THE COST OF ILLNESS ON AGRICULTURE PRODUCTION OF RURAL HOUSEHOLDS: THE CASE OF TEUKA VILLAGE, ZOMBA DISTRICT

Master of Arts (Economics) Thesis

By

LAURYN KUWALA KHANGAMWA
BSoc. Sc. (University of Malawi)

Submitted in partial fulfillment of the requirements for the degree of
Master of Arts in Economics

UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE
JUNE, 2010

DECLARATION

I the undersigned declare that this thesis is my original work and that it has not been submitted for any degree at this or any other University. The opinions expressed in the study are those of the researcher and do not represent the views of the supervisors and therefore errors made herein are mine alone. Where other researchers work has been used, due acknowledgements have been made.

Lauryn Kuwala Khangamwa

_____

Signature

_____

Date

CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval.

_____

Patrick Kambewa, Ph.D

First Supervisor

Date: _____

_____

Winford Masanjala, Ph.D

Second Supervisor

Date: _____

DEDICATION

I dedicate this work to my late dad Jim and my mom Dorothy who have inspired me to come this far by having confidence in me. Thanks dad for teaching me to believe in myself I cannot ask for more.

ACKNOWLEDGEMENTS

Let me say Ebenezer because I would not have made it this far without God's guidance. There are some people who deserve mention for the support and effort rendered to me during the thesis writing and the entire study period. My sincere thanks go to my supervisors Dr. Patrick Kambewa and Dr. Winford Masanjala for their support and guidance during the process of writing this thesis.

My gratitude goes to the Evidence for Development for the financial support. I especially thank Dr. Celia Petty and Dr. John Seaman whose comments helped to shape this work. I would also like to thank the team that did an amazing job in data collection, Kondwani Zimba, Stella Ngoleka and Lucky Mfungwe. Many thanks to my classmates, the lecturers and the rest of the staff at the Department of Economics.

In a special way I would like to thank my family for all kinds of support, motivation and encouragement. Your confidence in me has really carried me through. Last but not least my appreciation goes to my dear friend, partner and fiancé Pachisi Nyasulu for your love and care. You have been there for me in amazing ways and I truly appreciate, may God continue blessing you!

ABSTRACT

Following the severe morbidity burden in Malawi as evidenced by the World Health Organization in their yearly World Health Statistics, the study was aimed at assessing the cost of illness on agriculture production of rural households as the most reliable livelihood source for households in rural Zomba. The study used primary data and employed the Individual Household Method (IHM) in both data collection and analysis. The study had limited resources therefore purposive sampling was used in order to select Teuka village for its relatively small size. A census approach where each household in the village is interviewed was used in conducting the interviews.

Disposable incomes per adult equivalents were used as a measure of welfare and the impact of illness on welfare of households was analyzed. The results from the IHM indicate that illness imposed costs on agriculture production of rural households. The study specifically found that illness led to a decline in labor supply and productivity. Illness therefore motivated households with enough resources to hire-in labor in order to mitigate the impact of illness in agriculture production. However, illness led to land under-utilization and lost production for resource constrained households. Illness costs were found to be regressive on poor households. Overall illness affected the welfare of households by reducing a household's disposable income.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ADMARC	Agricultural Development and Marketing Corporation
AIDS	Acquired Immune Deficiency Syndrome
ARI	Acute Respiratory Infection
BLM	Banja La Mtsogolo
CHAM	Christian Health Association of Malawi
GDP	Gross Domestic Product
HIV	Human Immune Virus
IEC	Information Education and Communication
IHM	Individual Household Method
IHS	Integrated Household Survey
IMF	International Monetary Fund
LDC	Less Developed Countries
MACRO	Malawi AIDS Counseling and Resource Organization
MDGs	Millennium Development Goals
MDHS	Malawi Demographic and Health Survey
MGDS	Malawi Growth and Development Strategy
MNHP	Malawi National Health Policy
MoHP	Ministry of Health and Population
OECD	Organization for Economic Co-operation and Development
SAPs	Structural Adjustment Programs
SOLT	Standard of Living Threshold
STIs	Sexually Transmitted Infections
TB	Tuberculosis

TBAs	Traditional Birth Attendants
TIP	Targeted Input Program
VCT	Voluntary Counseling and Testing
WHS	World Health Statistics
WHO	World Health Organization

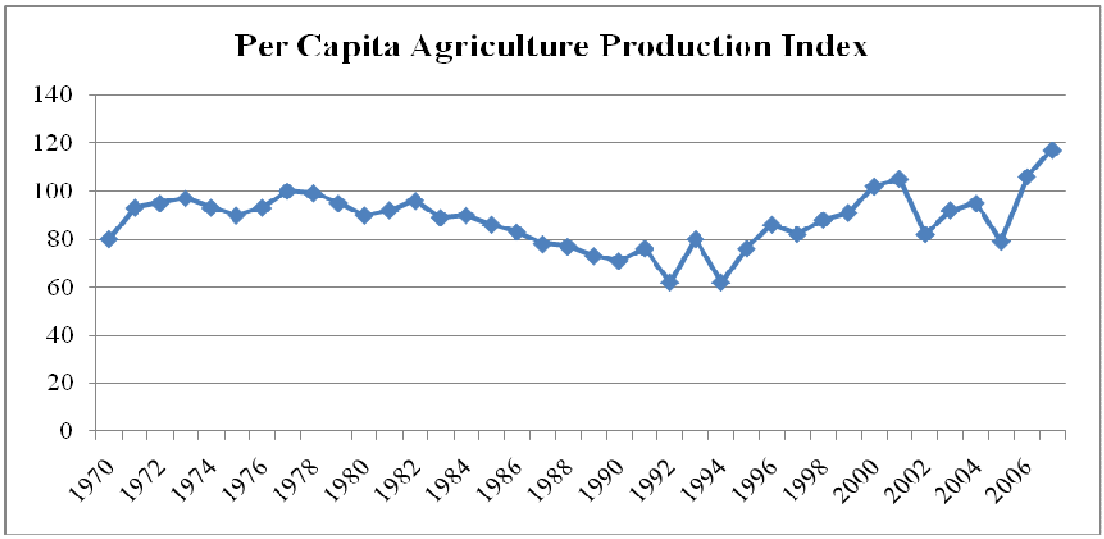
CHAPTER ONE

INTRODUCTION

1.0 Background and Motivation

The Malawi economy is relatively small with GDP of about US$4.9 billion and per capita income of US$352 (IMF, 2009). The economy is dependent on a narrow base of economic activity that is concentrated in the agricultural sector. The agricultural sector contributes about one third of GDP and forms more than 80 percent of total exports (MEPD, 2007). This high dependence on agriculture makes the economy vulnerable to external shocks and droughts. Figure 1 below shows performance of the sector measured by agriculture production per capita index;

Figure 1.1: Per Capita Agricultural Production Index from 1970-2007



Source: FAOSTAT online statistical services

Note: Production index relative gives relative level of aggregate volume of agricultural production in each year in comparison with the base period 1999-2000

Figure 1 above shows that the agriculture performance of the sector has been quite volatile over the years. Agriculture production per capita index depicts a steadily declining pattern in the 80's, an oscillating pattern in the 90's and during the first half of the decade of 2000's and an upward trend from 2006. Pryor (1990) and Kandoole (1989) concluded that large farm strategies employed after Independence did not benefit majority of the smallholder population on account of widening income differentials. This is evidenced by poor performance of the sector in the 1970's and 80's as depicted by a fluctuating and steadily declining trend of per capita production index in that period.

Some researchers have shown that strategies employed soon after Independence favored large scale or estate farmers at the expense of small scale farmers and overall development of the sector (Kydd & Christiansen, 1982; Pryor, 1990; Harrigan, 2003). Furthermore, SAPs adopted in the 1980's aimed at removing structural rigidities did not improve the situation either (Kaluwa, 1989; Chirwa, 1999). Failure of the estate model and SAPs to achieve a broad-based improvement in living standards and the unlikelihood of achieving future success in this respect led the government to refocus its strategies in the sector from large scale farmers to small scale farmers from the 1990's.

Another problem faced by farmers in Malawi is inequitable distribution of land among farmers characterized by small landholdings for small holder farmers. Land holding estimates indicate that over half of Malawi's smallholder farmers have less than one hectare of cultivatable land (Malawi, 2002). The land holding situation has worsened over the years by depleted soils and high population increases estimated by intercensal growth rates of 2.8 percent (National Statistical Office, 2008) making increased production on the basis of extending cultivatable land impossible. This only leaves productivity increases as a basis for increasing agriculture production in Malawi. The broad objective of the agriculture sector has been to improve land and labor productivity

of both food and cash crops by smallholder farmers with heavy constraints (MGDS, 2006).

As a way of improving agriculture productivity in 2005 the government introduced fertilizer subsidy against opposition from donors and other development partners. However, this has proved to be successful in boosting agricultural growth and greatly contributed to the reversed trend in terms of performance of the sector and the economy at large. Analysis of the fertilizer subsidy program by Dorward et al. (2008) showed that the program has been broadly successful but there is still room for improvement in management in order to ensure better program outcomes and efficient use of government resources. It is worth noting that increased access to fertilizer through the subsidy program addresses land productivity issues but health which affects labor productivity remains an outstanding issue.

The MGDS which is the country's overarching mid-term development strategy recognizes the importance of health in economic growth and development. Theme three on Social Development stresses that the major sectors of agriculture and industry require an educated and healthy workforce to take on new challenges and achieve the objectives of the sectors. Hence the first sub-theme is on health, however, this subtheme also recognizes that Malawi's health situation based on the health indicators such as maternal mortality rate, child mortality rate, child and maternal malnutrition, life expectancy, access to health facilities have been very unsatisfactory. In addition, Malawi is considered to be one of the countries with the poorest health indicators in the region. The country has one of the highest populations to doctor ratio of about 50,000:1 and this is far too high and may also be a contributory factor to the poor health indicators.

Research has shown that there is a bi-directional relationship between health and economic performance both at the macro and micro level. Studies of the WHO European

Region show that increases in life expectancy (LE)[1] in countries are clearly matched by improved economic performance (Sauto-Arce, 2008). At the micro level, the health status of farmers is important in production because good health forms part of human capital. Good health and productive agriculture are important in the economy of any country. IFPRI (2008) found that good health and productive agriculture are both essential in the fight against poverty and these are interlinked.

Just as good health is important for economic growth and development, ill health commonly referred to as "illness or sickness" can have a negative impact on production, growth and development of an economy at large. Illness in any economy imposes economic costs both at the macro and micro levels. According to Schultz (1999), and, Strauss and Thomas (1998), there is a positive relationship between health and productivity of skilled and unskilled labor. Good health as related to labor output or better production organization can enhance farmers' income and economic growth.

The motivation to undertake this study stems from the fact that illness imposes costs on a household. Ngwira *et al.* (2001) found that a host of expenses incurred during illness reduces resources that can then be devoted to agriculture. The study simply identified the costs associated with illness but the costs were not measured per se. It is worth noting that illness costs vary from place to place, season to season and household to household depending on economic activities being undertaken and available resources.

Illness costs may be borne by an individual, household, health care provider and/or the economy in various forms. *Shepard et al.* (1991) points out that the effect of illness result in various cost components which can be categorized into direct costs, indirect costs and intangible costs. Intangible costs take into account things like pain, suffering and anxiety.

[1] LE at birth estimates the number of years one is expected to live. It is a measure of a country's population health status.

In measuring illness costs at the household level, this study only focused on direct and indirect costs while intangible costs were ignored because they are not costs in economic sense. Glenn *et al.* (1996) argues that economic costs are resources forgone and since psychosocial effects do not have resources per se they should simply be treated as negative benefits. In this study, direct costs refer to the household expenditure linked with seeking treatment including non-medical expenses such as transportation and special foods. Indirect costs refer to the opportunity cost of household productive labor time lost by patients and caregivers due to illness.

The operational definition of "illness" in this study is any infirmity or physical state of well-being which imposes costs on a household in monetary terms, labor supply and production. Illness is likely to lead to a decline in labor productivity, labor supply and money resources. These effects quantified will give a measurable cost of illness on agriculture production.

1.1 Statement of the problem

Illness incidences are pervasive in Malawi and have been found to affect resource allocation at the household level as well as at the community level (Peters et al, 2008; Ngwira *et al.*, 2001). Agricultural incomes have been found to be an important part of total household income in rural areas. Employment opportunities in rural areas are seasonal and unreliable. Whiteside (1999) found that casual labor (ganyu) the most common labor type in Malawi is the dominant coping strategy for most poor households in the hungry period. This shows that agriculture remains the most reliable livelihood source.

Despite the country's dependence on agriculture and poor health indicators, existing literature on ill health and economic activities does not measure the cost of illness on agriculture production. The bulk of the literature currently available is qualitative and

most of the studies specifically focused on the impact of HIV and AIDS. This study does not pay attention to a particular illness but considers all illness incidences. This is desirable because focusing on a particular illness obscures the important implications that other illnesses may have on the welfare of a household. Gouge *et al.* (2009) found that illness-related impoverishment can result both from direct consequences of having to pay for health services, as well as the indirect effects of illness and health expenditure on household productive activities and livelihood sources. Therefore, the main purpose of the study is to measure the cost of illness on agriculture production of rural households in Zomba district. The purported cost of illness on agriculture production is not well established in Malawi. The results from this study will therefore fill the existing literature gap. In addition, the study will make a methodological contribution to overall literature on illness and production studies.

1.2 Objectives of the Study

The general objective of the study is to estimate the cost of ill health on agriculture production at household level. In order to achieve this, the following specific research objectives were formulated;

i. To estimate direct and indirect costs of illness on agriculture production
ii. To find out if illness affects land utilization in agriculture production
iii. To find the impact of illness on household income

1.3 Hypotheses

Based on the objectives of the study, the paper examined the following hypotheses:

i. Illness does not impose costs on households in agriculture production
ii. Illness does not affect land utilization in agriculture production
iii. Illness does not impact household income

1.4 Justification of study

Health is at the core of the Millennium Development Goals, working through the contribution of improved health to poverty reduction as well as through the direct health and disease control targets. The Malawi Growth and Development Strategy (MGDS) is the country's medium term strategy (2006-2011) which is aligned to the attainment of the MDGs. The mid-term evaluation of attainment of MDGs in the health sector shows that Malawi like most developing countries will not be able to achieve some of its set targets.

