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HOUSEHOLD FOOD SECURITY IN RURAL TANZANIA: A CASE STUDY OF MOSHI RURAL DISTRICT KILIMANJARO REGION

By

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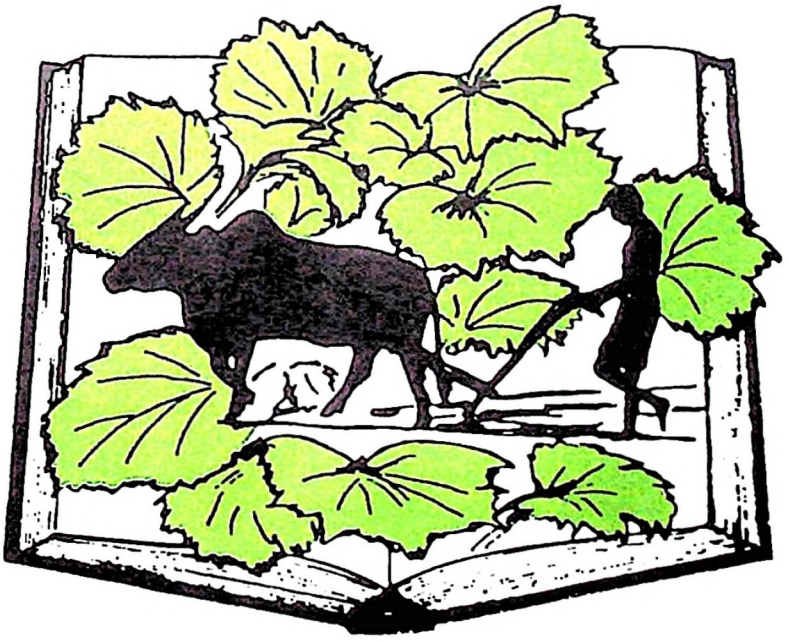
1996



A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE (MANAGEMENT OF NATURAL RESOURCES AND SUSTAINABLE AGRICULTURE)

AGRICULTURAL UNIVERSITY OF NORWAY

DECLARATION.

I, FLORA L. K. MAKUNDI, do hereby declare to the Senate of Agricultural University of Norway that this thesis is my own original work, except where otherwise acknowledged and that it has not been submitted for a degree award at any other University.

Signature..... Flora L. K. Makundi

Flora L. K. Makundi

Date and Place..... May, 1996 - ÅS-NLH

DEDICATION

TO:

My parents Rev. Lucas M. Kyessi and Mrs. Fransiska Lucas Kyessi,
Who brought me up and gave me the value of education,
Thank you very much.

ACKNOWLEDGEMENT.

First and foremost I am greatly indebted to my main supervisor Ms Ingrid Nyborg for her intellectual stimulation, guidance and valuable detailed comments which enabled this work to be accomplished. She was always very helpful, supportive and critical from the time I prepared the proposal to the time of writing up this thesis. I really enjoy working with her.

I also appreciate the efforts made by my co-supervisor Prof. Ruth Haug and my local supervisor Dr. Emmanuel Mbiha. Their advice, comments and suggestions have enabled this work to be accomplished.

I would like to express my gratitude to NORAD (Norwegian Agency for International Development) for financial support to carry on this work. I'm also highly grateful to my employer, Sokoine University of Agriculture for granting me study leave.

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ABSTRACT

This research was undertaken to investigate the household food security situation in rural Tanzania. The specific objectives were to evaluate the food and energy adequacy of the study area based on total food production, to study the factors affecting food availability and accessibility and to find out the extent of women's involvement in food cycles relative to men.

A formal structured questionnaire was used to interview 90 respondents from three villages selected from two different agro-ecological zones. Informal surveys were carried out using a non-structured questionnaire in group interviews. Various foods raised per annum at household level were expressed as maize equivalents for measuring food and energy adequacy. Both quantitative and qualitative data was obtained in the survey. With quantitative data Analysis of Variance (ANOVA) was the statistical tool used to measure homogeneity of the food security variables between the villages whereas Chi-square analysis was used for the qualitative data.

Assessment of household food and energy adequacy based on the production data alone shows that on aggregate, the three villages studied were not food deficit on a good year. However, when the villages were treated individually, the lowland village does not meet food and energy requirement even in a good year. In an average and bad year, all the three villages are food and energy deficit. When the sold food was also considered, the three villages could not meet the daily food and energy requirement even in a good year. When the results were further disaggregated to household level, it was found that members of the rich households could consume as high as 4500 Kcal/capita/day while members of poor household could consume as low as 500 Kcal/capita/day.

Farmers depended mostly on farming to obtain their food. The lowland farmers indicated a state of decrease in their main staples for the past five years whereas the upland farmers indicated a state of fluctuation mainly caused by drought conditions. Other factors affecting food availability were availability of cash crops and animal husbandry activities, partitioning of the main food crops in the households for food and sale (as not all crops produced were meant for direct consumption), the use of bananas and root crops, the amount of stored food and the storage and preservation methods employed. Labour was gender differentiated from the process of food and cash crop production to the final procurement of food at household level.

Food accessibility was affected by availability of extra income and the role of that income in securing food, the household and child care and food shortages in the households. The monthly income was from off-farm income-generating activities and from selling food and cash crops. Most of the households surveyed reported food deficit in their homestead before the next harvest. This necessitates the use of different coping strategies in the three villages. Based on the data on food production alone, it was found that most households were not food secure. The main cause of food insecurity was drought and dependence on rainfed agriculture. According to farmers responses, household food security can be improved by buying food during peak season and store it, selling less food at harvest, spending less on alcoholic drinking, women being given more power to decide on matters related to food and through provision of credits to help farmers improve crop and animal husbandry.

CONTENTS. Page

Declaration i
Dedication ii
Acknowledgement iii
Abstract iv
List of contents v
List of Tables viii
List of Figures x
List of Appendices xi
List of acronyms xii

CHAPTER 1. 1

1.0 Introduction 1
1.1 Background information 1
1.2 Problem statement 6
1.3 Objectives of the study 9
1.4 Research questions 8

CHAPTER 2 10

2.0 Description of the study area 10
2.1 Geographical location and size 10
2.2 The physical environment 10
2.2.1 Climate 10
2.2.2 Soils 13
2.2.3 Vegetation belts 13
2.3 Socio-economic environment 15
2.3.1 Population 15
2.3.2 Crops and Cropping pattern 16
2.3.3 Farming systems 16
2.4 Villages selected for the study 17
2.5 Rationale for choosing the study area 17

CHAPTER 3 20

3.0 Literature review 20
3.1 Household Food Security concept 20
3.2 The major subdivisions of Food Security 21
3.2.1 Food availability, adequacy and stability 21
3.2.2 Food accessibility 24
3.3 Food Insecurity 25
3.3.1 Types of Food Insecurity 25
3.3.2 Causes of food insecurity 26

3.4 The food security situation in Tanzania 27
3.4.1 Conceptual analysis 27
3.4.2 Food security at household level 27
3.4.3 Food security at regional level 29
3.4.4 National food security 31
3.5 Women, Work and Food Security 32
3.5.1 Women and agricultural production 32
3.5.2 Breast-feeding 34
3.5.3 The caring capacity of women 35
3.6 Indicators used for assessing Household food security 35

CHAPTER 4. **38**

4.0 Methodology 38
4.1 Secondary data collection 38
4.2 Primary data collection 38
4.2.1 Formulation of the questionnaire 38
4.2.2 Sampling procedure 39
4.2.3 Preliminary Survey 40
4.2.4 Group interviewing 40
4.3 Measurement of Food and Energy adequacy 40
4.4 Statistical Analysis 42
4.5 Definition of the Household 43
4.6 Data limitations 44
4.7 Problems encountered during data collection exercise 44

CHAPTER 5 **46**

5.0 Results and Discussion 46
5.1 Household characteristics 46
5.1.1 Household size and composition 47
5.1.2 Education 48
5.1.3 Members of the household interviewed 50
5.2 Assessment of Household Food and Energy Adequacy 49
5.3 Household Food Availability 53
5.3.1 Agricultural Production 53
5.3.1.1 Food crop production 53
5.3.1.2 Cash crop production 54
5.3.1.3 Gender labour involved in agricultural tasks 55
5.3.1.4 The role of plantains/bananas and root crops in the food system 58
5.3.1.5 The performance of main crops 60
5.3.2 Animal husbandry 62
5.3.2.1 Intensive animal husbandry 62
5.3.2.2 Extensive animal husbandry 62
5.3.2.3 Gender roles in animal husbandry 63

5.3.4 The use of main food crops 64
5.3.5 The availability and consumption of relish food 69
5.3.6 Food storage 72
5.3.6.1 Storage methods employed 73
5.3.6.2 Preservative methods employed to minimize storage losses 75
5.3.6.3 Storage losses 76
5.4 Accessibility of the food in the household 78
5.4.1 Income generating activities 79
5.4.1.1 Selling labour 79
5.4.1.2 Selling local brew 80
5.4.1.3 Blacksmith business 81
5.4.1.4 Petty trade 81
5.4.1.5 Others activities 81
5.4.2 Women's small enterprises 82
5.4.3 The role of monthly income in securing food 83
5.4.4 Household care 85
5.4.4.1 Housework 85
5.4.4.2 Child care practices 86
5.4.4.2.1 Young child feeding 86
5.4.4.2.2 Weaning foods 88
5.4.5 Food shortage 90
5.4.5.1 Food deficit in the households 90
5.4.5.2 Groups in the household which are mostly affected in the period of food shortage 94
5.4.5.3 Coping strategies during periods of food shortages 95
5.5 Causes of food insecurity in the study area 99
5.5.1 Drought and dependence on rainfall 99
5.5.2 Limited access to productive land 100
5.5.3 Lack of capital and shortage of labour 103
5.5.4 Lack of farm inputs and improved technology 104
5.5.5 Inadequate agricultural extension 105
5.5.6 Local beer brewing and drunkardness 107
5.5.7 Large families 108
5.5.8 Others causes 108
5.6 Improvement of household food security 118

CHAPTER SIX **116**

6.0 Conclusion and Recommendations 116

7.0 References **121**

8.0 Appendices **128**

LIST OF TABLES

		Page
Table 1.1	List of the major food security campaigns, policies and programmes	2
Table 1.2	Commercial producer Prices (Tshs/Kg)	4
Table 2.1	Agro-ecological zones and climate in Kilimanjaro region	13
Table 2.2	Total rainfall/month (mm) In Kilimanjaro region in Moshi meteorological station in Moshi Urban District 1984-1993	14
Table 3.1	Regional Food Balance Sheet 1988/89	30
Table 3.2	Production of Main staples Versus Requirements, 1990	31
Table 3.3	Percentage of Time Spent by African men and Women in selected Agricultural and Subsistence-Related tasks	32
Table 4.1	Sample percentage of the total households interviewed	39
Table 5.1	Household age structure	47
Table 5.2	Education level of the respondents	47
Table 5.3	The respondents distribution according to their tittle and status	49
Table 5.4a.	Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages for 1995/96 based on total food production only (Good year)	51
Table 5.4b.	Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages on an average year based on total food production only	51
Table 5.4c.	Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages on a bad year based on total food production only	52
Table 5.5	Total food production per village based on quantifiable food produce expressed as maize equivalents	53
Table 5.6	Percentage women and men respondents involved in various agricultural tasks (aggregate results for the three villages)	56
Table 5.7	Means to bring the produce home after harvesting	57
Table 5.8a.	The performance of the main staples in the past five years	60
Table 5.8b.	Reasons for the observed trend in performance of the main staples	60
Table 5.9	Percentage men and women respondents involved in various animal husbandry activities (aggregate results for the three villages)	64
Table 5.10	Main staples sold in the three villages	65
Table 5.11	Reasons given by farmers as to why they sell their staples	66
Table 5.12	Household Food Balance Sheet for Mawanjeni, Komakundi and Mbahe villages on a good year based on the food left for consumption after selling	67
Table 5.13	The status of the households based on the average Kcal per capita per day for the three villages	68
Table 5.14	Important relish foods of the households	69
Table 5.15a.	Frequency of eating protenous foods for Mawanjeni village	70
Table 5.15b.	Frequency of eating protenous foods for Komakundi village	71
Table 5.15c.	Frequency of eating protenous foods for Mbahe village	71
Table 5.16	The main stored food produce	73

Table 5.17	Methods used to store the produce after harvest	74
Table 5.18	Preservative methods against storage pests	75
Table 5.19	Storage losses of the food produce experienced in the three villages	77
Table 5.20	Causes of food storage losses in selected districts in Mtwara Region 1988	77
Table 5.21	Means of generating extra income	79
Table 5.22	Women's small enterprises to obtain extra income	82
Table 5.23	Average monthly income per household in the three villages	83
Table 5.24	Percentage women and men respondents involved in housework (aggregate results for the three villages)	85
Table 5.25a.	Percentage respondents on on-season feeding of under-five's	87
Table 5.25b.	Percentage respondents on off-season feeding of under-five's	87
Table 5.25c.	Average feeding frequencies for under-five's for the three villages	87
Table 5.26	Types of weaning foods given to the under-five's	88
Table 5.27	Cropping calendar for coffee/banana and maize/beans farming system in the uplands and lowlands	92
Table 5.28	Groups in the household which suffer most during food shortage periods	94
Table 5.29a.	The major coping strategies during periods of food shortage	96
Table 5.29b.	Minor coping strategies during periods of food shortage	96
Table 5.30	Reasons of food insecurity in the study area as perceived by the farmers	100
Table 5.31	The average owned and cultivated land per household in the study area	101
Table 5.32 a.	Means of tiling the land in the farms located in the village	105
Table 5.32b.	Means of tiling the land in the farms located somewhere else	105
Table 5.33	Frequency of visits from agricultural extension officers	106
Table 5.34	Percentage respondents on decision making related to selected activities (aggregate results for the three villages)	110
Table 5.35	Comprehensive evaluation of food security (combination of factors)	114

LIST OF APPENDICES

		Page
Appendix A.	A questionnaire for studying the household food security situation in the study area	128
Appendix B.	Amount of food produced at household level in the three villages for three years	134
Appendix C.	ANOVA Tables for quantitative data	138

LIST OF ACRONYMS

CBD:	Coffee Berry Disease
FAO:	Food and Health Organisation of the United States
FSG:	Food Studies Group
FSU:	Food strategy unit
GDP:	Gross Domestic Product
ICRA:	International centre for Development Oriented Research in agriculture
IDD:	Iodine Deficiency Disorders
ILO:	International Labour Organization
Km:	Kilometre
KNCU:	Kilimanjaro Native Co-operative Union
m.a.s.l.	Metres above sea level
NORAD:	Norwegian Agency for International Development
MALD:	Ministry of Agriculture and Livestock development
NMC:	National Milling Corporation
NSF:	National Food Strategy
PEM:	Protein Energy Malnutrition
SADCC:	Southern Africa Development Co-ordination Conference
SADC:	Southern African Development Community
TFNC:	Tanzania Food and Nutrition centre
Tshs.	Tanzanian shilling
UNICEF:	United Nations Children Fund
UNU:	United Nations University
URT:	United Republic of Tanzania
WID:	Women in Development
WHO:	World Health Organisation

CHAPTER ONE.

1.0 INTRODUCTION.

1.1 BACKGROUND INFORMATION

Tanzania covers an area of approximately 939,700 square kilometres with a population of 23.2 million people and a population density of 27 persons per square kilometre according to the population census of 1988 (URT, 1992). The climate of Tanzania is generally subtropical, sub-humid to semidry allayed largely by variations of altitudes which influence both rainfall and temperature. The rainfall averages 750 mm to 1800 mm per annum in central western and northern coastal areas respectively.

Agriculture forms the backbone of the Tanzania's economy. The demographic and economic structure of most countries in Sub-Saharan Africa is such that the majority of their population live in rural areas and earn their living from agriculture. Thus the majority of Tanzanians virtually depend on agriculture as the main occupation and source of livelihood. Approximately 85% of the population live in the rural sector. The sector contributes about 50% of the Gross Domestic product (GDP), approximately 84% of the total export earnings in 1991 and provides livelihood for almost 90% of the economically active population (Tanzania, 1993).

There exists several definitions of food security which suggests the complexity of the concept. The most frequently used definition is probably the World Bank (1986) definition: Access by all people at all times for enough food for an active, healthy life. It is about food availability and the ability to acquire it, and includes food production as well as food distribution and effective purchasing power. The continuous increase in food crisis in Sub-Saharan Africa, has stimulated much research on themes related to food, nutrition and agriculture in general.

The 1973 - 75 world food crisis demonstrated the vulnerability of food systems in many countries especially in Sub-Saharan Africa (Kennes, 1990). Tanzania being one of the countries had to set strategies for food security. The Party and the Government have made several policy

declarations and carried out a number of campaigns, programmes and reforms with the objective of attaining food security (Table 1.1).

Table 1.1 List of the major food security campaigns, policies and programmes.

Year	Campaign, policy or programme
1972	Siasa ni Kilimo (Politics is Agriculture)
1974-75	Kilimo cha kufa na kupona (Agriculture as a matter of life and death)
1975	The National Maize Programme
1978	Public Works for food security
1983	Nguvu kazi (Human resource Development
1983	The National Agricultural Policy
1984	The National Food Strategy
1991	The National Food and Nutritional Policy
1991	The National Food Security Programme

Source: Kavishe and Mushi, (1993).

The Government of Tanzania conception of food security is contained in the Agricultural Policy of 1983 (Biseko, 1989). The policy goals with regard to food security are *inter alia*, achieving national self-sufficiency and raising the nutritional standards of living of all Tanzanians. Based on the Agricultural Policy, the Government launched a National Food Strategy (NFS) in 1984 which elaborated upon the options for attaining food security.

The major interventions have been in increasing food availability and food accessibility. In most rural areas of developing countries, increased food availability depends most on improved agriculture. The role of agriculture in alleviating food insecurity in the third world can not be overemphasized. As Swaminathan (1992) points out, a nations poor and hungry people are unlikely to have access to enough food throughout the year to lead an active and healthy life unless they produce own food in adequate amounts.

Agriculture is important as a vehicle for addressing food security problems in Tanzania for at least two reasons;

First, in SADCC[1] agriculture remains the mainstay of the region's economy as 80% of the population in the region is based on agriculture and around 60% of the food grain produced is retained on-farm for domestic consumption or local trading (Rukuni, 1988 cited in Ashimogo, 1995). Agriculture is contributing about 34% of the region's GDP, employing about 79% of the total labour force and contributing about 26% of the total foreign currency earnings (Dhliwayo, 1988). Stimulating agricultural growth will therefore be the major instrument for increasing national and household incomes, with which food can be imported and bought domestically.

Secondly, in most SADCC countries, agriculture is the principal means of ensuring food availability. The large number of people in the SADCC who suffer food insecurity are the rural poor, who have insufficient land and other resources to provide sufficient income or food. Increased food production through agriculture is the major way to increase food security of the insecure rural people in the medium term, since alternative employment will not be readily forthcoming and dependence on food aid is unpredictable for more than a short term.

Since the implementation of the NFS in 1984, the government has established a Food Strategy Unit (FSU) in the Ministry of Agriculture and Livestock Development (MALD), which has been charged with the duty of formulating food policy and programmes, monitoring their implementation and reviewing them when necessary (Biseko, 1989). The FSU has already prepared a Drought Resistant Cereals Strategy which focuses on sorghum and millet, a Cassava Development Strategy, Rice Development Programme and a village level storage programme. Implementation of seven irrigation projects which will increase irrigated land by an estimated 17,000 hectares is underway. The government also aims at improving and expanding

[1] In 1980, nine African countries agreed to form the Southern African Development Co-ordination Conference (SADCC). The SADCC countries, which originally included Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe aimed among other things at integrating their agricultural markets. Namibia and the Republic of South Africa later joined the SADCC and make the number of member countries eleven. SADCC was then transformed into the Southern African Development Community (SADC) in August, 1994.

the production of maize and wheat in state farms. The target is to improve maize productivity and expand wheat cultivation by 8000 hectares.

The Government also aims at improving smallholder production through implementation of four projects, *viz.*: a fertilizer programme which has the objective of promoting the proper use of fertilizer to attain high yields; a Southern Highlands Crop Improvement Programme which seeks to utilise the potential of the major maize growing regions in the south (Ruvuma, Mbeya, Rukwa and Iringa regions); a Food Security programme which aims at providing support services to farmers, to enable farmers to increase their yields of food crops; and a pilot project on extension research linkages in food crop production which aims to involve peasants in crop research and adoption of research results. The Government also aims at continuing the implementation of a grain storage and milling project with the objective of rehabilitating existing milling machines and expanding milling and storage capacity.

Major interventions by the Government in increasing access to food have been through; the price mechanism, reorganisation and rationalisation of the marketing and distribution system, nutrition programmes and food relief. Following the launching of the 1983 Agricultural Policy, the government has relied on the price mechanism to induce increased production (Table 1.2).

Table 1.2. Commercial Producer Prices (Tshs/Kg)

	Prices (Tshs/Kg)			
Crop/Year	1986-87	1987-88	1988-89	1989-90
Maize	6	8	9	11
Rice	10	14	17	19
Wheat	7	9	10	13
Cassava	4	5	5	5
Sorghum/Millet	5	6	7	7
Beans	14	22	25	27

Source: Biseko, (1989).

Price policy reforms in the agricultural sector have helped to increase incomes in rural communities. Amani et al (1988) confirmed that there has been an increase in real incomes among the rural population which is largely explained by the increase in agricultural producer prices. Liberalisation of the market has also improved accessibility to food. By removing the monopoly of the National Milling Corporation (NMC) on food trade and reducing internal trade barriers, open market consumer prices for maize declined thus increasing the real purchasing power of consumers.

Nutrition interventions are planned by the Food and Nutrition unit of MALD. The unit and UNICEF are currently implementing a Household Food Security Nutrition and Child Survival Programme. Priority areas to improve household food security for those most at risk are; production of cassava and other drought resistant crops, reduction of the workloads of women, nutrition education and child care (Biseko, 1989).

