most of the African culture. They attend to demanding field operations like land clearing, ploughing, sowing, transplanting, weeding, harvesting, threshing and agro-processing in crop production. Women also attend to household chores like fetching fuel wood and water, cleaning, cooking and child rearing. According to Lukmanji (1992), women are subjected to different health stresses from economic, domestic and agricultural work.

The majority of these activities, which are full of drudgery, have not been supported by the mechanical advantages of tools and appliances. Moreover, most of them consume time and energy which eventually results into poor nutrition. According to Wandel and Holmboe-Ottesen

(1992), women in Tanzania, including those in Babati spend 11-16 hours per day doing agricultural activities. Furthermore, studies by FAO and World Health Organization (WHO) (1992) reported that women and female headed household are chronically undernourished individuals in developing countries including Tanzania and its number increases at a rate of four million per year.

According to URT (2006), the prevalence of underweight (BMI less than 18) is about 12% in women in Tanzania. Furthermore, Kavishe *et al.* (1985) have reported that 29.5% of women in rural areas had a BMI of < 20 indicating underweight due to excessive workload, low food intake, walking long distances and poor tradition agricultural tools which are very laborious and energy consuming. In addition, a study conducted by Mosha (2003) in Morogoro using cut-off points (MBI ≥ 19.5) classification methods revealed preference of underweight to be four percent in the rural district. Engagement of rural women in household food security results in the possibility of poor nutritional status. However, no adequate information has been documented on nutritional health status of rural women farmers. Therefore, this research intends to assess the nutritional health status of rural women performing agricultural activities in Babati district in respect to their BMI.

1.3 Problem Justification

Good nutritional status for women farmers promotes good health outcomes and thus improves performance in work. For sustainable agriculture, the issue of nutritional health status of women engaged in agriculture has to be addressed. This research provides information on

nutritional health status of women farmers in Babati District. The results from this research also provide information on the nutritional situation and status of women farmers to planners, policy makers and agricultural researchers for them to understand the link between women's productive farm work and their nutritional status and consequently be in a position to introduce technologies which will empower women farmers to have alternative sources of income, minimizing their work load and time they spend in the field, reduce labour input and increase productivity without affecting their nutritional status. The results will also be useful in planning nutritional health programmes to women farmers through District Agricultural Development Plans (DADPs). Furthermore, the study addresses the Millennium Development Goals (MDGs) the goal number three of ensuring gender equity and women empowerment (United Nations (UN), 2004).

1.4 Objectives of the Study

1.4.1 General objective

To evaluate the nutritional health status of rural women practicing in agriculture

1.4.2 Specific objectives

1) To assess agricultural production activities performed by women;
2) To examine nutritional health status (BMI) of both male and female practicing agriculture by using anthropometric method;

3) To assess relationship between agricultural production activities and the Body Mass Index (BMI) of both men and women practicing in agriculture.

1.5 Research Questions

1. How do agricultural production activities affect nutritional status of women?
2. What is the nutritional health status (BMI) of rural women practicing agriculture compared to men by using anthropometric method in the study area?
3. What is the relationship between agricultural activities and nutritional health status

1.6 Conceptual Framework

The conceptual frame work shows the relationship between independent and dependent variables. Agricultural production activities are the independent variables and nutritional health status (BMI) is the dependent variable. In this study, nutritional health status (BMI) of an individual is defined as the interpretation of the results obtained from the measurement of the individual's body parts i.e. weight kg/height m^2. This study assumed that agricultural activities and other factors such as household responsibilities and food habit affect farmers' nutritional status on their productivity. The frame work of this concept is shown in Fig. 1

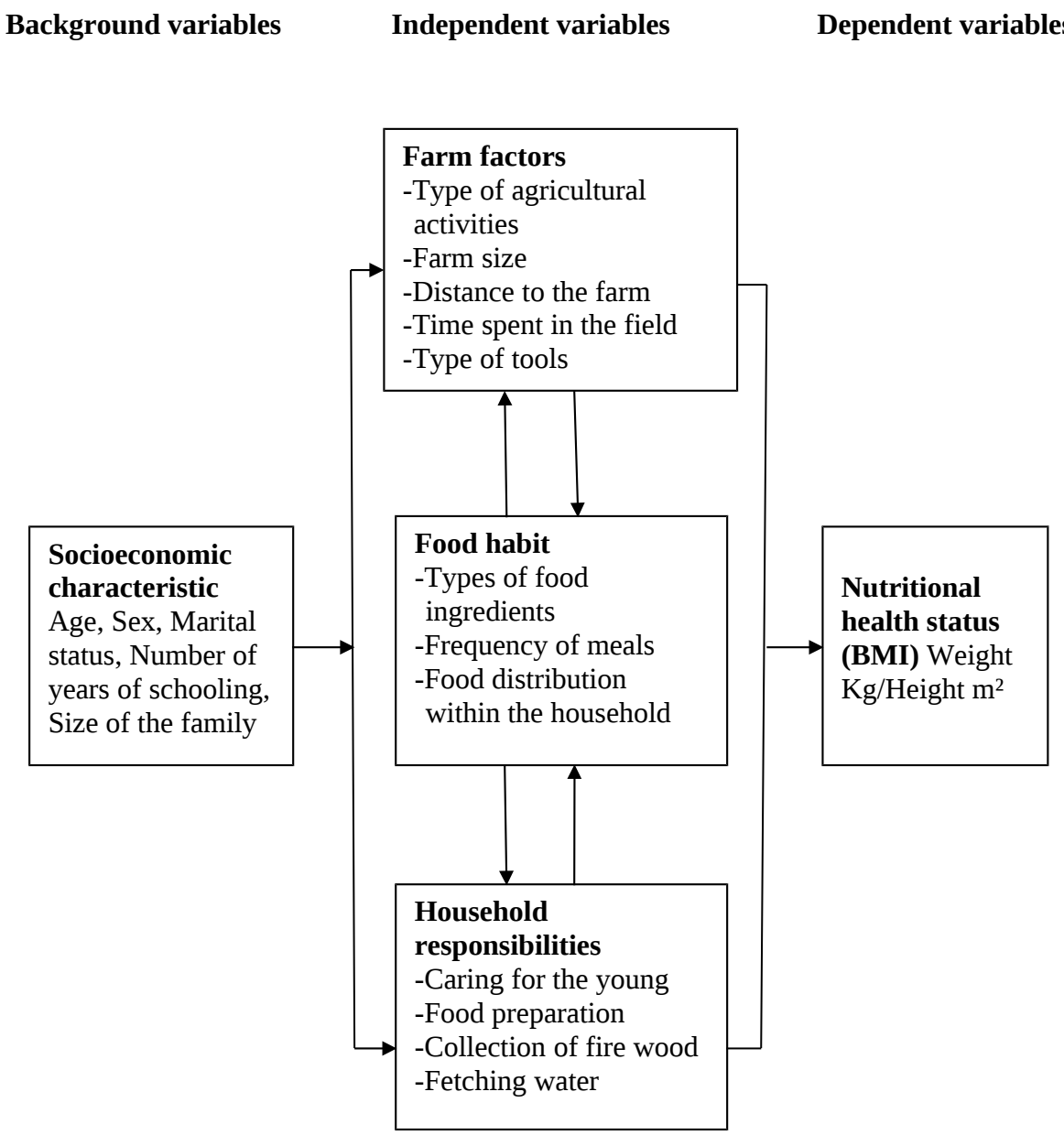

Figure 1: Conceptual framework

Table 1: Variables measured by the study

Variables		Indicators
Dependent	**BMI (weight kg/height m^2)**	Is a measure which identifies the nutritional current status of an individual
Independent variables	**Household characteristics**	
	Age	Age of the respondents in years
	Level of education	Number of years one attended in school
	Household size	Number of household members
	Marital status	A state of being married, divorce, single or widowed
	Sex of the household head	Household head if is male/female
	Fertility	Number of children per female
	Farm factors	
	Activities performed on farm	Type of agricultural activities
	Labour	Household members working on farm
	Time spent in the farm	Number of hours spent in farm
	Size of the farm	Land cultivated
	Distance to the farm	The length at which the farm is located
	Food habit	
	Types of food ingredients	Protein, starch and vegetable food
	Frequency of meals	Number of meals taken per day
	Food distribution	Meals distribution per individual
	Household responsibilities	
	Caring for the young	Labour involvement in household responsibilities
	Food preparation	
	Collection of fire wood	
	Fetching water	

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This chapter presents definition of key terminologies covered in the field of study. It also covers previous research findings done on Nutritional Health Status of Rural Women practicing in agriculture worldwide, in Africa and Tanzania. The chapter comprises of seven main sections. Section 2.2 defines important terms, 2.3 shows the contribution of women in agricultural production. Furthermore, section 2.4 discusses the impact of women participation in farming on nutritional and health. The chapter also discusses theories and measurement of adult nutritional health which is presented in section 2.5. Assessment of nutritional status by dietary methods and review of previous work on nutrition and women health are presented in sections 2.6 and 2.7 respectively. Finally section 2.8 discusses the women workload.

2.2 Definition of Key Terms

2.2.1 Nutritional Health Status

Nutritional health status can be defined as the interpretation of the results obtained from the measurement of the individual's body parts, for example, height, weight and age. According to FAO (2003), nutritional status is a physiological state of an individual that results from the relationship between nutrient intake and requirements and the body's ability to digests absorb and use these nutrients.

The World Bank (2008) defines individual's nutritional status as a consequent result of a complex set of intra-related factors that act synergistically and are dependent on the environment in which people live and intra-household process they are exposed to.

It is directly determined through the use of anthropometric measurements of weight, height, and arm circumference or growth patterns based on these measurements, clinical symptoms and physical signs of malnutrition, and biochemical or laboratory measurements of body nutrients and constituents. According to Jacobson (1993), the nutritional and health status of women is of great concern in the contemporary world because of the multiple roles played by women result into serious health and nutritional problems.

2.2.2 Anthropometric measurement

According to Leather and Foster (2005), anthropometry is a science of measuring human body and its parts. It is a method used for the assessment of the protein-energy malnutrition, especially in young children. It can be used to monitor normal or abnormal growth in childhood, pregnancy, and fatal life, as well as pathological 'over growth' in adult (Leather and Foster, 2005). Anthropometric measurement is a process of taking measurements from human's body parts such as weight, height, mid upper arm circumference and fat fold at triceps. It is a process commonly used for assessing individual's nutritional status. According to WHO (2005), anthropometric indices that are used as criteria for assessing nutritional status for adult include, BMI, Mid Upper Arm Circumference (MUAC), Waist Circumference (WC), Hip Circumference (HC) and Waist-Hip Ratio (WHP). All of these indices are compared with the recommended reference for health populations.