Despite the poor health indicators the importance of good health as a form of human capital cannot be overemphasized. The poor health status of people in an agro-based economy creates the need to assess the cost of illness on agriculture production at the micro level. The study is worth undertaking because the methodology used in this study is new to illness cost studies. Furthermore, the measurement of income used by this methodology is different from the conventional income measures used in most income related studies which use expenditure or consumption data. Finally, no study measuring and analyzing the cost of illness on agriculture production has been done in the study area.

1.5 Organization of the Study

The rest of the paper is organized as follows: Chapter two gives the background of the study by showing the importance of the agriculture sector to the economy and an overview of the health sector. The chapter goes further to contextualize the study area. Chapter three reviews both theoretical and empirical literature on the relationship and any existing links between health and economic activities. Chapter four presents the methodology employed by this study. Chapter five discusses the findings/results and finally chapter six makes a conclusion of the paper and policy recommendations based on the research findings.

CHAPTER TWO

IMPORTANCE OF THE AGRICULTURE SECTOR AND OVERVIEW OF THE HEALTH SECTOR IN MALAWI

2.0 Introduction

2.1 Importance and Performance of the Agriculture sector

The Malawi economy largely depends on agriculture. The sector contributes more than one third of GDP and below is a summary of selected sectoral contributions to GDP from 1973 to 2009.

Table 2.1: Summary of Sectoral Contributions to GDP (%)

	PERIOD			
SECTOR	**1973-1979**	**1980-1989**	**1990-1999**	**2000-2009**
Agriculture, forestry and fishing	44.7	36.6	36	34
Manufacturing	11.9	12.3	13	9
Utilities	1.4	2	2.4	1.4
Construction	5.1	4.5	3.7	3.9
Distribution	13.9	13	13.9	.
Wholesale and retail trade	12.3	.	.	13.8
Transportation and storage	6.4	6.1	5.2	3.7
Financial and Insurance services	6.2	6.2	6.9	6.4
Real estate activities	4	4.3	3.8	3.8

Source: RBM annual reports (1978, 1987, 1997, 2001 and 2009)

Note: the dots under Wholesale and retail trade sector, and Distribution sector indicate missing data.

The agriculture sector's contribution to GDP has been declining over the years but the it remains the most important sector contributing more than 30 percent to GDP. It is important to note that out of the contribution made by the Agriculture, forestry and fishery sector crop production makes up more than 90 percent. The manufacturing sector has received a lot of attention over the years but its importance based on the sector's contribution to GDP has been declining from about 13 percent in the 1990's to about 9 percent between 2000 and 2009. However, sectors of mining and quarrying, information and communication, and financial and insurance services are becoming important to the economy. Evidently, agriculture remains the most important sector and the most reliable livelihood source for majority of Malawians.

2.2 Overview of the Health Sector in Malawi

2.2.1 Health Indicators

Health indicators are important in any country because they give a reflection of the health status of a country's population and performance of the health sector as a whole. Malawi is considered to be one of countries with the poorest health indicators in the region. The WHO (2009) estimates the life expectancy (LE) at birth and the healthy life expectancy (HALE)[2] at birth at 50 and 44 years below the regional estimates of 52 and 45 years respectively. Infant and child mortality[3] is estimated at 145 per 1000 live births and 19 per 1000 live births respectively. Maternal mortality is estimated at 1100 per 100,000 live births above the regional average of 900 per 100,000 and adult mortality is at 544 per 1000 population higher than the regional average of 401 per 1000 population. It is also striking to note that 87 percent of years of life are lost to communicable diseases.

2.2.2 The Structure of the Health Sector

The Health sector in Malawi is organized around activities of the Ministry of Health that has the overall responsibility of developing policies, planning strategies and programs for

[2] HALE estimates the number of years a person is expected to live in good health
[3] Mortality is expressed as the probability of dying per 1000 population

health care. Health service providers both private and public are classified into formal and informal sectors. Within the formal or modern health sector there are three main categories of health service providers namely; the public sector, non-profit private sector and the private-for-profit sector.

The public sector has health facilities provided by the MoH as the main provider. The Ministry of Local Government and other agencies such as the Army, Industries and Estates provide curative and preventive health services in varying degrees of scope and sophistication. Under the non-profit private sector are Christian Hospitals Association of Malawi (CHAM) hospitals. CHAM is made up of independent church related and other private voluntary agency facilities. The government assists CHAM by providing it with annual grants that covers local staff salaries. CHAM facilities charge user fees for treatment with the exception of growth, monitoring, immunization and community based preventive services including treatment of specific communicable diseases such as Tuberculosis (TB), Sexually Transmitted Infections (STI's) and leprosy.

The informal sector has two main categories: Traditional healers and Traditional Birth Attendants (TBAs). TBAs had links with the formal sector who trained them in order to provide support to the MoHP as part of the Ministry's strategy of primary healthcare since 1992 (Malawi Government, 2001). It is worth noting that from 2007 activities of the TBAs were banned because they are considered to be one of the reasons for escalating maternal mortality. However, this is against the background of insufficient nurses. Statistics have shown that only 54 percent of births are attended by skilled health personnel (WHO, 2009). This raises issue for concern on the implication the ban may have on mortality levels.

2.2.3 The Health System and Access to Health Care Services

The health infrastructure consists of dispensaries and clinics; health centers; and community, district, and central hospitals, which are linked by a referral system. The health system in Malawi follows the health system pyramid. Based on this system, a typical national health system can be classified into 3 categories based on sophistication and complexity of health services or medical technology such as primary, secondary and tertiary services. WHO (2003) stresses that with this system much care should be provided at the primary level or the bottom of the pyramid.

At the apex are the Central hospitals and at the base are clinics and basic health units which provide basic primary care. In between the two are district facilities which are designed as referrals. Services at the district hospitals include both out-patient and in-patient care with limited surgery. District hospitals and health units at the base form the "District Health System". Access to health care services in rural areas remains low with 85 percent of the rural population living within a 10-kilometre radius. However, the MoHP would prefer to have every community living within a 5 kilometer radius to a health facility. The long distance to health facilities in rural areas negatively affects access to these facilities. Financial accessibility to services is also a problem, especially at CHAM facilities (which account for 30 percent of health service delivery), where patients are charged user fees.

2.3 The Study Area (Teuka Village) in Context

The survey was conducted in Teuka village in Zomba district. Zomba district has a population of about 670, 533 out of which 87 percent is rural and 13 percent is urban (National Statistical Office, 2008). The economy of Zomba District is dominated by agriculture with maize production accounting for the major economic activity and tobacco as the main cash crop. According to the World Fish Centre, Zomba is said to be one of the districts with well spread fish pond farming. There are about 2600 farmers

involved in aquaculture operating more than 5000 ponds and producing as much as 757 tonnes of fish annually.

In Teuka village, agriculture is the major economic activity among people in the study population and about 15 percent of the population is involved in fish farming. Each and every household was involved in crop farming with maize as the dominant crop. Other crops cultivated were rice, cassava, sorghum, beans, tomatoes, pumpkins, peas, vegetables and sugarcane. About 68 percent of the households were involved in rice farming. Out of the households in the study population, 32 percent were involved in irrigation farming mostly used for planting a second maize crop. People in this area use the gravity type of irrigation. About 95 percent cultivated in low lying areas (dimba) where they mostly cultivate rice, vegetables, sugarcanes and maize. Following this about 21 percent of the households had three maize harvests while 69 percent had two harvests and only 10 percent of the households had one harvest in the reference year. However, crops cultivated varied from household to household depending on availability of resources and a household's dependence on agriculture.

Health care delivery in Zomba District follows the district level referral type. The people in Teuka village live within a 10 km radius of a public health facility. The nearest public health centre in this area is called Mmambo health centre. This health centre is located 10 km to Chingale turn-off ward. There is also a CHAM clinic called Nkasala health clinic located 5 km to Chinseu ward. Clearly the CHAM health clinic which charges user fees is closer to the village compared to the public health centre. In addition to the health facilities specified, there is a Traditional healer who was also a practicing birth attendant. Therefore, people in the village have access to both modern health services and traditional health services. It is worth noting at this point that the village is located 17 kilometers from Chingale turn-off along M3 road. Driving the 17 kilometer distance from

Chingale turn-off to the village used to take about 40-60 minutes because of the condition of the road (see figures 2.1 below).

Figure 2.1: State of the road to village from Chingale turn-off

2.3.1 Access to Social Services

2.3.1.1 Access to markets

It is important to note that there is no public transportation on this road and the main transport used by people in this area is bicycles. Most of the people that own bicycles in this area use them for business by hiring out the bicycles. However, hiring a bicycle for a 17 km distance from the turn-off to the village cost about MK500 - MK750[4]. The people in the area considered the transport costs to be high and further said that these have a negative effect on market access by the farmers. In most cases, producers in the area wait for middlemen to go to buy directly from them yet these middlemen are also accused of exploiting them. Otherwise, majority of the people simply sell their produce at the nearest local market. Consequently, people in the area do not have control over the market for their produce and therefore, end up being price takers to external buyers.

2.3.1.2 Access to health facilities

In this area, access to public health services was affected by the poor condition of the road and lack of public transportation which scales up transport costs. Bicycle hire from the village to the public health facility cost about MK700 per a return trip compared to MK200 to MK300 for a return trip to the CHAM health centre. The CHAM health centre charges user fees ranging from MK100 to MK1000 for most out-patient cases depending on illness. The health facility also provides some in-patient care for minor cases.

In order to increase access to health services, government ensures that public health services are provided free of user charges. The high transport costs and user fees charged at the nearest CHAM health facility may have an impact on both physical and economic access to health services by people in the area. Consequently, the high costs incurred in accessing health services may affect the amount of resources that households assign to agriculture production.

[4] The prevailing exchange rate for the period was MK140 to $1

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

Achieving growth in agricultural production and food security at the household level is crucial for a developing country like Malawi in the face of high population increases, depleted soils and the high disease burden worsened by the HIV and AIDS epidemic that reduces labor supply. Investigating food security at household level is particularly important because even when countries achieve national food self sufficiency, due to market and entitlement problems, national food self sufficiency hardly translates into household food self sufficiency. One source of variation in food production and self sufficiency is illness which causes people to miss work, reduces their productivity and eventually total production. This section reviews both the theoretical and empirical literature that explores the impact of ill-health on economic activities. Theoretical literature provides a household modeling framework and an understanding of health as a source of human capital. The empirical literature, on the other hand, provides findings based on appropriate modeling framework and theory around the area of interest.

3.1 Theoretical literature

3.1.1 Rural Households and Household Modeling

Two issues have held sway in the debate about the impact of diverse socio-economic or demographic variables on agricultural production in a subsistence setting. The first is how to define a household and the second is how to model household production. Regarding the first, a household can be defined based on either its membership composition or the role that it plays. The Malawi National Statistical Office (NSO, 2004) defined a household based on membership as a person or group of persons related or unrelated who live together and make common arrangements for food, or who pool their

income for the purpose of purchasing food. However, a household is not synonymous to a family because a family only includes biologically related members. Definition of a household in a rural setting based on the role it plays brings in the concept of peasants. Schuren (2003) showed that earlier definitions of peasants considered them as rural cultivators whose most important source of livelihood was subsistence agriculture understood as production for self consumption. Ellis (1993) builds on this view by recognizing the labor allocation role that peasant households play. He therefore specifies that an agricultural household in LDCs makes three key decisions and these are: consumption, production and work or labor allocation.

Peasants have for a long time been viewed as sole agriculturalists, however, this view suffers from limitation where the identity of a social actor thus a household is reduced to only one or two economic activities. Kearney (1996) argues that this view disregards the existence of multiple economic activities e.g. petty trade, transportation and rural wage labor. He addresses this problem by recognizing that in the current globalized world the rural population combines different sources of income and develops complex forms of reproduction. He also recognizes the important role played by remittances in subsidizing rural livelihoods. Regardless of the various views of peasants Ellis (1993) argues that peasant households need to be looked at differently from other households because of the dual economic nature of their production.

Various peasant and farm household models have been developed but most of these models are a generalization or departure of the pioneering work of Chayanov in the 1920's who opened the stage on household modeling. The model focused on the subjective decision made by the household with respect to the amount of family labor to commit to farm production in order to satisfy its consumption needs. The main factor influencing the tradeoff between income and leisure is the demographic structure of the household. This factor is summarized by the ratio of consumers to workers called c/w

ratio. According to the Chayanov model, the total income of the family is a function only of the market price of output and the labor input. In this model, a farm household is required to meet its minimum acceptable standard of living. However, the Chayanov model is argued to have some very restrictive and unrealistic assumptions such as inexistence of labor markets and flexible access to land for cultivation. Some models have therefore been developed by relaxing some of these restrictive assumptions (Low, 1986; Becker, 1965; Barnum and Squire, 1979).

On the second issue, there are two main approaches to modeling household production: the unitary model and the collective model. The former household model assumes that households behave as individuals and employs the neo-classical paradigm of utility maximization. This paradigm aggregates individual preferences and the household is assumed to behave as a single individual. While such aggregation is convenient, Udry *et al.* (1995), argues that such restrictive assumptions may not be capable of investigating intra-household resource allocation and gender differences in agriculture.

In contrast, Chiappori (1992) proposes a 'collective' approach to modeling the family based on the cooperative bargaining approach. One assumption about the cooperative bargaining models of a household is that the allocation of resources is Pareto efficient, in addition to other assumptions such as a variety of sharing rules and threat points. Under this approach a household is considered to be a collection of individuals who behave as if in agreement on how best to combine time and goods to produce commodities that maximize some common welfare index. This approach also appreciates the complexity of household decision making and intra-household resource allocation. In another development, Browning and Chiappori (1994), builds on the collective approach and suggest that regardless of how conflict is resolved in the house, resource allocation is assumed to be Pareto efficient.

The appeal of the unitary model is the simplicity of comparative statics generated and the diversity of issues it can address. However, its theoretical foundations are weak and restrictive; its underlying assumptions are of questionable validity; it has not stood up well to empirical testing; and it ignores or obscures important policy issues. Generally, researchers argue that economists should regard households as collective rather than unitary entities. Chirwa (2003) argues that the collective approach is more relevant in analyzing smallholder agriculture production in Malawi for two reasons. First, smallholder agriculture in Malawi has become more fragmented with the growing population and there is tendency for households to own several plots in different areas. Thus plot level characteristics may be important in determining efficiency of production activities. Second, unitary household model is less appealing given the fact that the concept of the family is still strong.