The Tanzania's food security programme has yet to achieve its goal due to a number of constraints. Climatic factors still contribute greatly to food insecurity in Tanzania. This is largely due to the fragile nature of smallholder peasant agriculture. In 1988 drought conditions necessitated famine relief in parts of Lindi and Kilimanjaro regions and floods have affected one fourth of the regions in mainland Tanzania (Kavishe and Mushi, 1993). An estimated 18327 hectares were water logged as a result of the floods, necessitating 6875 tonnes of maize for famine relief.

The same author further reported that 98% of Tanzania's agriculture depends on rains and in every 3-5 years (on average) there has been crop failure (in some parts of the country) due to droughts, floods or both. Severe droughts were experienced in 1961/62, 1970/71 and 1973-75, followed by floods in 1978/79 and poor rains in 1979/80 and 1980/81; then moderately satisfactory rains in 1981/82 to 1984/85, followed by floods in three "grain basket" regions (Morogoro, Mbeya and Rukwa) in 1988/89 and Kilimanjaro (Moshi and Rombo District) and

Mtwara Regions during 1990/91. Droughts and floods affected large parts of the country in 1992/93.

Farming technology is low; about 85% of cultivation is still done by hand hoe, and only 10% by oxen and 5% by tractor (URT, 1990a). Farm inputs (fertilizers, hybrid seeds, insecticides and herbicides) are fast becoming inaccessible to the smallholder due to rising prices due to removal of state subsides. Socio-economic factors also contribute to food insecurity, particularly for the non-agricultural population such as those living in urban areas and the poor rural households who can not produce enough food for their own. Amani et al, (1988) reported food expenditures exceeding official incomes in most households in Dar es salaam. It is understood that many people perform other income earning activities outside their official jobs, but it is not known whether this applies to all income groups. In some regions which experience frequent droughts, low income has also been a major cause of food insecurity. Other causes of food insecurity include pests and diseases, improper land use, lack of adequate and appropriate techniques, infrastructure bottlenecks and lack of realization by men of the heavy workload borne by women (Biseko, 1989, Kavishe and Mushi, 1993).

Women, as key producers in many regions of the world, play a central role in the development and production of food and agriculture, participating actively in all phases of the production cycle, including conservation, storage, processing and marketing of food and agricultural products. Women make up 60 to 80% of the agricultural workers in Africa and Asia and more than 40% in Latin America (Bandarage, 1984, Jaquette, 1986). Increasing numbers of households in the world, especially the one-third or so that are headed by women, are dependent on the productive roles of women for their very survival.

Despite their very important role in food production, food processing and storage, women do not have full participation in its control and decision making and they have not received due attention by policy makers working to increase world wide agricultural production. The demand that women be given access to resources to enhance production has grown over time.

The challenge of the future is to see that women as food producers receive their fair share of recognition not only in the full panoply of economic and demographic statistics intended to count workers and value their labour, but in the institutional/political systems that provide access to resources that will raise agricultural productivity and the returns of women's work. More importantly, account should be taken of the vital role women could play in seeking solutions to the food crisis that Africa is experiencing and the need for a continual effort to promote an awareness of their contribution to agriculture and food sector.

1.2. Problem Statement.

An analysis of national level food balance data for the past half decade showed that on aggregate terms, Tanzania produces enough food to satisfy domestic food requirements (Kavishe and Mushi, 1993). An examination of the trend of national food adequacy from 1984/85 to 1988/89 confirmed the observation that in all those years, national food adequacy was consistently above domestic requirements (TFNC, 1992). Thus it seems that at the aggregate level, food security is not at jeopardy because of insufficient food production.

It worth noting however, that household food security is clearly more than food production alone. National food sufficiency is not regional nor district nor community nor household food sufficiency. An examination of the pattern of food production shows that some regions produce more than what it needs while others produce less. This implies that food has to be moved from one district to another or from one region to the next. Due to infrastructure bottlenecks, food accessibility in some places is hampered by distribution problems. From the few studies which have assessed household food security in Tanzania, the proportion of households in the rural areas which suffer from food insufficient is very high being as high as 77% (TFNC, 1992).

Availability of food does not guarantee its accessibility due to social and or economic constraints. Those areas with large volumes of food also suffer from high rates of malnutrition and child mortality (TFNC, 1992). That some members of the household suffer from malnutrition while others do not under the same conditions of physical and economic food

accessibility is indicative of differential cultural access to food within the household. Also, availability of food in the market does not guarantee individual or household accessibility due to economic constraints.

More importantly is that the food produced is not only for household consumption. For subsistence farmers, there is a need to satisfy non-food demands like clothing, housing, food commodities they can not produce, farming tools and various fees. Food is not always sold because it is surplus but because of pressure from expenses. For small holders the expense pressure leads to their retaining inadequate stocks for domestic consumption to ensure food security as the food have to be sold to cater for the other needs. The low stocks held may further be depleted by losses due to storage and spoilage pests

In Tanzania and most of Sub-Saharan Africa, women play a triple role of producers, reproducers and the major offerers of care in the household (Kavishe and Mushi, 1993). Despite of this, they are not integrated fully in the food security and nutrition related programmes and projects (Dey, 1984). Because of categorizing women's duties as what takes place in home sphere, many opportunities had been lost to support women's production as well as domestic activities and thus develop their potential in increasing food production and thus improving their household food security.

Food security as an important factor in the community well being and national development must be studied from the household level. Only scanty serial information on household food security problems is available, most often in only a few parts of the country making it difficult to examine trends over time. This calls for research on household food security, the involvement of women in household food security and the constraints met to alleviate food insecurity. All the factors determining household food security must be studied before any conclusion about food security situation of the households in an area is made.

1.3 OBJECTIVES OF THE STUDY

General objective.

The general objective of this study was to investigate the household food security situation in Moshi Rural District.

Specific objectives

1. To evaluate the food and energy adequacy of the study area based on total production only.
2. To study the factors affecting food availability and accessibility.
3. To find out the extent of women's involvement in food cycles relative to men. This will involve studying who does what in agriculture, animal husbandry activities and housework.

1.4 RESEARCH QUESTIONS.

-What is the food security situation of the study area?

-What are the factors determining household food availability?

-What are the factors determining household food accessibility?

-What are the coping strategies of the people during periods of food shortages?

-What are the root causes of food insecurity in the study area?

-What is the gender division of labour of the study area and what is its significance for food security?

CHAPTER TWO

2.0 Description of the study area.

The area chosen for the study is Moshi Rural District in Kilimanjaro region. Moshi is among the five districts of Kilimanjaro region; others include Moshi urban , Mwanga, Same, and Hai. Kilimanjaro Region is located on the north eastern part of mainland Tanzania just south of equator. It boarders Kenya to the north, Tanga Region to the east and Arusha region to the west. Figure 2.1 shows a map of Tanzania with Africa insert showing the regions of Tanzania mainland and location of Kilimanjaro region.

2.1. Geographical location and size.

Moshi District is located in the southern central part of Kilimanjaro region. It encompasses an area of 1529 Km^2. It lies between latitude 3° S and 3° 30^1 S of the equator and longitude 37° 30^1 E and 37° 45^1 E of the Greenwich meridian. Most of the area is highlands, 1000 m to more than 2000 m a. s. l on the slopes of Mountain Kilimanjaro to 5895 m a. s. l at the highest peak of mountain Kilimanjaro. Figure 2.2 shows the sketch map of Moshi District and the approximate location of Mawanjeni, Komakundi and Mbahe study villages.

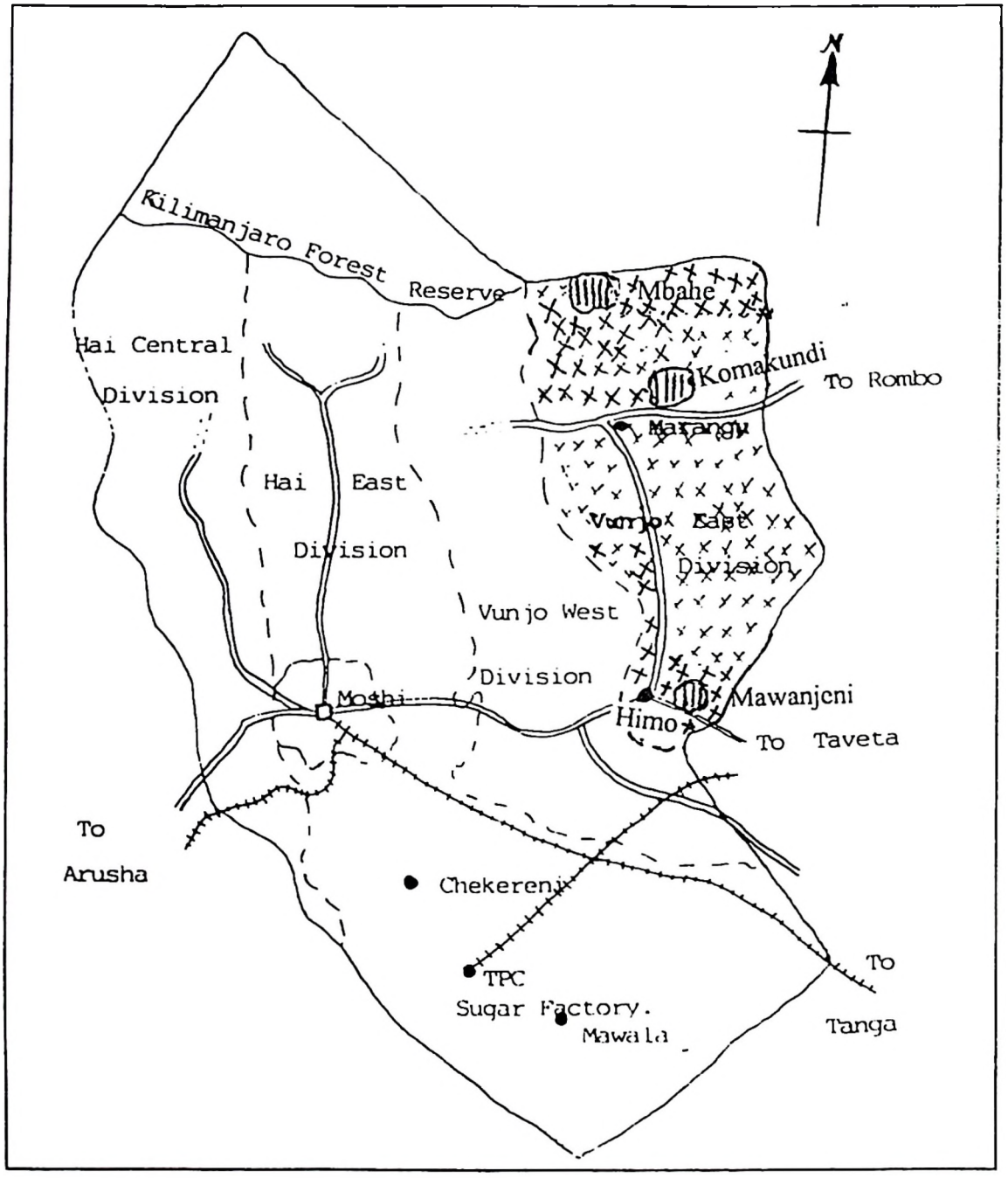
2.2. The physical environment

2.2.1. Climate

Moshi District is characterized by a cool and wet climate. Mean temperature is close to 20°C throughout the year. The area receives a bimodal rainfall pattern with short rains occurring from November to December. Long rains start mid March through late May or early June. The wettest areas are at the elevations from 1500 m to 2000 m a. s. l. where mean annual precipitation reaches 2000 mm. Below 1500 m rainfall decreases to about 700 mm on the low lying plain. Based on this variation, the agricultural land around mount Kilimanjaro has been divided into three altitude belts *viz.*; lowlands, midlands and uplands (Table 2.1). Table 2.2 shows monthly rainfall pattern at Moshi District whereas Figure 2.3 shows total rainfall (mm)/year.

Source: GDI, 1983 cited in ICRA (1992)

Figure 2.1. A Map of Tanzania with Africa insert showing the regions of Tanzania mainland and location of Kilimanjaro region



Study division | Division boundary | Study villages

Major roads | District boundary | Railway line

Source: Office of DADO Moshi (1995)(Not to scale)

Figure 2.2 The sketch Map of Moshi District and approximate location of Mawanjeni, Komakundi and Mbahe villages of study

Table 2.1 . Agro-ecological zones and climate in Kilimanjaro region.

Zone	Altitude (m.a.s.l)	Rain (mm)	Temperature °C
High zone (uplands)	1100-1800	1250-2000	15-25
Middle zone (midlands)	900-1100	800-1250	25-30
Low zone (lowlands)	up to 900	up to 800	over 30

Source: URT, (1994)

2.2.2 Soils

Soils on the slopes of Mount Kilimanjaro have been formed by volcanic activities of Mountain Kilimanjaro. These soils show great variations because they have developed from volcanic materials of different ages (Deckers et al, 1990). There are four major groups of soils which can be identified from Moshi District.

1. Humic Nitosols and associated humic Andosols
2. Chromic cambisols and associated eutric Cambisols
3. Orchric Andosols and associated chromic Cambisols and Vitric Andosols
4. Mollic Andosols and associated eutric Nitosols

In general, these volcanic soils are fertile with a high base saturation and cation-exchange capacity (Fernandes and O'kting'ati, 1984) but they have been continuously used so they are nutrient depleted. Steep slopes in many areas of the mountain prevent farm mechanization and necessitate substantial erosion control in order to maintain high agricultural production. In other areas arability is limited by stoniness or by shallow petrocalcic horizon (O'kting'ati and Kessy, 1991)

2.2.3 Vegetation belts

The vegetation changes with altitude and five types of vegetation cover is identified in Kilimanjaro region (Mwasaga, 1991).

The vegetation of the plains at the lower elevations of Mount Kilimanjaro is a woodland and bushland belt. On the wetter southern slopes of Mount Kilimanjaro, the upper limit of this belt is 900 m while on the drier northern slopes this belt reaches up to 1500 m -1650 m.

Table 2.2. Total rainfall/month (mm) in Kilimanjaro region in Moshi urban meteorological station in Moshi District 1984 - 1993

	Year										10 year
Month	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	mean
January	38.7	14.3	87.6	38.9	60.8	76.0	48.5	126.3	2.9	111.1	60.5
February	1.9	99.2	5.4	8.8	8.6	0.7	45.7	18.0	16.9	54.7	26.0
March	13.7	146.5	164.5	25.0	196.8	103.2	244.9	78.4	37.9	73.5	108.4
April	553.5	200.7	392.6	108.6	517.8	281.3	633.9	168.5	446.8	46.6	335.0
May	58.9	173.2	198.6	97.1	128.6	156.9	49.5	283.7	215.5	103.6	146.6
June	72.2	28.1	29.5	0.3	22.4	16.2	6.4	5.6	3.1	5.8	19.0
July	79.9	12.4	2.2	59.0	7.2	3.0	8.8	6.7	144.0	8.2	33.1
August	0.6	15.8	7.0	60.8	4.8	17.9	6.2	29.7	24.1	12.5	17.9
September	4.2	3.1	11.4	4.1	37.5	10.3	4.0	26.8	0.8	0	10.2
October	6.4	40.0	43.8	0.6	1.2	14.2	39.8	16.1	0.1	35.0	19.7
November	30.1	116.3	58.7	13.4	27.5	5.6	173.7	38.1	91.8	45.2	60.0
December	95.2	63.7	89.2	14.6	79.1	107.3	43.4	105.1	52.4	32.2	68.2
Total	**955.3**	**913.3**	**1000.5**	**431.2**	**1092.3**	**792.6**	**1304.8**	**903.0**	**1036.3**	**528.4**	**904.6**

Source: URT (1994)

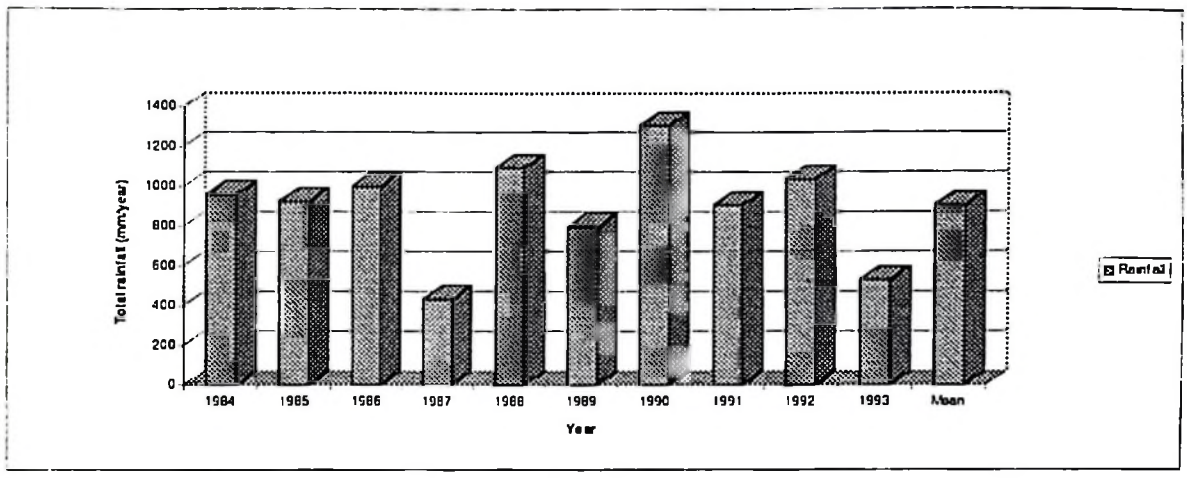


Figure 2.3 Total rainfall/year (mm) in Moshi Urban Meteorological Center.

This belt is susceptible to fire and can be characterized as a mosaic of *Acacia spp.*, thorn bushland and *Combretum/Terminalia* woodland.

The cultivated belt constitute the replacement of the lower part of the montane forest belt. The cultivated belt completely encircles the mountain with the exception of a narrow (8 Km) corridor of native vegetation on the northwestern slope. This belt reaches its highest point in the Machame and Marangu regions (1900 m) on the southern slope but in most other areas on the southeastern and western sides of the mountain it extends no higher than 1700 m.

Other vegetation belts identified from Kilimanjaro region on an altitude above 2000 m.a.s.l are montane forest, ericaceous belt and alpine belt.

2.3 Socio-economic environment

2..3.1 Population

Total population according to 1988 data is 342553 people but according to population projections the population has increased. The population density is 224 persons per Km^2. Actual densities are as high as 700 people per square Km in the zone between 1100 - 1800 m where the majority of the population is settled and as high as 3339 people per square Km in Moshi Urban.

2.3.2 Crops and Cropping pattern.

A wide varieties of crops are grown in Moshi District. The main crops are perennial crops such as coffee and bananas. Popular cereals are maize, sorghum and finger-millet. The finger-millet is used mostly for local beer brewing. Others are sweet potatoes, Irish potatoes and yams. Common vegetables are cabbages, spinach and tomatoes. Fruits such as mangoes, plums, avocados, guavas and peaches are widely consumed in the peak periods. Beans are the dominantly eaten legumes.

2.3.3 Farming systems

Three main farming systems are identified in the Moshi District. These are categorized as follows; coffee/banana, maize/beans and extensive livestock. The coffee/banana farming system is practiced by the farmers resident in the uplands or in the midlands between 900 - 1900 m.a.s.l. The main distinguishing factor of these farmers is the production of coffee and banana and keeping of dairy cattle in the uplands. Intensive management of dairy cattle is integrated into the farming system as crop residues, including banana leaves and pseudo-stems are fed to cattle under a system of zero-grazing. Cattle are kept for milk and manure while chicken, goats, sheep and pigs are kept for meat for sale and/or for home consumption. Trees and shrubs are deliberately retained in the home gardens to provide shade for coffee, fodder, mulch, live fence, fuelwood, fruits and local medicine. Manure is mostly applied in their farms with very minimal application of fertilizer.

The agricultural land is differentiated into two types in Moshi District, that is, "Kihamba" and "Shamba". Most of the farmers from the uplands have two farms. The Kihamba is in principle clan land to which the occupant has permanent freehold and is located in the uplands. The Kihamba, or the Chagga homegarden[1] is where an individual establishes his residence and plants permanent crops such as coffee and bananas. Shamba is land located on the lowland and is mainly used for growing maize and beans. Other crops in their shamba are, sorghum sunflower and finger-millet.

[1] Homegarden is a mult-storey farm where several crops are intercropped for instance coffee, bananas, maize, beans, cocoyams, fruits and vegetables, potatoes, sugar cane, yams and trees.

Due to land scarcity in the uplands, maize and beans are grown in the midlands and in the lowlands. This entails travel of as much as 20 Km between the highlands and the lowlands for several times during the crop's life cycle. The crop residues are sometimes transported to the homestead for feeding livestock. Some farmers grow maize and beans in the uplands too.

Maize/beans farming system is represented by farmers residing in the midlands and lowlands who do not own coffee/banana fields. A number of them may have more than one field in different areas of the two zones but they do not own land in the uplands. Their fields are situated side by side with those of non resident farmers from the uplands. The major crops grown are maize and beans in combination, sorghum, sunflower and finger-millet. They graze their animals in the grazing land or in the farms after harvesting as the farms contain no permanent crops.

Extensive livestock farming is commonly practiced in the lowlands for instance in lower Moshi areas. The Maasai are the dominant ethnic group in this area. The grazing area in the lowlands is interspersed with arable fields. The lowland village for this study was chosen from the maize/beans farming system area.

2.4 Villages selected for the study.

The study villages were chosen from two different agro-ecological zones. Two villages were chosen from the slopes of the mountain Kilimanjaro (uplands) where rainfall pattern is predictable throughout the year and thus allowing permanent home gardens around the homeyards. One other village was chosen from the plains (lowland) and it represented a Semi-arid area where rainfall is not predictable and thus have seasonal cropping pattern.

Komakundi and Mbahe villages were chosen from the uplands. They are typically Chagga villages. They are situated in the Mamba North and Marangu west ward respectively in the slopes of Mountain Kilimanjaro (uplands). These villages lie at an altitude of about 1400 m and 1600 m a. s. l. respectively. They have a population of 3314 and 3520 people respectively.

The main cash crop for both villages is coffee while the main food crops are maize and bananas. Other crops grown in the homegarden are as mentioned earlier. Stored products are mainly maize, beans and finger millet although finger millet is mostly for preparing local beer and maize is for home consumption.