2.2.3 Body Mass Index (BMI)

BMI is an anthropometric index of weight and height that is defined as body weight in kilograms divided by height in meters squared (BMI = weight (kg) / height (m) ^{2}). BMI is the commonly accepted index for classifying adiposity in adults and is also recommended

for use with children and adolescents, this is according to (Centre for Disease Control and Prevention (CDCP), 2009).

Like weight-for-stature, BMI is a screening tool used to identify individuals who are underweight, overweight or obese. For children, BMI is gender and age specific and therefore referred to as "BMI-for-age". Because BMI changes substantially as children get older, BMI-for-age is the measure used for children aged between 2 to 20 years (CDC, 2009).

BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems. BMI is used as a screening tool to identify possible weight problems for adults. However, BMI is not a diagnostic tool (Javed and Chaudhry, 2009).

Leather and Foster (2005) define BMI as a measure which identifies the current status of nutritional over time; it acts as an indicator of food situation and nutritional well being of a community. It is considered to be a useful measurement of the amount of body fat. A cut-off point of 18.5 is used to define thinness or acute under nutrition and a BMI of 25 or above usually indicates over weight or obesity. Occasionally, some very muscular people may have a BMI in the weight range (BMI>25.0). However, these people are not considered overweight because muscle tissue weighs more than fat tissue (Gordon, 2003).

It is important to remember, however, that BMI is not a direct measure of body fatness and that BMI is calculated from an individual's weight which includes both muscle and fat. As a result, some individuals may have a high BMI but not have a high percentage of body fat.

For example, people involved in heavy physical activities may have a high BMI because of increased muscularity rather than increased body fatness. Although some people with a BMI in the overweight range (from 25.0 to 29.9) may not have excess body fatness, most people with a BMI in the obese range (equal to or greater than 30) will have increased levels of body fatness (Mei, 2002). The use of BMI allows people to compare their own weight status to that of the general population. Thus, BMI is the most established anthropometric indicator used for assessment of adult nutrition status (Lee and Nieman, 2003).

2.2.4 Food security

The concept of food security is complex and covers a wide range of aspects from global food balance to nutrition adequacy at the individual level (Ehui *et al.*, 2002). According to Clay (2002), food security exists, when family members have physical, social and economic access at all times to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. This implies that the household's ability to secure adequate food, either through their own food production or purchases to meet the dietary needs of all its members (Young, 2003).

Agriculture remains the source of food and most important income generation activity in rural areas. However, the World Bank (2001) has noted that the main causes of rural poverty are those related to food security. Food security is one of the important conditions that must be achieved for an individual to be nutritionally secure and to maintain good health. A person's nutritional status involves accessibility to resources for food and translating the food obtained into satisfactory nutritional levels. Agriculture also generates resources that support the caretaker's successful adoption of new knowledge of improved health and nutrition practices.

Increases in food production should lead to increased food availability, access, and ultimately, food intake. Therefore, food security as reported by Mittal (2006) is a situation in which both food supply and effective demand are sufficient to cover nutritional requirements.

2.3 Contribution of Women in Agricultural Production

2.3.1 Women farmers in the world

Rural women are responsible for half of the world's food production and produce between 60 and 80% of the food in most developing countries (FAO, 2004). Women sow, weed, apply fertiliser and pesticides, and harvest and thresh the crops. In the livestock sector, women feed and milk the livestock, while raising poultry and small livestock such as sheep, goats, rabbits and guinea pigs. A report by Michailidis (2007) in the Mountain villages of Florina in the Western Macedonian region of Greece revealed that long working hours are normal for women. It was found that women in the research area were working 11.5 hrs per day and that small ruminant activities take place all the year round, unlike crop production.

It is now widely confirmed that rural women throughout the world are engaged in a range of productive activities essential to agricultural productivity, economic growth and the household welfare. Reports from Onian'go and Mukudi (2002) stated that once the harvest is stored in the household, rural women provide most of the labour for post harvest activities, taking responsibility for storage, handling processing and marketing. They are primarily responsible for meeting the nutritional needs of their households. Women are more likely than men to use

available resources and skills to further improve the welfare of their family especially the nutrition and health aspects (United Nations Development Program (UNDP), 2003). In Philippine as reported by Lu (2011) women participate in all stages of farming i.e. planting, pre harvesting and post harvesting periods; they work in their gardens for an average of hours during non peak seasons and up to twelve hours during peak season. Despite this massive contribution to global food security, women farmers are frequently underestimated and overlooked in terms of their nutritional outcomes.

2.3.2 Women farmers in Africa

In most of the SSA, agriculture is an important sector and a significant proportion of the agricultural activities take place in rural areas. It is a central to African societies and rural women contribute a substantial share of the labour that goes into this sector as food producers or agricultural workers. International Labour Organization (ILO) (2000) describes women's role in agriculture and food security as critical in SSA because they produce up to 80% of basic foodstuffs both for household consumption and for sale (FAO, 2006). Fonjong (2004) observes that female food crop entrepreneurs form an essential distribution link in ensuring food security in big cities and towns. According to Hyder, *et al*. (2005), women in SSA are primarily responsible for food production, food preparation, food storage, and food sale within the family.

In SSA countries, more than 50% of the active female population works in agriculture, reaching a total of 93% in Burkina Faso, 87% in Angola, 98% in Burundi, 96% in Malawi, and 92% in Mali and Tanzania (Sekitoleko, 2004) According to Fonjong and Athanas (2007), rural women have historically played and continue to play an important role in rice production. They contribute to agricultural production, especially food production, more

than it has been generally recognized. This is, also, confirmed by Yahaya (2002) in Nigeria who noted that 76% of women are actively involved in farming activities or are engaged in their husband's farms. Likewise, Ejembi (2006) in Gambia reported that women produce 84% of the rice grown. They supply most of the needed labour in agricultural activities and this is the most important factor of production to farmers since it is needed at almost all the stages of agricultural production. Although many researchers pointed out the lack of visibility of women's participation and contribution in agriculture and development in general, there is also lack of information on their nutritional health status.

2.3.3 Women farmers in Tanzania

In Tanzania, like in any other developing countries, women are most silent participants in economic life and also an important work force in agriculture and other related activities. A report by URT (2006) revealed that Tanzanian women produce about 70% of the food crops. For example, Quisumbing and Meinzen-Dick (2001) reported that women play important roles as producer of food, managers of natural resources, income earners and caretaker of household food and nutrition security. As a consequence, they spend more time per day carrying out farm and household responsibilities compared to their male counterparts. Hyder *et al.* (2005) found that women spend much time in farm and home activities than resting. In their study in Bagamoyo, Hyder *et al*. (2005 ranked women's activities relative to men's by using the number of beans (Table 2), and so the more the number of beans scored by each sex, the more the time spent in each activity. Further, Table 2 shows that women spend much time in food preparation (259 beans), in farming (218 beans) rather than in resting (43 beans) compared to men, (0 beans) in food preparation, (103 beans) in farming while (384 beans) in resting.

Table 2: Time spent by women on daily activities in Tanzania

S/N	Activity	Sex	Ranking (No. of beans)
1	Food preparation	Female	259
		Male	0
2	Farming	Female	218
		Male	103
3	Cleaning	Female	162
		Male	0
4	Fetching water	Female	87
		Male	0
5	Fetching fire wood	Female	58
		Male	0
6	Resting	Female	43
		Male	384
7	Gathering food	Female	36
		Male	0
8	Business related activities	Female	32
		Male	291

Source: Adapted from Hyder *et al.* (2005)

2.4 The Impact of Women Participation in Farming on Nutrition and Health

Agriculture is the basic link in the chain of life and it is linked with nutrition and health status achieved by the people. Progress in agriculture contributes to progress in nutrition and health and vice-versa. Agriculture and health are basically related and this relationship has significant implications for the well-being of people around the world, especially poor and vulnerable people. Women's health affects the household economic well being because women with poor health will be less productive in the labour force. Women's participation in various agricultural activities may have a positive or negative effect on their nutrition, depending on socio-economic conditions. A report by Lukmanji (1992); Wandel and Holmboe-Ottessen (1992) from Tanzania reported that women participated more in agricultural activities compared to their male counterparts, subsequently impacting negatively on women and children's health.

Moreover, a report by Barker *et al.* (2006) revealed that women are more likely to work full time in farming than men, to carry the burden of all household chores, to have less sleep, and to eat less food away from home than men. They fast more frequently and more strictly than men for the sake of their household members.

Forastieri (2007) of the ILO described agriculture along with mining and construction to be one of the three most hazardous sectors of human activity in both developing and industrialized countries. Women's work in the agricultural sector as farmer or wage earner is, therefore, not without some serious health consequence. The literature on rural women's health indicates that reproductive health risks, occupational accidents, and ergonomic-related problems directly stem from the nature of the work they do, but nutritional problems appear to be influenced by their intertwining productive and reproductive or domestic roles (Chiong-Javier, 2009).

Time spent by women per day in doing different home and farm activities in SSA societies is longer than that spent in resting. This might affect their meal type and frequency as a result they lose their nutritional status. The study in Nigeria by Ene-Obong *et al.* (2001) revealed that the longer the hours women spend on work, the higher the energy intake, the lower the protein, iron, calcium, riboflavin and niacin intake, the lower the BMI. From this data therefore, nutrition-related objectives can be effectively incorporated into the design of agriculture programs by planners and researchers for maximum impact on women farmers.

In Tanzanian, women face nutritional challenges and are subjected to different health stresses from economic, domestic, and agricultural work (Lukmanji, 1992). Due to the role played by women in agriculture their nutritional status tends to vary according to season. In the production season people tend to lose their body weight due to agricultural activities. This has also been reported by Wandel and Holmboe-Ottesen (1992) in Rukwa where they found out that heavy workload for women might lead to poorer diets not only for their children and other

members of the families but also for themselves. Ulimwengu (2009) in his study reported that individuals in rural areas have low BMI compared to their counterparts in urban areas suggesting a higher risk in terms of health degradation. The implication of his findings was that rural people due to farming activities which are accompanied by low or poor food intake may result to loss of body weight. This is also confirmed by Lukmaji (1992) who has observed that during the rainy season there is heavy agricultural work that is unfortunately accompanied with low energy intakes among female farmers leading in turn to weight loss.