The collective approach of modeling households is preferred in this study because of the intra-household resource allocation that it argues for, the Pareto efficiency assumed in resource allocation and its relevance in production. This approach allows for complex decision making and in this case allows the study to take into account household characteristics that affect resource allocation such as prevalence of illness or not. For instance, in the event of an illness household members agree on how best to allocate both time and goods in production activities in order to maximize the welfare of the whole household and not just a single individual. Illness depreciates the human capital that a household has and therefore may affect household welfare. However, in order to understand illness effects on agriculture production and welfare of households the study adopted the Grossman's Human Capital approach.

3.1.2 Understanding health as part of Human Capital: Grossman Model Applied

Grossman (1972) came up with the human capital theory which is very influential in understanding health as a form of capital in production. According to the human capital theory, increases in a person's stock of knowledge or human capital raises his productivity both in the market sector where he produces money earnings and in the non market or household sector where he produces commodities that enter his utility function. A fundamental aspect of the Grossman model is that health or healthy time provides utility not only directly but also indirectly since it is a critical input into many production processes.

Grossman views an individual as both producer and consumer of health. Health is valued both as consumption good and investment good. As an investment good, health is depreciated by ageing hence demand for health services increases with old age. As a consumption good, the return on the stock of health capital is spending less time in bad health. Sick days are generally a source of disutility. Increasing the health stock generally reduces amount of sick time. Hence in the event of illness households seek medical care in order to achieve a higher health stock for both direct and indirect benefits from good health. Spending on health may lead to having relatively fewer resources spent on productive activities.

The Grossman model can be used to identify an individual's labor supply as a function of health. The approach provides a modeling framework for analyzing the relationship between health and productivity at the micro and macro levels. As Grossman suggests, health is also an important aspect of human capital and an important input into market and non-market production at the individual level. Currie and Madrian (1999) showed that health is associated with wages and income because health has a high impact on the number of hours worked. At the aggregate level Bloom and Canning (2000) supported the notion that health affects productivity by identifying four pathways by which health

can affect productivity. Evidence of the historical impact of population health on labor productivity was also provided by Fogel (1994). It was further suggested that 21-47.5 percent of GDP growth per worker from the 1970's can be explained by improvements in the health population at the country level (Rivera & Currais, 1999a, 1999b; and Knowles & Owen, 1995).

Grossman (1972) showed that illness is a source of disutility and in the event of illness individuals seek medical care in order to achieve a higher health stock for both direct and indirect benefits. This shows that illness imposes costs both in time and financial resources on productive activities. The interest of the study therefore is to measure such costs as they relate to agriculture production at the household level in rural Zomba district and finally determine the impact of illness on household welfare. The section that follows provides empirical evidence on the relationship between ill health and labor supply and/or productivity in agriculture production and consequently its impact on welfare both at the micro and macro levels.

3.2 Empirical literature

Various studies have been conducted in order to find productivity effects of ill health and its impact on welfare both at the micro and macro levels. This section reviews some of these findings in order to get some empirical evidence so far both within Malawi and beyond. Findings presented are those of studies whose analysis was done at the macro and/or micro level. Macro level studies analyze the effects of morbidity at national level, such studies give an overview picture by taking into account inter-sectoral linkages and also allow for cross-country comparisons where similar measures have been used; while micro level studies usually take an individual or household as the unit of analysis.

3.2.1 Studies in Other Countries

Studies evaluating the cost or burden of illness on agriculture and other economic activities have generally found that illness imposes costs at the individual, household and national level. However, evidence (Wellor, 1958) suggests that countries in the poorest continent are most affected by malaria. Africa is in this category and it is highly impoverished. This section discusses some findings on the impact of ill health on economic activities in various countries.

Ill health is one of the major sources of inefficiency in agriculture production. For instance in Kainji Basin, Nigeria Ajan and Ugwu (2008) found that output of the farmers was affected not only by traditional input variables such as land, labor and capital (fertilizer, seed and insecticide) but equally by socioeconomic factors such as age, experience and health as well as a series of dummy variables such as sex, education, type of primary occupation. Land, labor and capital had positive elasticities while seed and insecticide were negative. Fertilizer had the largest impact on output of the farmer in the study; land and labor were not significant because access to these was not a problem in the study area. Health and education had a positive effect. Out of all the variables in the inefficiency model, health had the largest coefficient and was statistically significant at 5 percent.

Illness reduces the quality and quantity of labor supplied at the household level however, the impact of illness on households varies depending on the nature of economic activities being undertaken. Rice production is one of the activities that are highly labor intensive. Larochelle and Dalton (2006) found that in Mali the impact of illness on labor supply was greater on rice producing households than households that were not involved in rice production. The study revealed that a sick child would reduce family labor supply by 893 hours per cropping season suggesting that time was shifted toward caring for the sick as opposed to working. Similar illness episodes that occur to people who do not produce

rice reduce agriculture labor by 455 hours per agriculture season or about 109 hours per hectare. The study also found that the impact of illness on labor varies according to household composition. The average effect of one day of sickness increases with the value of the dependency ratio. The average indirect impact of illness remains greater than the direct impact as shown by 495 hours of indirect labor and 24 hours of direct labor lost to an illness incidence.

Ill health is also associated with households moving into poverty and decreases household assets. Evidence provided by Lawson (2004) shows that there was a direct link between ill health and poverty in Uganda. Findings showed that ill health was associated with households moving into poverty. Evidence suggest that disproportionate numbers of the chronically poor and those moving into poverty represented by 21 percent and 28.3 percent respectively are headed by individuals who were sick in 1992 compared to 15 percent of households moving out of poverty who were headed by sick individuals. The study further established that a combination of demographic, activity and asset based factors also appear to be associated with household's poverty status and are accentuated by sickness. Furthermore, the study found that asset decreases for all households headed by the sick were distinctly larger than the decreases for the non-sick households and suggest an accentuated depletion of assets during the process of immiseration.

Ill health also contributes to impoverishment. Russell (2004) found that although the poor in general spent relatively less on treatment than other income groups and the spending was a greater proportion of their income. Studies in Africa have found that indirect costs make up more than 75 percent of total malaria costs. Nearly all studies in Africa found that sick adults lost 1-5 days per malaria episode depending on severity. Indirect costs were quite significant for most countries with Burkina Faso registering the largest component at 69 percent of total costs and the time lost by healthy caregivers was almost

equal to the time lost by the sick. The costs of TB and HIV and AIDS were catastrophic for households incurring more than 10 percent of their income.

It has already been shown that illness has the potential to lead a household into impoverishment but some sort of protection against health shocks can help poor households mitigate its impact. In assessing the impact of health shocks on the poor and uninsured, Lindelow and Wagstaff (2005) found that worsening health shocks were associated with significant changes in income. The study specifically found that a large negative health shock reduced income by 12.4 percent and increases medical expenditure by 17.6 percent on average. Both effects serve to reduce income. There was a positive and significant effect on in-kind transfers from family and friends. This suggests that the poor benefit from some protection against income shocks associated with health events. However, the study made it clear that health insurance does not reduce expected out of pocket expenditure but the insured receive more and better care than the uninsured.

The above section has shown that illness reduces labor supply, household resources and the asset base. Generally, illness has a negative impact on economic activities both at the macro and micro levels. However, it is worthwhile to consider the burden of certain specific morbidity effects. Malaria for instance is pervasive in Sub Saharan Africa. Malaria mortality rate of 104 per 100, 000 people in Africa is the highest in the world. The toll of malaria on households and economies has been found to be quite significant on economies. Malaria has generally been found to reduce labor supply, production and accentuate costs borne by households. This section provides some evidence on the economic burden of malaria.

At the macro level, malaria reduces economic growth and it has been found that eliminating malaria improves the economic growth of such countries. A regional study by Gallup and Sachs (2001) found that most malarial countries are poor and certain

countries that managed to completely eliminate malaria in recent times have had more rapid growth than their neighbors. Controlling for other factors, countries with malaria had much lower economic growth amounting to 1.3 percent lower growth per year. Reductions in malaria over the 1965-1990 period in addition to malaria levels in 1965 are associated with higher economic growth. This corresponds to a 0.3 percent rise in annual economic growth for a 10 percent reduction in the malaria index. Over the 25 year period, the average reduction in the malaria index was 7 percent. However, the study was unable to evaluate the opportunity cost of lost opportunities of household members who help out a person with malaria.

It has already been shown by Gallup and Sachs (2001) that malaria reduces GDP growth at the macro level but the costs at the household level and institutional level are also significantly high. Asante and Asenso-Okyere (2003) employed both a macro and micro approach in estimating the cost of malaria in Ghana. The study verified the negative impact of malaria on real GDP growth in Ghana. The findings show that a percentage increase in malaria morbidity resulted in a decrease in real GDP growth of 0.41 percent. At the micro level the study found that; direct costs of illness represented 43.52 percent of total costs of malaria episode to the household. The indirect cost of illness represented 56.48 percent of the total cost of illness per malaria case. An average of 9.03 hours was lost by economically active patients per malaria case. The estimated cost of illness of a case of malaria to the household is equivalent to the value of output of 14 farm workdays on average. Malaria cost to public facilities in the study sample represented 48.5 percent of the total recurrent expenditure.

Malaria has also been found to reduce crop production and wage incomes at the micro level. Mwabu (2008) adopted a household level analysis where the economic burden was derived from estimates of crop production. The study found that for malaria affected households, their crop production fell by anywhere from 10-21 percent. Findings further

showed that malaria reduced wage incomes by 15-16 percent relative to other diseases whose effect has been normalized to zero in order to identify the effect of malaria. The toll of malaria on per capita income was nearly 40 percent, which is in the same order of magnitude as the losses reported in macro-economic literature.

It has generally been found that malaria leads to a reduction in labor productivity and supply, financial and material resources. Further evidence was provided by Olagoke (2008) on the economic burden of childhood malaria in Nigeria. The study found that malaria morbidity affects household welfare and decline in productivity through lost time. The study found that at the household level, malaria affects the productivity of two major assets and these are labor and land. Average expenditure per bout of malaria in a child within the household is well over ten percent of the individual household income.

HIV and AIDS has been found to claim lives of a lot of people particularly in Sub-Saharan Africa. The WHO (2009) shows that Africa has the highest HIV and AIDS mortality rate at 198 per 100, 000 people compared to rates below 15 per 100, 000 people in other developing country regions. Evaluating the burden of HIV and AIDS on economic activities therefore sheds more light on the burden of illnesses and this section focuses on this.

At the macro level, HIV and AIDS can reduce long term economic growth and therefore inflict significant welfare losses. Kambou *et al.* (1989) found that there are three interrelated mechanisms through which AIDS induced labor shortages affect the economy. First, the epidemic directly affects the capacity of the economy to produce by reducing quantity of labor inputs availability. Second, as the supply of labor falls wages and prices rise, leading to higher domestic costs of production which in turn cause the real exchange rate to appreciate. The result is a loss in external competitiveness reflected in lower exports, less production, employment and foreign exchange shortages. Finally,

Lower government revenues coupled with lower private savings cause the level of savings in the economy to decrease which translates into less investment and hence slower growth. In a nutshell, the AIDS shock adversely affects the economy.

Chronic illnesses such as HIV and AIDS have been found to affect labor supply, amount of resources committed to agriculture production and land utilization. Chaminuka *et al.* (2006) found that mean loss of hours per day by illness and death for AIDS affected households were significantly different from the non-affected household. An average of 7.30, 7.87 and 8.55 hours per day for death affected, illness affected and non-affected respectively. Overall, labor input differences were statistically significant at 1 percent level of significance. Mean value of purchased inputs were significantly different from the non-affected. Death affected and illness affected ones spent 45 percent and 60 percent less respectively on purchased agricultural inputs. Mean cultivated land area for the two proxy groups was also significantly different from the non-affected with the affected households utilizing less land than the non-affected households.

Illness reduces a worker's productivity and may ultimately reduce the value of an employee to his employer in case of chronic illnesses. In evaluating the effect of AIDS on labor productivity in Kenya Fox *et al.* (2004) found that relative to other tea pluckers, pluckers who ultimately go on to an AIDS related termination produce 30.5 percent less tea in their second year of life and 35.1 percent less tea in their last year. Tea pluckers who were terminated because of AIDS related causes suffered an earnings loss of 16 percent in their second to last year before termination and 17.7 percent in their last year of termination. Relative to other tea pluckers in the last 365 days on the job, a tea plucker who eventually dies of AIDS related condition has an absenteeism increase of 87 percent; an increase in light duty of 66 percent; a reduction of 17 percent in productivity. Each of these effects reduces the workers value to the employer.

The entire section above has shown the negative impact of illness on economic activities and clearly improvements in health indicators are associated by improvements in economic performance. Sauto-Arce (2008) found that in the WHO European region increases in life expectancy were clearly matched by improved economic performance. These studies further found that good health enhanced workers earnings and some health shocks increased the probability of retirement. Good health increased wages by 22 percent for women and 18 percent for men in Russian Federation. In Germany a 10 percent increase in health satisfaction enhanced women's hourly wages by approximately 0.14-0.47 percent and men's by about 0.09-0.88 percent. It was further found that Poor self reported health and limited activity affected the probability of being employed. People whose activities were limited in Georgia and Kazakhstan were 7 percent and 30 percent respectively less likely to participate in the labor market than those whose activities were not limited. Health shocks such as stroke, incident cancer and heart attack affect retirement age. In Denmark men were 8 percent likely to retire within 2 years after experiencing an acute health shock. In Estonia, chronic illnesses increased the probability of retirement in the following year by 6.4 percent and 5.6 percent for men and women respectively.

3.2.2 Studies in Malawi

Few studies have been conducted in Malawi on health and economy. However, the few studies that have been done have mainly focused on the effects of HIV and AIDS. Below is a summary discussion of these findings.

There is evidence that in Malawi illness has asymmetric impacts on poor and rich households. Peters *et al.* (2008) found that 50 percent of sampled households in Zomba district had at least one death certainly due to HIV and AIDS; and 29 percent of the sample households were taking care of orphans during 2006. About a quarter of adult deaths attributable to HIV and AIDS were of the principal couple. The immediate impact

of such death is often acute with reduced cultivation time and harvest, loss of other sources of income and rising costs, financial and others in caring for seriously sick and in organizing funerals. HIV and AIDS effects on better-off households lead to huge losses. These losses have broader implications because the better-off households are the producers of surplus maize, burley tobacco and other cash crops. Losses by better-off households mean that the demand for local goods declines. Hence, major losses among the better-off minority do not augur well for the poorer.