Mawanjeni village is situated in Mwika South rural ward in the lowlands. It lies at about 850 m a. s. l. The population is 2596 people. The village is largely inhabited by a mixture of tribes; the Chagga, Taita, Kamba, Pare and few Mbulu. The main food and cash crop for this village is maize. Sunflower is increasingly gaining popularity as a cash crop and food crop. Other crops grown in the area are beans sorghum and finger millet.

2.5 Rationale for choosing the study area.

There has been tremendous increase in population densities in the slopes of Mount Kilimanjaro. Except for the gradual shift of people from the highlands to the lowlands, the areas with high densities have continued to experience increasing densities as population growth tends to take place *in situ* (Maro, 1988). Such high densities have resulted in decrease in farm size and lowered crop productivity due to depleted soils caused by over-cultivation. There is gradual movement of people down slope towards dry lowlands which have poor soils and poor climate.

Although the coffee, banana production system of the uplands represents one of the more successful system in terms of production, level of income and welfare of the people who depend on it, it is also a system under severe pressure as far as food production is concerned. In the past, this area has been favored by the Government. Inputs have been subsidized and there has been substantial investment in infrastructure and social services. In part, at least, the impact of the adjustment program has threatened this process, particularly through increase in input prices thus lowering farmers capacity to buy inputs (FSG, 1992).

There has been a long term assumption that the Kilimanjaro Region is self-sufficient in food despite the fact that only scanty serial information on food security is available from this area as many other areas of Tanzania. So it is of interest to study household food security situation in this area.

CHAPTER THREE.

3.0. LITERATURE REVIEW.

3.1. Household Food security concept

Food security is a complex issue, recently developed in the field of food science, nutrition and economics. It is a multidisciplinary cross-sector concept which combines natural and social science in one integrated approach. Many authors are trying to link it with different fields of study. Food security can be addressed at different levels; that is, global, national, regional, community and household. Regarding the present situations of global overproduction of food, community and household food security are the most interesting levels. In this study, the main concern is on the household food security.

In 1970's food security was mostly concerned with food supply, usually in the form of grain stocks and was being applied at regional or district levels (FAO, 1983). In the 1980's, the focus shifted to questions other than supply. FAO (1983) defined the objective of food security as "to ensure that all people at all times have both physical and economic access to the basic food they need". In this context, food security is seen to have three specific aims: ensuring adequate production of food, maximizing the stability of food supplies and ensuring access to food particularly for those in greatest need. Food security is generally accepted as entailing not only food availability through domestic production, storage and/or trade, but also and perhaps more importantly, food access at households and individual levels through home production , purchase in the market, or food transfers. (Maxwell and Frankernberger, 1992).

The World Bank (1986) has given a definition to food security that has become widely accepted as defined in section 1.1. The definition is "access by all people at all times to enough food for an active and healthy life". Its essential elements are the availability of food and the ability to acquire it. Access to food indicates a focus on the process whereby food is reaching people . It entails a concern not only for the production and supplies of food but also for the actual consumption of it (Holmboe-Ottesen and Wandel, 1992). Swaminatham (1986) has pleaded that this concept be enlarged into one of nutritional security. Only access to balanced

nutrition and safe drinking water can ensure that all children have an opportunity for full expression of their innate genetic potential for physical and mental development.

Weber et al. 1988 has defined food security as "the ability of a country or region to assure, on a long term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food. It involves assuring both an adequate supply of food and access of the population to that supply, usually through generating adequate levels of effective demand via income growth or transfers. The same authors advocated that food security is influenced by both micro and macro factors, ranging from the technology and support institutions available to farmers and merchants, to monetary, fiscal and exchange rate policies that affect the overall rate of growth and distribution of income.

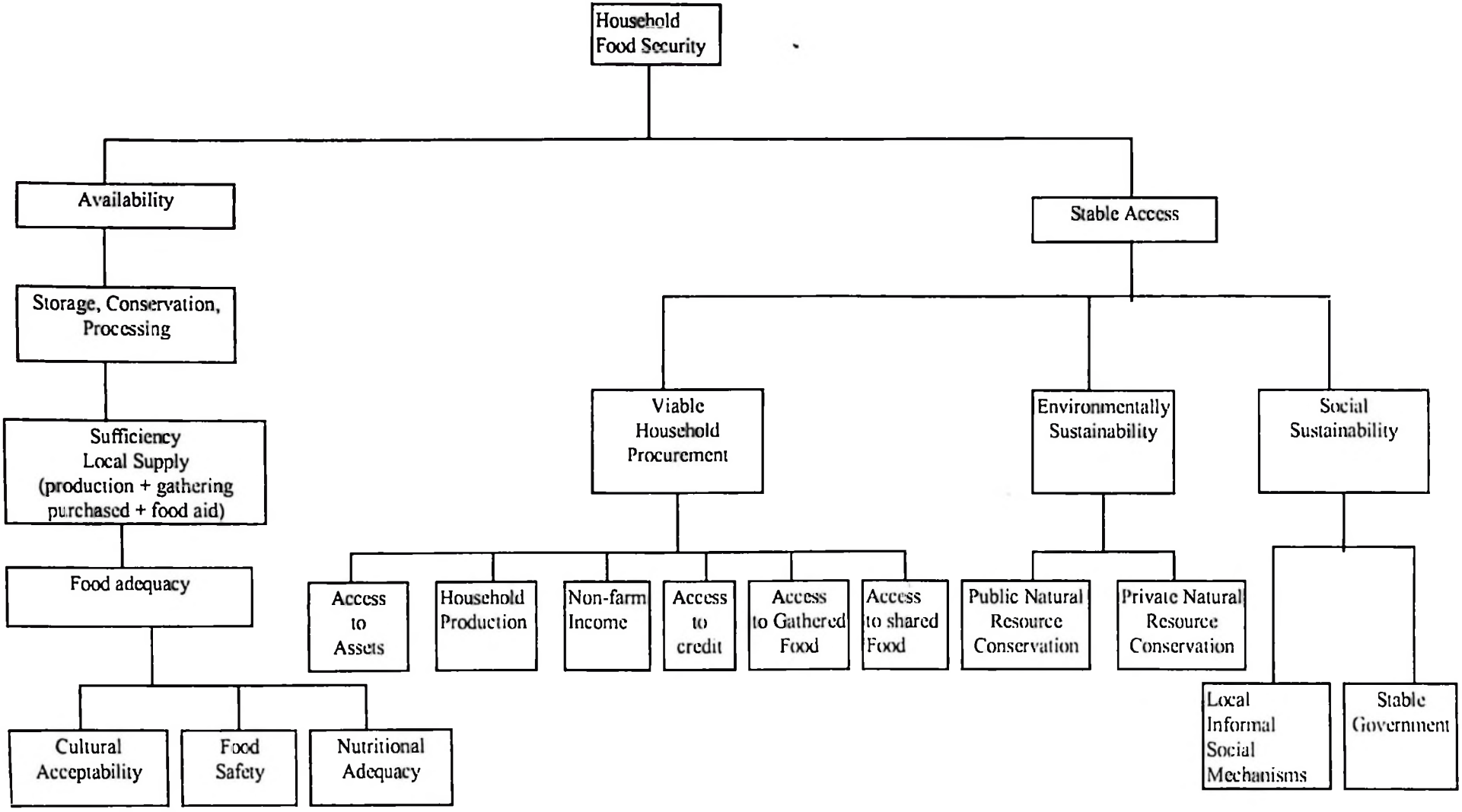
There are more than 30 definitions of food security and insecurity which have been proposed from 1975 - 1991 (Maxwell and Frankenburger, 1992), but it is not the aim of this chapter to mention all of them. These few definitions were highlighted just to introduce the food security concept.

3.2 The major subdivisions of Food Security.

The achievement of the goal of household food security depends mostly on two things; namely food availability, adequacy and stability of supply and physical, economic and social accessibility to food (Figure 3.1)

3.2.1 Food Availability, Adequacy and Stability.

Food availability, accessibility and consumption are often used indiscriminately to mean the same thing (Holmboe-Ottesen and Wandel ,1992). In reality however, they may refer to very different things. In pure subsistence societies, food availability would be equal to the food in stock plus what can be picked directly from the fields and gardens as well as from foraging of



Source: Frankernberger, (1992).
Figure 3.1: Conceptual Framework for Household Food Security.

wild foods. In more market integrated societies, the situation is more complex, since food and other crops can be sold and cash income can be used to purchase food available in the market.

Adequacy refers to quantity and quality; that is, there should be enough food to meet daily requirement for all the members of the household (Mosha, 1990a) and the food should be of the right type to provide all essential nutrients to provide a balanced diet.

Stability (sustainability) of food supply on the other hand is the continuous flow of food in the homestead either through quantity stored or from external sources. This concerns a just income distribution and effective markets, together with various public and informal support and safety nets (Oshaug, 1994). The same author further argues that, a society which can be said to enjoy food security is the one which has developed the internal structures that will enable it to sustain the food Norm in the face of crises threatening to lower the achieved level of food consumption.

Food interventions must be in line with local culture, traditional and religious beliefs (Holmboe-Ottesen and Wandel, 1992). When the food is available and affordable, the utilization pattern is determined by consumer preferences some of which may be embedded in cultural norms and taboos (Mosha, 1990a). The foods may be termed as being edible or inedible depending on the culture or beliefs of some societies. For instance, some tribes eat snails, dogs, insects, wild fruits and vegetables while others do not. Foods like pork and beef are strictly forbidden for some religious groups. Cultural beliefs can sometimes rob people their food entitlement. A good example from Tanzania is the belief that chicken and eggs are harmful to pregnant or lactating mothers. As a result of the work of community development field staff, and campaigns of UNICEF sponsored nutrition and child survival programs, these taboos have been gradually changing and consumer preferences re-oriented (Mushi, 1988 cited in Kavishe and Mushi, 1993).

Food must also be procured with dignity. This is linked with socio-cultural traditions. For most people, to be able to feed oneself is also a source of human dignity, self-respect, cultural belonging and personal identity, as well as a prerequisite for being able to claim and use one's civil and political rights (Hasselskog, 1994). Being hungry or malnourished one can scarcely fully enjoy the freedom of expression. Laws of the land, society and community forms of behavior must be considered in procuring the food. For example, if people are deprived of their land, their right to feed themselves is also impaired (Mosha, 1990a).

Food safety must also be taken into consideration. Food safety implies protection from contamination from various sources. The presence of micro-organisms and agrochemical residues represents health hazards that should be dealt with in development efforts (Holmboe Ottesen and Wandel, 1990). It also involves inactivation of antidigestive factors and agents that inhibit absorption and food that does not contain health hazards such as naturally occurring toxins and dangerous additives such as colors, and flavor enhancers (Mosha, 1990a).

3.2.2 Food Accessibility

Access to food encompasses physical, economic and social aspects. It involves processes whereby food is reaching people. Physical access to food relates both to the adequacy of supply and to the efficiency of the distribution system, including storage, preservation, transport, marketing and processing. Economic access to food relates to the ability of groups of people to establish entitlement over a requisite amount of food (Sen, 1981). It is related to the access to resources for the procurement of food, the ability to generate income, whether in cash or in kind and the proportion of income that is actually available for consumption purposes (Holmboe-Ottesen and Wandel, 1992).

The purchasing power which is dependent on income largely determines the degree of access to food at the household level. What is known today is that poverty is the main reason for the lack of food security and not scarcity of food (Haug, 1994). Inadequate purchasing power in turn is due to insufficient opportunities for gainful employment. The famines of jobs and

purchasing power are the primary causes of famines of food in poor households (Sinha et al 1989).

It should be noted that, increased food supply and availability alone does not relieve food insecurity. Food insecurity occurs in situations where food is available but not accessible because of an erosion of peoples entitlement to food (Borton and Shoham, 1991 cited in Nyborg and Haug, 1995). That some members of a household suffer from malnutrition while others do not under the same conditions of physical and economic food accessibility is indicative of differential cultural access to food within households. For instance, a variety of ethnic social systems in Tanzania tend to favor men to have the choicest access to food (Mushi, 1988 cited in Kavishe and Mushi, 1993).

3.3 Food Insecurity.

3.3.1 Types of food insecurity

It is useful to subdivide food insecurity problems into transitory and chronic (Kennes, 1990). Transitory food insecurity refers to a temporary decline in households food intake resulting from instability in food production, food prices or income. In its extreme form it can mean famine, a situation where a sizable population group lacks the resources for even a minimum subsistence diet (Kennes, 1990, UNECA, 1992). It is the result of short-term fluctuations in production brought about by fluctuations in household income, food consumption, and availability of food at the national and global levels. It is thus a manifestation of temporary lack of access to sufficient food and therefore be eliminated or drastically reduced by corrective stocking policies. Because enough food has traditionally been available at the global level, the problem of temporary food insecurity in the African context must be seen largely as one of inability to buy (Sinha et al, 1989).

Chronic food insecurity occurs when households on a more permanent basis lack the resources to acquire enough food for a healthy and active life, while they are not directly threatened by starvation. It is worth while to further subdivide chronic food insecurity into a lack of overall food quantity, normally measured in energy; that is, caloric intake and

insufficiencies at the level of particular nutrient. Lack of specific nutrient can as well be related to lack of information or nutritional knowledge and not necessarily lack of resources or income. It is now generally accepted that the problem of food insecurity is not just about food alone but also about the general problem of poverty and unequal distribution of purchasing power among and within regions and nations (UNECA, 1992).

3.3.2 Causes of Food Insecurity.

Causes of food insecurity may be grouped as follows (TFNC, 1992):

i. **Inadequate food supply in rural households:** This may result from crop failures, storage and production deficiencies and sale of food in higher proportions than food security would require (in order to meet other essential needs).

ii. **Poverty:** Reports from UNECA studies in Africa show that the widespread hunger prevailing in many nations is not due to non-availability of food in the market, but to inadequate purchasing power among the rural and the urban poor

iii. **Inflation:** Consumer purchasing power has been declining over the last years in most developing countries. The hardest hit are the urban low wage earners and the rural poor who are food deficit and they have to buy food.

(iii) **Inappropriate food practices**: Insufficient frequency of feeding, especially for young children, or inadequate weaning foods, and low intake of animal protein by growing children, are the major direct causes, but the origin of this behavior is social and cultural. Meal frequency is linked with other factors such as the time availability of women to cook and availability of food.

iv. **Women's workload**: Overwork resulting from the time and energy expended in undertaking the numerous onerous tasks expected of women, not only in Tanzania, creates or amplifies the conditions of inadequate children's and female adult food intake by reducing the frequency of meals. During the peak period the number of daily meals can be as low as one and the care with which the food is prepared can be reduced during this time. Also due to too much work, women might not be able to produce enough food for their families.

3.4. The Food Security situation in Tanzania.

3.4.1 Conceptual analysis

When analyzing food security it is essential to bear in mind that food self-sufficiency at the national level, in no way guarantees that household level food and economic security, that is the ability of families to produce or purchase adequate amount of food to meet biological needs will be achieved. Equally important is that household food and economic security does not necessarily imply good nutrition for all family members (Quinn et al, 1990). Such factors as intra-household food distribution, feeding practices, illness and sustainability govern an individuals food intake and its utilization by the body.

Basing on the above information, one cannot conclude that the rural households of Tanzania are food secure; although on aggregate Tanzania is not a food deficit country. Equally important is that in some areas in the rural Tanzania, one cannot talk of a balanced diet while the food at the homestead is not sufficient, income sources are limited, children are not clothed and medical services are minimal if not available. The household which does not have anything to chew will never bother to chew whatever available if it palatable. The distinction between food security and adequate dietary intake is based on the quantity/availability and quality respectively. Even if a household is secure with enough available food resources for all family members, the nutritional quality might not be sufficient. While adequate food security may not necessarily lead to a good nutritional status, food availability is a precondition for nutritional improvement. The rate of improvement of the nutritional status in the food shortage prone areas is slower than in those areas not affected by food shortage (TFNC, 1992).

3.4.2 Food Security at Household Level

Availability of food at the household level requires that food be available in the households and in the local or community markets. This requires adequate products from agriculture or smooth market operations, functioning infrastructure and a free flow of information. Ringia (1990) in his paper on food security indicated that although intermittent, food insecurity problems in Tanzania have been persistent. He identified the following factors as being the

most important factors contributing to food insecurity; drought and dependence on rainfall, poor storage and rural transportation, poor agricultural pricing, local beer brewing, overselling of food crops for family income and traditional dancing and funerals. Research done in 40 villages in Iringa region showed that the shortage of food in households was a result of big families, large costs attached to agricultural inputs, idleness and drunkardness (URT, 1990b).

Mtebe et al, (1988) conducted a survey on household food security in a child survival development program area in Morogoro region and revealed that small cultivated land coupled with inadequate crop management practices does not guarantee availability of sufficient food for most households. The same author concluded that in over 50% of all respondents surveyed, there was insufficient food availability all across the region over the two seasons (1987/1988 and 1988/1989). Figures for Morogoro rural district were the most alarming for which about 73% of respondents expressed a situation of food inadequacy. About 93% of the respondents in Morogoro rural indicated drought conditions as the number one reason for the low food availability in their households.

Mosha, (1990b) found 10% and 20% less acceptable cereal harvest per household for good food security in Nyegezi and Kishapu division in Shinyanga region. This indicated that food production in the two divisions was below the optimum food security at household level. Mamiro (1991) reported that the proportion of household reporting inadequate harvest to meet food needs in Mtwara region averaged 67.7% in 1988 and 1989.

Kavishe and Mushi (1993) have reported that a large proportion of households in food deficit areas and to a much lesser extent in food surplus regions do not produce enough food for their own consumption. They further reported that many of the households do not have other sources of income to purchase food.

Studies by UNICEF and TFNC have shown that food insecurity is a crucial problem for many households in Tanzania. A rapid assessment of food availability and consumption in

about 500 rural households in Mtwara, Zanzibar and Shinyanga showed that for 63.8% of households in Shinyanga, 43.6% of households in Mtwara and 43.3% of households in Zanzibar the staple food grains lasted only for six months (TFNC, 1992).

As for many other developing countries particularly those in Africa, the information indicates that Tanzania suffers from four major endemic nutritional deficiencies. These are Protein Energy Malnutrition (PEM), Nutritional Anaemia, Iodine Deficiency Disorders (IDD) and Vitamin A deficiency. Malnutrition affects more than one quarter of the population. Twenty eight percent suffer from PEM and 32% from Nutritional Anaemia (Kavishe, 1987). The most affected group is the children under 5 years old; as much as half of them suffering from PEM. For pregnant and lactating women 80% suffers from Nutritional Anaemia (TFNC, 1992). Although the estimates were made in 1987, the picture has not changed significantly todate and these estimates could also be applied for 1990's (TFNC , 1992).

NOTE: It should be noted that malnutrition or a decline in anthropometric measures is not necessarily an indicator of food insecurity. Nyborg and Haug (1995) have concluded that malnutrition has also other causes which can be independent of food insecurity, for instance, poor health and poor maternal and child care. Thus, household food security is necessary but not sufficient for adequate nutrition.

3.4.3 Food Security at Regional Level

At the regional level there is an imbalance in food production. For the marketing year 1989/90, which benefited from the bumper harvest of 1988/89, it appears that 40% of the Tanzania population lives in food deficit regions, that is, in regions producing less food than they actually require to feed their populations, another 20% just reached a tight balance; leaving only 40% who could be described as self-sufficient from own production (TFNC, 1992) (Table 3.1).

Besides Dar-es-Salaam area, the main food deficit regions are Coast, Dodoma, Kigoma, Lindi, Mara and Tanga, with a production of less than 90% of their food requirements.

According to production statistics the main surplus regions are Kagera (banana and cassava), Ruvuma (maize), Shinyanga (maize and paddy) and Rukwa (maize), producing more than 200% of the food they actually require (TFNC, 1992). This means that production is concentrated in a few regions and because of severe problems of transportation and communication, internal distribution system are severely constrained, putting the food deficit regions at great risk of food insecurity. The problem is compounded by the geographical distribution of production areas which are remote from the main consumer market; particularly Dar es salaam the mist food deficit area. It should be noted that even in some of the food sufficient regions pockets of food deficits sometimes occur in certain districts or parts of those districts because of drought, floods and lack of purchasing power.

Table 3.1. Regional Food Balance Sheet 1988/89.

Region	Population ('000) 1989 estimates	Production ('000) tones	Percent adequacy	
			Food	Energy
Arusha	1390	537	150	112
Coast	656	135	80	57
Dar es salaam	1399	24	7	5
Dodoma	1272	235	72	53
Iringa	1243	527	165	124
Kagera	1363	782	223	172
Kigoma	879	155	69	51
Kilimanjaro	1140	283	96	76
Lindi	665	147	86	61
Mara	998	200	78	58
Mbeya	1518	510	130	100
Morogoro	1257	386	119	88
Mtwara	914	393	167	118
Mwanza	1931	666	134	100
Rukwa	714	391	212	156
Ruvuma	805	450	217	159
Shinyanga	1822	980	209	158
Tabora	1065	439	160	120
Tanga	1320	293	86	64
Total	**23165**	**7819**	**131**	**98**

Source: Kavishe and Mushi, (1993).

3.4.4 National Food Security.

The problem of food insecurity at the national level is caused by a number of factors including serious disparities in consumption and production of cereals; lack of access to food grains, and logistical and financial constraints in the transportation and distribution of food grains to deficit areas (Kavishe and Mushi, 1993).

Until the mid 1970's, excepting during drought years, Tanzania was largely self-sufficient in food production. During the 1961 - 66 period; food self sufficiency was taken for granted and at that time Tanzania was the only independent African country achieving a growth trend in food production greater than that of its population (Amani, et al, 1988). The situation started to change during the two drought years 1973-75; when food grain imports especially maize were necessary for relief during the crisis years. A campaign dubbed "Kilimo cha kufa na kupona" (Agriculture as a matter of life and death) was then started and coupled with the World Bank financed national food programmes, the food crisis was relieved.

An analysis of national level food balance data in "normal" years show that on aggregate terms Tanzania produces enough food to satisfy domestic food requirements (Kavishe, 1987). Thus it seems that at the aggregate level food security is not a jeopardy because of insufficient food production. In bad years, however, huge deficits occur in the main staples (Table 3.2).

Table 3.2. Production of Main Staples Versus Requirements, 1990.