2.5 Theories and Measurement of Adult Nutritional Health Status

Several studies have been done by different researchers investigating adult nutritional health status. The study in Phillipine by Chiong-Javier (2009) on health consequences of rural women's productive role in agriculture revealed that women farmers face many consequences of which the major ones include female reproductive health risks owing particularly to women's use and exposure to hazardous agrochemicals, farm-related accidents or physical injuries, ergonomic problems resulting from women's use of tools or technology that is better suited to men. They also face nutritional deficiencies that are compounded by poverty and overwork.

A study by Thatcher *et al.* (2005) in India which investigated the physiological stress of women at work (ergonomic consideration), findings from their study revealed on the basis of heart rate, energy expenditure and rate of perceived excretion showed due to farm and allied activities that ergonomic cost while performing these activities was very high. Therefore, they concluded that all these activities are heavy and induce fatigue in some or other way to the women work force. According to Bonnard (2001), the strategy and policy

brief on improving the nutritional impacts of agriculture interventions, is that health and nutrition have a direct impact on a country's productivity and growth.

There are the immediate effects of a stronger and healthier work force. She insisted that nutrition also plays a critical role in determining an individual's health status and ability to overcome illness, including Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS). Nabinta *et al.* (2007) insisted that optimum food production, adequate nutrition and good health seeking behaviors need to be encouraged for good health.

Therefore, it is very important to identify farming, nutrition, and health constraints facing women farmers who are the food producers. Javed and Chaudhry (2009) investigated on status of BMI and found out the relationship of dietary factors with BMI. In their study they found that carbohydrate, protein, fiber, energy density and glycaemic index influence obesity.

2.6 Assessment of Nutritional Status

According to Saito and Mark (1999), nutritional assessment refers to the interpretation of information obtained from dietary, biochemical, anthropometrics and clinical studies. The information is therefore used to determine the nutritional status of an individual. The purpose of nutritional assessment is to perk up nutrition status, to avoid further complications and enhance the individuals' quality of life and survival (Javed and Chaudhry, 2009). Reports by Food and nutritional Technical Assistance (FANTA) (2003) stated that, nutritional assessment helps to identify information about changes on nutritional status of an individual.

2.6.1 Dietary assessment methods

According to Gibson (1990), dietary assessment is a first stage of nutritional assessment in which dietary intake may appear to meet nutritional needs but conditioning factors such as disease states may interfere with ingestion, absorption, and/or utilization of nutrients. It involves measuring the quantity and quality of foods consumed in one to several days or assessing the pattern of food consumed during the previous days or months. For example, dietary history and intake of 24-hours recall; three days food record and food frequency. This involves the respondent to recall all the dishes, snacks, or other food she/he had eaten during this period regardless of the fact that the food was eaten inside or outside the compound.

2.7 Review of Previous Work on Nutrition and Women Health

2.7.1 World wide

In the wake of numerous studies conducted worldwide about women since the United Nations' Decade for Women (UNDW) (1976-1984), data appear sparse on the relationship between women's work and women's health in the agricultural setting to enable policy makers and program implementers to adequately address their health needs (Chiong-Javier, 2005). Improvements in nutritional status of women farmers increase the productivity of labor, especially if people switch from low to high productivity jobs as their health improves. In particular, there is strong evidence that growth in early industrialized countries was associated with significantly increased caloric intake and, therefore, greater height and a higher body mass index (Fogel, 2004). A study by Smith *et al*. (2010) in China revealed that childhood health has strong effects on adult health outcomes particularly among women and strong effects on adult BMI particularly for men.

As pointed by the World Bank (2007), illness and death from HIV/AIDS, malaria, tuberculosis and other diseases reduce agricultural productivity through the loss of labor, productive adults' knowledge, and assets to cope with illness. In Philippine Antle and Pingali (1994) found that pesticide use has a negative effect on farmer health, while farmer health has a significant positive effect on productivity. Agriculture and nutrition form a synergistic cycle, whereby each supports and advances the other. According to Fogel (1999), improvements in nutrition and human physiology contributed significantly to the economic growth and technological progress. As reported by Katani (1999), women over work due to expenditure of time and energy in undertaking various activities which creates a condition of inadequate food intake by reducing the number of meals. During the peak period of the season the quality and number of daily meals can be as low as one. A study by Barcker *et al*. (2006) in India revealed that women who were involving in agriculture were thinner (low BMI) than those in non farming families. Many researchers reported on the influence of socioeconomic factors such as education, income marital status, occupation on nutritional health status and found significant association. Bharati (2007) investigated on the nutritional status of women in India and its relation to the prevalence of Chronic Energy Deficiency (CED) and obesity. The result by regression analysis shows that all the socioeconomic variables significantly affect BMI in Indian women.

A report by Rao *et al.* (2010) revealed that women's health affects the household economic well being. They further noted that a woman with poor health will be less productive in the labour force. Nutritional status pertains to the condition of the individual affected by the intake of foods and the utilization of nutrients. Thus, nutritional status is related to food consumption as well as to the

general health-care status. Knox *et al*. (2003) insisted that nutrition also plays a critical role in determining an individual's health status and ability to overcome illness, including HIV/AIDS.

2.7.2 Africa

Women farmers in SSA use most of their energy and time doing farm activities especially during the onset of rains which results to a large variation of nutritional status between individuals. The study by Schultink *et al*. (1993), Tetens (2003) and Simondon *et al.* (2008) found that season is a major determinant of the anthropometric status of rural African women. During the rainy season women tend to lose their nutritional status compared to off-season. This might be due to the fact that there is no enough time to prepare food for themselves and sometimes even when and where the food is available they have no time to eat thus experiencing skipping one or two of their meals per day.

In Kenya, nutritional deficiencies that arise from inadequate agricultural information have a strong interaction with diseases, since they lower the body's immune response (Omwaha, 2007). This eventually impacts negatively on the community's socio-economic development efforts.

In Ethiopia research evidence shows a significant link between health and nutritional status and agricultural productivity. For example, Croppenstedt and Muller (2000) have noted that the distance to the source of water, nutrition and morbidity status affect agricultural productivity and elasticity. Moreover, Ulimwengu (2009) investigated on farmers' health

and agricultural productivity found out that healthy farmers produce more per unit of inputs, earn more income and supply more labor than farmers affected by sickness. The model results show that production inefficiency increases significantly with the number of days lost to sickness. The results further suggested that investing in the health sector in rural areas will not only improve farmers' agricultural performance but also increase their income.

Nabinta *et al*. (2007) study in Gombe Nigeria on the health status of female farmers and farmers' children (future farmers) in which they examined their micro-nutrient, immunization and morbidity status concluded that optimum food production, adequate nutrition and good health are positively correlated to good health. This implies that the health status of farmers has a direct bearing on their agricultural output. It is, therefore, very important to examine and analyze the health status of food producers with particular focus on women who carry a multi burden in the family survival mechanisms.

2.7.3 Tanzania

WACW (2009) and Hyder *et al.* (2005) who investigated on the role of women in household food security found out that women spend much of their time in ensuring household food security. A report by Hawkeys and Ruel (2008) found that women are usually the principal agents of household health and nutrition; they also tend to be exceptionally constrained agents in terms of time and resources. This observation has also been confirmed by Hyder *et al*. (2005) who have argued that the burdens of securing food for their families is a time consuming task and is accompanied with physical and mental stresses on the women and their children. Further, Wandel and Holmboe-Ottesen (1992) reported that participation of women in agricultural production results into using less time

in cooking and children are fed less often during the peak labour seasons. This eventually leads to impact their nutritional health status.

2.8 Women Workload

In SSA, Tanzania inclusive, women do almost all agricultural and domestic activities compared to men. Women are more likely to work full time in farming than men, to carry the burden of all household chores, to have less sleep, and to eat less food away from home than men (Barker *et al.*, 2006). Women's work load in agriculture and non agricultural activities contributes to a large extent in the variation to their nutritional status. Their work particularly **agricultural farming in rural areas is arduous and time consuming.**

Wandel and Holmboe-Ottesen (1992) noted that heavy workloads, particularly during the agricultural season, place a physical and emotional burden on women and thus reduce their ability to provide care for themselves and their families. Due to heavy workload, women face a shortage of time in preparation of quality diet, which in turn results in loss of body weight.

Research by Ene-Obong *et al.* (2001) revealed that work load was negatively correlated with protein intake. Overworking resulting from the time and the energy expenditure in performing various activities creates conditions of inadequate food intake by reducing the frequency of meals. According to Katani (1999), during the peak period of farming, the number of daily meals can be low and the care with which the food is prepared can be reduced during this time. Also due to limited time, women might not be able to produce enough food for their families.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Description of the Study Area

Babati District Council is among the six councils of Manyara region. It has an area of 5,609 square kilometres. Neighbouring districts are Monduli in the North, Karatu in the North-West, Mbulu in the West, Hanang' in the South-West, Kondoa in the South and Simanjiro in the East. Administratively, it has 4 divisions, 18 wards, 82 villages and 133 hamlets (sub villages). The altitude ranges from 950 metres to 2450 meters above mean sea level. Most of soils are of volcanic origin and range from sand-loam to clay-alluvials. Rainfall distribution ranges from 500mm to 2000mm per annum. Average temperatures range from 10°C to 25°C (URT, 2006).

According to the Population and Housing Census (PHS) of August of 2002, the district had a population of 237 601 with an annual growth rate of 2.7%. At the time of this study the district population was estimated to be of 297 519 of which 152 403 were males and 148 116 are females. The District Council's population account for 79% of total district population. The Council has a population density of 48 people per square kilometre.

According to URT (2006), the majority of rural population in Babati district are small scale farmers and agro pastoralists. Their traditional farming system is characterised by low use of farm inputs. The food crops grown are mainly maize, beans, paddy and sorghum. The main cash crops are coffee, pigeon peas, sunflower and sugar cane.