It has also been found that HIV and AIDS affect the demographic structure of a household and this has welfare implications. Petty and Seaman (2005), on the impact of HIV and AIDS on household economy in Salima District using the Individual Household Method (IHM) found that the epidemic leads to an increase in dependency ratios as the number of orphans increase and this worsens the poverty situation. However, the study could not gather detailed retrospective information on changes in individual household economy that would be needed to quantify the economic impact of HIV and AIDS.

It has been established that illness in general contributes to impoverishment and evidence in Malawi is in line with these findings. Ngwira *et al.* (2001) found that quantity of labor supplied in agriculture production is reduced as members of the afflicted household spend time looking after the sick and less time in agricultural pursuits. The sequence of responses to illness and death reduced production, shift to less demanding and remunerative enterprises, sale of assets, indebtedness results for many afflicted households in deepening impoverishment. In addition, in terms of economic activities, people afflicted by HIV and AIDS prefer to invest in short term enterprises such as petty trade rather than agriculture enterprises whose returns take longer to accrue.

HIV and AIDS also has the potential to affect household food insecurity. Mtika (2000) found that as illness and death become extensive households would be vulnerable to

AIDS related food insecurity. The study established that the incidences of illness and deaths in rural areas were high in all research areas. High levels of illness and death obviously stressed households and made it difficult for them to carry out their production activities efficiently. Despite the AIDS epidemic, the study found that the spread of illness and death was still at a level that households could contain its impact through reciprocal and distributive exchange of labor and food.

3.3 Overview of Literature Review

The collective approach provides a good theoretical household framework for analyzing costs of illness on agricultural household production because decisions about treatment and coping are based on negotiations within the household. Illness costs are incurred by caregivers as well as the sick and costs fall on the household budget and not just the individual. Empirically, both macro and micro studies have found that ill health of whatever type imposes costs on the economy and micro studies have also confirmed costs at household level due to illness. Overall, studies found that illness imposed costs both at the micro and macro level.

From the findings, indirect costs have been found to weigh heavily on households than direct costs. However, there are differences in how studies measure indirect costs of illness. A number of studies have had to make assumptions in measuring indirect costs which may lead to having misleading results. For instance, in order to measure indirect costs of malaria, Olagoke (2008) assumed that in the event of a malaria incidence visitation to a health facility coincides with periods of labor shortages within a household. This is unrealistic because we all know that illness incidences occur randomly and assuming that all illnesses only occurred in periods when labor demand was high is just wrong. Russell (2004) used market wage rates to value lost time to morbidity whereas Asante and Asenso-Okyere (2008) follows the same approach but did not only include

productive time lost to morbidity but also to mortality by considering potential years lost. These valuations poorly represent the data by ballooning costs in most cases.

The main problem that leads to making such assumptions is that most of the data used by these studies was not initially collected for the purpose served. Studies done in Malawi have mainly focused on morbidity and mortality effects of HIV and AIDS on households. However, the burden of the disease on agriculture has just been speculated than actually measured. This study therefore collected information on illness costs with respect to agriculture production at the household level. In order to correctly measure indirect costs households were asked to provide information on mitigation measures that were undertaken in the event of illness. This allowed the study to get the real opportunity cost of time spent in sickness.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter presents the methodology employed in order to measure the cost of illness on agriculture production at the household level. The study used primary data and this chapter presents the research design, sampling design, data collection, data measurement and data analysis method employed.

4.1 Research Design

The study employed the Individual Household Method (IHM) in order to estimate the cost of illness on crop production of rural households in Teuka Village in Zomba district. The model allows for a counter-factual analysis of the cost of illness on agriculture production. This was achieved by collecting illness specific costs on agriculture production and also by accounting for fertilizer use.

4.1.1 Sampling design

The study used non-probability sampling methods where the sampling method does not afford any basis for estimating that each item in the population has equal chance of being included in the sample. A village with 30-50 households was desirable because of the small budget for the study. Purposive sampling was therefore used to choose Teuka village. The village had 42 households and a sketch map was drawn showing each house by household name and a number assigned to each house for ease of identification when conducting household interviews. A census approach where each household in the village was interviewed was used in conducting the interviews.

The only problem which was encountered in village selection was getting a village of the desired size, most villages were too big with 200-400 households hence not feasible for the study. Out of the 42 households in the village one was cancelled because it was providing conflicting information due to unwillingness to participate in the study. Therefore, the study ended up with 41 households. Exclusion of this household may not have introduced any distortion.

4.1.2 Data Collection Method

The field assessment team composed of five members of whom two were supervisors. Household interviews related to the reference period October 1, 2008 to September 30, 2009. This period was selected in order to capture all the maize harvests in 2009 considering that the people were involved in irrigation farming and majority were farming in lowlands.

The IHM interview technique requires that (1) the interviewer has good working knowledge of the local economy e.g. crop types and probable returns, employment opportunities, seasonality and prices. Specific to this study, interviewers also had to know the common illnesses and accessibility of health facilities e.g. distance from the village and if the facilities are free of user charges or not; (2) questions were asked in a way which was likely to allow the respondent to recall all illness incidences and costs incurred and all sources of income i.e. this involved working through the year month by month; (3) interviews took about an hour in length. In order to ensure data quality, interviews were also scheduled to the convenience of the interviewee and interviewers were required to conduct only 3 interviews each day to avoid errors that would come with interviewer fatigue; (4) the data was checked and verified ideally on the day of collection.

Following the requirements specified above, data collection method was done at two levels: the village-level which used key informants and the household-level which used

the interview form or guide. Key informants interviews were used to collect contextual information about general economic activities, market information for crops grown in the area, employment types and rates. In addition, the study collected information on social programs currently in the area, programs or projects by both government and non-governmental organizations. Secondly, interview forms with semi-structured questions were used in interviewing households. The data collected using the semi-structured interview forms was on household demographic data such as household membership by age and sex; household income by source; crop production by crop which was split into consumption, sales and gifts; employment; comprehensive health data was obtained on the illness incidence, type, treatment sought and production mitigation measures employed in the event of illness. See attached questionnaire in appendix 2 for detail.

Data collection on agricultural output was mostly based on local measures e.g. plates, basin and basket. Conversion factors were used to convert these measures into standard metrics. In addition, the conversion of food items to their food energy equivalent was done using standard reference sources and where no equivalent value was found estimates were made. Land areas were recorded in acres. More importantly, at the macro level items that define social inclusion were identified. This was important in aiding the establishment of the standard of living threshold. At the end of the day interview data was entered in the IHM software to allow the data to be reconciled and checked for inconsistencies. After checking for completeness, interview forms which were found to be incomplete or with some inconsistencies had the households revisited to resolve the identified problems.

4.2 Analytical Framework

The study employed the Individual Household Method (IHM)[5]. This approach has been developed from the Household Economy Approach (HEA) currently used by Malawi Government: the Ministry of Development Planning and Cooperation. The two approaches (HEA and IHM) are quite similar in that both approaches provide a quantitative description of defined populations based on various strategies that people employ to access food and income. Both approaches provide analysis of the relationship between a shock and ability of a household to maintain food and non food consumption. However the main difference is that the IHM is based on individual analysis of households while HEA focuses on groups of typical households sharing common characteristics.

As a household modeling tool some features in the IHM reflect the legacy Chayanov conceptualization of farm household. However there are significant departures from Chayanov's approach. First, like the Chayanov model, the IHM has the household demographic structure at the centre of its analyses. However, instead of using the c/w ratio as in the Chayanov, the IHM uses adult equivalents in order to determine a household's food and non-food needs. Secondly, in both models households are required to meet some set standard of living threshold. Even though both models have standard of living thresholds, the threshold in the Chayanov is arbitrary because it is not clear how it is set while the SOLT in the IHM considers a household's basic needs in greater detail and hence is more reflective of the household's needs. Thirdly, unlike the Chayanov which only considers agriculture income, the IHM recognizes five sources of income and these are crop production, livestock, employment, wild foods and transfers. On this backdrop, the IHM provides a more accurate measure of income. Finally, as opposed to

[5] The IHM associated software was developed by Evidence of Development, a UK based organization. The Department of Mathematical Sciences at Chancellor College of the University of Malawi is redeveloping the software for an open source project.

the Chayanov the IHM recognizes the existence of labor market and does not make any restrictive assumption on cultivatable land. The IHM is designed to measure impact of a shock. Hence the IHM model is more versatile and more appropriate for this study.

4.2.1 Model Specification

Economic theory posits that Labor is the key input in determining the quantity of output that can be produced with a given technology. Other things being equal, the greater the quantity of labor the larger the quantity of output produced. The larger the output produced the higher the agriculture income and ultimately higher total household income. Illness reduces output by increasing absenteeism from work and reducing work capacity or effort. In terms of agriculture production, the cost of illness was conceptualized as below;

ILLNESS ⟹ AGRICULTURE PRODUCTION ⟹ HH INCOME

According to Grossman (1972) illness depreciates human capital and reduces amount of healthy time available hence it affects labor supply into productive activities i.e. agriculture production in this case. The economic cost of illness effects is the total loss or reduction in output that is associated with illness (Glenn *et al.*, 1996). The cost of illness can be derived from estimates of a production function or its analog following the practice in macro-econometric literature (Gallup and Sachs, 2000; McCarthy *et al.*, 2000). Studies analyzing the cost or burden of morbidity on production both at the macro and micro levels have adopted the following specification;

$$Q = f(K, L, X, M) \quad (4.1)$$

Where; Q is output; K is capital stock; L is labor inputs; X vector of other relevant factors of production and M is the morbidity index.

Most studies on health and output both at the macro and micro levels have adopted the conceptual framework above (Gallup and Sachs, 2001; Asante and Asenso-Okyere, 2003; Mwabu, 2008). In the same line, this study adopted the specified framework where the cost of illness is measured on agriculture production. This was preferred because the cost of illness on labor supply and capital inputs in agriculture production was unambiguously measured.

To implement this framework, this study employed the IHM and used household income as a measure for welfare. The IHM is superior to expenditure and consumption methods in getting an accurate measure of household income. Expenditure and consumption are used as proxies for income, therefore, the IHM addresses shortfalls associated with these methods by using an accurate measure of household income in its analyses. In the IHM the sources of income in a rural setting are considered to be crops, livestock, employment wild foods and transfers. Below is a specification of the income function;

HH Income = f (agriculture income, employment, wild foods and transfers) (4.2)

Where; Agriculture income aggregates incomes from crop and livestock production. Using equation 4.1, the purpose of the study was to estimate the cost of illness on agriculture production and estimated an agriculture production function of the form;

Agriculture production = f (K,L,X,CI) (4.3)

Where, K is a vector of capital inputs including seeds, fertilizer and amount of land utilized; L is labor inputs measured by adult equivalents, X is the sex of household head and CI is cost of illness in monetary terms per adult equivalents. The study assumes optimal allocation of resources at the household level.

The study only analyzes the cost of illness on household production in order to determine how illness costs imposed on agriculture impacts on household income. Andreano and Helminiak (1988) classified illness effects into economic and social effects. The economic effects which the study focuses on are associated with health consumption and agriculture production effects (both short term and medium term effects). These effects then result in various costs which the study categorizes into direct and indirect costs. Using income as a measure of welfare, the costs of illness and their potentially impoverishing effects were measured using the indicator of health expenditure as a proportion of household income. The health expenditure indicator reflects concern about the opportunity cost of healthcare or its consequences for household members' ability to meet other basic needs such as food, shelter or education.

4.2.2 Data Analysis

The study was aimed at estimating the cost of illness on agriculture production which affects welfare at the household level. This was done by measuring both direct and indirect costs of illness on agriculture production. This analysis goes beyond the health expenditure burdens to measure more precisely the opportunity costs of illness for other basic needs. The study first analyzed household income by using conventional economic theory that conceptualizes and measures poverty in terms of income. Secondly, illness specific costs on agriculture production were analyzed in greater detail.

4.2.2.1 Counter Factual Analysis

By default, the IHM conducts counterfactual analysis. This counter factual analysis considers two scenarios i.e. scenario with impact and scenario without impact. This analysis is commonly referred to as the "with" and "without" analysis. In this case, the household incomes collected in the survey were treated as incomes in the "with" scenario since these incomes were obtained by households in the event of illness episodes. Households with illness episodes were identified and both direct and indirect costs

imposed by illness on agriculture production were quantified for each household. A sum of the quantified illness costs and initial incomes gave us incomes in the "without" scenario since the illness costs were diverted from other household uses. Comparisons were made between the "with" and "without" scenarios to assess the impact of the costs imposed by illness on a household.

4.2.3 Some Methodological Issues

4.2.3.1 Income Measurement

This study used disposable income per adult equivalents as a measure of household welfare. The IHM defines disposable income as income remaining after a household meets its food needs. Adult equivalents use weights assigned to each household member based on individual needs and this is dependent on age and sex of a person. Calculating disposable income per adult equivalent used in this study is a 3 step procedure described below;

1. The household food energy requirement is calculated for each individual by age and sex. This distinction is important because there are differences in food energy requirements between individuals. For instance based on the food energy requirement a 15-18 year old male requires about 3000 kilocalories while a 15-18 year old female requires about 2200 kilocalories. The food energy requirements also differ between age groups for instance a child aged between 1 and 3 requires about 1300 kilocalories whilst a child aged between 4 and 6 requires about 1800 kilocalories.
2. Household disposable income is defined as the money income remaining to the household after its food energy requirements have been met i.e. in the case of a deficit in food production, we first establish the:
    (i) the food energy which the household needs to purchase (using the cash income earned throughout the year) to meet its requirements = the

calculated household food energy requirement minus the food energy produced and consumed by the household

(ii) and then calculate the household disposable income = household money income minus the cost of food energy to be purchased from (i)

3. The calculated disposable income for each household is then standardized by the number of adult equivalents in the household

4.2.3.2 Adult Equivalents versus Per Capita Measures of Welfare

This study preferred to use adult equivalents and not per capita measures because with per capita income: everyone in the household receives an equal allocation of items consumed irrespective of age or sex. Per capita measures assume that everyone in the household has the same needs irrespective of age or sex and therefore the cost of two or three more people living together is the same as if they lived separately (Skoufias, Davis and Behrman, 1999). In contrast, adult equivalent basis normalizes consumption by taking into account the age and sex composition of the household members because food energy needs differ by age and sex as has already been shown in the above section.