Crop	Actual production ('000 metric tons)	Requirements ('000 metric tons)	Surplus + or deficit -
Maize	2270.5	2245.0	+ 25.5
Rice	294.0	431.0	- 137.0
Wheat	75.7	143.0	- 67.3
Beans	369.1	323.0	+ 46.1
Millet	745.4	834.0	- 88.6
Cassava	1168.8	1494.0	- 325.2
Potatoes	233.6	487.0	- 253.4
Bananas	633.9	517.0	- 116.9

Source: Kavishe and Mushi, (1993).

It should also be noted that despite the good weather and the economic recovery during the last half of 1980's aggregate national food availability has not been that of plenty but of a flimsy balance between production and needs because of the distribution system and lack of purchasing power.

3.5 Women, Work and Food Security

3.5.1 Women and agricultural production.

Women's roles as food producers and providers are crucial among the poor. They tend to be responsible for important staple crops as well as for secondary and gathered foods which are drought resistant. They are involved in the cycles of land preparation, tilling, planting, weeding, harvesting, transporting crops from farm to house, storing, processing, marketing, preparation and serving the food. Rural women spend more time compared to men in agricultural production (Table 3.3)

Table 3.3. Percentage of Time Spent by African Men and Women in selected Agricultural and Subsistence-Related tasks.

Task during the year	Men	Women
Clearing forest and staking out field	95	5
Turning soils	70	30
Planting seeds and cuttings	50	50
Hoeing and weeding	30	70
Harvesting	40	60
Transporting crops home from fields	20	80
Storing crops	20	80
Processing food crops	10	90
Marketing surplus crops	40	60
Carrying water and fuel	10	90
Hunting	90	10
Feeding and caring of the family	5	95

Source: UNECA, Women's Programme, (1975).

In virtually all the studies, the number of women taking part in agricultural work was found to be higher than that of men (Boserup, 1970). The reasons are, Firstly, older men can often stop working by leaving it to their usually younger wives or to their children; Secondly, many

old women are widows who must fend for themselves; Thirdly, more boys than girls go to school and more young men than young women are away from the villages. In Sub-Saharan Africa the contribution may be even higher.

In Tanzania where agriculture is a major source of food for the entire population, 98% of the economically active women are involved in agriculture (Kahurananga, 1990). Women work harder than men and have a larger share of responsibility for family survival in Tanzania. As producers, women work for many hours spending on average 14 to 15 hours a day on agriculture, child care and household chores often under very hard conditions and low technology as shown in a study of 3 districts in Morogoro region (Ishengoma, 1989). In Tanzania women work an average of 3,069 hours per year where as men work an average of 1,829 hours (Taylor et al, 1985 cited from Dankelman and Davidson, 1989). Household tasks are not taken into account in this estimation. Women play a bigger role than men in the food cycles[1] contributing overall 71.6% of the time (Carr, 1991).

Studies conducted by Swantz, (1985) in Tanzania shows that, 70% of the hoeing and weeding is done by women, 60% of the crop harvesting, 80% of the carrying of the crops from the fields to home or storage, 90% of food processing, 60% of the marketing of excess products and 50% of planting. This is a heavy burden for the women when we know that they have other activities to perform at the household level for the well being of all members of the social unit. The distribution of work at the household level is such that women spend most of their time on food production and general care of the household.

Apart from being busy with agricultural production, women also involve themselves in money raising activities for the family (Kavishe, 1983). A study undertaken in Ivory coast showed that women provided from their own earnings one third of the money spent on food purchases, brought more than half of the purchased food and cultivated more than three quarters of the subsistence crops (Dey, 1984).

[1] Food cycles in this case is used in a wide sense including in addition to meals and meals preparation, all activities related to procurement and handling of food.

Since official Government data have often seriously underestimated the number of women active in agriculture, the importance of increasing their production and productivity has not been fully recognized (Mascarenhas, 1983). The usual strategies aimed at alleviating hunger and malnutrition range from short term food aid to long term development efforts in the hope of boosting food production, and reducing post-harvest losses. If any one of these strategies fail to address women's and children roles and needs in the food cycles, it is unlikely to succeed. The deteriorating national food security in Africa, will require efforts for improvement on every level, including the household. More importantly, account should be taken of the vital role women could play in seeking solutions to the food crisis Africa is experiencing and the need for a continual effort to promote an awareness of their contribution to agriculture and the food sector.

3.5.2. Breast-feeding.

Breast-feeding is the most important and critical food security factor in infant nutritional (TFNC, 1992). Close to 100% of women breast-feed during the first six months and up to two thirds continue breast-feeding for nearly two years (Kavishe, 1990). Breast-feeding is highly positively correlated with nutritional status up to 18 months. Thus for infants breast-feeding is a most efficient food security banking system where withdrawals can be made on demand and not greatly influenced by problems of distribution, income, marketing, educational status nor climatic fluctuation.

Kavishe, (1990) has calculated that as a food security measure, the annual cost of breast-feeding in Tanzania is estimated at about 12.0 billion US$. The assumption underlying this estimation is that about 1.0 million women are lactating in a year and that each produces about 800 mill-liter of breast milk per day, whose estimated cost is about 40 US$ per litter. Thus the total cost would be 1.0 million women x 0.8 litter/day x 40 US$/litter x 365 day/year or 11.68 billion US$.

As the major players in "biological reproduction" most of Tanzanian women are either pregnant or lactating during most of their reproductive lines (TFNC, 1992). The nutritional

drain resulting from these pregnancy-lactation cycles lead into the "maternal depletion syndrome" characterized by poor nutritional reserve and pelvic inflammatory diseases. So good food security system is needed to maintain the pregnant and lactating mothers.

3.5.3 The caring capacity of women.

The ACC/SCN defines "care" to refer to the provision in the household and the community, of time, attention and support to meet the physical, mental and social needs of the growing child and other family members (Gillispie and Mason, 1991). In Tanzania and most of Sub-Saharan Africa, women play the triple role of producers, reproducers and major offerers of "care" (Kavishe and Mushi, 1993).

The caring capacity of the mother, therefore depends on how she allocates her time between productive (income-earning) and reproductive (domestic) work as well as her access to essential services and supplies like health, water and fuel. In addition, her capacity to care for the children will also depend on the economic and social status within the household. This determines her ability to effect decisions which will ensure the health and well being of the family. It is through good care, that the available resources are used to secure food in the households. Also it is through good care that the available food in the household is made accessible to all members of the household

3.6 Indicators used for assessing Household Food Security.

To reduce and monitor food insecurity we must determine who is food insecure, why and how they become vulnerable and where they reside (von Braun et al, 1992). In the past food security indicators have been measures of regional or national food supply or its correlate (rainfall). Many policy makers believed that supply indicators were highly correlated with indicators of household food access (Maxwell and Frankemberger, 1992). Recently, many have began to question the validity of commonly used indicators of food security measured at the national level as a representative of indicators of access to food at the household level.

One critical dimension of household food security is the availability of the food in the area for the households to obtain. A number of factors play a role in limiting food availability and the options household have for food access. Maxwell and Frankemberger (1992) classify indicators that reflect food supply as process indicators or" risk of an event indicators". These are indicators that provide information on the likelihood of a shock or disaster event that will adversely affect household food security. They include such things as inputs and measures of agricultural production (agro-meteorological data), access to natural resources, institutional development and market infrastructure, and exposure to regional conflict or its consequences for example influx of refugees. It should however be noted that, these indicators are not necessarily correlated to the situation of food security/insecurity in the household (Nyborg and Haug, 1995) as situations have occurred whereby for instance food supply, agricultural production increases but does not lead to food consumption.

There are indicators that reflect food access. The importance of indicators that measure food access became apparent when the government and development agencies realized that household food insecurity and famine conditions were occurring despite the availability of food. These types of indicators provide information on the capacity of the population affected by shock or disaster to withstand its effects. (Maxwell and Frankemberger, 1992) refer to these types of indicators as "coping ability" indicators.

People who live in conditions which put their main source of income at recurrent risk will develop self insurance coping strategies to minimize risks to their household food security and livelihoods; examples of such strategies are; migration to towns in search of urban employment, collection of wild foods, use of inter household transfers and loans, migration to other rural areas for employment, rationing of current food consumption, consumption of food distributed through relief programmes, sale of productive assets, dietary change, diversification of income sources to mention a few (Maxwell and Frankemberger, 1992).

Coping strategies are pursued by households to ensure future income generating capacity that is livelihood rather than simply maintaining current levels of food consumption. These

strategies will vary by region, community, social class, ethnic group, household, gender, age, and season (Chambers, 1989 cited in Maxwell and Frankemberger, 1992).

The third category of indicators according to Maxwell and Frankemberger (1992) are outcome indicators which are usually proxies for adequate food consumption. These indicators may be measuring more than food intake for instance the nutritional status. Household food security outcome indicators can be grouped into direct and indirect indicators . Direct indicators of food consumption include those indicators which are closet to actual food consumption rather than to marketing channel information or medical status, for instance household perception of food security, and food frequency assessments, that is, frequencies of eating.

Indirect indicators are generally used when direct indicators are either unavailable or too costly (in terms of time and money) to collect, for instance, storage estimates, subsistence potential ratio and nutritional status assessments whereby nutritional status of a vulnerable group may be assessed basing on age or other methods.

CHAPTER FOUR.

4.0 METHODOLOGY

The study was carried out in four main steps. The firsts step involved review of secondary data on food security from various sources. This included research reports, papers, books, personal communications etc. The second stage was a preliminary survey which involved only few households chosen randomly. The third step was the main survey whereby the food security variables were studied in depth formally, using a structured questionnaire and informally by group interviewing. The final step was analysis of data whereby the information obtained was analyzed and the results presented in the results and discussion chapter.

4.1 Secondary data collection.

This involved collection of basic information to guide the whole research undertakings. The data collected involved general information on the rainfall pattern and incidence of severe droughts. Also information concerning Food Security Policies and the nutritional values of the main foods was obtained. The sources of information were the district and regional agricultural offices, meteorological stations and the department of catchment forest. Information from researchers at Sokoine university of Agriculture and Tanzania Food and Nutrition Centre was also sought.

4.2 Primary data collection

4.2.1 Formulation of the questionnaire.

The primary data collection exercise involved interviewing of the respondents from the sampled households using a structured modified questionnaire (Appendix A). The questionnaire was designed to answer the research questions. The information was based on the selected food security variables under food availability, food accessibility and gender activities related to food cycles. Information on the land use, important food and cash crops grown in the area, the total food production in a good, bad and average years, the use of the main food crops, the performance of the main staples, the availability and consumption of relish foods, the use of chemical fertilizer and manure, the storage and preservation methods employed, the pre and

post harvest losses, activities to secure extra income and the role of that income in securing food, feeding frequencies of under-five's, the weaning foods, food shortages in the households and coping strategies during shortages, gender roles in agriculture, animal husbandry and housework, the causes of food insecurity and how to improve household food security in the study area was sought.

4.2.2 Sampling procedure

Sampling of the villages was done based on the altitudes. Three villages were chosen randomly one from the lowlands 850 m a.s.l (low zone) and two from the uplands at 1400 m.a.s.l. and 1600 m a.s.l (high zone). Two villages were chosen from uplands because most people live there. The population density in the uplands is about 700 person per square kilometre.

Sampling of the households was randomly done but at least one household was interviewed from each village cell. The population from which the information was obtained consisted of both women and men.

A representative sample for the study from the villages was based on the Boyd et al, (1981) formula.

$n/N \times 100 = c$,

Where c = a figure greater or equal to 5% of the village households.

n = the number of the selected households

N = the total number of the households in the village.

Table 4.1. Sample percentage of the total households interviewed.

Village	Number of Households	Sample size	Sample % of Total Households
Mawanjeni	352	30	8.5
Komakundi	480	30	6.2
Mbahe	370	30	8.1

For the purpose of this study, sample size of 30 farmers from each of the 3 villages was taken. Table 4.1 shows the number of households, the sample size and the percentage of the sample interviewed. In all three villages the sample represented more than 6% of the total household and thus deemed representative. Question number two section E required both husband and wife. In case one was not present, whoever present answered his/her part.

4.2.3 Preliminary Survey.

The preliminary survey was done before a more intensive study was undertaken. The preliminary survey was very important to obtain general information about the village, familiarization with the ward and village authority, introducing the study objectives to the village government and modifying the questionnaire. Five households were selected randomly from each village for a preliminary survey. The households were interviewed using the structured questionnaire. The questionnaire was modified after the preliminary survey. Questions which were ambiguous, not appropriate for the research or too difficult to answer were eliminated. Enclosed in appendix A is the modified questionnaire.

4.2.4 Group interviewing.

Information which was difficult to obtain by using questionnaire was obtained by interviewing groups. Most of the animal husbandry and women's small enterprises information was obtained through group interviewing. The information obtained from the groups was used to supplement the information obtained using the questionnaire.

4.3 Measurement of Food and Energy Adequacy.

Various sources of food crops raised per annum at household level were expressed as maize equivalents. Computation of the percentage food and energy adequacy was done to see whether the households meet their daily food and energy requirements.

The criteria of production only was used in order to measure the degree of food self-sufficiency in the villages surveyed. The amount of quantifiable foods available was taken as an indicator of food security in Moshi rural.

Food and energy adequacy per capital per day was calculated using the following formulae:

$$FA = \frac{Tp}{P \times T \times R} \times 100$$

Where:

FA = Food Availability

Tp = Household Total Food production for Consumption (Kg).

P = Total Population.

T = Number of Days in one year (365 days).

R = Recommended amount of food (0.7 Kg/person / day)*
(TFNC, 1990).

$$EA = \frac{Tp \times K}{P \times T \times R} \times 100$$

Where:

EA = Energy Adequacy.

Tp = Household Total food production for consumption (Kg).

P = Total Population.

K = Energy density of Tanzania maize edible portion
(Kilo calories / person / day).**

T = Number of days in one year (365 days)

R = Recommended amount of energy.
(2780 Kilo calories/ person/day)*** (FAO/WHO/UNU 1985).

* Food requirements of 700 gm/person/day is used instead of the FAO/WHO/UNU recommendations of 600 gm/person/day in order to allow for post harvest losses as practised by the Food Security Unit of the Ministry of Agriculture and livestock Tanzania (TFNC, 1990). This assumes a post harvest loss of 17%.

** An average energy content of 3450 Kcal per 100 gm of edible portion which is about the energy density for maize grown in Tanzania is assumed since the various foods raised in the household were converted to maize equivalents.

*** For the daily energy requirement, a figure of 2780 Kcal/person/day which is the latest figure recommended by FAO/WHO/UNU (1985) for a subsistence farmer in the tropics is used.

Daily Food Production per capital (Kg) and Daily energy per capita (Kcal) was calculated using the following formulae.

$$\text{Daily Food Production per Capita (Kg)} = \frac{\text{Food available (Kg)}}{\text{Population x Time (365)}}$$

Daily Energy (Kcal/capita) = Daily food Production per capita x 3450 Kcal (TFNC 1990).****

**** Those below 2000 Kcal/capita/day are severely affected and those between 2000 - 2500 are moderately affected.

NOTE: Energy content of different foods is obtained from the food commonly eaten in East Africa Composition Tables (West et al, 1988).

4.4 Statistical Analysis.

The coding of information from the questionnaire was done using Lotus 1-2-3 (1990) package. The analysis of data was done using the MINITAB 9.2 (1993) and EXCEL 5.0 (1993) statistical packages. The quantitative statistics such as mean and percentage of the criteria under study for each village were calculated and results presented in form of frequency tables and histograms. In some cases, the data was disaggregated to household level, where differences between rich, medium, poor and very poor households were analyzed. In these cases rich, medium, poor and very poor were defined based on the caloric intake.

For the characteristics which were measured on a numerical scale (total food production and food and energy adequacy), the two way analysis of variance (ANOVA) was a tool used for analysis. This versatile statistical tool partitions the total variation in a data set according to the source of variation that are present (Johnson and Bhattacharyya, 1992). The Null hypothesis of no significant statistical mean difference in the three villages with respect to food security variables under study was tested against an Alternative hypothesis which states that there was a significant mean difference in the villages with respect to food security variables under study.

With categorical data, the Chi-square test of homogeneity was used to measure homogeneity of farmers responses across the three surveyed villages for the selected variables. The name categorical data refers to observations that are only classified into categories so that the data set consists of frequency counts for categories (Johnson and Bhattacharyya, 1992). The Null hypothesis of no significance difference in a specific variable under test was tested against the Alternative hypothesis stating that there is a significant difference in the specific variables between the villages.

The Chi-square analysis results are stated under appropriate Tables in the text whereas F-values for ANOVA are indicated in Appendix C Tables C1 to C4.

4.5 Definition of the Household.

In Tanzania, groups of approximately ten households are organized within a "ten cell" structure with an elected "ten cell leader". In the rural areas, several ten cells are organized in villages. Villages were established under the local Government (District Authorities) Act Number 7 of 1982 as a body of corporate.

Households were the basic units of gathering information used in this survey. The household was taken as the unit of analysis because it is assumed that decisions about production, investment and consumption are taken primarily at the household level (Corbett, 1988). In this study, a household was defined based on residence, where members of the household were

those who dwell under the same roof and share the same bowl (Brydon and Chant, 1985). Normally this unit is mostly individuals in the family consisting of the father, mother and children. Under extended family tradition, relatives and servants are also included. Children who were in boarding school and come home during the holidays only were not counted as members of household as they spend a very short time eating in the household. Polygamous household were treated as two households. This is because normally it is the farther only who is eating in both households. Wives are kept in separate houses with separate farms. So each wife is taking care of her husband, children and the dependants.

4.6 Data limitations.

Things which might have been quantified were sometimes difficult to quantify, for instance how many bunches of bananas the farmers harvest per year; this was based on estimates and farmer's memory. The food production data was reported as "bags". The weight of the bags were just estimated as bags do differ and filling also differs. The weight of a bunch of banana (edible portion) was estimated to be 12 Kg. This might not be accurate as the sizes of the bunches do differ. Also some crops were hand to mouth crops for instance the cocoyams as they could well be left underground as the storage method and harvested when needed. Since cocoyams were eaten when needed or when other foods were not available it was difficult to measure exactly how much was produced or harvested. Most of the information like the size of the farm and the distance from home to the next farm was based on estimations. Except for the farms which they got from the Government (the former sisal plantations) they could only estimate the size of their traditionally inherited farms.

4.7 Problems encountered during the data collection exercise.

Tanzania has undergone a change to a multiparty system. The research was conducted at the time when different political campaigns were held. It was also the time for registering to vote for the presidential post and member of the parliament seats. It was sometimes difficult to interview the villagers because the village leaders thought that maybe we were political leaders of opposition parties and that we wanted to bribe the farmers to vote for the opposition parties. Also villagers lamented that since the registration exercise has started they have been

harassed by the police officers over any suspected offence to the ruling party. So they were not sure who we were and they did not want to jeorpadize their peace by talking to us.

CHAPTER FIVE.

5.0 RESULTS AND DISCUSSION.

This chapter discusses the food availability and accessibility in the study area. Food available can be from one's own produce or from the market using income from selling food and cash crops and from off-farm activities. Under food availability the following are discussed: the agricultural production (food and cash crops) and the factors affecting it, the animal husbandry activities, the gender labour involved in those activities, the use of the main foods, the role of bananas and root crops in the food cycles, the availability and consumption of relish foods, the food storage, the preservation methods employed and the storage losses. The household food and energy adequacy is also determined.

Food accessibility also depends on the food produced, food obtained from the market and how this food is utilized in the household. The food can be available in the market as it was the case in this study but the purchasing power of the people was low such that the households had no access to that food. The following are discussed under this section; the off-farm activities to obtain extra income, the role of the household total income in securing food, the household and child care practices, the coping strategies during the periods of food shortage, groups in the household which are affected most during the period of food shortage and the food shortage months. The causes of food insecurity in the study area and the ways to improve household food security is also discussed.

5.1 Household characteristics.

5.1.1. Household size and composition.

The average household size in the three villages studied was found to be 6 persons per household for Mawanjeni and 7 persons per household for Komakundi and Mbahe villages. Table 5.1 shows the age structure for the studied villages. Thirty nine percent of the total population of the surveyed households was above 18 years (thus considered as adults) whereas 61% was below 18 years old thus considered as dependants. Chi-square analysis results show that there is no significant difference ($p < 0.05$) for the age structure between the villages. Thus,

households still encountered high dependency as most of those below 18 years are school children and not all those above 18 years are able to work, that is, older and disabled. So the economically active group has to produce enough food to feed itself and its dependants. As a result of sharing, the food produced might possibly be adequate for a short period of time.

Table 5.1 Household age structure.

Village	Population above 18 years		Population below 18 years		Total Population
	No.	%	No.	%	
Mawanjeni n = 30	69	36	124	64	193
Komakundi n = 30	75	36	132	64	207
Mbahe n = 30	88	44	111	56	199
Total n = 90	**232**	**39**	**367**	**61**	**599**

Chi-square = 3.795 df = 2 p-value = 0.1499 (Not significant)

5.1.2. Education

The study revealed that generally, literacy level is high among the population studied.

Table 5.2 Education level of the respondents.

Education level	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Adult education	0	0	0	0	0	0
Primary education	17	57	23	77	20	67
Secondary education	2	7	6	20	8	27
University education	0	0	1	3	0	0
No formal education	11	37	0	0	2	7

Most of the respondents from the villages studied had attended primary school (Table 5.2). Very few had attained secondary education. Only one respondent from Komakundi village had university education and he was a retired officer. Mawanjeni village had high proportion of respondents who had not attended any formal classes followed by Mbahe. Out of 11 respondents who had no formal education in Mawanjeni village, 8 were women and the 2 respondents from Mbahe village were also women. Out of 8 respondents in Mbahe village who had attended secondary school, only 2 were women. In Komakundi village out of 6 respondents

who had secondary education only 1 was a woman and the 2 from Mawanjeni village were both men.

The development of the national education system in Tanzania has stressed universal access to basic education. Education opportunities are high in the villages as at least one primary school was found right in the village. Because of traditional norms which govern the traditional societies, women might not have been given greater opportunities for education as men in the past. Most of female respondents were aged and they did not have an opportunity of attending school as women today. The female illiteracy rate has been decreasing from 80% in 1967 to 12% in 1986 (Kavishe and Mushi, 1993). The average school entry age for the three villages was 8 years. In Mawanjeni village, 28% of the total population in the households were in school whereas 29% in Komakundi and 32% in Mbahe villages were in school respectively. Since primary education is universal nowadays, all school age children attend primary education in all households studied.