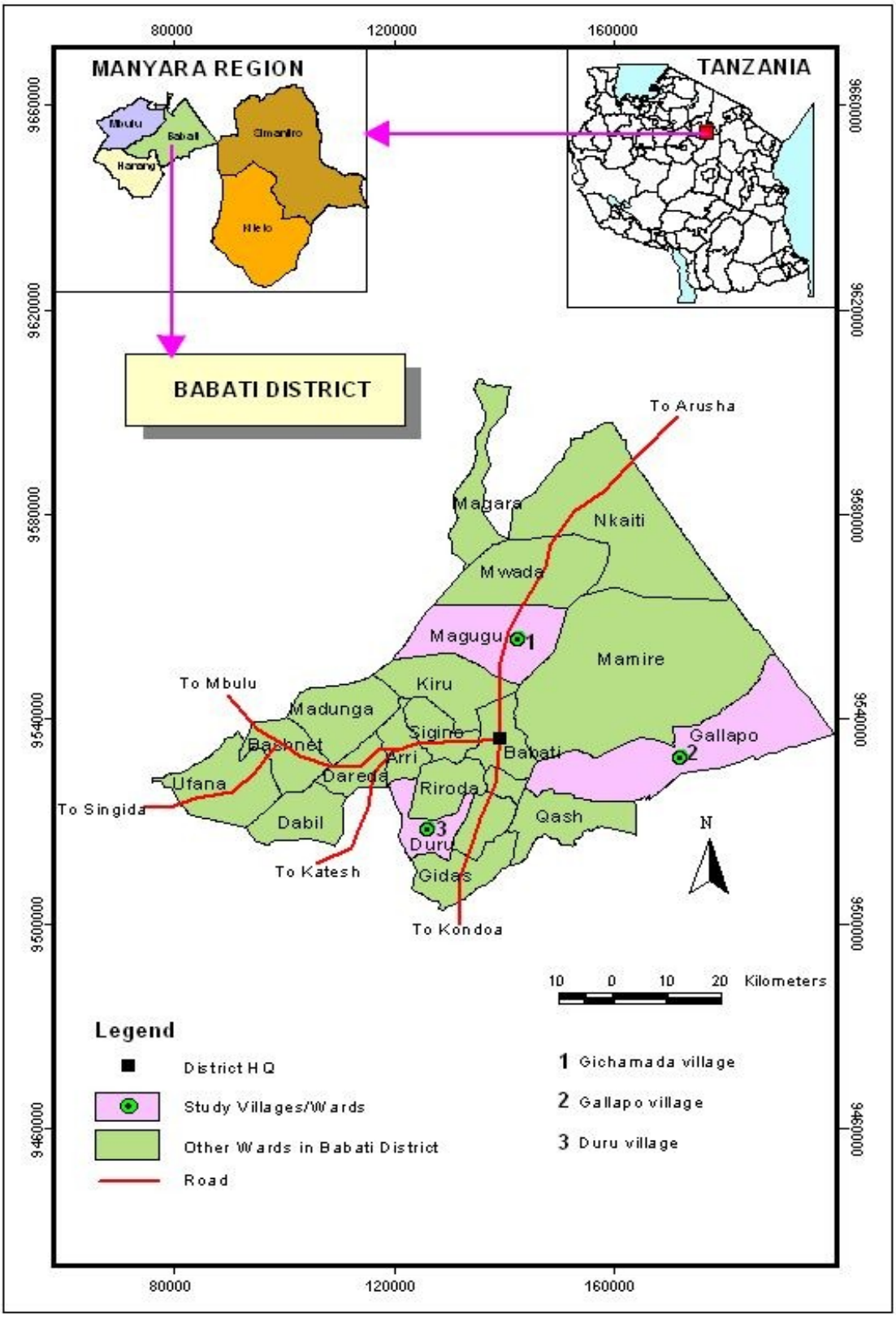

Figure 2: Map showing location of study area in Manyara region Babati District

3.2 Research Design

The research employed a cross-sectional design whereby by data were collected at a single point in time from a sample selected to represent some larger population. The survey consisted of asking questions to a representative sample of village farmers. According to Bailey (1998), this research design is suitable for descriptive purposes.

3.3 Sample Size and Sampling Procedure

The research population involved female and male performing agricultural activities composed of ages of greater than 18 years. The assumption was that individuals at this age are adults and energetic in performing farming activities.

Purposive sampling was used to select divisions, wards and villages. The criterion used to select the study areas was where agriculture is done under irrigation schemes and other village which depend on rain fed agriculture. A total of 180 respondents were selected purposively based on their sex, occupation (must be real farmer) and must be aged above 18 years. Simple random sampling used to select 30 women farmers and 30 men farmers in each village. According to Bailey (1998) a sample size of 30 objects is sufficient number for meaningful analysis.

3.4 Data Collection Technique

Primary data were collected using structured questionnaire which had open and closed ended question items. The questionnaire was tested in Matufa village (Magugu ward) in Babati District on November 2009 for

the purpose of correction and rephrasing for relevance. Secondary data were collected from various reports and publications such as Household Budget Surveys, NGOs, DALDO's Office and health service centres in the study area. Most of the publications were found at the Sokoine National Library (SNAL), and internet.

3.4.1 Weight measurement

Weight was measured using a digital electronic SECA weighing scale (SECA Vogel and Halke. Hamburg Germany) in which the scale pointer was set at zero before taking the measurement. The weighing scale was calibrated to the nearest 0.1 kg to reduce errors. The respondents were required to dress in light clothes and take off shoes. Women were required to remove scarves. The respondent stood straight and unassisted in the centre of the balance platform.

3.4.2 Height measurement

The height of the respondents was measured to the nearest mm with locally made portable device equipped with height gauges calibrated in cms up to 200 cms height. Respondents were asked to remove their shoes, heavy outer garments and hair ornaments before being asked to stand on the height rule. They stood erect, looking straight in a horizontal plane with feet put together and knees straight. The heels, buttock, shoulder blades and the back of the head touched against the wall. The respondents were asked to look straight; the head piece was lowered so that the hair (if present) was pressed flat.

3.4.3 Determination of Body Mass Index (BMI)

The respondents' variable was recorded from a person's weight in Kg and Height in centimetres. The height in cms was converted to metres (1metre=100 cm). The BMI was calculated using the following formula: BMI= [Weight/ Height² (kg/m²)]. According to the Centre for Disease Control and Prevention (CDCP) (2009), for adults of 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women. The standard weight status categories associated with BMI ranges for adults are shown in Table 3.

Table 3: Body Mass Index (BMI) cut-off points

BMI	Weight status
<18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
>29.9	Obese

Source: CDCP (2009)

3.5 Statistical Analysis

Surveyed data was organized, coded and cleaned. It was then analyzed by using SPSS windows version 16.0. Qualitative and quantitative data analysis was also done. Descriptive analysis including arithmetic means, standard deviation, maximum, minimum and percent distribution of households according to different variables was carried out. Cross tabulation, Harvard model and chi square model were done where applicable to measure the relationship between agricultural activities and nutritional status of women and men performing agriculture production. BMI of both males and females was compared to the standard.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the results of research on nutritional status (BMI) of rural women compared to men practising in agriculture. The chapter is divided into ten main sections. Section 4.2 discusses the respondents' demographic and social-economic characteristics. Section 4.3 describes agricultural activities performed on the farm and section 4.4 shows land sizes and acquisition. Moreover, section 4.5 shows time spent and labour involvement in farming, section 4.6 discusses BMI measurement and physical characteristics of the respondents followed by section 4.7 which shows comparison analysis of health status between men and women and its relationship with agricultural production. Section 4.8 discusses nutritional status of the respondents according to their socioeconomic status. Section 4.9 describes other social factors apart from agriculture which can contribute to the variation of the BMI especially for women which include household responsibilities and food habit. The last section 4.10 discusses women's workload and household responsibilities.

4.2 Demographic and Social Economic Characteristics

This section presents the demographic and socioeconomic characteristics of households in the study area. These include age of the respondents, years of schooling, household size, marital status and household head by sex of the respondents. Table 4-8 present these variables and their mean, minimum, maximum, and standard deviation (SD).

4.2.1 Age of the respondents

The distribution of the respondents by age is presented in Table 4. The respondents were asked to state their exact age and then grouped into four groups based on their ages (< 30 years, 30-45 years, 46-60 years, and those >60 years). The results show that the average age of the respondents was 41.14 ±11.18 years while the minimum and maximum age was 19 and 82 respectively. The results further show that the age group of 30-45 years constitute the majority (50.6%). It was also revealed that more than half (54.4%) of female were in the age group (30-45 years) which is economically active compared to male (46.7%). In this study it was also assumed that most agricultural activities are done by women who are mature, energetic and economically active. Furthermore, results from the Table 4 show that 31.1% of the respondents were between 46-60 years which imply that at this age group they are in the adulthood age and are not strong enough to participate in agricultural activities instead they do diversification by engaging on other non-farm activities. The remaining respondents (4.4%) were above 60 years old which imply that at this age individuals are economically not active especially in practicing agriculture. It was also revealed that none of the respondents were below 19 years of age. The chi-square test ($x^2 = 6.87, df = 6$ p-value$= 0.344$) shows that there is no statistical significant variation in age group within and across villages who are practicing agriculture. The implication of these results is that those who practice agriculture and depend on it as a major source of income in the study area are in the same age category i.e. (30-45 years) as it was indicated by more than half of the respondents.

Therefore, this simply implied that women were more economically active and main food producers relative to men. The results of this study on active labour distribution on the basis of age and sex compared well by FAO (2004) that women in SSA are responsible for the half of the world food production.

Table 4: Distribution of the respondents according to their age

Age group	Sex (%)		Villages (%)			Total	Description			
	Male	Female	Duru	Gichameda	Gallapo	%	Mean	Min	Max	±SD
Less than 30	16.7	11.1	16.7	8.3	16.7	13.9				
30-45	46.7	54.4	55.0	53.3	43.3	50.6				
46-60	27.8	34.4	26.7	35.0	31.7	31.1				
Above 60	1.1	7.8	1.7	3.3	8.3	4.4	41.14	19	82	11.18

4.2.2 Education level of the respondents

The assumption of the study was that education provides farmers with knowledge and skills that can lead them to a better understanding of agricultural production and nutritional status in the study area. The respondents were asked to state the number of years they had spent attending formal schooling. They were also asked to state the level of education they had reached. Results in Table 5 show that the average number of years attended by the majority (56.7%) was 7 years out of which 30.6% were males and only 26.1% were females. The respondents who had no formal education accounted for 8.3% of the total sample of which 3.9% were males and 14.4% were females. Furthermore, results show that the maximum number of years for the respondents to attend school was 16 which were mentioned by only 8.7% of the respondents out of which 5.6% were females and 12.2% were males.