Consequently, the per capita measure of welfare tends to provide a higher estimate of the negative impact on household welfare of the addition of a child to the household than if an adult equivalent basis were used. The IHM adopted by this study estimates non-food costs at the household and the individual levels. For instance, minimum costs are estimated for school going children and cost of non-food items needed at the household level such as paraffin, salt and soap are also estimated. Note that items allocated by household, are those for which the cost is calculated as a one off cost to each household (e.g. utensil and household sundries) while an age cut off point was established for those items allocated by person. For example, primary school age was taken as 6 years to 16 years of age. The total cost for non-food items were used to compute a household's standard of living threshold (refer to appendix 1). Furthermore, the IHM recognizes the

need to provide an allowance for medical costs but the arbitrary nature and variability of such costs from household to household makes it impossible.

4.2.3.3 Correction for errors

Recall that there are two main types of errors: sampling errors and measurement errors. The study used population or census sampling method. This method removes sampling errors and biases. Since this is not a random sample or a probability study there was no need for statistical analyses. Measurement errors were reduced by the data collection technique. Standardizing disposable incomes and illness costs by adult equivalents also removed some biases. The standardization that was adopted also helped to address heteroscedasticity which is a likely problem when dealing with primary data. Jacobs et al. (2006) showed that estimating the ratio of output to a deflating variable is desirable because the residual is more likely to display homoscedasticity. Furthermore, data entry was done the same day that it was collected. Once the data was entered the IHM software was used to check for completeness and consistency in the data. The data collectors were then able to go back to the households for discussion if anomalies were identified. Following the correction of errors the data was rechecked and made ready for use.

In order to ensure reliability of results on the cost of illness on crop production and to avoid attributing all reductions in crop production to illness; questions on illness were clearly framed and cautiously asked. In addition, a separate question on hiring in labor was asked to find out if illness incidence prompted households to hire-in labor as a way of mitigating illness costs (refer to appendix 2).

4.3 Definition and Measurement of key variables

Measurement of income as the main variable has already been explained in earlier sections and this section will not duplicate effort. The study measured cost of illness by quantifying both direct and indirect costs. Direct costs measured out of pocket expenses

in accessing health care and also included non-medical costs such as transportation to a health facility. Measurement of indirect costs of illness is often estimated through the human capital approach which considers the value of lost productivity as a result of illness and premature mortality. This approach is applied within the opportunity cost framework which is a central concept in market economies (Harwood, 1994).

The study therefore, adopted the human capital approach and opportunity cost framework in measuring indirect costs but the study does not use market wage rates or wages forgone as proposed because more than 90 percent in the study population do not have regular employment. Using the human capital approach in the strict sense may have over-estimated illness costs in this case. The study therefore quantified actual costs incurred in hiring in of labor and lost production due to a decline in labor supply as a result of illness. In addition, costs associated with death are considered to be indirect costs of illness. The study standardized illness costs per adult equivalents to allow for a meaningful analysis and comparisons across the population.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.0 Outline of the Chapter

This chapter presents the results of the analyses done following the methodologies explained in chapter four. This is done by first providing basic socio-economic information and a summary of the study population. Further on descriptive statistics of the data and finally, a discussion of the results of the Individual Household Model using the IHM software is presented.

5.1 Basic Socio-economic Information

The people in Teuka village are Yao by tribe and predominantly Muslim. Households in the study area follow matrilineal and matrilocal patterns of organization where descent and inheritance are traced through the mother's line and husbands move to the wives village on marriage. Land is inherited by female heirs and men are expected to use their wives' land. In terms of cultivatable land most households had both upland and lowland which is commonly referred to as dimba land. In total households had 71.45 acres of upland with an average holding of 1.7 acres per household whilst the total for dimba land was 45.1 acres with an average holding of 1.1 acres per household.

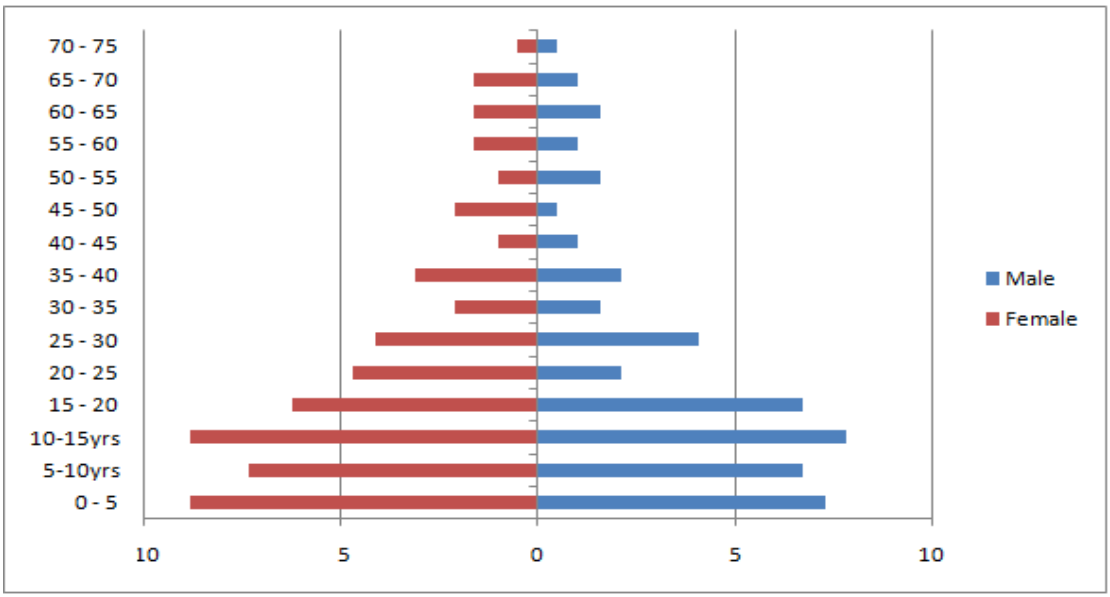
The major livelihood source in the area was farming with some off-farm activities such as bicycle hire, petty trade, mowing grass and sale of wood and charcoal selling. The area was characterized by two farming seasons viz; (1) rain fed farming from October to March/April and (2) irrigated farming from April/May to August/September. Animal husbandry was not well developed in this village. The main livestock kept was chickens, goats were kept at a very small scale and only one household had pigs. Households that kept chickens accounted for about 41 percent of the population.

More than 90 percent of the households hired out their labor as ganyu in other people's fields while 22 percent of the households hired in labor for various reasons. Some of the reasons were attributed to illness incidences, mere labor shortages and some households hired in labor because they were generally better-off and they could afford it. About 44 percent of the households failed to utilize their cultivatable land for various reasons. Out of these about 39 percent attributed the underutilization due to illness while the other households attributed the under utilization to general labor shortages and insufficient resources.

5.2 The study Population

Data for 41 households was used in the study and out of these households the study had a study population of 193 people. Figure 5.1 below presents the population pyramid to show the demographic structure of the village.

Figure 5.1: Population Pyramid



Source: Own analysis using study data

Figure 5.1 above shows that there were slightly more females than males as indicated by 54 percent of females and 46 percent of males to the total population. In addition, the population was concentrated in the lower age groups. It is worth noting that this demographic structure is not far from what is presented in the Integrated Household Survey Report 2 (NSO, 2004). Dependency ratios were also calculated in order to better describe the study population. Dependency ratio is a ratio of economically active members to non-economically active members in a household. A dependency ratio of zero means that the household or population only has economically active members. Dependency ratio increases with increasing number of dependents. Overall, the study population had an average dependency ratio of 1.25 with the ratio ranging from 0 to 2.5. This shows that the number of dependents is higher than the number of the economically active people in the study population. At the household level, high dependency ratios of 2.5 mean that the number of dependents is more than twice the number of the economically active members. Table 5.1 below presents a summary of dependency ratios in quintiles of ascending order of disposable income.

Table 5.1: Dependency ratio per Quintile of Disposable Income per Adult Equivalent

Quintiles				
Quintile 1: Poorest (N=9)	Quintile 2(N=9)	Quintile 3(N=8)	Quintile 4(N=8)	Quintile 5: richest (N=8)
1.03	1.61	1.38	1.27	0.97

Source: Own computations using study data

Table 5.1 above shows that households in the fifth quintile have the lowest dependency ratio of 0.97 and this means that there are slightly more active members than dependents in this quintile. Quintile 2 has the highest dependency ratio of 1.61 and this ratio is declining the higher the disposable income per adult equivalent per income quintile. However, quintile 1 with the poorest households in the population has a dependency ratio of 1.03 which is second from the least. This to some extent shows that the poverty in this

group is not necessarily explained by dependence burden but a general lack of resources caused by other factors.

5.3 Descriptive Statistics

Descriptive statistics in this study provide a summary of disposable income and various incomes by source. These statistics are aimed at providing an overall description of the village in terms of disposable incomes and major income sources for households. Therefore a summary breakdown of the five income sources has been given and a summary of standardized household income expressed as disposable income per adult equivalent has also been given. The breakdown provided also helps to identify the major income contributors to total household income. Table 5.2 below presents summary statistics for income sources and disposable income per adult equivalents.

Table 5.2: Income by Source and Disposable Income per Adult Equivalent (MK)[6]

	Income Source						
Statistic	**Crops**	**Livestock**	**Employment**	**Transfers**	**Wild foods**	**Aid, Cash**	**Disp. Inc./AE**
Average income (MK)	27,426.10	4,362.68	20,183.90	1,808.54	0	0	**13,795.20**
Standard deviation	45,530.90	9,968.68	60,980.30	3,328.29	0	0	**16,023.50**
Max. value	165,011	55,120	378,600	13,000	0	0	**56,889**
Min. value	0	0	0	0	0	0	**-468**
Number	41	41	41	41	41	41	**41**
Median	975	0	12,300	2,000	0	0	**1,126**

Source: Own computations using study data

[6] Recall that the prevailing exchange rate in the reference period is MK140 to 1$

From table 5.2 above, it can be seen there is a high disparity in the incomes of the households in the study population. This is verified by a large difference in the percentage of total disposable income per adult equivalents to the total population disposable income per adult equivalents for quintile 5 compared to the other income groups. People in income quintile 5 held about 62 percent of the total income while the quintiles 1, 2, 3 and 4 held 2 percent, 6 percent, 11 percent and 18 percent respectively. Evidently, the lower four income quintiles only held 38 percent of the total population income. From the table above, it is also clear that crops and employment were the major contributors to household income followed by livestock and transfers.

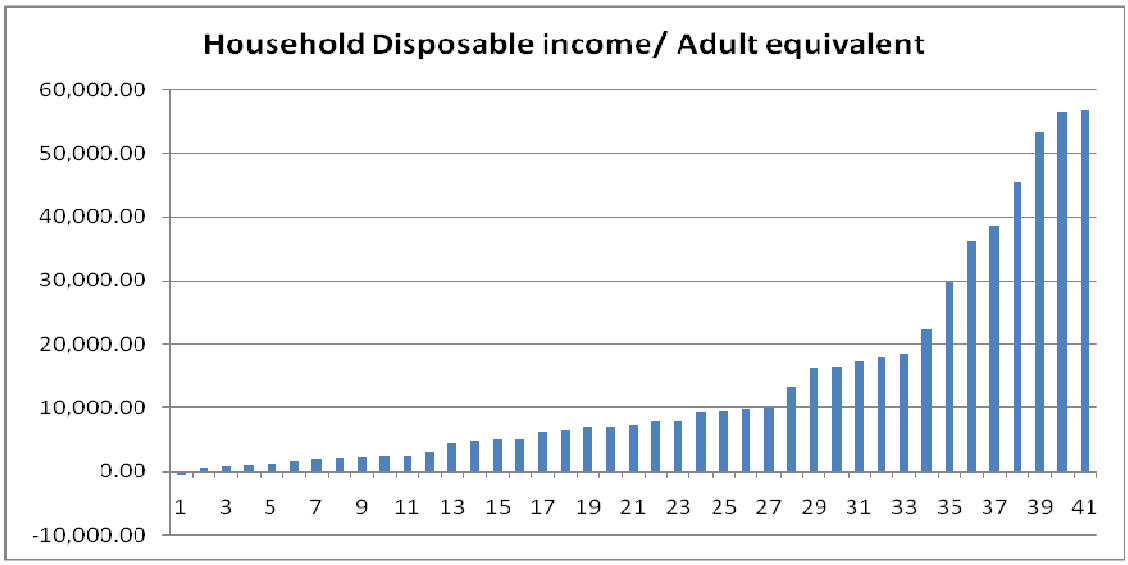
Generally, illness incidences were randomly distributed across the population. The most common morbidity causes in the study population were malaria, diarrhea and common cold and fever. Chronic illnesses found were two tuberculosis (TB) cases and three asthma cases. There was one mental illness case and five malnutrition cases amongst children in the study period. Accidents during the study period were found to be due to falling of houses and snake bite. A few cases of other illness types ranging from headache to rheumatism were also found. Following such illness incidences, there was variation in costs incurred by households largely because of differences in income sources, assets and most importantly the time or month of the year that illness occurs. It was found that the month of the year illness occurred was important in the study population because illness costs tended to be higher during months when demand for agricultural labor was high. Hence relatively high illness costs were imposed on households during such months as opposed to months when demand for agro-labor was low.