Education level might have an effect on the level of awareness in utilizing various means to ensure food security at household level (Liwenga, 1995). Bearing in mind that women are the ones most concerned with rural household food security, their literacy must be high in order to adopt new information/technologies affecting household food security. Apart from increasing nutrition related information and therefore, a more efficient management of limited household resources for nutrition improvement, female literacy and education has a multiplier effect on development and income and thus contributes to nutrition improvement (Kavishe and Mushi, 1993).

5.1.3. Members of the household interviewed.

Both male and female respondents were interviewed during the survey (Figure 5.1). Fifty four males respondents were interviewed which represented 60% of the total respondents whereas 36 females represented 40% of the total respondents. Single, married, widow and divorced respondents were encountered during the survey. Anybody above 18 years old was considered mature enough to answer the questions, being married or single.

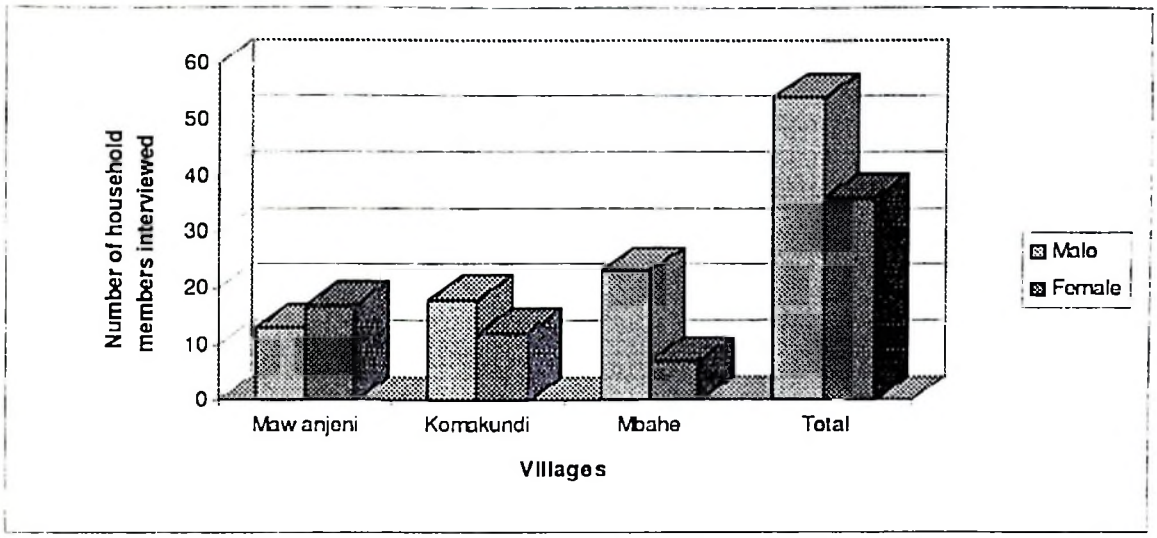


Figure 5.1 Members of the household interviewed according to sex.

Table 5.3 The respondents distribution according to their tittle and status.

Village	Husband	Wife	Daughter	Son	Head of the household	Not head of the household
Mawanjeni	11	16	1	2	19	11
Komakundi	13	11	1	5	21	9
Mbahe	20	5	2	3	18	12
Total	**44**	**32**	**4**	**10**	**58**	**32**

Table 5.3 shows the distribution of respondents based on title and status. Sixty three percent, 70% and 60% of the respondents were the heads of the family for Mawanjeni, Komakundi and Mbahe village respectively. As in most rural areas of developing countries, when men are present they are considered the head of the family. In cases where a woman is a widow, or the husband does not stay home the woman becomes the head of the family. In Mawanjeni village there were 6 widows and they were the head of the household.

5.2 Assessment of Household Food and Energy Adequacy.

The proportion of households in the rural areas of Tanzania suffering from food insecurity is difficult to estimate. As reported earlier, the proportion has been estimated as being as high as 77% (TFNC, 1992). However, what prevails at regional level neither prevails at village level,

nor does it prevail at household level. Each household has its means of survival, and food insecurity problems vary from one household to another.

The results obtained from this study are presented in aggregate terms at village level based on the information obtained from interviewing individual households. Then the results are further disaggregated to individual households. The calculations on food and energy adequacy are based on the total production of the quantifiable foods presented as maize equivalents so as to ease summing up and allow for the comparisons between the villages. Calculations for proteins were omitted because it is assumed that once energy requirements are met from the normal diets, protein requirements are automatically met (TFNC, 1992).

Tables 5.4a, 5.4b and 5.4c show the household food balance sheets for Mawanjeni, Komakundi and Mbahe villages for a good, average and bad year respectively (computed from Tables in Appendix B). Production during 1995/96 was considered representative of a good year. The picture which emerges from these calculations is that, based on production alone, the villages taken together are not food deficit in a good year. The village's food production in 1995/96 was above food and energy requirements by about 17% and 2% respectively. When the villages are treated individually, the Mawanjeni village does not reach the food and energy requirements even in a good year and it has a deficit of 50% and 57% respectively. Komakundi and Mbahe village are above the food and energy requirements by 57% and 37% and 40% and 22% on a good year. ANOVA results show that there is a significant difference ($p< 0.05$) on food and energy adequacy in the three villages. Also, there is a significance difference on food and energy adequacy in a good, bad and average years (Appendix C Tables C1 and C2). This is the situation at the village level and it must not be taken as what is happening at household level. Some big farmers might have been behind the big figures of production obtained and the poor peasants are just covered by what is being produced by big farmers.

On an average year, all the three villages are food and energy deficit. Mawanjeni, Komakundi and Mbahe villages have a deficit of 79% and 81%, 19% and 29%, and 29% and 38% food and energy requirements respectively. The situation is worse on a bad year. Mawanjeni village is

seriously affected on a bad year. There is a deficit of 94% and 95%, 59% and 64%, and 61% and 66% food and energy requirement for Mawanjeni, Komakundi and Mbahe villages respectively. However, the villagers reported that they rarely had bad years. Most years are good or average years except for some years when the area was severely hit by drought.

Table 5.4a. Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages for 1995/96 based on total food production only (Good year)

Village	Population (1995)[1]	Total Food Production per capita (Kg)*	Daily Food Production per capita (Kg)	Daily Energy (Kcal/capita)	% adequacy per capita per day	
					Food	Energy
Mawanjeni	193	24976	0.35	1208	50	43
Komakundi	207	83009	1.1	3795	157	137
Mbahe	199	71079	0.98	3381	140	122
Total	**599**	**179064**	**0.82**	**2829**	**117**	**102**

[1] Total population of the surveyed households
*Total food production of quantified food produce expressed as maize equivalents

Table 5.4b. Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages on an average year based on total food production only.

Village	Population (1995)	Total Food Production per capita (Kg)	Daily Food Production per capita (Kg)	Daily Energy (Kcal/capita)	% adequacy per capita per day	
					Food	Energy
Mawanjeni	193	10973	0.16	517	21	19
Komakundi	207	43364	0.57	1967	81	71
Mbahe	199	36690	0.50	1725	71	62
Total	**599**	**91027**	**0.42**	**1449**	**60**	**52**

When the daily energy per capita is considered, the households which are below 2000 Kcal/capita/day are considered severely affected whereas those between 2000-2500 are moderately affected (TFNC, 1992). On aggregate the daily energy per capita is 2829 Kcal/capita/day for the three villages on a good year. On a good year, the daily energy Kcal per capita for Mawanjeni, Komakundi and Mbahe villages is 1208, 3795 and 3381 Kcal respectively. Mawanjeni village could not meet the daily energy requirement even in a good year and it is seriously affected (Table 5.4a). On the average and bad year all the villages are affected,

Mawanjeni seriously as far as daily energy requirement is concerned. The daily energy requirement per capita per day for Mawanjeni, Komakundi and Mbahe villages is 517, 1967, 1725 Kcals and 138, 1001, 932 Kcals for an average and bad years respectively. On an average year Komakundi village is moderately affected as 1967 Kcal is just near the lower limit of 2000 Kcal for those who are moderately affected (Table 5.4b).

Table 5.4c. Household Food balance sheet for Mawanjeni, Komakundi and Mbahe villages on a bad year based on total food production only.

Village	Population (1995)	Total Food Production per capita (Kg)	Daily Food Production per capita (Kg)	Daily Energy (Kcal/capita)	% adequacy per capita per day	
					Food	Energy
Mawanjeni	193	3035	0.04	138	6	5
Komakundi	207	22300	0.29	1001	41	36
Mbahe	199	19741	0.27	932	39	34
Total	**599**	**45076**	**0.21**	**725**	**30**	**26**

The complementary energy provided from unquantified foods, for instance, sweet potatoes, cocoyams, sugar cane, yams, fruits and vegetables and foods bought form the markets thus not included in the farmers estimates, might have been providing adequate calories per person per day in the uplands. Due to that constraint, it is difficult to prove beyond doubt that food is absolutely inadequate in the households on the uplands in average and bad years as varieties of foods are available in the homegardens and can be used as a coping strategy during food shortages. For Mawanjeni village, the situation is different as there is no permanent crops in their homeyards. The calculations based on the harvested produce only. The food might have been eaten while green, for instance, green maize and green beans.

In the calculations, finger millet and sunflower were included. It should be noted that finger millet on occasion serve as food as it is used mostly for local beer brewing. The energy density of sunflower is high, 9000 Kcal/Kg of edible portion. This could have elevated the energy content values bearing in mind that the farmers can not consume all the oil in case of a good harvest.

5.3 Household Food Availability.

5.3.1 Agricultural Production

5.3.1.1 Food crop production

Household food availability is determined by what the particular household is able to produce, store, process and prepare. In turn, these are determined by the agriculturally available productive resources to that household such as the amount and quality of land, the amount and division of labour, the availability of production assets, the level and type of technology, as well as climate and ecology.

Most of the respondents produce their own food and they depend on the market mostly for the food items they cannot produce. Agricultural production is the mainstay of most households in the study area, so crop failure means disturbed food security. From food production, the households get food and extra income to buy foods they cannot produce as well as other household needs. Table 5.5 shows the total food production per village of quantifiable food products expressed as maize equivalents in good, average and bad years.

Table 5.5 Total food production per village based on quantifiable food produce expressed as maize equivalents.

Village	Total food available (Kg)		
	Good year	Average year	Bad year
Mawanjeni n=30	24976	10973	3035
Komakundi n=30	83009	43364	22300
Mbahe n=30	71079	36690	19741
Total n=90	**179064**	**91027**	**45076**

The ANOVA results show that there is a significant difference ($p<0.05$) in food availability between the three villages. Also there is a significant difference ($p<0.05$) in food production between villages in good, average and bad years (Table C3 Appendix C). The high level of food production in the villages in the uplands (Komakundi and Mbahe) can be explained by several factors. The climate in the uplands allows the farmers to have permanent home gardens around the homeyards. As explained previously the farmers in the uplands have two types of farms; "Kihamba" and "Shamba". In the kihamba the food which is predominantly produced there is banana. Maize, beans, sweet potatoes, cocoyams and Irish potatoes are also produced. In the

shamba which are located in the midlands or lowlands, they produce mainly beans, maize, finger-millet and sunflower. The climate in the lowlands and midlands is different with less rainfall. While the people from the uplands (Mbahe and Komakundi) enjoy the two farms and two farming systems, that is, banana/coffee and maize/beans farming systems in the uplands and lowlands respectively, the people from lowlands (Mawanjeni village) rely mainly on a single farm and a single farming system, that is, maize/beans only. They also produce sorghum, as it is drought resistant in case there is not enough rainfall. Finger-millet and sunflower are also produced in their shamba.

From Table 5.5, it can be concluded that the uplands produce more food than lowlands and thus are better as far as food security is concerned based on total food production alone.

5.3.1.2 Cash crop production

The important cash crop in the uplands is coffee. There is no important cash crop in the lowlands. Sunflower is categorized as cash crop in the National category of crops but in this study it was considered as a food crop because it was not planted at large scale and most of the times it was cultivated as a boarder crop or mixed in the maize/beans farms. On average, the coffee production for Komakundi and Mbahe villages was 242 Kg and 194 Kg per household per year respectively.

The coffee was sold at 700 Tshs per kilogram to private enterprises and 800 Tshs per kilogram to government co-operatives union - the Kilimanjaro Native Co-operative Union (KNCU) during the time of interview. Some people did not like to sell their coffee in the government co-operatives as they were not being paid on time. The delay could take up to six months. Others prefer to sell to government co-operatives because they could be paid the second and even third payment depending on the coffee market, where as in private enterprises no second payment. If government price is taken for calculation, then, with 242 Kg of coffee on average, the farmers could get 193600 Tshs per year in Komakundi village with an average of 16133 Tshs per household per month. For the Mbahe village an average income from selling coffee was 155200 Tshs per year which is equivalent to 12933 Tshs per household per month. This money may not

be enough to cater for the household needs bearing in mind that the farmers have to buy agricultural inputs for the coffee and satisfy other needs of the family, leave alone the food. Some small quantity of coffee is processed by farmers for their domestic consumption.

The uplands are again better as far as food security is concerned as coffee earns the households money which can be used to buy food. Coffee is a men's crop but women labour is crucial in its production. Some men discourage congestion of shade tolerant food crops planted by women for instance taro under the coffee plants and sometimes uproot them and thus affect the household food security.

5.3.1.3 Gender labour involved in agricultural tasks.

Gender roles must be appreciated in this section because labour is gender differentiated from the process of food and cash production to the final procurement of food at household level. The gender roles did not differ among the three villages, hence what is presented in Table 5.6 is the aggregate of the three villages.

As mentioned earlier, 98% of the economically active women in Tanzania are involved in agriculture (Kahurananga, 1990). Hence when talking of agriculture you are talking of women. This was confirmed in this study as well. Women are involved in different agricultural tasks from land preparation, hoeing, weeding, application of manure/fertilizer, harvesting, transporting the produce from the field to home, threshing, selecting and keeping seeds and storage (Table 5.6).

Women participate in hoeing (75%). More than 80% of manuring and weeding is done by women. They also participate in harvesting (70%), transportation from the field to home (65%), threshing (68%), selecting and keeping seeds (86%) (Table 5.6). Men ranked high on land preparation (72%). However, women also prepare land (28%). While land preparation can by some definitions include hoeing, ploughing, tractorization or burning the remnants of the last harvest, that is, activities done before sowing, land preparation in my context means to prepare

virgin land (clearing bushes, trees and uprooting trees) and it needs strong labour. There is, however, very little virgin land in the area.

Table 5.6 Percentage women and men respondents involved in various agricultural tasks (aggregate results for the three villages)

Activity	Percentage respondents n = 90	
	Women	Men
Land preparation	28	72
Hoeing	75	25
Manuring/fertilizer	87	13
Weeding	81	19
Applying pesticide	21	79
Harvesting	70	30
Transporting from fields	65	35
Threshing	68	32
Selecting and keeping seeds	86	14
Storage and preservation	54	46

Manuring is the women's responsibility although in applying fertilizers men also participate. Thus where men have been stated as doing the job it is in relation to fertilizer application - very rarely does it refer to cow dung application. It is the role of women to clean the animal sheds, collect all the manure, transport it and spread it on the farm. Application of pesticide is the men's role in most instances (79%). Spraying the crops in the lowland or coffee in the uplands is done by men. Women rarely spray pesticides unless they are widowed and do not have money to hire a man to do the job.

The transportation of the produce from the field (by head) is mostly done by women. When men are stated as transporting the produce from the field it is by providing money to hire a vehicle or labour, but they rarely carry the produce on their own heads; especially if the man is of Chagga tribe. It is clear form Table 5.7 that household labour is mostly used to bring the produce home in Mawanjeni village (100%) and Mbahe village (97%) whereas in Komakundi village vehicles are mostly hired (60%) followed by family labour (43%).

In most cases family labour is synonymous with women, however, boys and girls can help on Saturdays when they do not go to school or in the evening after school hours if the farms are not very far away from the homesteads.

Table 5.7 Means to bring the produce home after harvesting.
(multiple responses)

Means	Mawanjeni n=30		Komakundi n=30		Mbahe n=30	
	No.	%	No.	%	No.	%
Family labour	30	100	13	43	29	97
Hired labour	0	0	4	13	6	20
Hired vehicle	0	0	18	60	7	23
Own car	0	0	0	0	0	0
Public transport	0	0	4	13	4	13

Threshing is done mostly by women, boys and girls but almost everybody in the family is involved in this job. Women are mostly concerned with selecting and keeping seeds for the next season (86%) although some men also do so. Both women and men are involved in storage and preservation. Chemical application, for instance, on maize is done mostly by men whereas traditional preservation, especially of beans, is done by women.

It can be concluded from this section that in the majority of households in the study area, women's agricultural work considerably exceeds that of men. Women as key producers in many regions of the world, play a central role in development and production of food and agriculture, participating actively in all phases of production cycle. Women therefore make a vital contribution to economic development particularly in agriculturally based economies (Boserup, 1970). Their importance in improving food crop production and thus household food security cannot be over emphasized.

The time spent or the work done by each man and woman is a reflection of the culturally accepted patterns of division of labour. The quality of women's reproductive work and care is an important determinant of their social esteem (Holmboe-Ottesen and Wandel, 1991). The same authors further argue that, since women are active in agricultural production of food, their

identity is also tied to this work. When a woman is working and a husband is participating in discussions (whenever men met for instance in beer bars and in a shade under a tree) is what society perceive as female and male. Whereas it is considered reasonable for a man to spend his time in beer clubs in the Chagga society, there is general disapproval of a woman having such freedom (Swantz, 1985).

Thus work not only has a practical, but also a symbolic dimension. The symbolic meaning of work is closely tied to personal identity. Hence, work is an important factor in shaping male and female identity (Melhuus, 1988 cited in Holmboe-Ottesen and Wandel, 1991). In Abyssinia, a male being on the verge of starvation could not be induced to grind grain into flour between the mightily stones employed by his mother or his wife. The women prepare all forms of food and drinks and she would not dream of killing the smallest bird or beast for the kitchen (Daniel, 1983 cited in Tirunch, 1992).

5.3.1.4 The role of plantains/bananas and root crops in the food system.

Suffice it to say that roots and tubers, fruits and vegetables need to be paid more attention to when analyzing the food security situation at the household level as most studies tend to concentrate on cereals only. It must be recognized that for several reasons, it is not appropriate to limit foodstuffs to cereals or even to grains in general. In some countries in Sub-Saharan Africa, the cereal portion of the diet is so low that to assess the food situation based on cereals alone is entirely inadequate. For example, the proportion of cereals in total food consumption in Zaire for the period 1979 - 1981 was 14.5% (UNECA, 1992). Any assessment of food insecurity in Africa must take into account roots, tubers, nuts, oilseeds, fruits (which includes plantains/bananas), secondary foods like relish foods and in certain countries even alcoholic beverages.

An example of a root crop which is predominantly grown and eaten on the slopes of Mount Kilimanjaro is cocoyams. Cocoyams were difficult to quantify in my study as they are harvested when needed. They store well in the ground all the year round and are harvested when needed provided that the area is not infected by the underground rodents-in this case moles. When the

farmers were asked to rank the four most important staple foods for the household, the farmers from Mawanjeni village ranked maize highest (100%) followed by sorghum (53%) and millet (3%) respectively. This emphasizes the importance of cereals in the dry areas especially those which are drought resistant. However roots crops like cassava can survive dry conditions as well. Cassava is being highly promoted in dry regions of Mtwara region (TFNC, 1992). Farmers from Komakundi ranked the following staples highly; bananas and maize 100%, rice 60% and cocoyams 40% whereas farmers from Mbahe ranked the following foods highly; maize 97%, bananas 93%, cocoyams 53% and Irish potatoes 30%. Rice is not grown by most of the people in the area but it was ranked as the third important staple food in Komakundi village. This perhaps explains the role of extra income in securing food as rice is bought from the shops/market.

Cocoyams are considered as food of low quality by rich farmers and it is thus consumed mainly by less rich people. Although cocoyams were found on almost every kihamba, some farmers reported that they are for sale and not for their family consumption. If they can sell them, it means that there are people who are consuming them, and those who are selling them got extra income to buy whatever they want including food. The energy content of cocoyams/taro is 940 Kcal/Kg of edible portion (West et al, 1988). So they are of good quality and can potentially alleviate some food insecurity problems as they can store well underground and their management is simple. Also in case of pest outbreaks especially locust the roots and tubers can be very important. Cassava and cocoyams were very crucial on the slopes of Mount Kilimanjaro in 1952/53 due to famine resulted from the outbreak of locust (Minjas, 1995).

Plantains/bananas are considered as fruits in food science. What was noticed in this study is that bananas can be used in different ways depending on the varieties. Bananas are the staple food for everybody in Komakundi village and 93 out of 100 persons in Mbahe village. Some varieties are used for local brewing, others as fruits and others as the main staple food. The energy content of plantains/bananas (raw) is 1200 Kcal/Kg per 100 g edible portion (West et al, 1988).

Irish potatoes were also gaining popularity as some people especially in Mbahe village were replacing coffee with Irish potatoes. It was ranked as the fourth most important staple food for Mbahe village. These three non-cereal staples, that is, bananas, cocoyams and Irish potatoes are very important in the slopes of Mount Kilimanjaro as far as food availability is concerned. Any study on food security around Mount Kilimanjaro should take them into account.

5.3.1.5 The performance of the main crops

Most farmers have indicated a state of decrease and fluctuation of their main staples for the past five years (Table 5.8a). This is mostly caused by drought as most of the respondents indicated; Mawanjeni (90%), Komakundi (70%) and Mbahe (57%). Other reasons given were, shortage of labour, lack of capital, poor soils and lack of technology (Table 5.8b).

Table 5.8a. The performance of the main staples[1] in the past five years.