Generally, these results imply that the maximum level of education attended by the majority was standard seven. However, the results from the Chi-square test ($x^2 = 16.144$ and $p = 0.000$) indicate a statistical significant difference at $(p < 0.05)$ in number of years of schooling attended by female and male respondents. The implication of these results is that females have little or no access to education compared to their male counterparts. Despite the policy of equal education for all children of school age, there is a higher illiteracy rate among rural women than their male counterparts. This situation might be due to the existence of gender imbalance in the division of labour from the

household level. Women in developing countries Tanzania inclusive are considered as household care takers hence they do not access education. These results are collaborated by the findings from a study done in Ethiopia by Teferau (2007) which revealed that of all respondents interviewed, none of the women farmers were educated.

In Tanzania women with higher education are more likely to be overweight or obese (BMI>25) than non educated one (NBS, 2005). Likewise, the study in India has also shown that the nutritional status of women goes together with the enhancement of their educational status (Bharati *et al.*, 2007). This concurs with a report by Nyaruhucha *et al*. (2006) which showed that in Simanjiro, an educated mother was less likely to have an undernourished child.

Table 5: Level of education of the respondents

Level of education	Sex (%)		Villages (%)			Total %	Description			
	Male	Female	Duru	Gichameda	Gallapo		Mean	Min	Max	±SD
Non formal school	3.9	14.4	30.0	16.7	8.3	18.3				
Std i-iv	3.3	3,6	5.0	6.7	10.0	7.2				
Std vii	30.6	36.1	43.3	66.7	60.0	56.7				
Secondary	12.2	5.6	21.7	10.0	21.7	17.8	6.11	0	16	3.477

4.2.3 Marital status of the respondents

Table 6 summarises percentages on marital status of the respondents across the villages. The categories used to classify the marital status of the respondents were, single, married, widowed, and divorced or separated. The findings show that the majority (75%) of the respondents performing agriculture activities were married, implying that the agricultural production in the surveyed respondents was mostly an affair involving married couples. This also collaborates by that of

Novarty (2005) who observed that married couples are likely to be more productive than single ones due to labour reinforcement in accomplishing farm and non-farm activities. However, Barker *et al.* (2006) in their study in rural India concluded that being married into a farming family is an important factor in determining the thinness of a woman because their study showed that married couples have low BMI than single, widowed or separated due to farm activities.

Table 6: Marital status of the respondents

Marital status	Sex (%)		Village (%)			Total %
	Male	Female	Duru	Gichameda	Gallapo	
Single	5.6	13.3	1.7	10.0	16.7	9.4
Married	85.6	64.4	78.3	81.7	65.0	75.0
Widowed	1.1	6.7	6.7	3.3	1.7	3.9
Divorce/separated	7.8	15.6	13.3	5.0	16.7	11.7

4.2.4 Household size

Family size is an important factor in determining the nutritional status of a family and the extent to which labour force is available in practicing agricultural activities. It was expected that the bigger the number of household members the higher the household labour power. The size of household members involved in labour power has an influence on the nutritional status of an individual.

If labour power is small much time and energy is used by an individual to complete a certain piece of land and this affects one's nutritional status. Research results in Table 7 show that the average family size of the entire population of the three villages which were involved in the study area was 5.9. Generally the average household members in the sampled household was slightly lower than the surveyed average household size in Manyara region (Babati inclusive) which is 6.4 people per household (URT, 2006). The

reason might be due to an increases family planning awareness which should be credited to the health service centres. This size of household can contribute to the household labour power and thus improves household food security, although in terms of food pattern and distribution it can affect an individual's nutritional status. Sango (2003) reported that the composition of household members' in terms of their age distribution has implication on the household ability to meet its food requirements. In Simanjiro district it has been reported by Nyaruhucha *et al*. (2006) that a small size household was in favour of nutrition status based on food distribution within household members.

Table 7: Household size of the respondents

Household size	Villages (%)				Description			
	Duru	Gichameda	Gallapo	Total %	Mean	Min	Max	±SD
< 4 members	15.0	20.0	21.7	18.9				
4 - 6 members	26.7	31.7	38.3	32.2				
7 - 9 members	40.0	38.3	30.0	36.1				
> 9 members	18.3	10.0	10.0	12.8	5.99	1	14	2.315

4.2.5 Head of the household by sex of the respondents

Table 8 shows the distribution of the household head by sex. Among the respondents interviewed in the study area, males dominated (46.1%) as heads of the household, only 23.3% of females were heads of the households. These were either single, widows, divorcees or separated couples or married women who were household heads. Normally household decision making is done by heads of the households for different activities undertaken. Since the study results show that the majority of women were not heads of the households they have no or little contribution in household decision making. Taking into consideration that women are the main household care takers and food producers the decision making power concerning agricultural production and household food security is mostly done by males. Such constraints could easily influence women's nutritional health

status taking into account the fact that they form the majority of the active labour force in the household.

Table 8: Head of the households by sex of the respondents

House hold Head	Female		Male		Total	
	Number	Percent	Number	Percent	Number	Percent
Head	42	23.3	83	46.1	125	69.4
Not head	48	26.7	7	3.9	55	30.6
Total	90	50	90	50	180	100

4.3 Participation of women and men in agricultural activities in the study area

Type of farm activities and the tool used by an individual in performing agricultural activities might have negative effects on an individual's nutritional health status. There are some farm activities which use more physical energy than others. An example of these activities includes clearing of a virgin land, ploughing and weeding.

The hand hoe is a major tool used by most women farmers in the study area. It is used in ploughing thus more energy is expended and more time is spent with such a tool to complete a certain piece of land. Results from the study area revealed that the majority (76.1%) of the respondents did all the activities on the farm, i.e. ploughing, planting/sowing, and weeding, harvest and shelling/threshing. Of these, 82.2% were females and 70.0% males. However, land clearing appeared to be a major activity performed mostly by males who accounted for 23.3% against 12.2% who were females. In some societies certain agricultural activities are gender biased. It was also observed that, females in the study area participated in all activities except the most physically demanding farm activities, such as bush-clearing and bush burning.

However, there is no great difference in participation in other agriculture activities for both males and females especially in Magugu ward where rice production is done. Results

show that sowing and weeding account for 2.2% for both males and females. This is contrary to the results from a study of Sizya (2000) in Mbeya in which nearly 70% of the work force weeded using the hand-hoe mostly done by females. The reason for males and females to participate equally in doing farm activities might be due to the fact that rice production in the irrigation scheme in the study area creates employment for all types of sex in which both males and females get involved in order to obtain cash.

These results from the study area based on females and males participation in agricultural activities differ with the report by other researchers findings like Garcia, (2004) in Philippine and Fonjong and Athanas (2007) in Cameroon where they found that rice production has long been a women's domain, involving activities like seed selection, uprooting and transplanting of seedlings, and storing of grain.

This might be due to the fact that in Cameroon and Philippine, rice production is a food crop while in the study area rice production in irrigation schemes is a cash crop which provides employment in the form of hired laborer for both females and males.

The results in Table 9 are contrary to other study findings which showed that almost all agricultural farm work is done by women. For example, data compiled by IFPRI show that African women perform about 90% of the work of processing food crops, 80% of the work of food storage and transportation from the farm to village, 90% of hoeing and weeding, and 60% of the harvesting work and marketing (Quisumbing *et al*., 1995).

Table 9: Participation of women and men in agricultural activities in the study area

Type of activity	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent

Type of activity	Male		Female		Total	
Land clearing	21	23.3	11	12.2	32	17.8
Ploughing	1	1.1	0	0.0	1	0.6
Sowing	2	2.2	2	2.2	4	2.2
Weeding	2	2.2	3	3.3	5	2.8
Harvesting	1	1.1	0	0.0	1	0.6
All activities	63	70.0	74	82.2	137	76.1
Total	90	100.0	90	100.0	180	100.0

4.4 Land Size and Acquisition

Land is a very important resource for agriculture production. In most SSA women's access and control over production resources is not present (Kisamba-Mugerwa, 2001). In areas like Babati District where the main economic activity is agricultural production, one owning large size of land is likely to be intensively practicing agricultural production.

In many African societies, land ownership belongs and has been traditional men's right as opposed to their women counterparts because norms and customs do not allow women to let alone to own but also to inherit this particular production resource. Therefore, size of the land owned and cultivated was asked for. The results in Table 10 show that 27.8% of the male respondents own more than 4 acres while only 6.7% of the female respondents own the same size of acreage. In addition, results show that 38.3% of the respondents owned less than 2 acres, of these, 36.3% were females and 40.0% males. Moreover, results indicate that nearly half (45%) of the respondents owned 1-2 acres and few (18%) owned more than 4 acres. However, the mean acreage owned by the majority was 2.5±1.5. The size of land owned were much for the respondents given that their means of cultivation for the majority was hand hoe. Pearson Chi square test $(x^2 = 0.874, df = 3, p = 0.000)$ shows that there is a significant statistical difference in land size owned by female and male in the study area. The implication of the results is that women in the study area have little access to land and other economic production

resources. These findings concur with the report from the World Bank (2005) which showed that landholdings of female headed households tend to be smaller than those of male headed households.

It was assumed in this study that the management of larger size of land is different from the smaller one in terms of nutritional health status. As the land size increases, the labour intensity also increases thus affecting BMI of an individual. More time and energy is spent in management of larger size of land compared to smaller one. From the study area as it is shown in Table 10, the average of 2.5 acres is reasonable for the individual to be food secure but it may affect the individual's BMI due to energy consumed in the management process especially when the tool used is the hand hoe. The reason behind is that much time and energy is used to complete a certain type of work in that size of land.

In rural India, women who were from agricultural community were thinner in joint land-owning families, where the main occupation was farming, than those in non farming families (Backer *et al*., 2006).

Table 10: Land size and acquisition by the respondents

Land size	Percentage			Mean	Min	Max	±SD
	Female	Male	Total				
0	37.8	5.6	21.7	2.594	0.5	6	1.50
<2	36.7	40.0	38.3				
2-4	18.9	26.7	22.8				
> 4 acres	6.7	27.8	17.2				

4.5 Time Spent on Farming by the Respondents

Time spent in agricultural production was recorded based on a single activity performed in a day by a respondent excluding domestic work in the study area. The results in Table 11 show that the average time spent per day in each agricultural activity by both females and

males was 4.6 ±1.02 hours. Results, however, show that more than half (56.7%) of women spent five to seven hours in the field. It was also revealed that there was no woman who spent less than two hours however, 5.6% of men spent less than two hours in the field. Further results show that more male spent 2-4 hours. This implies that women spent more time in the field compared to their male counterparts.