5.4 Population Poverty Profile

Recall that the study uses disposable income per adult equivalent as a measure of welfare. The population poverty profile therefore ranks households in ascending order of disposable income to show the richest from the poorest. Disposable income in IHM is the

income a household has after meeting its food energy requirements. Any income level above the zero threshold indicates that a household was able to meet its food energy requirements while any income below zero shows that a household was unable to meet its food energy requirements from its own production. Figure 5.2 below shows the income profile for people in the study population;

Figure 5.2: Household Disposable Income per Adult Equivalent (AE) in MK



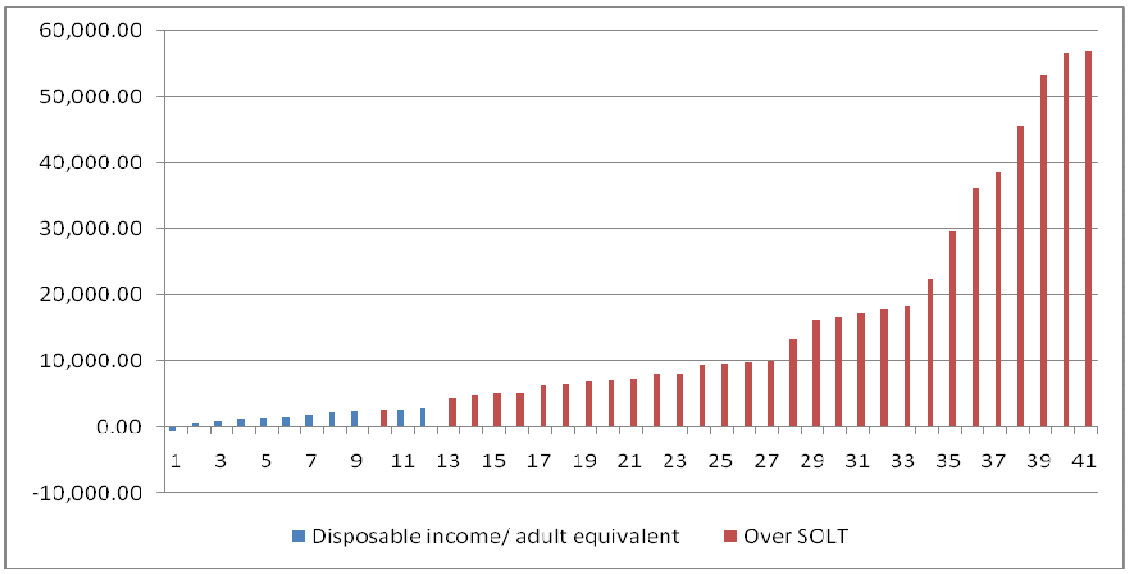
Source: Own profile using study data

From the population poverty profile presented in figure 5.3 above, it can be seen that only one household out of the forty-one households could not meet its basic food energy requirements. This shows that on the overall, the village is food sufficient and this is clearly reflected in having almost the entire population above the zero threshold.

Recall that there are two types of needs that have to be met at a household level, these are basic food and basic non-food needs. Although almost all the households in the village were able to meet their food energy requirements some of these households were not able to meet their basic non-food needs. This is shown by having relatively more households

below the computed standard of living threshold (SOLT). The SOLT calculates a household's basic non-food needs after it meets its basic food energy requirements. Figure 5.4 below shows disposable incomes per adult equivalents of the households that were above and below the SOLT;

Figure 5.4: Disposable Incomes per AE (MK): Households below and above SOLT



Source: Own profile using study data

With the disposable income per adult equivalents in figure 5.4 above; about 29 percent of the households the households in the study population were not able to meet their basic non-food requirements hence these households were below the SOLT during the study period. The remaining 71 percent was able to meet both food and non-food needs which is a reflection that the village was generally better-off. It can also be seen that with respect to the SOLT there is no pattern. Some households with higher disposable incomes relative to others were below the SOLT hence were not be able to meet their non-food requirements while some households with relatively lower disposable incomes were above the SOLT. This was largely the case because of differences in demographic composition of households.

5.5 Accounting for Fertilizer use

The Malawi government has in the past 4 years promoted fertilizer use amongst smallholder farmers as a way of addressing agriculture productivity issues in Malawi. This has generally been achieved by the distribution of fertilizer coupons redeemable by some amount of cash which has been changing over the years. In the study period, farmers were required to pay MK800[7] in order to redeem one fertilizer coupon. Almost all the households in the study population had access to at least one fertilizer coupon but some were unable to redeem them due to lack of money. Therefore, there were still some households that did not apply fertilizer for various reasons during the study period.

On average households applied about 27kg of fertilizer per acre and got average yield of 397kg per acre. The household with the highest application rate was 133kg/acre and the least rate was about 14kg/acre. There were also differences in the maize yield as the household with the highest application rate got about 467kg per acre while the one with the least application rate got about 271kg per acre. On the other hand households without fertilizer got yields ranging from 67kg per acre to 333kg per acre. Average yield without fertilizer was 225.83kg and average yield with fertilizer was 284.51kg. Based on these differences fertilizer was found to contribute about 26 percent to maize yield. Overall, it was found that fertilizer use scaled up crop production levels. Generally, the impact of fertilizer use on incomes of agricultural households was positive across the board.

In order to separate the influence of fertilizer from illness influences, it is worth noting that the distribution of households without fertilizer was random across the population. Out of the households that did not apply fertilizer 60 percent of them had illness incidences. Households that applied fertilizer and had illness incidences had an average yield of about 259kg while households that had illness incidences and did not apply

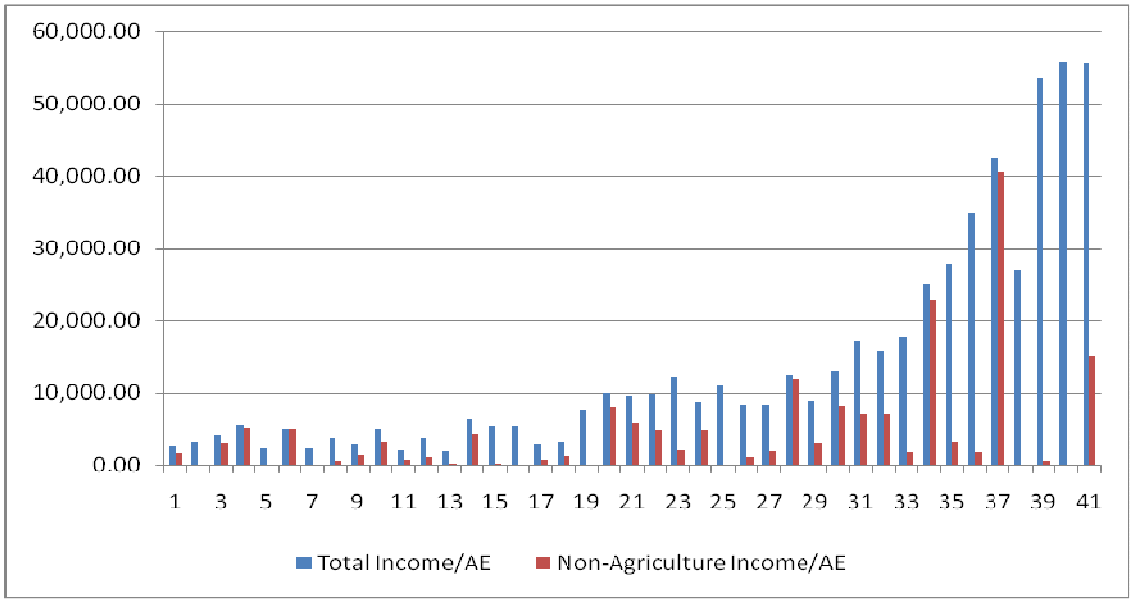
[7] Recall that exchange rate in the reference period was MK140 to $1

fertilizer had an average yield of 260kg per acre. Therefore, it can be argued that fertilizer affects output independent of illness. The sections that follow focus on analyses that link illness costs and agriculture production and household income.

5.6 Cost of Illness on Agriculture Production

In this paper, it has been made clear that illness costs have been measured in relation to agriculture production. It has also been specified that there are five sources of income in the IHM and these are crop production, livestock, employment, wild foods and transfers. However, this study focused on agriculture production alone because it was the main livelihood source for the population and illness costs were collected with respect to agriculture production. Agriculture production was also chosen in order to narrow focus of the paper and simplify analysis. In order to show importance of agriculture income, figure 5.5 below shows a simulation of households' total incomes and their incomes without agriculture income.

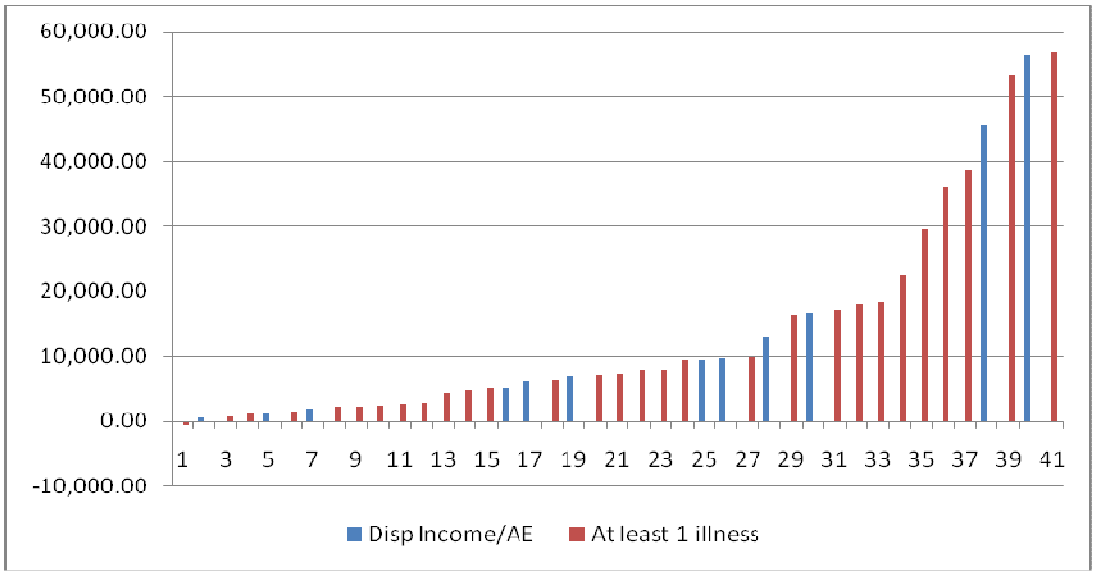
Figure 5.5: Household Incomes (MK) per AE and Non-Agriculture Incomes per AE



Source: Own simulations using study data

Note that incomes presented here are simply aggregated incomes per adult equivalents obtained in the year and not necessarily disposable incomes. From figure 5.5 above it is can be seen that agriculture income which represents income from crop production and livestock is the main source of income for majority of the households. Without agriculture incomes about 20 percent of the population would not have had any income at all. While over 50 percent of the population would have incomes way below their standard of living thresholds. On average, excluding agriculture income reduces total income by about 64 percent. Clearly the study population is highly dependent on agriculture. Therefore, measuring illness costs on agriculture production gives a better representation of the impact of illness on households' welfare. Figure 5.6 below shows the distribution of illness incidences across the population by their disposable incomes.

Figure 5.6: Disposable Incomes (MK) per AE of Households with at least one illness



Source: Own categorization using study data

From the study population about 71 percent of the households had at least one illness episode during the study period as shown in the following figure. This shows how pervasive illness incidences are in this village.

5.6.1 Direct costs of Illness

As defined earlier, direct illness costs comprise of medication, transportation and diet costs. Out of the households with illness episodes: 100 percent incurred medication costs through self treatment and clinical prescriptions; 33 percent of households with illness episodes incurred transport costs to and from a health facility; and 10 percent incurred extra food costs due to illness. Direct costs incurred by households in the study period range from MK30 to MK10, 000 per household for nominal values while standardized direct costs range from MK7 to MK1, 952 per adult equivalents per affected household.

On average direct costs represented about 28 percent of total illness costs incurred by a household. However there is an extreme case where the poorest household in the spectrum incurred MK147 per adult equivalent yet its disposable income was (MK468) per adult equivalent representing more than 100 percent of its disposable income. Since this is an outlier case, analyses on illness costs as a proportion of disposable income left it out because its inclusion was going to distort the picture. Therefore on average, direct costs represents about 7 percent of disposable income per household. However, the percentages range from 0.08 percent to 51 percent of disposable income per household.

5.6.2 Indirect illness costs

Indirect costs are costs incurred by households mostly due to a reduction in labor productivity and labor supply as a result of illness. In this study, the reduction in labor due to illness led to hiring in of labor and a reduction in land utilization rates which further led to a reduction in output. These costs will therefore be classified in two: costs associated with hiring in of labor and costs associated with lost output. Other studies have sought to assess the impact of illness on assets but this study just focused on labor costs and output losses mainly because of unreliability of asset information in the study population.

5.6.2.1 Costs associated with hiring in labor

Out of the households with illness episodes in the study population about 28 percent incur labor costs as an illness production mitigation measure. On average indirect costs associated with hiring in labor represent about 44 percent of total illness costs incurred by such households. These direct costs represent about 6 percent of disposable income. Indirect costs associated with hiring in of labor range from MK500 to MK6, 500 per household in the study period. While standardized labor costs range from about MK213 to about MK2063 per adult equivalents per affected household.

5.6.2.2 Costs associated with underutilization of cultivatable land

Illness incidences led to a reduction in labor productivity and supply at household level. Therefore households that could afford hired in labor to mitigate production losses but households that could not afford it ended up underutilizing their cultivatable land and this led to production losses. On average illness led to about 30 percent underutilization of cultivatable land by households with illness episodes. The average value of lost production due to illness is about 94 percent of total illness costs incurred by the households. These costs represent about 90 percent of a household's disposable income of affected households. Indirect costs associated with lost production range from MK2, 000 to MK18, 000 per affected household. While standardized illness costs associated with lost production ranged from about MK387 to about MK6, 202 per adult equivalents per affected household.