Performance of the main staples [1]	Mawanjeni n=30		Komakundi n=30		Mbahe n=30	
	No.	%	No.	%	No.	%
Increase	0	0	2	7	1	3
Same	0	0	3	10	1	3
Decrease	16	53	6	20	7	23
Fluctuation	14	47	19	63	21	70

Chi-square = 13.22 df = 6 p-value 0.0396 *

[1] Included in the term is maize, bananas and sorghum

Table 5.8b. Reasons for the observed trend in performance of the main staples. (multiple responses)

Reasons	Mawanjeni n=30		Komakundi n=30		Mbahe n=30	
	No.	%	No.	%	No.	%
Drought	27	90	21	70	17	57
Shortage of labour	2	7	1	3	3	10
Lack of capital	7	23	10	33	4	13
Poor soils	0	0	7	23	8	27
Lack of technology	0	0	2	7	1	3

Chi-square = 14.897 df = 8 p-value 0.0611 (Not significant)

The decline in soil fertility and therefore productivity, is largely due to continuous cultivation and more intensive use of the land without appropriate fallow periods or adequate fertilization,

in response to population pressure (Mnkeni, 1992). Chi-square analysis results show that there is a significant difference ($p<0.05$) in the performance of the main staples among the villages whereas there is no significant difference in the reasons given for the observed trend.

Coffee yields have also been declining steadily since 1980 (ICRA, 1992). The number of banana plants per hectare has been increasing steadily as a result of substitution of coffee due to low coffee prices. So reasons for the decline of the main staples are not the same as those of coffee. The coffee is also afflicted by CBD (Coffee Berry Disease), leaf spot, leaf miners and Tip borers. All these diseases and pests are controlled by chemicals but CBD has become a bit difficult to eradicate (Cunard et al, 1984).

Perhaps at this juncture it is important to discuss the pre- harvest losses. Whereas pre-harvest losses may not be considered as a serious issue according to most farmers, it was of importance for coffee and sunflower. Coffee Berry Disease destroys the berries before they mature. In serious cases the whole berries can be destroyed and thus the harvest is very much minimized. For the sunflower the main problem is birds. Farmers were using different methods of bird scaring in the farms in the lowlands. The farmers residing in the lowlands have advantage as far as bird scaring is concerned as they stay near the farms so they can scare birds easily. Apart from shouting to scare birds, some farmers hang large papers in their farms. The papers mimic the presence of human being and the birds got scared. Some could hang a long rope and empty tins are tied on the rope. When the wind blows the tins make a sound which scare birds. Some farmers covers the flowers with nylon bags but this is tedious work if the farm is big. Others could harvest the sunflower early but this makes the productivity in terms of oil produced little. Bird scaring is a tough job and some birds could still eat the sunflower even if the above methods are employed.

Pre-harvest losses associated with bananas is spoilage especially during the peak period. Birds could feed on the bananas in the farms but this happens when the bananas are left to ripe in the farm which is not always the case. For the maize the main problem is theft. Cocoyams, yams,

Irish potatoes, sweet potatoes (root and tuber crops in general), the main problem is the underground moles. Pre-harvest losses were not estimated in this study but for the case of coffee and sunflower, the harvest could be very low if proper measures to control the causes are not taken.

5.3.2 Animal husbandry

5.3.2.1 Intensive animal husbandry

Livestock in the uplands is kept under stall-feeding as there is no grazing land in the uplands. Almost all the land is cultivated and zero grazing is practised. This needs intensive management. Fodder is collected from the fields, or from the areas left only for fodder, or from the Kilimanjaro forest reserve (cutting grass in this area and collecting dry fuel wood is allowed). The crop residues produced from the maize/beans fields in the midlands and lowlands are transported to the uplands where they are stored to be used as fodder. Some farmers add molasses to increase the quality of maize residues, but molasses is not easily available. Banana leaves and pseudo-stems form a large proportion of feed items. Some farmers could buy grass/hay but it is sometimes expensive and only a few can afford it. The availability of concentrates is low and these are fairly expensive therefore most of the farmers cannot afford to buy them regularly. Most farmers keep 2-3 dairy cows but a few may own up to 5 cows. Most of the farmers in the uplands keep cattle of improved breeds. Other animals kept are sheep, goats, pigs and chicken.

5.3.2.2 Extensive animal husbandry

In the lowlands (Mawanjeni village) the farmers keep Zebu cattle. Animals are grazed on the grazing land. Groups of animals from different farmers are usually headed together to save labour. During the planting season when the fields are under crops, the animals are taken to more distant pastures which involves long walking distances everyday. After harvesting the animals are allowed to graze on the crop residues. The average number of cattle per household was 1-2, but rich farmers could have more than 20 cows. Five farmers had no animals in Mawanjeni village. Milk production of Zebu cattle is normally very low. Half a litre is the average production per day per cow but it can increase up to 4 litres per day. Improved cattle

for milk production are rare in this farming system. Other animals kept in the lowlands are goats, sheep and chicken.

It is from the animals that extra income, milk, meat, eggs and manure is obtained. Animals are also kept for prestige and also for obtaining cash in emergency situations, for instance when there is food deficit in the households. Animal keeping is not a seasonal activity unlikely cultivation. The sale of animals or animal products can be done any time the need arises. Thus, it is a permanent way of getting cash as compared to the income from farms. Hence animal keeping is important as far as food security is concerned.

However, livestock can be restricted to playing a minor role because of inadequate feeding. The problem is more acute for milk cattle because the improved breeds require more intensive management and are fed in the stall in the uplands. Main constraint for livestock production in the uplands is the limited amount of range land and availability of concentrates. In the lowlands, during the dry season, the livestock suffers from lack of fodder and water. Also the Zebu cattle in the lowlands are not very productive as far as milk production is concerned.

5.3.2.3 Gender roles in animal husbandry

Different gender roles were also evident in animal husbandry activities. In the plains, the animals are grazed on the grazing land and it is the responsibility of men and boys to take animals out for grazing. Table 5.9 shows the percentage men and women respondents involved in animal husbandry activities. It is the responsibility of women to cut grass transport it home on heads and feed cattle in the uplands (65%). Men could feed the cattle with banana leaves and pseudo-stems but traditionally men can not cut grass using a sickle. Men are responsible for feeding goats and sheep. They are always fed on tree branches leaves (browse) and it is the role of men to climb trees and cut the branches for the goats and sheep.

Milking is a daily activity usually done two to three times a day depending on the age of the calf. Milking is women's work (94%). Very few men do milking. The milk is sometimes fermented

to yoghurt or be churned to remove butter. The butter thereafter can be processed to ghee. Milk processing is exclusively women's duty (98%). Some women are never involved in processing because they keep local breeds of cattle which produce very little milk all of which is used for tea only. Men sometimes help in milking, especially if the cow is a bit harsh, but are not involved in the process of churning milk. Boys also are not allowed to churn milk but they can do so when requested by their mothers. That accounts for the 2% . Butchering of animals is solely the role of men.

Table 5.9 Percentage men and women respondents involved in various animal husbandry activities (aggregate results for the three villages).

Activity	Percentage respondents n = 90	
	Women	Men
Fodder[1] collection	65	35
Grazing	4	96
Feeding	60	40
Cleaning the shed	86	14
Milking	94	6
Milk processing	98	2
Slaughtering animal	0	100

[1] Included in the term is grasses, banana remnants, plants remnants, plants steams, leaves and branches.

Women play a significant role in all aspects of animal husbandry. The success of small-scale animal production to improve the diet of the rural poor will depend to a large extent on the assistance and training of women. In fact, the income women earn by selling milk and butter at almost every market is the basic source of the daily diet of the household. With improved husbandry and improved breeds, substantial income from milk and other dairy products could be earned. Local breed cattle (Zebu) could provide extra-income through out-hiring of oxen.

5.3.4 The use of main food crops.

Despite the fact that most of the households in Komakundi and Mbahe are above the food and energy requirements per capita per day in a good year, these were the figures representing total production of various crops in the households. Empirically, not all these crops were meant for direct consumption in the households. Different crops were used for different purposes. For

example, not all bananas were consumed in Mbahe and Komakundi village. There are a large number of varieties of bananas grown which can be grouped into varieties for cooking, brewing and for fresh consumption (ICRA, 1992). Two of the most popular varieties in the study area are the "ng'ombe" which is used for beer brewing and "mshare" which is a cooking variety. "Kisukari" a variety that has a sweet taste is mostly grown in the midlands and eaten ripe as fruit. "Matoke" a local variety from Bukoba is gaining acceptance due to its good cooking characteristics (ICRA, 1992). Finger-millet is used mostly for making local brew "mbege[1]" and it is also used as a weaning food for some households.

Farmers reported that they sell some of their staples due to several reasons. Sixty three percent of the farmers from Mawanjeni village reported to have sold some of the main staples; 53% and 77% from Mbahe and Komakundi villages respectively. The main quantifiable staples which were sold are maize, sorghum and bananas (Table 5.10). The sold food was reported for the 1995/96 which was a good year because it was difficult for the farmers to recall what they have sold in the past years. The Mawanjeni village sold up to 33% of the total quantified food product whereas Komakundi and Mbahe sold 38% and 28% respectively (Tables B1, B2 and B3 Appendix B). Other foods were also sold but were not quantified in this study for instance; cocoyams, sweet potatoes, eggs, milk, fruits and vegetables and sugar cane.

Table. 5.10 Main staples sold in the three villages.
(multiple responses)

Staples sold	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Maize	7*	23	13	43	12	40
Sorghum	8	27	0	0	2	7
Bananas	0	0	25	83	8	27

* The data for Mawanjeni might not be very accurate as the farmers did not want to admit that they sell maize amidst hunger. But in the actual fact more farmers do sell maize because there is no major cash crop in the area. Sunflower is gaining popularity as a cash crop.

[1] Mbege is the Swahili name for finger-millet and the local brew mbege is named after finger-millet as it is the most important cereal used on its manufacture.

The farmers gave different reasons why they sell their staples (Table 5.11). There is highly significant difference ($p<0.01$) in the reasons given by the farmers between the villages. The picture which emerges from Table 5.11 is that the majority of the households sell their food crops after harvest because of the immediate cash needs to meet other obligations, and food supplies which they can not produce in the household. Other necessities included payment of school fees, buying clothes, purchase of farm inputs and paying for medical services.

Table 5.11 Reasons given by farmers as to why they sell their staples.
(multiple responses)

Reasons	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Surplus	2	7	15	50	9	30
Immediate cash need	16	53	20	67	12	40
Better prices	0	0	0	0	1	3
Poor storage facilities	1	3	0	0	6	20

Chi-square = 17.996 df = 6 p-value = 0.0062 **

The agricultural survey done by Bureau of Statistics in 1986/87 found that as high as 41% of rural households had their main source of income from sale of crops while only 31% of the income was from non agricultural source (TFNC, 1989). The food deficit population is estimated to be 40% with the prevalence of malnutrition in the rural areas also estimated at 40%. It could be interesting to look more closely at the relationship between sale of crops, food deficits and malnutrition.

Estimates from Iringa indicated that farmers sell up to 20% of the food produced to meet immediate cash needs and up to 75% of the cash income may be derived from the selling of foods crops (TFNC, 1992). In Mtwara between 10-46% of the farmers sell their food crops even though they know that it will not meet their annual food needs (Kingamkono, 1987). It should be pointed out that in the absence of other sources of income the decision made by these farmers is completely rational.

The main crop depended on and stored most for home consumption is maize. The introduction of maize in the early 19th century has considerably changed the traditional farming system in the

area. Studies conducted by Mamiro (1991) showed that maize is increasingly being accepted as a staple crop in the uplands, partly due to decrease in land area under banana cultivation as a result of fragmentation, and partly due to changing tastes and preferences of the farmers. Also, under good management maize can store well compared to bananas. In peak harvesting periods, the bananas are sold at very low prices and others spoil as they are not easy to store. Perhaps this explains the high percentage of selling noted in Komakundi village (83%) as this village produces a lot of bananas.

When we consider the food sold, the food and energy adequacy are not met for the three villages. Mawanjeni has a deficit of 67% and 71% food and energy respectively whereas Komakundi and Mbahe have a deficit of 5% and 19%; 4% and 17% food and energy respectively. Table 5.12 shows the food left for household consumption after selling.

Table 5.12 Household Food Balance Sheet for Mawanjeni, Komakundi and Mbahe villages on good year based on the food left for consumption after selling.

Village	Population (1995)	Total Food Production per capita (Kg)	Daily Food Production per capita (Kg)	Daily Energy (Kcal/capita)	% adequacy per capita per day	
					Food	Energy
Mawanjeni	193	16282	0.23	793	33	29
Komakundi	207	49998	0.66	2277	95	81
Mbahe	199	48699	0.67	2311	96	83
Total	**599**	**114979**	**0.53**	**1828**	**75**	**65**

From Table 5.12 we can not conclude explicitly that people are food and energy deficit after selling some of the food. People might be selling one type of food for another for instance selling bananas and maize to buy rice, wheat flour, meet, milk and others. Also the income from selling food and cash crop and from extra activities can be used to buy food from the market. As mentioned earlier, crops in the homegardens which were not quantified in this study might be used to supplement the food and energy deficit.

The above information is based on the village level. However, when the individual households are considered the situation is different. When the calorific values were calculated based on the individual households, it was found that some households consume very high calories while others consume very little. Table 5.13 shows the status of the households based on the daily calories available for the household. There is highly significant difference ($p<0.01$) on the status of the households based on the average Kca/capita/day between the villages.

Table 5.13 The status of the households based on the average Kcal per capita per day for the three villages.

Status[1]	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Rich	2	7	6	20	6	20
Medium	5	17	16	53	12	40
Poor	7	23	6	20	9	30
Very poor	16	53	2	7	3	10

Chi-square = 25.987 df = 6 p-value = 0.0002 **

[1] Farmers were categorized as being rich, medium, poor and very poor based on the daily per capita energy intake (Kcal). The classification was made according to Brian (1994).

-The households with average Kcal per capita per day less than 1500 - very poor.
-The households with average Kcal per capita per day between 1500 to 1900- poor.
-The households with average Kcal per capita per day between 2000 to 2800 - medium (this based on the FAO recommendation of 2870 Kcal per capita per day for a farmer in the tropics)
- The households with average Kcal per capita per day above 3000 - rich.

What was noticed is that members of some rich farmers could consume as much as 4500 Kcal/capita/day whereas the very poor could consume as low as 500 Kcal/capita/day in a good year. So when the village aggregate is taken, the conclusions can be misleading. Whereby on aggregate the average daily energy per capita for Komakundi village on a good year after selling is 2277 Kcal and thus showing that most households are medium as far as caloric intake is concerned , only 16 households could be categorized as medium, 6 rich, 6 poor and 2 very poor when households are treated individually. On aggregate the average daily energy intake per capita for Mawanjeni village is 793 Kcal which shows that the households are very poor. When the households are treated individually 2 households are rich, 5 medium 7 poor and 16 very poor. For Mbahe village the average daily energy intake per capita is 2311 Kcal on aggregate

which shows that the households are medium. When the households are treated individually, 6 are rich, 12 medium 9 poor and 3 very poor. These findings emphasize the importance of studying food security at household level before any conclusion about food security situation of an area is made.

5.3.5 The availability and consumption of relish food.

A variety of relish are used in the households. Table 5.14 below shows different relish food consumed in the households.

Table 5.14 Important relish foods of the households
(multiple responses)

Relish food	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Grain legumes [1]	29	97	26	87	30	100
Fish	23	77	13	43	14	47
Milk [2]	14	47	17	57	11	37
Meat [3]	9	30	27	90	15	50
Green vegetables [4]	26	87	30	100	29	97

Chi-square = 14.060 df = 8 p-value = 0.08 (Not significant)

[1] Included in the term is the variety of legumes for instance common beans, cowpea, pigeon pea but the most used and referred here is common beans.

[2] Milk is considered as a relish when taken with maize meal, banana foods and rice.

[3] Included in the term is the variety of meats for instance beef, pork, chicken, goat and lamb.

[4] Included in the term is a variety of green vegetables for instance cabbage, spinach, pumpkin leaves, amaranthus, Solunum species etc.

The most important relish food for the three villages surveyed was grain legumes and green vegetables (Table 5.14). Chi-square analysis show that there is no significant different ($p < 0.05$) on the relish food consumed in the three villages. Legumes were the most important source of protein afforded by many households. The frequency of eating protenous foods is shown on Tables 15a, b, and c for Mawanjeni, Komakundi and Mbahe villages respectively. Ninety seven percent of the respondents from Mawanjeni reported that they take beans almost everyday whereas only 7% and 20% of the household in Komakundi and Mbahe villages respectively have reported to consume beans almost everyday. Twenty seven percent and 57% of respondents in Komakundi and Mbahe consume beans three to four times a week and 47% and 20% two times a week.

Table 5.15a. Frequency of eating protenous[1] foods for Mawanjeni village (multiple responses)

Frequency (per week)	Legumes		Fish		Milk		Meat	
	No	%	No.	%	No.	%	No.	%
Almost everyday	29	97	0	0	1	3	0	0
Twice per week	0	0	18	60	4	13	0	0
Once per week	0	0	3	10	6	20	1	3
Three to four times per week	0	0	3	10	0	0	0	0
Rarely	1	3	6	20	19	63	29	97

[1] One would wonder why eggs are not included in the list. Most of the farmers reported not to consume eggs. Even if they rear layers, they sell the eggs. Most of the respondents especially women have reported not to eat eggs. If we go down to the culture/roots - in the past women were prevented to eat eggs as reported in the literature fearing that eggs are harmful to pregnant and lactating mothers.

Fish is an important relish food for Mawanjeni village (77%). Sixty percent of the respondents reported to consume fish twice per week where as 10% consumed fish three to four times per week in Mawanjeni village. Twenty percent eats fish rarely. The Mawanjeni village is near to the fish source as fishermen from Nyumba ya Mungu dam could bring the fish to the nearby market and fish was not as expensive as meat. Most people reported to eat fish twice per week because the market take place twice per week. Only 43% and 47% of respondents ranked fish as an important source of relish for Komakundi and Mbahe villages respectively. Twenty three percent and 27% eat fish twice a week, 47% and 13% once per week and 23% and 53% very rarely for Komakundi and Mbahe villages respectively.

Table 5.15b. Frequency of eating protenous foods for Komakundi village

Frequency (per week)	Legumes		Fish		Milk		Meat	
	No.	%	No.	%	No.	%	No.	%
Almost everyday	2	7	0	0	14	47	4	13
Twice per week	14	47	7	23	1	3	5	17
Once per week	5	17	14	47	2	7	2	7
Three to four times per week	8	27	2	7	5	17	19	63
Rarely	1	3	7	23	8	27	0	0

Fermented milk was sometimes used as a relish in some of the households. Foods like bananas, stiff porridge (maize meal called ugali) and rice are sometimes taken with milk. Fresh milk was

used in tea in most of instances and for giving under-five's although fermented milk was the most common type of milk given to under-five's (Figure 5.2). Forty seven percent, 57% and 37% of the respondents reported milk as a source of relish for Mawanjeni, Komakundi and Mbahe villages respectively. Three percent, 47% and 27% of the respondents consume milk almost everyday for Mawanjeni, Komakundi and Mbahe villages respectively, whereas 63%, 27% and 30% consume milk rarely.

Table 5.15c. Frequency of eating protenous foods for Mbahe village

Frequency (per week)	Legumes		Fish		Milk		Meat	
	No.	%	No.	%	No.	%	No.	%
Almost everyday	6	20	0	0	8	27	0	0
Twice per week	6	20	8	27	6	20	13	43
Once per week	1	3	4	13	5	17	2	7
Three to four times per week	17	57	2	7	2	7	6	20
Rarely	0	0	16	53	9	30	9	30

Meat was also considered as an important source of relish as reported by 30%, 90% and 50% of respondents from Mawanjeni, Komakundi and Mbahe villages respectively. However, the frequency of consumption was different in the three villages as meat was bought from butcheries. Ninety seven percent of the respondents from Mawanjeni village rarely eat meat and only 3% manage to take meat once per week. This was different from what was happening in Komakundi and Mbahe villages. Thirteen percent of the respondents managed to eat meat almost everyday in Komakundi village. Sixty three percent and 20% of respondents eat meat three to four times per week from Komakundi and Mbahe villages respectively whereas 17% and 43% eat meat twice per week and 7% from both villages eat meat once per week. Thirty percent of respondents from Mbahe village eat meat rarely.

It should however be noted that; most of the households in the study area do keep animals ranging from cattle, goats, sheep, pigs and poultry. Household cattle is rarely, if ever slaughtered for home consumption except for an extremely important occasion. Cattle are kept for their manure, milk and as a store of wealth in time of need. However, not all the cattle kept are milk cattle, and not all milk cows are milked every day. Sometimes milk is bought, or

sometimes milk is available at home but it is not consumed by the household. Instead it is sold in order to get money to cater for other needs. Chicken can be eaten occasionally for those families which can afford to keep them. Chicken meat is expensive and it is eaten by better-off households. Poor households rear chicken for sale and not for their own consumption. Goats and sheep are slaughtered at special occasions, for instance at Christmas, when a baby is born or on marriage ceremonies.

The relish foods are served with the staple food, completing the nutritional contribution of the staples. They also provide variety in the diet, which increases palatability and appetite (Dey, 1984). The value of protein in cereals is balanced and enhanced by combining it with grain legumes. The availability of food in the household should include the availability of staple foods and relish foods as they always go together. Women are responsible for providing the relish foods eaten with the staples and they tended to play a predominant roles in the cultivation of secondary crops.

5.3.6 Food storage.

Although most of the households store food it does not guarantee steady flow of food in the homestead for the whole year. The amount of stored food, the storage methods employed, selling food between harvests can be determinant factors to the availability of food in the homestead for the whole year. Even after a good harvest a lot of food may be lost during the post harvest period, particularly during storage thus affecting food availability. Although it has been difficult to obtain accurate data, it is estimated that nearly three quarters of all food produced is stored at the household level at least for a considerable period of time before it gets into the distribution channels (TFNC, 1992). As a result a lot of food is lost through destruction by rodents, insects and vermin other than pests depending on the storage methods employed.