The above study results are more similar to many researchers' findings on female farmers in SSA. For example, report by Nti, *et al*. (2001) in Ghana revealed that women were involved in multiple activities and worked between 12 and 17.5 h daily. Due to this situation women suffered many physiological problems, with general weakness and tiredness, body pains, dizziness, headaches, arthritis and malaria being the most common ailments.

Bahmi (1999), has confirmed the same results in Tanzania in which it was found out that women spend 9.75 hours in agricultural production while male is 7.75. Likewise, in Kenya according to Omwaha (2007) women spend 12.5 hours while male spend 8 hours. Moreover, in Nigeria, Ene-Obong (2001) reported that the type of work the women did and the number of hours spent affected their food intake. The study revealed further that the longer the hours of work, the higher the energy intake, and the lower the protein, iron, calcium, riboflavin and niacin intake and consequently lower the BMI. Similar findings have also been reported by Hyder *et al.* (2005) in their study in Bagamoyo that women spent much time doing farm work than resting compared to their male counterparts. According to Omwaha (2007), the fragmentation of women's time allocation in Kenya has adverse effects on household food security, leading to a reduction of a number of meals taken in a day. It was discovered that the frequency of feeding was lower during the cropping season. However, in Nigeria as it has been reported by Ene-Obong (2001), the

number of meals depended on the availability of food of which over 75% of farmers reported skipping breakfast or lunch.

Table 11: Time spent on farm by the respondents

Time	Percent			Mean	Min	Max	±SD
	Female	Male	Total				
<2 hrs	0.0	5.6	2.8	4.6	1.5	7.2	1.0204
2-4 hrs	33.3	42.2	37.8				
5-7 hrs	56.7	45.6	51.1				
>7	10.0	6.7	8.3				

4.6 BMI Measurement and Physical Characteristics of the Respondents

Physical characteristics such as age, weight and height of the female and male respondents performing various home and farm activities were as described in Table 12. The results show that the average age for female farmers was 39 years while for male was 42 years.

This implies that female and male farmers with the age between (35-45 years) are economically active and energetic in performing farm activities. Further the results revealed that the average female body height was 161 cm and body weight 64.3 kg, BMI was found to be 24.3 which was almost the same as the mean BMI (23.5) for male. The minimum BMI for female was 17 while for male was 18. However, the statistical Chi-square results show that there was no significant $\left(x^2 = 26.68, df = 23, p = 0.256\right)$ difference in BMI between male and female farmers in the study area implying that women's agricultural activities have no influence on their nutritional status. This is due to the reason that women and men participate almost equally in all agricultural activities especially in areas where rice production is done. The results are contrary to other researchers' findings which revealed that women farmers have poor nutritional status compared to men because women play triple roles and thus have limited time to prepare food which results in the skipping of meals (Hyder *et al*., 2005, Ejembi, *et al*., 2006 and

Rao, *et al*., 2010). Fig. 3 presents the average age, height, body weight and BMI for female and male respondents.

Table 12: BMI measurement and Physical characteristics of the respondents

Variables	Female			Male		
	Mean	Min	Max	Mean	Min	Max
Age (Years)	39	19	64	42.2	24	82
Height (M^2)	1.61	1.30	1.82	1.64	1.30	1.85
Weight (Kg)	64.3	45	95	62.9	44	105
BMI	24.38	17	35	23.58	18.0	32.0

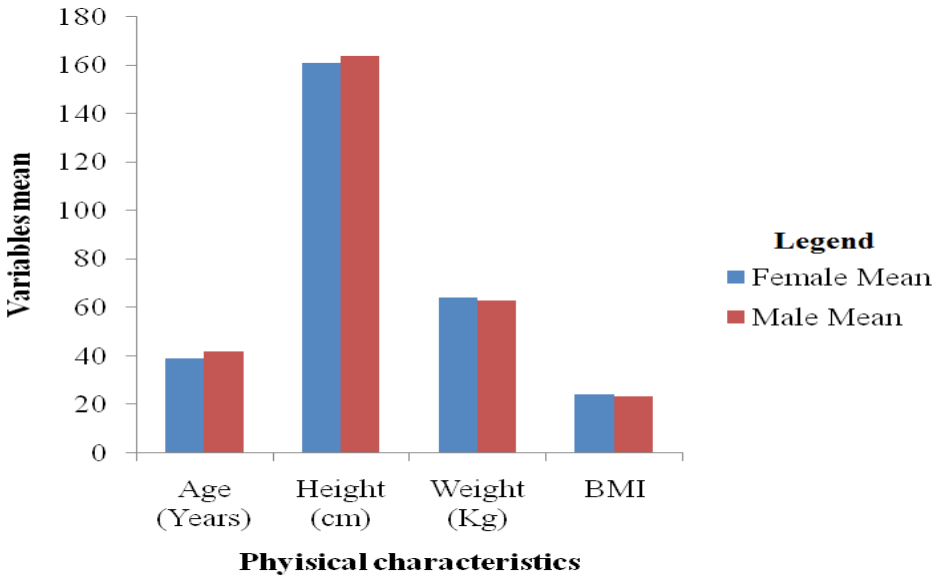

Figure 3: BMI and phyisical characteristics of female and male respondents

4.7 Comparison Analysis between Female and Male Nutritional Status

Nutritional status of male and female farmers was assessed using Body Mass Index (BMI). Women with poor health and nutritional status are less likely able to provide food and adequate care for their children as well as themselves. Table 13 present the nutritional status of the respondents based on their BMI. From the assessed respondents more than half (57.2%) of the respondents had normal body weight i.e. BMI between 18.5 and 24.9 out of which 25.0% were female and 32.2% male. Few (29.4%) of the respondents were

overweight i.e. BMI 25 to 29.9 out of which 15.6% females and 13.9% male. However, very few (8.9%) were obese i.e. (BMI> 30) and only 4.4% were under weight i.e. (BMI< 18.5) of which there were more female than male. The results are centrally to NBS (2005) which reported that underweight among women is most frequent in Singinda, where 22% of women are too thin.

It was also observed that there were more female who were overweight and obese compared to male. These were from rice producing areas where there is availability of food and thus no skipping of meals. The results concur with the report by NBS (2005) which stated that women in urban areas and those with greater wealth are more likely to have overweight or obese (i.e. BMI greater than 25). The statistical Chi-square test ($x^2 = 6.061$, $df = 3$, $p = 0.117$) at $p = 0.05$ suggests that there is no significant relationship between agricultural activities performed by female and male and their BMI. The result contradicts findings reported by Tetens *et al*. (2003) which revealed that among adults, a significantly higher prevalence of chronic energy deficiency BMI < 18.5 was observed in the peak season of agriculture (67%) than in the lean season (61%), despite a higher energy intake in the peak season. Fig. 4 also presents percentage underweight, normal body weight, overweight and obese for female and male respondents in the study area.

Table 13: Comparison analysis between female and male nutritional status

Health category	BMI	Percent Female	Male	Total
Under weight	< 18.5	5.6	3.3	4.4
Normal weight	18.5-24.99	45.6	68.9	57.2
Over weight	25.0-29.99	35.6	23.3	29.4
Obese	> 29.99	13.3	4.4	8.9
Total		100.0	100.0	100.0

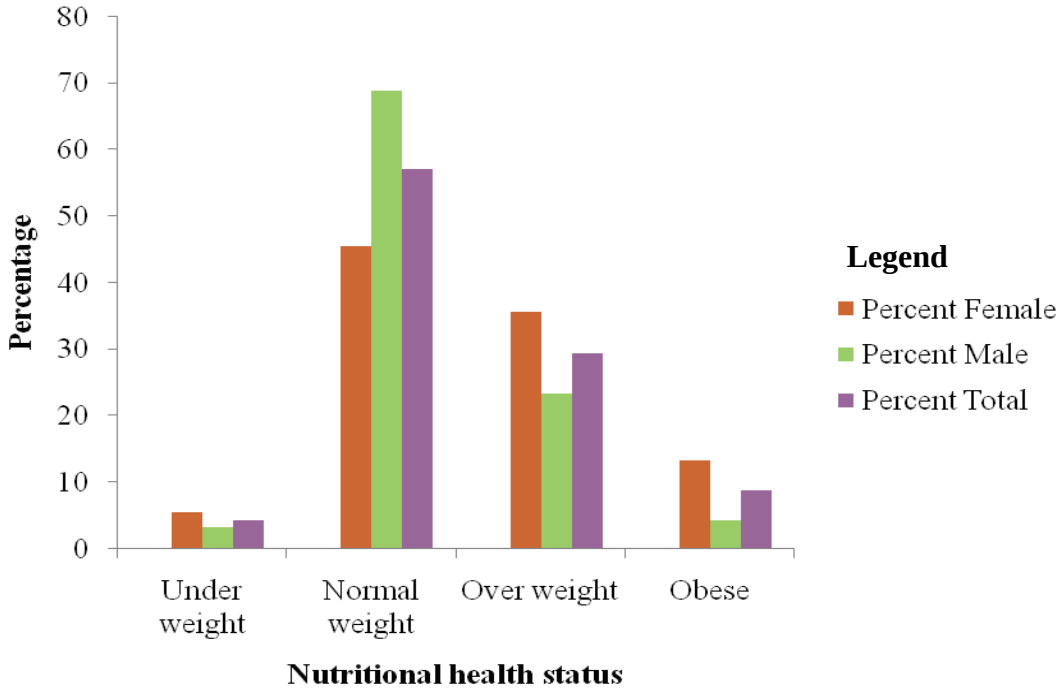

Figure 4: Comparison analysis between female and male nutritional status

4.8 Nutritional Status of the Respondents According to Their Socioeconomic Status

4.8.1 Nutritional status with age of respondents

Results in Table 15 show that age increased with increased BMI. Results also show that more than half (57.2 %) of all interviewed respondents have normal body weight, of these 60.4% were in the age group of 30-45 years. Results further show that this age category is the one which is mostly engaged in agriculture and depend on it as a source of income. It is also shown that 37.5% of the respondents are

overweight i.e. BMI > (24.99) and these are from the age of > 60 years. People in this age category do not engage fully in agricultural activities because they are old and not energetic to perform field works. Therefore, they do not exhaust their energy in a way of losing their body weight.