5.6.2.3 Costs associated with death

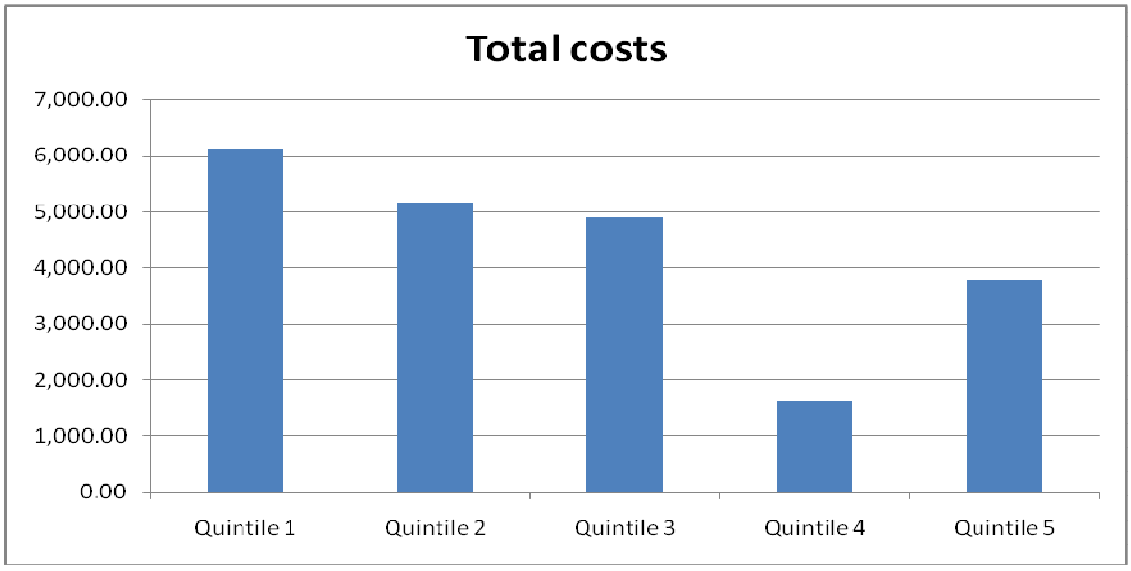
In this study, death was taken to be an indirect cost of illness and 2 households in the study population had death incidences. Costs incurred by a household due to death were estimated at MK3000 per household. It was found that households do not spend much on funerals because they do not have to buy a coffin since the people are Muslims. Other food costs are relatively small because friends and relatives usually make a contribution

in kind where necessary. Other household specific costs incurred in the event of death were difficult to collect because of the sensitivity of the issue.

5.6.2.4 Direct and Indirect Illness Costs

Further analysis of illness costs aimed at determining the nature of illness costs incurred by households. This was done by first of all dividing the households in quintiles by ascending order of disposable incomes. This implies that the first quintile is the poorest and the last quintile is composed of people with the highest incomes. Following these ordering, average values of the total illness costs incurred by households in each income group were calculated by the IHM software as shown in figure 5.7 below;

Figure 5.7: Illness Costs (MK) by Income Quintiles

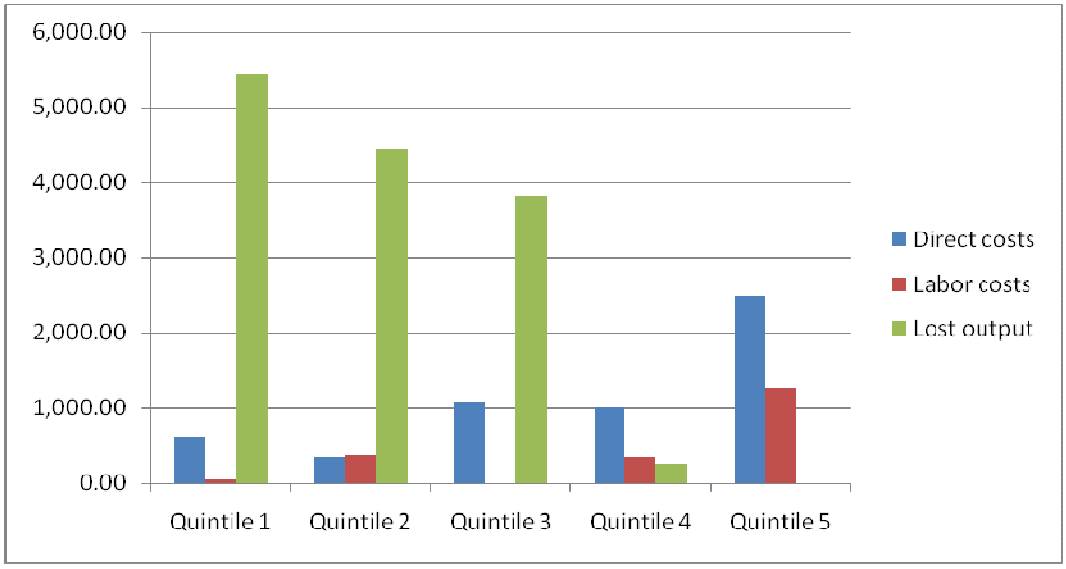


Source: Own analysis using study data

Evidently, the poor incurred the largest costs in absolute terms compared to other income groups and households in the forth quintile incurred the least costs. Generally, illness costs were declining with increasing disposable incomes per adult equivalents. Figure 5.8

below gives a breakdown of the illness costs by quintile in order to determine a pattern in the type of costs incurred by disposable income quintiles.

Figure 5.8: Breakdown of Illness cost (MK) by quintiles



Source: Own analysis using study data

Based on the categorization of illness costs; direct costs were highest in the last quintile and there were no costs associated with lost output. The forth quintile shows a similar pattern where the highest costs incurred were direct costs followed by labor costs and then costs associated with lost output. However, although the poor spent less direct costs in absolute terms compared to other income groups, these direct costs were a high proportion of their disposable incomes. Further analysis of these costs showed that although households in quintile 1 had relatively low direct illness costs, these costs formed about 51 percent of their disposable income per adult equivalents and although direct costs were highest in quintile 5 these only formed about 5 percent of their disposable income per adult equivalents.

Overall, from the three illness cost categorizations, different income groups display different patterns. Illness costs associated with lost output were the highest among poor households with direct costs being the least while for high income groups direct costs were the highest with costs associated to lost output being the least. This was the case because illness affected households in high income groups tended to mitigate such costs by hiring-in labor while resource constrained households tended to underutilize their land by cultivating less than they would have. Costs associated with output losses were declining with higher income quintiles as figure 5.8 above shows. While direct costs and indirect costs associated with hiring-in labor were increasing with higher disposable income quintiles. This shows that illness cost mitigation measures were effective in the high income groups and were either ineffective or non-existent among the poor households in the population. In order to determine the nature of illness costs, table 5.4 below summarizes illness costs by quintile.

Table 5.4: Summary of the nature of illness costs (MK)

Group values	Quintile1: Poorest	Quintile 2	Quintile 3	Quintile 4	Quintile5: richest
Illness costs (IC)	1,787.00	1,180.00	1,609.00	529.00	886.00
Disposable Income (DY)	1,225.00	4,169.00	7,848.00	14,900.00	42,406.00
IC as % of DY	145.88	28.30	20.50	3.55	2.09

Source: Own computations using study data

Table 5.4 above shows that illness costs were found to be regressive by disposable incomes. The poor spent more both in absolute and relative terms. The table above clearly shows that the poor incurred the highest costs both in absolute and relative terms. A summary of income groups by quintiles show that on average illness costs imposed on the poorest income group were more than 100 percent of their disposable incomes while the second quintile incurred about 28 percent of its disposable income in costs while the

richest quintile incurred about 2 percent of its total income as illness costs. Generally, the burden of illness costs declined with increasing income groups and this confirms the regressive nature of illness costs.

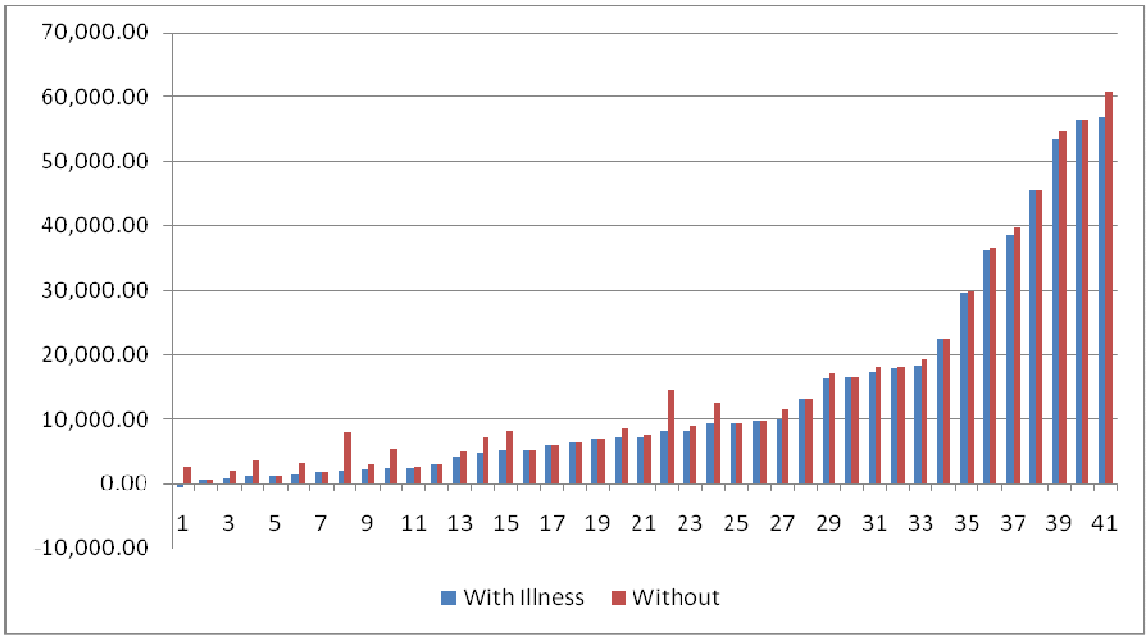
5.6.2.5 Costs Incurred by Households with Chronic Illnesses

There were three households with four chronic illness incidences in the study period. Out of these, there were two TB cases while the other two were Asthma cases. On average households with chronic illnesses incurred about MK2271 per household while those with non-chronic illness incurred average illness costs of about MK1745 per household. Amongst the households with chronic illnesses, the ones with TB cases incurred the highest costs; an average of MK4109 per household whilst those with asthma cases incurred an average illness cost of MK434 per household mostly in direct costs as opposed to high indirect costs incurred by households with TB cases. Nevertheless, these households were still able to meet both food and non-food expenses because they had relatively high disposable incomes of about MK8000 per adult equivalents.

5.7 With and Without Analysis

The paper has so far estimated the costs of illness on agriculture output and the nature of costs has also been identified. This section therefore, assesses the impact of illness on household welfare. Recall that health expenses or illness costs are a proportion of household income because in the absence of illness, these resources would have been used to meet other needs at the household level. Disposable incomes collected form incomes in the "with" scenario. In order to assess impact of illness on household welfare, the computed illness costs were added to disposable incomes for the affected households in the "with" scenario in order to have incomes in the "without" illness scenario. The impact of illness is therefore achieved by comparing incomes in the "with" and "without" scenarios as seen in the figure below;

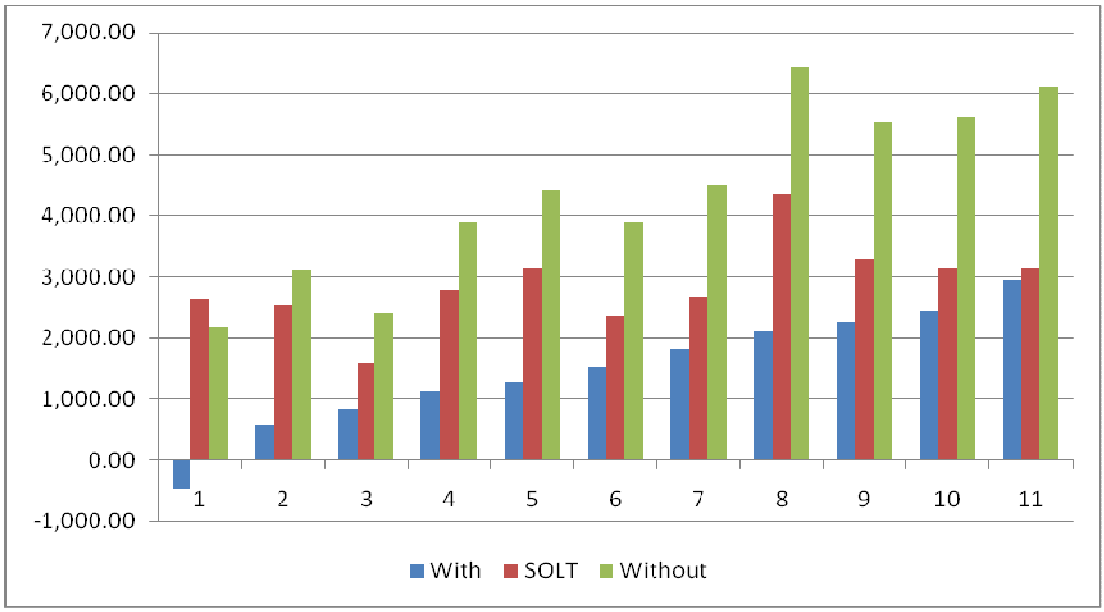
Figure 5.9: Disposable Incomes (MK): With and Without Illness Scenarios



Source: Own simulations using study data

From figure 5.9 above it can clearly be seen that illness negatively affected household's welfare. Without illness, all the households would have been food sufficient. Most importantly out of all the households that were below the SOLT with illnesses all but one of them would have been above the SOLT. Even though one household would still remain remain below the SOLT in the "without" scenario the household would have met all its food needs and about 83 percent of its non-food needs. This is a remarkable improvement in welfare considering that this household was not even able to meet its food energy requirements. Hence illness affects resource allocation and welfare at the household level by reducing disposable income for a household. However, in order to get a clearer picture of the welfare improvements in the "without" scenario figure 5.10 below just zoomed in on disposable incomes of households that were initially below the SOLT. These incomes were ploted with the SOLT to see if these households could have been able to meet both their basic food and non-food needs in the absence of illness.

Figure 5.10: With and Without scenario for households initially below the SOLT



Source: Own simulations using study data

Figure 5.10 above shows the seriousness of the impact of illness on households by using illness costs as a proportion of income. Clearly illness has the potential to even lead to impoverishment of households especially the resource constrained ones.

In a nutshell, the study found that illness costs affect agriculture production of rural households. Illness also negatively affects land utilization which leads to lost production. Overall, by having high income quintiles spending more on direct costs and incurring the least or no costs associated with lost production shows that the investments in health that these households made paid off. The effects of illness costs have an impact on household income as shown in the analyses hence affects household welfare. Consequently, illnesses have implications for resource allocation and welfare at the household level.

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Summary of the Study

Incidence of illness is not only a health issue but also an economic issue. The study aimed at finding the cost of illness on agriculture production as the most reliable livelihood source for most rural households. Disposable incomes were used as a measure of welfare and primary data was used. The study hypothesized that illness does not impose costs on agriculture production; illness does not affect land utilization in agriculture; and illness does not household income.