The challenge in storage is to protect the foodstuffs from different kinds of losses and deterioration. Products in store are injured by mechanical damage as well as heat and moisture. (Haugen, 1995) In addition there are various organisms adapted to the special conditions in store, competing with human being for the stored food. Such organisms are storage bacteria and

fungi, snails, slugs, insects, rodents, larger animals and thieves (Hill, 1990). Storage is of importance to the farmer because it is upon the efficacy of his/her storage methods that he/she is assured of his own food supplies throughout the year until the following harvest. In the study area the main crop stored were beans, maize, sorghum and sunflower (Table 5.16)

Table 5.16 The main stored food produce.
(multiple responses)

Stored produce	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Maize	30	100	26	87	28	93
Beans	18	60	18	60	20	67
Sorghum	6	20	0	0	0	0
Sunflower	18	60*	8	27	3	10

* Staying near the farms so they can scare birds easily and thus have good harvest.

5.3.6.1. Storage methods employed.

Several methods are employed to store food in rural areas depending on the economic capability of the farmer. Some of the storage techniques employed by the farmers in the study area are presented in Table 5.17. Chi-square analysis results shows that there is a significant difference ($p<0.05$) in the storage methods employed between the villages.

Ninety seven percent, 43% and 47% of the farmers Mawanjeni, Komakundi and Mbahe villages respectively use sacks to store their products. The Mawanjeni farmers are mostly using sacks because they are cheap to manage as indicated by 97% of the respondents. One sack was sold at 700 Tshs (US$ 1 = 580 Tshs in 1995) during the survey period. Sacks are cheap to manage but they are not good when it comes to security against pests and rodents.

Drums were used by a bit well off farmers and those with a bit big harvest. Drums are hermetically sealed containers (air tight containers). When the produce is well dried it can store very well in those containers as most of the produce destroyers are aerobic organisms. So in such reduced oxygen environment they can not be active. Twenty seven percent, 70% and 60% of the farmers from Mawanjeni, Komakundi and Mbahe villages were using the drums respectively. One farmer pointed out that, despite the fact that the produce store well in the

drums, they are expensive . One drum was sold at around 5000 Tshs during the survey period. In addition to being expensive, the produce stored in the drums does not germinate well when planted due to lost viability.

Table 5.17 Methods used to store the produce after harvest.
(multiple response)

Methods used	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Sacks	29	97	13	43	14	47
Drums	8	27	21	70	18	60
Hanging on the ceiling	3	10	4	13	1	3
Traditional granary	1	3	3	10	1	3

Chi-square = 16.497 df = 6 p-value = 0.0113 *

Other farmers tie the unhusked maize and hang it on the ceiling above their kitchen fire especially when the maize is intended for seed during the next harvest. It is difficult to store the whole produce in this way as the kitchen houses are small and there is no enough space to put most of the produce. Also some farmers believed that the modern varieties of maize got infested when hanged on the ceiling compared to the local variety.

Traditional granaries were also employed but not by many farmers. These granaries were mostly used to store finger-millet as it stores well up to three year when it is stored unhusked. Unhusked maize was also sometimes stored in the traditional granaries. The granary hut is constructed in such a way that rodents can easily invade the storing units for grains. Some farmers solve this problem by keeping cats. Traditional storage structures need to be improved to avoid attacks by rodents.

Spreading on the floor and hanging on the trees is sometimes practised by the farmers but they need to have a large store to spread the food in case of spreading on the floor. Also this can be done at a very short period normally during the period of unhusking the maize as it can be infested easily when left open as the produce is subjected to moisture, pests and rodents. Hanging on the trees is traditional and it worked in the past. It is not so much practised nowadays as the produce could get stolen. Also if it have to stay for a long time in the tree it

could be spoiled by rain, birds, wild animals, and micro organisms. Only one farmer from Mbahe village reported to be using tins but he use them specifically for storing honey.

5.3.6.2. Preservative methods employed to minimize storage losses.

Farmers used different preservative methods against pests (Table 5.18). Chi-square analysis results shows that there is highly significant difference ($p<0.01$) on the preservative methods employed between the villages. Hermetically sealed containers are considered as storage method and a preservative method at the same time as farmers use them specifically for security against pests/rodents as indicated by farmers from the surveyed area; Mawanjeni(20%), Komakundi (53%) and Mbahe (60%). The produce stored in the drums is mainly maize and sometimes beans. The usual practice is to thresh the maize and dry it to a very low moisture content. Then the maize is cleaned (winnowed) and being placed in the container which in turn is sealed. Some farmers could redry the maize if at the beginning it was not well dried and this can be noticed when using the maize as it will be stained by fungus.

Table 5.18 Preservative methods against storage pests
(multiple responses)

Methods employed	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Traditional methods/herbs	8	27	9	30	3	10
Redrying	22	73[a]	4	13	9	30
Application of chemicals	14	47	4	13	13	43
Use of air tight containers	8	27	21	70	18	60

Chi-square = 27.364 df = 6 p-value = 0.0001 **

[a] They have to redry as most of them use sacks

Application of chemicals for preservation is mostly done on dried maize. The maize is dried then threshed. Then it is mixed with the chemical according to recommended concentrations. Most of farmers were using actellic supper. Both women and men are involved in storage and preservation (Table 5.5). Chemical application, for instance on maize is done mostly by men whereas traditional preservation especially of beans is done by women. Some prefer to store the maize unwinnowed after threshing especially when they are not using any chemical as they believe that the pests will feed with the chaff first before attacking the grains. Some farmers

decorticate the maize and store it without winnowing it for the same reason. Redrying is mostly done on the produce stored in the sacks as it will likely be attacked by the storage pests. Some farmers apply Malathion 1% dust to cobs to discourage storage pests. Some of the problems involved with insecticidal powder are; it is costly and sometimes not easily available at the time required, it is difficult to obtain accurate dosage and a thorough admixture and it needs extra labour. Maize with chemical preservatives have to be washed before being consumed.

Several traditional methods/herbs are also employed as preservative measures. Twenty seven percent, 30% and 10% of respondents from Mawanjeni, Komakundi and Mbahe village respectively apply traditional methods as preservative measure. Maize is hanged on the ceiling on the fire place. The smoke from the fire has a protective effect against micro-organisms. Also the produce is continuously being dried in the process.

Beans are considered as women's crop and most of its preservation is done by women. There are several methods employed to preserve beans. The beans can be threshed and then stored without winnowing or can be winnowed but mixed with *Cyprus spp.* leaves. The leaves from this tree have a certain smell which repel pests. Another method is mixing the beans with pepper after winnowing. Pepper has a repelling effect to pests. The use of ash from the burnt firewood is also effective against storage pests. Some women could use air proof tightened banana leaves which are traditionally made to store beans (kisuke).

5.3.6.3 Storage losses.

Storage pests are a threat to many rural households. Seventy three percent, 50% and 53% of the respondents from Mawanjeni, Komakundi and Mbahe villages respectively experience storage losses. On average, losses as high as 19% were caused by rodents whereas losses as high as 33% are caused by other pests (Table 5.19). Most of the losses originate from other methods of storage than hermetically sealed containers.

The greatest damage to stored produce is generally caused by insects, though this may be exceeded by rodents in some countries (Katerere and Giga, 1990). Considering that about six

rats eat food enough for an adult person requirements, the role of rats in food losses during storage becomes very important (TFNC, 1992). Table 5.20 depicts the storage losses reported from selected districts in Mtwara Region.

Table 5.19 Storage losses of the food produce experienced in the three villages.

Causes	Storage losses (%)[1]			
	Mawanjeni n = 30	Komakundi n = 30	Mbahe n = 30	Average n = 90
Pests	43	23	33	33
Rodents	23	13	20	19

[1] Storage losses were estimated from the stored maize.

Some farmers at Mtakuja village in Kilimanjaro have adopted the practice of selling all their maize crop in order to avoid the total loss that would be caused by the larger grain borer (Scania) in storage. The large grain borer (*Prostephanus truncatus*) which attack maize is known to destroy huge amounts of maize during storage. This new pest in the villages is causing losses sometimes amounting to 100% (Cunard et al, 1984). The same author reported that the scania beetle (*Prostephanus truncatus*) is extremely resistant to pesticides and reduces the whole cob within its sheath to a friable white powder.

Table 5.20 Causes of food storage losses in selected districts in Mtwara Region 1988.

Type of storage problem	Percentage respondent			
	Masasi	Newala	Mtwara rural	Total
Rodents	52.5	69.4	82.1	66.9
Insects	47.5	27.5	16.7	31.8
Others	-	3.0	1.2	1.3

Source: Modified from TFNC, 1992.

Despite the big losses experienced, farmers did not consider storage as a big problem. When the farmers were asked about their seasonal storage capacity, they claimed that they could store as much as possible only that they do not have enough harvests to meet their needs and for storage. Farmers need to be educated on how to improve their storage facilities and how to improve the potential of traditional storage and preservative measures in order to reduce storage losses. In many localities food availability could be increased by helping farmers and farm

households learn how to improve storage facilities. Increasing food availability means not only increasing food production but also the reduction of food losses.

The significance of storage losses is different for wealthy and poor farmers; that is, the poor farmers often use their stocks before there is a significance damage. Storage is thus important for those who have stocks lasting long and if the poor farmers increase production enough to last for number of months. On the other hand storage may not be a problem when production is increased because the farmers may sell more to cater for other needs, or can also sell and buy hermetically sealed containers and store their produce better, or maybe the farmers might be eating less because of less harvest, so by increasing the harvest they can eat more and store less. Hence, increased food production does not necessarily make the role of storage significant because there are several options at the disposal of the farmer.

The storage losses are significant to food security when we consider the physical loss and the quality loss. Even if the physical loss may not be significant the contamination of food could lead to food poisoning and affect the health of the consumer. Thus there is a need to improve storage methods in line with other improvements to alleviate food insecurity but the farmers cannot do it themselves especially the farmers from Mawanjeni village because of their low purchasing power unless they are assisted by Government institutions or donor agents responsible for household food security improvement. Among the storage methods employed in the study area, the use of hermetically sealed containers can best be promoted in the villages in order to reduce storage losses.

5.4 Accessibility of the food in the household

The process and extent to which the available food can reach all the members of the household during the whole year defines the access to food. It is this accessibility to food that finally determines who eats what and how much. In most rural households, food access is dependent mainly on the ability to buy or produce own food. It is dependent on the ability to generate income, whether in cash or in kind (Holmboe-Ottesen and Wandel, 1992). It is also determined by the proportion of income that is actually available for consumption purposes. In addition,

household food accessibility is also determined by factors such as storage, price policies and intra-household food distribution among other things.

5.4.1 Income generating activities

People perform different off-farm activities in order to get money to supplement what they have produced (Table 5.21). Chi-square analysis results show that there is highly significant difference in income generating activities ($p < 0.01$) between the villages.

5.4.1.1 Selling labour

Labour was sold by farmers, especially from Mawanjeni and Mbahe villages. Fifty percent, 7% and 47% of respondents from Mawanjeni, Komakundi and Mbahe villages sell labour in order to obtain extra income. Out of the 50% of those who sell labour in Mawanjeni village, 30% was women. Quinn et al (1992) has pointed out that women must obtain food or cash for their dependants and it is not uncommon for members of the poorer rural households, to undertake low-paid casual labour (often with payment in kind), working in the fields of wealthier farmers. When this happens during weeding period the fields of these poorer households are left unattended, pushing these families further downwards into the poverty spiral. Increased on farm employment by female member of the household may reduce child care, with detrimental effects on child nutrition (Imminik and Alarcon, 1990).

Table 5.21 Means of generating extra income
(multiple responses)

Activity	Mawanjeni n= 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Selling labour	15	50	2	7	14	47
Selling local brew	2	7	6	20	2	7
Relatives/Husband/Children send money	5	17	10	33	2	7
Formal employment	2	7	6	20	7	23
Selling animals and animal products	1	3	9	30	7	23
Owns a blacksmith business	0	0	8	27	0	0
Petty trade[1]	3	10	3	10	7	23

Chi-square = 41.505 df = 12 p-value = 0 **

[1] Petty trade here is defined as any trade which is locally governed and the income obtained does not enter into the government circles through tax for instance buying commodities from the Kenyan boarder and sell them in the local markets.

In the study area, the poor and very poor households were selling labour in Mawanjeni and Mbahe villages. All poor and very poor households were selling labour in Mbahe village whereas in Mawanjeni village, 94% of the very poor households were selling labour but non of the poor were selling labour. The situation was a bit different in Komakundi village where very poor households were selling labour but non of the poor was doing so. Selling labour is sometimes considered as a humiliating job. So for some households, despite of being poor they may not opt for selling labour as the way of obtaining extra income.

Selling of labour could also be in the form of carrying luggage from the market for rich people. This is mostly done by women. Another form of selling labour which is mostly conducted in Mbahe village is carrying luggage for the tourists who are climbing mount Kilimanjaro. This is exclusively performed by men. Forty four percent of the males interviewed in Mbahe village sell their labour in this way. They are paid officially and the tourists most of the time pay them unofficially in cash or in kind.

5.4.1.2 Selling local brew.

People also get extra income from selling local brew (Table 5.21). This business is complex and it benefits people differently. There are those who sell their bananas of "ng'ombe" variety to the brew makers, those who sell their finger-millet, those who manufacture it and sell it, those who carry it from one beer "pombe" shop to the next (using head or a car), those who carry the bananas and the finger-millet from the market to the brewing place and those who buy the already made brew from one place and sell it at another place.

This business is conducted in many rural areas of Tanzania. Studies conducted in Kilosa district showed that the farmers thought that in order to get more money from, maybe a tin of maize, one has to sell the maize in a processed form as local brew instead of selling as maize grains (Mamiro, 1991). In this study this was the case with finger-millet. It was profitable to sell it in form of local brew.

Although it is a profitable business and can have a positive effect on food security as far as the income generation is concerned, it should be discouraged by the Government authorities, especially the type of local brew whereby the main ingredient is also the main staple food of the household for instance maize and sorghum. Appropriate policies could be used to promote consumption of food instead of beer, and reduce the incidence of drunkardness (See section 5.4.6).

5.4.1.3 Blacksmith business.

Some farmers especially in Komakundi village, own a blacksmith business. This is a simple enterprise where used pieces of metal are reprocessed to usable home utensils, for instance, machetes, sickles (used to cut grasses for livestock), knives, hand hoes, fork hoe, spears (for tourists or museums) and other home use commodities. Twenty seven percent of the respondents reported to involve themselves in this business (Table 5.21). It is the men's duty to reprocess metals but women participate in the marketing process.

5.4.1.4 Petty trade.

Some people conduct petty trade which are small enterprises where different items ranging from food items to non-food items are sold. People rely on buying commodities for example, sugar, soap, kitchen utensils, sugar, oil and others from the Kenyan boarder and sell them in their shops. This is mostly done by girls, boys and women. Some sell used clothes. The petty trade which involve moving from one market to the next is detrimental to agriculture and other tasks as most of the time is spent moving. Some parents complained that their children after finishing primary education are conducting petty trade for their own benefit and deny their parents their labour in agricultural production.

5.4.1.5 Other activities

Other activities included selling of animals and animal products, handicraft, mansory and carpentry. Those who own butcheries buy cattle mostly from Maasai land. Animal products include milk and milk products and these are exclusively marketed by women. Some people are

formally employed and they receive monthly salary. Some relatives, husbands and children working in towns sometimes send money to the household.

5.4.2 Women's small enterprises.

Women perform a wide spectrum of activities in order to secure extra income. Some of the activities mentioned in the group interview are; selling local brew, conducting petty business, selling cooked foods, selling fruits and vegetables, selling sisal ropes, selling sugar cane and sewing clothes. Table 5.22 shows the activities done by women to secure extra income.

In general the goods marketed by women are of lower cash value than those marketed by men, for instance bananas and sugar cane compared to coffee and maize. Although the items in women's domain look like minor products in quantity and price, they cannot be neglected. It is from the proceeds from the sale of these that things like salt, green vegetables, fruits, sometimes sugar or cooking oil, milk, meat or fish and sometimes clothes are purchased. Women have to walk long distances to different markets, and normally the local markets are full of women.

Table 5.22 Women's small enterprises to obtain extra income.
(multiple response)

Activities	Mawanjeni n=10		Komakundi n=12		Mbahe n=12	
	No.	%	No.	%	No.	%
Selling local brew[a]	2	20	5	42	3	25
Petty trade[b]	4	40	7	58	2	17
Selling cooked foods	3	30	0	0	0	0
Selling fruits and vegetables[c]	4	40	3	25	10	83
Selling ropes	8	80	0	0	0	0
Selling sugar cane[c]	0	0	0	0	11	92
Sewing clothes	0	0	3	25	0	0
Selling bananas[c]	3	30	12	100	0	0

n = Sample size of women.
a = The local brew can be bought from one bar and sold in another at a higher price
b = As defined under Table 5.21
c = These items can also be bought from the farms and being sold in the markets at higher price or brought from the markets in the uplands and sold at higher prices in markets in the lowland or on the Kenyan boarder.

5.4.3 The role of monthly income in securing food.

Table 5.23 shows the average monthly income from food crop, cash crop and off-farm activities for the three villages surveyed (Table 5.23)

Table 5.23 Average monthly income[1] per household in the three villages

Monthly income	Mawanjeni n = 30	Komakundi n = 30	Mbahe n = 30
Off-farm activities	2500	10000	7500
Food crops	2500	7500	7500
Cash crops	-	16000	13000
Total	**5000**	**33500**	**28000**

[1] These are just estimated figures. The incomes differ in different months and these figure might not be taken to represent all months. Also the rich farmers might have contributed to such high figures observed in Komakundi and Mbahe villages. In reality however, the monthly incomes per individual households are not so high.

On average the total monthly income in Mawanjeni village was 5000 Tshs, Komakundi 33,500 Tshs and Mbahe village 28,000 Tshs per month. ANOVA results show that there is significant difference ($p<0.05$) for the monthly income between the villages. There sources of obtaining income also differ between the villages (Table C4 Appendix C). The Mawanjeni village has very little average monthly income partly because there is not cash crop to sell, and their farms do not have permanent crops which can be sold throughout the year in contrast to Mbahe and Komakundi villages.

For both urban wage earners and poor rural families who can not produce enough food, cash income is necessary to ensure access to food. Although almost every respondent was doing something else apart from doing agricultural tasks, this does not necessarily guarantee that the income is used to buy food. Exactly how much money is used to buy food is difficult to estimate because it is affected by many factors, for instance, type of food to buy or amount of food in store. From the group interview, most farmers admitted that they use up to 50% or even more of monthly income to buy food. There are other needs to take care of, not only food in the household, such as paying school fees, buying medical services, buying clothes etc.

A disproportionate part of the earnings may also be used in acquiring "modern luxury" things, such as modern expensive clothes and drinking leaving an inadequate amount for a decent family diet. Research in Iringa Region revealed paradoxical situations where the nutritional status of children had worsened when the village was exposed to new economic opportunities. These opportunities were an additional burden on overburdened mothers who had less time to care for their children (Ljungqvist, 1981). There are circumstances as in the case of Kilimanjaro region whereby both parents are away from home the whole day on economic activities, leaving the children unattended and unfed.

Women reported using up to three quarters of the income from their small enterprises for buying food. This should be taken with caution depending on the groups of women interviewed, for instance, some women can spend the whole income in purchasing "modern things" for instance clothes (khangas) and drinking as this study revealed. This tendency was not very common in the rural areas in the past but it is growing due to modernization process. Jacobson (1993) argues that it is the mother's rather than the fathers income and food production and the degree of control she maintains over that income that determines the relative nutrition of children. If this tendency of women using money for fancy clothes and alcohol grows faster, then these findings may not hold. There was one serious case in the study area where a woman was divorced because of not taking care of the family when the husband was away and she uses all the money the husband left her to buy modern clothes.

Men control the cash crop income mainly from coffee and they tend to use most of this income on non-nutritional related expenditures. Sometimes women never know how much money the husband gets from the coffee even though they participate in all activities in its production and even carrying it to the co-operative centre where it is sold. The husband normally remains behind to collect the money while the wife returns home for other household chores.

With social mobilization for nutrition improvement, cash crop can be successfully tapped to achieve food security (Kavishe and Mushi, 1993). Income-generating food security programs must also pay attention to nutrition education, target women, provide seasonal buffer

mechanisms like seasonal credit or saving schemes, and also deal with the most prevalent health problems if they are to have the intended effect of improving nutritional status.

5.4.4 Household care

5.4.4.1 Housework

Child and family care is mostly done by women (81%). The girls and boys can also help their mothers to take care of their young brothers and sisters if the mothers have gone to the farms. This can explain the delay in sending their children to school as most of them can be busy taking care of their young brothers and sisters (Average school entry age was found to be 8 years).

Table 5.24 Percentage women and men respondents involved in housework (aggregate results for the three villages)

Activity	Percentage respondents n = 90			
	Women	Girls	Men	Boys
Prepare and cook food	66	24	3	7
Cleaning	42	33	0	25
Child and family care	81	11	4	4
Doing laundry	27	39	15	19
Collecting firewood	39	27	13	21
Collecting water	37	33	5	25

NOTE: Boys and girls are included in Table 5.24 as they are more involved in housework than the agriculture and animal husbandry activities.

It is the responsibility of women to prepare and cook food (66%). The mothers are helped by girls. Some husbands strictly eat the foods which has been cooked by their wives only. Very few men cook and on very rare occasions. The distribution of food during meals among the family members is done by women. This distribution is guided by cultural practice. Some women give their husbands the best and first food. It is not uncommon to find some men being served different food from the rest of the household.

Collecting water and firewood, doing laundry and cleaning the house surroundings is done by the women, girls and boys (Table 5.24). Sometimes the main sources of water can be very far from the homestead and thus takes the time which would otherwise be used in other productive activities. Fuelwood collection is also a time consuming task. Unlike during the dry periods, it is

not possible to get fuelwood that burns easily from the nearby areas in the rainy season. So women have to walk long distances about 5 Km to find firewood.

Although currently men do participate in some of the household production activities which were in the past done by women only, it is still uncommon to find men doing housework, for instance, cleaning the house surroundings, cooking, peeling bananas or carrying things on their heads, but they can help by using bicycles, motorbikes or wheelbarrow. No woman is allowed in the slaughtering house.