Further, results show that 12.5% of the respondents in the age category above 60 years were under weight. This implies that old aged individuals tend to emaciate not because of too much work but the physiology of the body at older age is accompanied by a low rate of fat deposition. However, statistical Chi-square tests $(x^2 = 26.681\ df = 23,$ show that there is no significant relationship between age and BMI at $p = 0.256)$. The results contradict those obtained by Barker *et al.* (2006) in India which reported that young women had a significantly lower BMI than their male peers.

Table 14: Nutritional status with age of respondents

	Age group of the respondents				Total
Nutritional status	**< 30**	**30-45**	**46-60**	**> 60**	**(%)**
Under weight	8.0	3.3	3.6	12.5	4.4
Normal weight	56.0	60.4	53.6	50.0	57.2
Over weight	28.0	29.7	28.6	37.5	29.4
Obese	8.0	6.6	14.3	0.0	8.9

4.8.2 Nutritional status with marital status of respondents

Marital status has an influence in variation of nutritional status of an individual. Married woman can be household food secured and nutritionally better than a single, widow or divorced. Results from Table 16 show that more than half (57.2%) of the respondents have normal

body weight out of which 60% were females from married couples. Further, 29.4% were overweight, out of which more than half (52.4%) of overweight were divorces/separated. However, 4.4% of the respondents were under weight and most of them were from married couple. Moreover, results show that there is no obesity in widowed individual 0.0%. The implication of these results is that marital status have influence on the variation of nutritional health status of an individual because married couples were under weight (5.9%), normal (60.0%), over weight (25.2%), and obese 8.9%. This concurs with the study by Barker *et al.* (2006) which revealed that being married into a farming family is an important factor in determining the thinness of a woman.

Table 15: Nutritional status with marital status of respondents

Nutritional status	Single	Married	Widowed	Divorced/separated	Total (%)
Under weight	0.0	5.9	0.0	0.0	4.4
Normal weight	52.9	60.0	57.1	42.9	57.2
Over weight	29.4	25.2	42.9	52.4	29.4
Obese	17.6	8.9	0.0	4.8	8.9

4.8.3 Nutritional status with level of education of respondents

It was expected that the higher the level of education the higher the BMI. The results in Table 17 show that 57.2% of the respondents had normal body weight (BMI<25) out of which (69.7%) did not attend formal education. Moreover, 29.4% were overweight (BMI> 25) out of which 18.2% did not attend formal education. This implies that there is no association between the number of years of school attendance and their BMI. The results are contrary to the report by Ene-Obong *et al.* (2001) from Nigeria which revealed that education influences

the health and nutritional status of rural women because more educated women had higher incomes.

The report by Maddah *et al*. (2003) stated that women with a higher level of education showed a significantly lower mean BMI than less educated women while more educated men had a higher mean BMI than that of less educated men. These findings are also confirmed by Van Lenthe *et al*. (2000) where it is reported that there was a consistent inverse association between education and BMI in women in developed countries. However, their report further shows that illiterate Indian women have a lower prevalence of obesity (5.1%) and a higher prevalence of thinness (24.3%) compared to a prevalence of obesity (11.1%) in Americans. Furthermore, the report by Van Lenthe *et al*. (2000) shows that Indian men have a very low prevalence of obesity overall although prevalence was highest (3.6%) in graduate men.

Table 16: Nutritional status with level of education of respondents

Nutritional status	Level of education (%)				
	Non formal school	Std i-iv	Std vii	Secondary	Total
Under weight	9.1	15.4	2.0	3.1	4.4
Normal weight	69.7	53.8	54.9	53.1	57.2
Over weight	18.2	30.8	32.4	31.2	29.4
Obese	3.0	0.0	10.8	12.5	8.9

4.9 Food Habit

4.9.1 Food ingredients and distribution within the family

Food ingredients and meal distribution within the family have a profound influence on the individual's nutritional health status. Usually in many parts of Tanzania, women take their meals after men have done throughout their lives (Hyder *et al.*, 2005). According to Mandal *et al*. (2002) each tribal population has its unique food habits. Results in Table 18 show that majority (79.4%) of the respondents reported that the food is saved on a separate plate and few (12.2%) of them reported that

children eat first before other members of the family. The reason pointed out for eating food on separate plate was that most male used to come late during the time of meal and also some beliefs restricted male to sit and eat together with their family members especially women. Saving food in a separate plate causes unequal food distribution among members. Many studies have confirmed the fact of inequality of intra-household food distribution between genders.

For example, Hyder *et al.* (2005) in their studies of Tanzanian and Kenyan women; found unequal pattern of food distribution between genders within the household from childhood through adulthood. Men are being favoured than women themselves and their children. This is contrary to the study in Sudani where Sudanese eat from the common dish and share the available food together (Ibnouf, 2009). Furthermore, in Nigeria the middle aged female farmers reported that "if a man is not around, his share must never be given out to anybody" (Ene-Obong *et al.*, 2001). Therefore, this unequal pattern of food distribution between genders within the household from childhood through adulthood may have long-term nutritional and health implications for women and female children.

Table 17: Respondents' food distribution in the family

Food distribution	Frequency	Percent
Men and boys first then women and girls eat the remainder	2	1.1
Adult men and women eat first then children	4	2.2
The food is saved on a separate plate	143	79.4
Children eat first	22	12.2
Don't have family	9	5.0
Total	180	100.0

4.9.2 Number of meals taken by the respondents per day

Number of meals taken per day by an individual contributes to his/her nutritional status. The assumption was that the more the number of meals taken by the respondents, the higher the BMI. Results in Table 19 proves this assumption that the majority (77.2%) of the respondents took three meals per day out of which 45.0% had normal body weight (BMI=18.5-24.9), while 22.2% of the respondents who took three meals per day were overweight.

The results also show that only 3.3% of the respondents who had three meals per day were underweight. Generally, the implication of these results is that the more the number of meals taken per day by the respondents, the good the nutritional status (BMI>18.5) as evidenced by the majority. This concurs with the comments by Wandel and Holmboe-Ortessen (1992) who noted that the number of meals taken per day is a useful indicator of nutritional status. Some of the factors that can influence the number of meals taken per day include food availability, type of diet, and time to prepare and eat the meal. It was observed in the study area that women have enough time to prepare their meals where the average time spent in the field by both female and male is 4.6 hours and the maximum time is 7.2 hours. Furthermore, it was observed that the type of diet that is usually taken by the respondent was composed of legume and starch foods which contributed to their nutritional health status.

However, the results contradict with other researcher's findings for example, reports by Holmboe-Ottesen *et al.* (1992) and Hyder *et al.* (2005) revealed that women spend much time in the farm as a results they skip meals. This situation also confirmed by Nti, *et al*. (2001) in Ghana that 70% of the women farmers interviewed had only two meals in a day. The reasons attributed to lack of time, the need to leave home early and too much involvement in work.

Table 18: Number of meals taken by the respondents per day

Nutritional status	Number of meals per day (%)				
	Once	Two times	Three times	Four times	Total
Under weight	0.0	1.1	3.3	0.0	4.4
Normal body weight	0.6	11.1	45.0	0.6	57.2
Over weight	0.0	5.6	22.2	1.7	29.4
Obese	0.0	2.2	6.7	0.0	8.9
Total	0.6	20.0	77.2	2.2	100.0

4.10 Women's Work Load and Household Responsibilities

4.10.1 Fuel used in cooking and distance to the source

This study assumes that nutritional status of women can be affected by having more burdens on the farm and domestic responsibilities. However, results in Table 20 show that majority (72.2%) of female used firewood, out of which 58.8% obtained firewood by collecting from the forest. It was also observed that 14.4% of female used charcoal and only 11.2% used both firewood and charcoal. However, few (2.2%) used firewood, charcoal or kerosene depending on the type of food cooked. The results imply that the major source of fuel used in cooking by the majority (72.2%) of women in the study area was firewood. Even though females were the main agricultural player in the study areas, they spent more time in collecting fire wood. This has also been demonstrated by FAO (1995) in which it was noted that 90% of women in SSA are responsible for the household water and firewood collection. According to Fonjong (2004) women carry out their entire triple roles manually and suffer from energy exhaustion. For example Table 13 shows that women cook using fuel wood, which has been carried over long distances (cooking with such wood can be a drudging task in the rain seasons).

Table 19: Fuel used in cooking and distance to the source

Type of fuel	Distance				
	<1 Km	1 to 2 Km	3 to 4 Km	Bought	Total
Fire wood	17.9	50.7	19.4	11..9	100.0
Charcoal	0.0	0.0	0.0	0.0	100.0
Fire wood and charcoal	20.0	40.0	10.0	30.0	100.0
Fire wood, charcoal and kerosene	0.0	50.0	50.0	0.0	100.0

4.10.2 The effect of distance of water source to nutritional status

Results in Table 21 show majority (70%) of the respondents walk a distance of less than a kilometre to and from the source of water out of which (1.2%) were underweight and (33.8%) had normal weight. The results also show that out of a total of 30% respondents who travelled between 1 and 2 km (5%) were underweight and (18.8%) had normal weight. The statistical Chi-square test shows that there is significant relationship $(x^2 = 0.028 df = 3, p = 0.05)$ between distance to the source of water and nutritional status of the respondents. The results imply that the long distance to the water source increases women's work load and energy utilization eventually reduce their body weight. The longer the distance to the source of water the more time and energy is spent by women. The results concur with the study in Northwest Cameron by Fonchingong, (1999) which reported that women work longer hours than men, they are overburdened and this could result in negative health from stress, physical deterioration and nutritional deficiencies.

Table 20: The effect of distance of water source to nutritional status

	Nutritional Health Status (%)				
Distance	**Under weight**	**Normal weight**	**Over weight**	**Obese**	**Total**
less than a Km	1.2	33.8	25.0	10.0	70.0
1 to 2 Km	5.0	18.8	5.0	1.2	30.0
Total	**6.2**	**52.5**	**30.0**	**11.2**	**100.0**

4.10.3 Involvement of helper in domestic work

Participation of family members in domestic work is explained in Table 22. Females were asked if they had helpers in their households; the results showed that 23.3% of

interviewed females involved themselves in domestic activities. About 19.4% of females were helped by their older children, and few (4.4%) of the females interviewed were assisted by their husbands. Further, results also showed that very few (0.6%) of interviewed women were helped by their housemaid. This implies that most of the domestic works were done by female themselves as mothers. A similar report by Thresia (2004) in India reported that nearly 70% of the women interviewed did not get any help from their men in the discharge of domestic responsibilities such as cooking, fetching water, washing clothes, cleaning floors or caring of children.