Using the IHM, the study found that illness imposed both direct and indirect costs on rural households. The findings showed that direct costs were high in high income groups and declined with low income groups. The study also found that indirect costs associated with hiring in labor were highest among households in the high income groups and declined with lower income groups. The study also found that illness negatively affected land utilization. It is worth noting that illness costs were associated with under-utilization of land were the largest costs incurred by households. On average, illness led to 30 percent under-utilization of land. Lost production due to under-utilization of land as a consequence of illness on average represented indirect costs of about 90 percent of household's disposable incomes. These costs were the highest in low income groups and declined with increasing income. Overall, the study found that illness imposed regressive cost burdens on households. This finding is consistent with findings in other countries. Russell (2004) found regressive cost burdens in China, India, Vietnam and Sierra-Leone. The study also found that illness led to a reduction in the disposable incomes of households hence negatively impacted on household welfare. However, there were variations in costs incurred by households mainly because of differences in resource

endowments and also the timing of the illness i.e. illness imposed relatively large costs if the incidence occurred during the farming season as compared to any other time during the year.

6.2 Policy Recommendations

The findings of this study hold some policy implications regarding general welfare and access to healthcare services in rural areas. It is important illnesses occur randomly but a household's resource base is important in having effective coping strategies. Considering the negative impact of illness on household welfare, improving physical access of public hospital services may improve the lives of rural people. Having a better road network and introducing public transportation would improve access to health services by addressing both physical and financial constraints and may ultimately improve the health status of the people through access to better care. There is also need to introduce other reliable income generating activities (IGAs) in order to improve the households' resource base. Rural agricultural households need to diversify their income sources in order to ensure effective illness coping mechanisms. Generally, every effort must be made by all stakeholders to look for cost saving methods of treatment and prevention.

6.3 Study Limitations

There are a number of limitations that have been identified for this study. Income and illness data was collected on a one year recall period and this might have compromised the quality of data obtained. It is therefore likely that some information was given less accurately.

6.4 Suggested Areas for Further Research

The study took a case study approach but further studies could assess the cost of illness at a larger scale by employing a micro level analysis with a district, regional or nationally representative sample.

REFERENCE

Ajan, O.I.Y. and Ugwu, P.C. (2008). "Impact of adverse health on agriculture productivity of farmers in Kainji Basin North central Nigeria," *Trends in agriculture economics,* Vol. 1, No. 1, pp. 1-7.

Andreano, and Helminiak, (1988). "Economic, Health and Tropical Disease: A review in *Economics, Health and Tropical Disease"*. University of Philippines School of Economics.

Asante, F.A. and Asense-Okyere, K. (2003). "Economic Burden of Malaria in Ghana," *Technical Report* submitted to the WHO African Regional Office.

Bloom, D.E. and Cunning, D. (2000). "The Health and Wealth of Nations," *Science's Compass* 287:1207-1209.

Browning, M. and Chiappori, P. (1994). "Efficient Intra-Household Allocations: A General Characterization and Empirical Tests," *McMaster University Department of Economics Working Paper* 94-07.

Chaminuka, P. Anim, F. Debusho, L.K. and Nqangweni, S. (2006). "Impact of HIV and AIDS on agriculture and food security: the case of Limpopo province in South Africa," *FANRPAN Working Paper*: Series Ref. No: NATSAA 005.

Chiappori, P.A. (1992). "Collective Labor Supply and Welfare," *Journal of Political Economy*, Vol. 100, pp 437-467.

Chirwa, E. W. (2003). "Sources of Technical Efficiency among Smallholder maize farmers in Southern Malawi," *Wadonda Consult Working paper* WC/01/03, Wadonda Consult, Zomba: University of Malawi.

Chirwa, E.W. (1999). "Structural Adjustment Programs and the Labor Market in Malawi," *Wadonda Consult Working Paper* WC/06/99, University of Malawi and Wadonda Consult.

Croppenstedt, A. and Muller, C. (2000). "The impact of farmers health and nutritional status on their productivity and efficiency: Evidence from Ethiopia," *The University of Chicago, Economic development and Cultural change*, 0013-0079.

Currie, J. and Madrian, B.C. (1999). *Health, Health Insurance and Labor Market,* New York: Elsevier Science.

Doward, A. Chirwa, E. Kelly, V. Jayne, T. Slater, R. and Boughton, D. (2008). "Evaluation of the 2006/07 Agriculture Input Subsidy Program, Malawi," *Final Report* prepared for the Ministry of Agriculture and Food Security.

Ellis, F. (1993). *Peasant Economics: Farm household and agrarian development,* 2nd ed, United Kingdom, University of Cambridge Press.

Fogel, R.W. (1991). "The Conquest of High Mortality and Hunger in Europe and America: Timing and Mechanisms," In *Technology, Growth and Economic Development since the Industrial Revolution,* ed. Lander, D., Higgonet, C. and Rosovsky, H., Cambridge, MA: Havard University Press.

Food and Agriculture Organization of the United Nations (2000). "Per Capita Agriculture Production indices" www.fao.org/faostat/production

Fox, M.P. Rosen, S. MacLeod, W.B. Wasunna, M. Bii, M. Foglia, G. and Simon, J.L. (2004). "The impact of HIV/AIDS on labor productivity in Kenya," *Journal of Tropical medicine and international health*, Vol. 9, No. 3, pp. 318-324.

Gallup, J.L. and Sachs, J.D. (2001). "The Economic Burden of malaria". *American Journal of Tropical Medicine and Hygiene,* Vol. 64, No. 1, pp. 85-96.

Glenn et al (1996). Economic cost of Health; Effects of occupational exposure to Hazardous substance. University of Sidney.

Goudge, J. Russell, S. Gilson, L. Molyneux, C. and Hanson, K. (2009). "Household experiences of Illhealth and Risk Protection Mechanisms," *Journal of International Development,* Vol. 21, pp. 159-168.

Government of Malawi (GOM, 2005). *Malawi Growth and Development Strategy,* Government Press.

Grossman, M. (1972). "On the concept of health capital and demand for health," *Journal of Political Economics*, Vol. 80, No. 2, pp. 223-255.

Harrigan, J. (2003). "U-turns and full circles: two decades of agricultural reform in Malawi, 1981-2000", *World Development Journal* Vol. 31, No. 5, pp. 847–863, Elsevier Science Limited.

Harwood, H. J. (1994). "Analytical Principles and Issues in making cost of illness estimates for Substance Abuse." CCSA, Canada.

International Food Policy Research Institute (2008). "Agriculture and Health: Addressing the vital links," *Brochure,* www.ifpri.org

International Monetary Fund (2009). "World Economic Outlook data," www.imf.org/data/weodatabase

Jacobs, R. Smith, P.C and Street, A. (2006). *Measuring efficiency in health care: Analytic techniques and health policy,* Cambridge University Press, New York.

Kaluwa, B. (1989). "Malawi Industry: Policies, Performance and Problems," In Mhone, G. Ed. *Malawi at the crossroads*.

Kambou, G. Devarajan, S. and Over, M. (1989). "The economic impact of AIDS in an African country: Simulations with a computable General Equilibrium model of Cameroun," *Journal of African Economies*, Vol. 1, No. 1, pp. 109-130.

Kearney, M. (1996). "Reconceptualizing the Peasantry: Anthropology in Global Perspective," Boulder: Westview Press.

Knowles, S. and Owen, P.D. (1995). "Health Capital and cross country variation in Income per Capita in the Mankiw-Romer-Weil Model," *Economics Letters* 48, pp. 396-402.

Kydd, J. and Christiansen, R. (1982). "Structural Change in Malawi since Independence: Consequences of a development strategy based on large scale agriculture," *World Development,* Vol. 10, No. 5, pp. 355-375.

Larochelle, C. and Dalton, T.J. (2006). "Transient Health Shock and Agriculture Labor Demand in Rice Producing Households in Mali," *Discussion Paper* Presented at the International Association of Agricultural Economists Conference, Gold Coast Australia.

Lawson, D. (2004). "The influence of ill health on chronic and transient poverty: evidence from Uganda", *CPRC working paper* 41.

Lindelow, M and Wagstaff, A. (2005). "Health shocks in China: Are the poor and uninsured protected," *World Bank Policy Research working paper* 3740.

McCarthy, D.F. Wolf, H. and Wu, Y. (2000). "The growth costs of malaria". World Bank *Working Paper*, Georgetown University and NBER.

Ministry of Economic Planning and Development (2007). *Annual Economic Report,* Government Printer, Lilongwe.

Mtika, M.M. (2000). "Social and cultural relations in economic action: the embeddedness of food security in rural Malawi amidst the AIDS epidemic," *Environment and Planning,* Vol. 32, pp. 345-360.

Mwabu, G. "The Economic burden of malaria in Kenya" In *Malaria and poverty in Africa: The economic burden of Malaria,* Fosu, A.K. and Mwabu, G., ed. (2007).

University of Nairobi Press and African Economic Research Consortium (AERC), Nairobi, Kenya.

National Statistical Office (2008). "2008 Population and housing: Preliminary Report," www.nso.org

National Statistical Office (2005). "Integrated Household Survey 2," 2004-2005, Vol. 1: *Household Socio-economic characteristics*, National statistical Office.

Ngwira, N. Bota, S. and Loevinsohn, M. (2001). "HIV/AIDS, Agriculture and food security in Malawi," *RENEWAL Working Paper 1*, Lilongwe and The Hague.

Olagoke, O.A. "The economic burden of childhood malaria in Nigeria" In Fosu, A. and Mwabu, G. (2007), *Malaria and Poverty in Africa*, University of Nairobi Press and African Economic Research Consortium (AERC), Nairobi, Kenya.

Organization of Economic Cooperation and Development (OECD) (2004). "Annual Report," www.oecd.org/publications.

Peters, E.P. Kambewa, D. and Walker, P. (2008). "The Effects of Increasing Rates of HIV/AIDS related illness and death on rural families in Zomba District, Malawi: A Longitudinal Study, *IFPRI and RENEWAL Report.*

Petty, C. and Seaman, J. (2005). "The impact of HIV/AIDS on household economy in 2 villages in Salima district," Malawi (unpublished).

Pryor, F.L. (1990). "Changes in Income Distribution in Poor Agriculture Nations: Malawi and Madagascar," *Economic Development and Cultural Change,* Vol. 39, No. 1, pp. 23-42.

Reserve Bank of Malawi (2009). *Annual Financial and Economic Report,* Government Press, Zomba, Malawi.

Reserve Bank of Malawi (2001). *Annual Financial and Economic Report*, Montfort Press, Limbe, Malawi.

Reserve Bank of Malawi (1997). *Annual Financial and Economic Report*, Blantyre Print and Packaging Limited, Blantyre, Malawi.

Reserve Bank of Malawi (1987). *Annual Financial and Economic Report*, Blantyre Print and Packaging Limited, Blantyre, Malawi.

Reserve Bank of Malawi (1978). *Report and Accounts*, Blantyre Print and Packaging Limited, Blantyre, Malawi.

Rivera and Currais, L. (1999a). "Economic Growth and Health: Direct Impact or Reverse Causation?" *Applied Economics Letters* 6, pp. 761-764.

Rivera and Currais, L. (1999b). "Income Variation and Health Expenditure: Evidence for OECD countries," *Review of Development Economics,* Vol. 3, No. 3, pp258-267.

Russell, S. (2004). "The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis and Human

Immune Virus/Acquired Immuno Deficiency Syndrome," *Journal of Tropical medicine and hygiene* Vol. 71, No. 2, pp. 147-155.

Sauto Arce, R. McKee, M. Rocco, L and Suhrcke, M. (2008). "The economic cost of illhealth in the European Region," *Discussion* Paper discussed at the WHO European Ministerial Conference on Health Systems: Health Systems, Health and Wealth.

Schultz, P. (1999). "Productive benefit of improving Health: Evidence from low income countries," Mimeo, Yale University.

Schuren, U. (2003). "Reconceptualizing the Post-peasantry: Household strategies in Mexican Ejidos," *European Review of Latin American and Caribbean Studies,* Vol. 7, pp. 47-63.

Shepard, D.S. Ettling, M.B. Brinkmann, U. and Sauerborn, R. (1991). "The economic cost of malaria in Africa." *Tropical Medicine and Parasitology,* Vol. 42, No. 3, pp. 199–203.

Skoufias, E. Davis, B. & Behrman, J. (1999). "An evaluation of the selection of beneficiary households in the Education, Health, and Nutrition Program (PROGRESA) of Mexico". PROGRESA evaluation project: *Research report*. International Food Policy Research Institute, Washington, DC.

Strauss, J. and Thomas, D. (1998). "Health, Nutrition and Economic growth," *Journal of Economic literature*, Vol. 36, pp. 766-817.

Udry, C. Haddinott, J. Alderman, H. and Haddad, L. (1995). "Gender Differentials in Farm Productivity: Implications for Household Efficiency and Agricultural Policy," *Journal on Food Policy*, Vol. 20, No. 5, pp. 407-423.

Wellor, T.H. (1958). "Tropical Medicine," in Encyclopedia Britannica. Chicago: William Bennett.

Whiteside, M. (1999). "Ganyu labor in Malawi and its implications for rural likelihood security interventions: An analysis of recent literature and implications for poverty alleviation," *Agriculture Research and Extension Network working paper* No. 99.

World Health Organization (2009). *World Health Statistics, 2009*, WHO Press; Switzerland.

World Health Organization (2003). *Learning to live with Health Economics*, WHO regional office for Europe.

APPENDICES

Appendix 1: Establishing Standard of Living Threshold

A standard of living threshold is set by defining a set of goods and services which a household should afford after it has met its food needs. The aim is to establish the set of services which define 'social inclusion' in a particular place and their price. This information was obtained from both key informants and by interviewers gathering a basic set of expenditure data from households. The items that constitute social inclusion in developing countries mostly include the items in the table below;

Table 4.1: Items used in establishing SOLT

Item	Allocated by:
Soap	Household
Fuel	Household
Utensils and household sundries	Household
Salt	Person
Primary school costs/child	Person
Replacement clothes- adult man	Person
Replacement clothes- adult woman	Person
Replacement clothes- child	Person

Generally, after meeting the food energy requirements, the study computed a Standard of Living Threshold for each household (SOLT) based on the basic non-food needs. The costs of these non-food needs were aggregated at the household level for the whole year. Based on these estimates, the IHM software computed an income level needed to meet a household's basic non-food needs specified as SOLT. Only basic non-food needs are taken into account because this is a poverty related study and therefore "survival" is crucial to most households. Hence the SOLT does not include luxuries.