Table 21: Involvement of helper in domestic work

Responsible person	Frequency	Percent
Older children	35	19.4
Husband	8	4.4
House maid	1	0.6
Myself	42	23.3
Older children and husband	4	2.2
Total	90	100.0

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Overview

Agriculture is a major source of income for the majority of rural people in developing countries. In many Tanzanian societies including Babati District women are the main players of ensuring household food security. In doing so, they face many nutritional health consequences. This study has shed more light on the relationship between women farmers in agricultural production and their nutritional health status.

5.1.1 Major findings of the study

It was expected that agricultural production a role played mostly by rural women affects their BMI. Results from the study area, however, contradict with the assumption by showing that more than half (57.2%) of the total respondents had normal body weight (BMI >18.5) of which male were the majority (32.2%). Further, the results show that only few (4.4%) of the respondents were underweight (BMI<18.5) of which there were more women (5.6%) than men. Results, however, show that there were more female (15.6%) overweight than male which contradicts with the assumption of the study.

Moreover, results show that majority (76.1%) of the respondents participate in all agricultural activities. Out of these (82.2%) were females and (70.0%) males. This implies that, female participated more

in all agricultural activities except the physically demanding farm activities such as bush clearing.

These findings concur with Holmboe–Ottersen *et al.* (1992) and Hayder *et al.* (2005) that, women are the main food producers and provide most of agricultural labour in most SSA.

It was also revealed that more than half (56.7%) of women spent five to seven hours in the farm while male spent two to four hours. The study also revealed that, the time spent in the field by the respondents did not affect their BMI. This might be due to the reason that where rice production is done under irrigation schemes in the study area women and male farmers spend equal time in the field as opposed to the casual labourers who are paid in cash after completing an agreed piece work. The other factor may be the education on gender issues provided by some NGOs and planners might have has created awareness in gender division of labour in the study area. This creates enough time for women farmers to prepare food and eating without skipping.

The study concludes that women participation in agricultural production has no negative impacts on their BMI. However, the reverse is true that agricultural production favours farmer's nutritional status basing on households food security as it is shown by more than half of the respondents

However, this study contradicts findings from many other study findings. For example, Holmboe-Ottersen *et al.* (1992) in Rukwa and Hayder *et al.* (2005) in Bagamoyo reported that women farmers as food producers skipped some of their meals due to agricultural activities which had a negative impact on their nutritional status.

5.2 Policy Implication and Recommendation

Based on the findings the followings are recommended to maintain nutritional status of women farmers.

1. Linking production goals with nutrition-related targets is something that agricultural planners and researchers are likely to be called upon to do more often.
2. Women must be empowered by enhancing their awareness, knowledge, skills and technology use efficiency so that agricultural production multiplies at a faster pace
3. Introduction of suitable tools for the operations demanding high energy to enhance human comfort, effectiveness, increase in production and quality life.
4. Introducing alternative sources of power such as solar power or stoves that use few fire woods.
5. It is also recommended that food allocation must take into account physical workload and the specific nutritional needs of each family member.

5.3 Area for Further Study/Research

The following studies could be carried out as a continuation of this study.

1. A study to determine nutritional status of women farmers in rural areas by using other anthropometric indicators such as mid upper

arm circumference, whist circumference, hip circumference and energy expenditure to investigate whether agricultural activities has a negative impact on nutritional status;

2. A study to determine seasonal variation on nutritional status of women farmers during the peak season of agriculture production and to compare with the nutritional status during off-season;

3. A comparative study on nutritional status of women farmers in rural areas and women in urban areas engaging in petty business.

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APPENDICES

Appendix 1: Questionnaire for women and men practicing in agriculture

Please give correct answer to the following questions

1.0 GENERAL INFORMATION

Respondent serial number……..Date……
Name of respondent……..
District……...Division……..
Ward……..Village……

1.1 Demographic and socioeconomic characteristics

Age of the respondent…….

Sex of the respondent (check one)

1. Female
2. Male

Marital status (check one)

1. Single
2. Married
3. Widowed
4. Divorce/Separated

How many children do you have?.....

Are you the head of this household?

1. Yes……
2. No…….

What is the total number of years did you attend in school?.....

2.0 PARTICIPATION OF WOMEN AND MEN IN AGRICULTURAL ACTIVITIES IN THE STUDY AREA

How many acres of cultivated land do you own?

1. Less than 1 acre
2. 1-2 acre
3. 3-4 acre
4. above 4 acre

How far is located farm from home?

1. Less than 1 km
2. 1-2 km
3. 3-4 km
4. Above 4 km

How do you reach there?

1. Walking
2. Bicycle
3. Bus
4. Ox-cart
5. Others (specify)

If it is by walking how many minutes/hours do you take to reach there?

1. Less than 30 minutes
2. 30 minutes-1 hour
3. 2 hours-3 hours
4. More than 3 hours

Do you cultivate all of your area?

1. Yes
2. No

If no why do you not cultivate the rest of the land?

1. Labour shortage
2. Low capital
3. Low fertility
4. Low technology
5. Others (specify)……

What type of agricultural activities do you usually practice?

1. Land clearing
2. Ploughing
3. Sowing
4. Weeding
5. Harvesting
6. Threshing
7. Transporting
8. All of the above

What time do you spend in each one of it?

1. Land clearing……..(hours)
2. Ploughing……(hours)
3. Sowing……(hours)
4. Weeding…….(hours)
5. Harvesting……..(hours)
6. Threshing……(hours)
7. Transporting……(hours)

When do you harvest?

Crop	**Month**
1. Maize	……
2. Rice	……
3. Sorghum	……
4. Sunflower	……
5. Pigeon peas	…….
6. Others (specify)	…….

What are the main food crops for home consumption? (List in order of importance)

1. Maize
2. Rice
3. Sorghum
4. Cassava
5. Banana plantain
6. Yams
7. Sweet potatoes
8. Others (specify) ……

What are the main non-food do you produce?

1. Cotton
2. Sesame
3. Sunflower
4. Coffee
5. Others (specify) ……

How much food did you produce this year? (Bag of 100kgs)

1. Maize
2. Rice
3. Sorghum
4. Others (specify) ……

Did you sell some of your food produce this year?

1. Yes
2. No

If yes why did you sell some of your food crop?

1. To obtain cash
2. Surplus
3. Lack of storage facilities
4. Unable to keep crops due to pests

Do you use fertilizer?

1. Yes
2. No

If no why?

1. Costly
2. Not available
3. Beliefs and taboos
4. Others (specify) ……

What type of tools do you use in agricultural activities?

1. Hand hoe
2. Oxen
3. Power tiller
4. Tractor

3.0 PHYSICAL CHARACTERISTICS OF THE RESPONDENTS BY ANTHROPOMETRIC MEASUREMENT

1. Age…….(Years),
2. Weight……(Kgs),
3. Height…….(cm)

4.0 FOOD HABIT

What is the main source of your dairy food?

1. Own produce
2. Purchase from the market
3. Gathering from the wild
4. Own produce and purchase from the market
5. Others (specify) ……

Who usually prepare meals for the household?

1. Myself
2. Husband
3. Home maid
4. Children
5. Others (specify) ……

What are the main ingredients of your daily family meals?

1. Only starch food
2. Legumes and starch foods
3. Vegetables and starch foods
4. Animal protein foods and starch foods
5. Others (specify) ……

Is your family sit and eat together in the same pot?

1. Yes
2. No

If no who eats separately?

1. Father (why)
2. Mother (why)
3. Children (why)
4. Others (specify) and why

How is food distributed in the family?

1. Men and boys eat first then women and girls eat the remainder
2. Adult men and women eat first then children
3. The food is served on the separate plate.
4. Children eat first.

Before you go to the field do you take any meal?

1. Yes……
2. No…….

If yes what type of food ingredient do you eat?

1. Only starch food
2. Legumes and starch foods
3. Vegetables and starch foods
4. Animal protein foods and starch foods
5. Others (specify) ……

If no why? Explain……..……

Do you carry the food in the field?

1. Yes
2. No

If no why? Explain…….……..

How many times per day do you take your food?

1. Once per day
2. 2 times per day
3. 3 times per day
4. 4 times per day
5. Above 4 times per day

Do you keep animals?

1. Yes
2. No

If yes what type of animals do you keep?

1. Cattle
2. Goat
3. Sheep
4. Chicken
5. Rabbit
6. Pig
7. Cattle and goat
8. Cattle and sheep

If you do keep animals do you take as food?

1. Yes
2. No

If yes, how frequent does your household has the habit of slaughtering animals for home consumption?

1. Every week
2. Every month
3. After three months
4. After six months
5. After one year
6. Others (specify) ……

5.0 INCIDENCE OF DISEASES IN RELATION TO NUTRITIONAL HEALTH STATUS

How many times did you fall sick in the past one month?

1. Once
2. Twice
3. Three times
4. More than three times

Where do you get treatment when you are sick?

1. Hospital/Dispensary/MCH clinic
2. Traditional doctor
3. Self treatment based on traditional knowledge
4. Others (specify) ……

For what illness?

1. Fever
2. Anaemia
3. Malaria
4. Diarrhoea
5. Others (specify) ……

Were you admitted?

1. Yes
2. No

If yes for how long?.....

Appendix 2: Questions for women only

1.0 WOMEN WORK LOAD

Who helps you with the household work?
1. Older children
2. Husband
3. Housemaid
4. Myself
5. Others (specify) ……

What type of fuel do you use for cooking?
1. Fuel wood
2. Charcoal
3. Kerosene
4. Electricity
5. Gas

If fuel woods how do you get it?
1. It is bought
2. It is collected

If collected how far you do have to walk to collect it?
1. Less than 1 km
2. 1-2 km
3. 3-4 km
4. More than 4 km

Who in the household fetch water?
1. Myself
2. Husband
3. Children
5. Others (specify) ……

Where do you fetch water for domestic use?
1. Tap in the house
2. Tap near the house
3. Well/river in the far from home

How far from home to the source of water?
1. Less than 1 km
2. 1-2 km
3. 3-4 km
4. More than 4 km