Adequate care leads to the optimal use of human, economic and organizational resources (Kavishe and Mushi, 1993). It is through good care that the available food in the household is made accessible to the members of the household. The available food have to be processed, cooked (made to palatable form) and served to the member of the household. Lack of good care to the household can jeopardize the food security of the household. It is also through good care that the available resources are used to buy food instead of buying luxurious things and drinking. Whereas a woman from poor households is supposed to do everything from doing agricultural and animal husbandry tasks, taking care of the whole household and doing other activities to secure extra income, women from rich households have more time to care for their households as they can hire house-girls/boys to help them with some jobs.

5.4.4.2 Child care practices.

5.4.4.2.1 Young child feeding

The frequency of feeding and the type of food given can determine the nutritional situation of a child (other factors remaining constant, for instance prevalence of diseases). Child care practices are important in supporting the health and nutritional status of young children, and in this respect mothers are apparently concerned for their children's well-being than fathers. Table 5.25a and 5.25b show the percentage respondents on frequency of feeding of under-five's during on and off season for the three villages surveyed whereas Table 5.25c shows the average feeding frequencies on and off season for the three villages surveyed.

The average meal frequency in the three villages was found to be 1.9, 3.1 and 3.3 meals per day for Mawanjeni, Komakundi and Mbahe villages respectively on season whereas the meal frequency was found to be 2.5, 3.5 and 3.5 meals per day on off season (Table 5.25c). The feeding frequencies for children in Tanzania is low, averaging about only twice per day (TFNC, 1992, Kavishe and Mushi, 1993).

Table 5.25a. Percentage respondents on on-season feeding of under-five's.

Feeding frequency (times per day)	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No	%	No.	%	No.	%
Once	3	10	0	0	0	0
Twice	17	57	3	10	6	20
Two to three times	1	3	14	47	11	37
Four times	0	0	1	3	8	27
Above four times	0	0	2	7	3	10
No information [1]	9	30	10	33	2	7

[1] No information from the households with no under-five's

Table 5.25b. Percentage respondents on off-season feeding of under-five's.

Feeding frequency (times per day)	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Once	0	0	0	0	0	0
Twice	10	33	0	0	5	17
Two to three times	11	37	13	43	11	37
Four times	0	0	5	17	5	17
Above four times	0	0	2	7	7	23
No information	9	30	10	33	2	7

Table 5.25c. Average feeding frequencies for under-five's for the three villages

Feeding frequency (per day)	Mawanjeni n = 21	Komakundi n = 20	Mbahe n = 28
On-season	1.9	3.1	3.3
Off-season	2.5	3.5	3.5

Too few meals compounds the problem of inadequate caloric intake. No special feeding routine for infants and young children exists in rural households and their meals depend on the preparation of adults meals. Feeding frequencies of less than four times a day in children under five years is significantly associated with poor nutrition as compared to higher feeding

frequencies (Kavishe et al, 1985). Because of their small stomach capacity, children unlike adults need to eat more frequently in order to meet their daily nutritional needs (Quinn et al, 1992, Kavishe and Mushi, 1993).

NOTE: Interpretation of what could be called a meal is important as some snacks, left over's and fruits are taken most often between the formal meals. Feeding between meals should be considered when calculating the feeding frequencies. In the study area, the children were fed with left-over's (whenever available) sometimes after the breakfast or together with the breakfast. This was also considered as a full meal.

5.4.4.2.2 Weaning foods.

Breast-feeding in Tanzanian communities is started universally and children appear to grow well during the first few months when mothers milk is adequate. Problems start with the initiation of weaning with the low frequency of feeding and bulky foods. In the study area, infants are weaned with "uji" stiff porridge which is a special thin gruel, prepared from maize flour, finger-millet flour or mixed flour and pounded bananas (Table 5.26).

Table 5.26 Types of weaning foods given to the under-five's.
(multiple responses)

Weaning foods	Mawanjeni n = 21		Komakundi n = 20		Mbahe n = 28	
	No.	%	No.	%	No.	%
Maize flour porridge	7	33	1	5	1	3
Maize flour porridge with milk	9	43	13	65	13	46
Finger-millet flour porridge	0	0	0	0	0	0
Finger-millet flour porridge with milk	1	5	6	30	4	14
Malted finger-millet flour porridge	0	0	0	0	0	0
Mixed flour porridge [1]	1	5	0	0	0	0
Mixed flour porridge with milk	3	14	4	20	12	43
Banana foods	1	5	13	65	13	46

[1] Different cereals are mixed together for instance maize, finger-millet, rice and sometimes ground nuts, beans or sardines can be mixed with the cereals.

Sometimes the gruel is of low quality, especially if it is made from one type of cereal. Most of the under-five's in Mawanjeni village are fed on maize flour porridge with milk (43%) and without milk (33%). Only 14% of respondent give their children mixed flour porridge with milk.

Finger- millet flour is not so much used to make porridge for most households as it use to be in the past. This is because it is used alternatively and more profitably to make the local brew. In the uplands (Komakundi and Mbahe) children are mostly fed with maize flour porridge and mashed bananas sometimes mixed with fermented milk or mixed with beans and bicarbonate of soda.

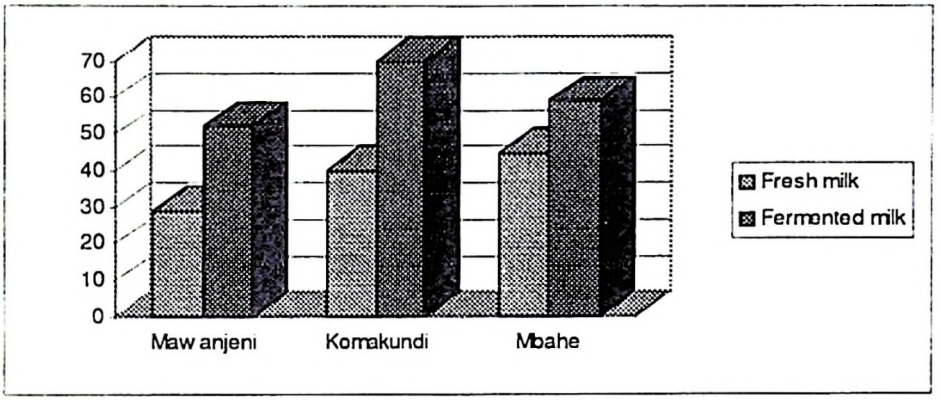


Figure 5.2 Percentage respondents on the type of milk given to the children

Children are fed with fermented milk in many households compared to fresh milk (Figure 5.2). The fermented milk might be of good or poor nutritional quality compared to the fresh milk depending on the fermentation techniques employed. Some women remove all the cream from the milk (by whipping) and what is given to children is skimmed milk. Maize flour porridge is used widely as weaning food in the country. Studies conducted in Kisarawe District in Dar-es-Salaam (TFNC, 1992) shows that maize based porridge is the most common weaning food consumed on average twice a day and comprising 54% of the weight of total food consumed in a day. In this study, the energy intake of children was only 54% - 62% of the recommended intakes.

A family's access to adequate amounts of food is a basic requirement for ensuring household food security; however, a child's nutritional status depends directly on the actual amounts and types of foods eaten as well as on its health status (Wandel and Holmboe-Ottesen, 1992). In addition, health and nutritional status of the mother has a direct impact on the new-born baby's nutritional well being. Influencing each of these factors is the dimension of seasonality which

affects not only the mothers workload time constraints and child care, but also household food supplies, feeding practices and incidence of illness and disease.

Child care practices are important in supporting the health and nutritional status of young children, and in this respects mothers are very much concerned for their children well being. However, many rural women face severe constraints on their time. Not only are they responsible for the care of their children, they also have to look after their homes and their crops. During the busy peak periods, when agricultural labour needs are highest, mothers may not be able to allocate enough time to food preparation and feeding their young children. This statement must be taken with caution as analysis of the direct relationship between the time mothers spent working in the field and child nutrition status gave no conclusive support to the notion that women's work has negative consequences for the child (Wandel and Holmboe-Ottesen, 1992).

5.4.5 Food shortage

5.4.5.1 Food deficit in the households.

Most of the households surveyed reported food deficit in their homestead before the next harvest (Figure 5.3). This is caused mostly by the fact that very little food is stored depending on production. There are very few farmers who buy food during the harvesting season and store it in case what was harvested is not enough until next harvest. So what is always stored is what has been produced in most cases.

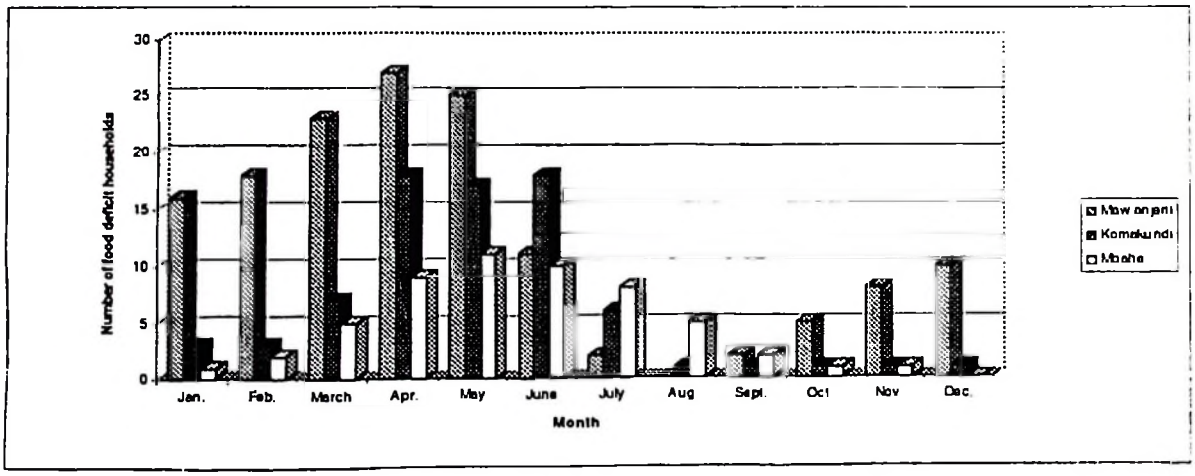


Figure 5.3 Food deficit households in every month.

Figure 5.3 shows food deficit households in every month whereas Table 5.27 shows the cropping calender for coffee/banana and maize/beans farming system in the uplands and lowlands. A very important picture emerges from Figure 5.3 and Table 5.27.

In August no family reported to be in food deficit in Mawanjeni village. This is due to the fact that most of the maize is ripe and it can be eaten in green form if not dry, and they have already harvested the beans (Table 5.27). Also after the first and second weeding, farmers collect varieties of green vegetables from the fields for instance, amaranths, cowpea leaves, and common bean leaves. If the production is good and enough food is stored, it is not expected to find households to be having no food on September as this is the harvesting time. In this case, however, two households had no food. This can be explained by the following reasons;

-The cultivated land was too small and all the maize was taken green

-Those farmers had no land so they depend on buying food from the market and their income is uncertain

-Little harvested and stored food coupled with big families can complicate the situation.

The food stored is depleted as time goes on and by April about 27 households are food deficit. April and May is the period where people have to work hard in the fields (Table 5.27) and unfortunately it is the period when the food is very little in the household. One respondent pointed out that there are a lot of "vibarua" (work) during weeding time, but unfortunately it is the time they have to weed their farms too. Sometimes they have to go for "vibarua" in order to get money to buy food as at this time of the year, food is very little or unavailable at all in the homesteads. This supports the findings by Quinn et al (1992), that food may be prepared less frequently during the peak agricultural season simply because the food stocks of the household are either low or fully depleted and not necessarily that people are working hard and have no time to prepare food at this period.

Table 5.27 Cropping calendar for coffee/banana and maize/beans farming system in the uplands and lowlands

COFFEE[1]			Transplanting				Harvesting between July to December depending on the ripeness of the berries. (Weeded as necessary)					
BANANA	Planting before march			Harvesting at different times but the peak period is between September and December (Weeded as necessary)								
MAIZE/BEANS -UPLANDS		Maize harvest			Land preparation Sowing			Weeding			Beans harvest	
MAIZE/BEANS -LOWLANDS	Ploughing		Sowing		First weeding/ fertilizer	Second weeding	Beans harvest	Maize harvest depending on the sowing time				
MONTH	JAN. 2	FEB. 2	MAR. 2	APR. 2,3	MAY 2,3,4	JUNE 2,3,4	JULY 2	AUG.	SEPT.	OCT.	NOV.	DEC.

Source: Modified from ICRA, 1992.

[1] Pruning regularly throughout the year.

2. Period where ten or more households are in food deficit for Mawanjeni village.
3. Period where ten or more households are in food deficit for Komakundi village.
4. Period where ten or more households are in food deficit for Mbahe village.

The trend is almost similar in the two villages in the uplands although with fewer households suffering food deficit. Komakundi village has good production of bananas compared to Mbahe village, whereas the Mbahe village enjoys the maize/beans farming system in the uplands most due to the fact that there are open farms where maize could be grown. Very few households are food deficit in the uplands from September to December. This can be explained by the fact that bean harvest in July, maize harvest from August, maize harvest in February in the uplands, coupled with the peak period of banana production (September to December) make the households food secure (Table 5.27). It should however be noted that, bananas are available throughout the year but at the peak period the bananas are plenty.

The bulk production of cereals is from the plains as the maize/beans farming system in the uplands is not very productive and the maize produced is sometimes very little and it can all be consumed green. Most of the households are food deficit in Komakundi and Mbahe village from April to July. This is the rain season and bananas are bearing fruits, taro and foods in the homegarden are not ready at this period. The stored food is almost depleted at this time. Also the farms in the lowlands are far with an average of 20 Km, so they can not enjoy the privilege of harvesting the green vegetables and green maize as frequently as the farmers from Mawanjeni.

It should however be noted that, it is the production from the lowlands which is mostly depended on to feed the people in the uplands and when the production is not good in the lowlands the people in the uplands are affected as well. Small plots for coffee/banana and maize/beans in the uplands, depleted soils, the nature of home gardens (too many crops on one farm), application of little manure or nothing at all in the farms, planting of local varieties of maize coupled with hand hoe agriculture can be the cause of decreased production in the uplands.

Sorghum is not included in the cropping calendar but it is always planted with maize. Sunflower is also planted as a boarder crop or mixed in maize/beans farms in the lowlands. The sorghum of

the serena variety is being encouraged by the agriculturists as it is drought resistant but it is not liked by many people as it is not very palatable.

5.4.5.2. Groups in the household which are mostly affected in the period of food shortage. During the periods of food shortage, different groups in the family suffer differently. Table 5.28 shows how respondents ranked the groups in the household which suffer most during the period of food shortage.

Table 5.28 Groups in the household which suffer most during food shortage periods. (multiple answer)

Group	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Men	0	0	0	0	0	0
Women	9	30	5	17	2	7
Both men and women	6	20	1	3	1	3
Female children	0	0	0	0	0	0
Male children	0	0	0	0	0	0
Both male and female children	6	20	11	37	2	7
Whole household	9	30	6	20	12	40
Old and disabled	2	7	1	3	1	3

Women respondents were in opinion that women and children suffer most during the period of food shortage whereas males respondents thought that the whole household suffers. Out of 39 male responses from the three villages 23 were the whole household suffer, 6 both men and women, 3 women, 5 both male and female children and 2 old and disabled suffer. Out of 35 female responses, 7 were the whole household suffer, 3 both women and men suffer, 11 women, 11 both male and female children and 3 old and disabled suffer. Women argue that they have to feed their family and if very little food is available they leave the food to the husband and children. When the food is being served, father gets fed first, then children and finally mother. The children are not sexually segregated when it comes to feeding. One woman from Mawanjeni village lamented that the husband has to find something in the house especially when he has being grazing the whole day (during the dry season fodder is difficult to get). Other women feel pity for their husbands when they come home from grazing so they must find something for them.

We had a long discussion in the groups concerning the groups in the family which suffer most. We finally reached a conclusion that, children, old and disabled people are the most vulnerable because they are almost handicapped. In this sense, women, old, disabled people and children are all vulnerable but women as a group are not normally vulnerable in the same sense as the other mentioned groups since they are adults and can take care of themselves.

Women also admitted that when they go out begging they could eat in the relatives house or when they go to seek work in the uplands they can eat there as well compared to the children and old ones who have to stay home waiting for whoever is supposed to feed them. They also reported that during this period, men could use the money they have to eat in the restaurants instead of sharing it with the whole household. No man admitted this.

5.4.5.3 Coping strategies during periods of food shortages.

Household coping strategies are measures for dealing with food scarcity situations. Households adopt a variety of coping mechanisms and strategies to offset the effects of production shortfalls and market uncertainties. As mentioned earlier, some households do sell food although they are certain that the food is not enough for their own consumption. This means that the majority of the households found their own means of surviving to the next harvest. Table 5.29a and 5.29b give the major and minor strategies mentioned by the farmers as being used during the period of food shortage in the study area. Chi-square analysis results show that there is highly significant difference ($p<0.01$) in the major coping strategies between the villages.

Reduction of both meal frequency and amount of food taken is the strategy taken by about 50% of the respondents from Mawanjeni village whereas begging from relatives is used by 53% of the households. Buying food from the local markets and other places is not considered as the best strategy by Mawanjeni farmers as foods are also expensive during the food shortage period and with their low income (Table 5.23) they cannot afford to buy food. Buying foods from the market is supported mostly by respondents from Komakundi and Mbahe villages as their

incomes are high and their sources of obtaining income are a bit more diversified than those of Mawanjeni village.

Table 5.29a. The major[1] coping strategies during periods of food shortage.
(multiple responses)

Coping strategies	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No	%
Reduction of the meal frequency	15	50	7	23	2	7
Reduction of the amount of food taken	13	43	3	10	2	7
Buying food from the local markets	8	27	13	43	12	40
Seek employment	10	33	5	17	5	17
Relying on food aid	15	50	0	0	0	0
Begging from relatives	16	53	4	13	3	10
Sale of animals	4	13	10	33	3	10

Chi-square = 41.518 df = 12 p-value = 0 **

[1] Categorized as major or minor depending on the number of the respondents

Table 5.29b. Minor coping strategies during periods of food shortage.
(multiple answers)

Coping strategies	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Borrowing food and money	2	7	4	13	5	17
Migration to other places	2	7	1	3	0	0
Wild gathering	0	0	0	0	1	3
Resort to low quality foods	0	0	5	17	5	17
Sell trees	0	0	1	3	0	0
Sell honey	0	0	0	0	2	7

Farmers from Mawanjeni village also rely on food aid and begging from relatives who are staying in the uplands. The food aid is from the government and Christian denominations. No farmer received food aid from Mbahe or Komakundi village during the period in question. Seeking employment is also common. People look for "vibaruas" in order to get extra income to buy food. Farmers from Mawanjeni could go to the uplands and sell labour in the homegardens where they can be paid in cash or in kind.

Farmers in the uplands (Komakundi and Mbahe) also resort to low quality foods in the homegarden, for instance yams and cocoyams/taro (during normal periods only the developed corm buds are eaten but during the period of less food, the corms are also eaten). There is

almost no virgin land in the area except the forest reserve, so wild gathering was not practised in the area. Migration was not so much practised. Farmers from Mawanjeni questioned; "how could the whole household migrate, and to where?". Even if they have some relatives somewhere else they could go there and ask for food and come back home but they could not stay there permanently. Other coping strategies employed are selling of animals, borrowing food and money, sell trees and selling honey.

There are different coping strategies practised in some other places in Africa. In a study conducted in Nigeria by Watts (1983), peasants coped with food insecurity by collecting wild foods, borrowing grain from kin, sale of labour power, borrow grain or money from merchants/money lenders, sale of domestic assets, mortgage farmland and sale of farmland followed by permanent migration. In some parts of Kilimanjaro region, some traditional preservation methods are also used to preserve foods which are eaten during the periods of food shortage. For instance, the bananas are pealed during the peak period, then dried. They are then eaten during periods of food shortage (Mamiro, 1991)

One might at this juncture ask if the farmers really cope with the above mentioned strategies. In many cases, "coping" may be a misleading, positive word, implying that food insecure households survive periods of high risk unscathed (Maxwell and Frankernberger, 1992). In the real sense, their health might be affected. If for instance the number of meals taken and the amount of food per meal is reduced over along period of time, their health must be affected. Coping here can mean "marginal survival" but not that the farmers are going through as it was in the normal periods unaffected.

How farmers consider the food shortage and livelihood sustainability is also important. The dilemma facing small-farm households involves a tragedy between immediate subsistence and long term sustainability (Maxwell and Frankernberger, 1992). People may choose to go hungry in order to preserve their assets and animals, for instance, if the household has few animals. Preservation of assets may take priority over meeting immediate food needs until the point of destitution, when all options have been exhausted. For instance, farmers from

Mawanjeni village know that from March to June they will have shortage of food but if the rainfall is reliable and they have planted their farms they can go hungry for those few months to preserve their assets while waiting for the harvest.

Coping strategies may vary significantly from one area to another depending on the cause(s) of the food crisis, the length of the food shortage period, the available opportunities for survival and the status of the household in question, that is, the availability of resources in the household differ from the poor, medium and rich households.

From Table 5.13, it is observed that Mawanjeni village has a high proportion of poor households. It is also clear from Tables 5.29a and 5.29b that their coping strategies differ significantly from Komakundi and Mbahe villages. Whereby half of the sampled households depends on reduction of meal frequency and food aid during the period of food shortage, only 7 and 2 households depend on reduction of meal frequency in Komakundi and Mbahe villages respectively and none rely on food aid.

Whereby 53% of respondents from Mawanjeni village depends on begging food from relatives in the uplands, only 13% and 10% of the respondents depend on this strategy from Komakundi and Mbahe village respectively. This is where the concept of opportunities available comes in. Because the Mawanjeni households have relatives in the uplands, then they can go there to beg. Those who do not have relatives do not have such opportunity. Farmers from Mbahe and Komakundi village could resort to low quality food because they have this food in the homegarden, whereas farmers from Mawanjeni village do not.

The availability of resources in the household also matters. Whereby 33% of respondents from Komakundi village could sell animals, only 13% and 10% of respondents from Mawanjeni and Mbahe village sell animals respectively. Some households do not have animals to sell. Mainly the rich families could sell big animals like cattle, goats and sheep but poor households could sell chicken. The rich families are buying chicken for food as mentioned earlier. For the big animals

like cattle, the butchermen buy them for business. It is very rare for a rich/poor households to sell a she cattle unless it has become old. Normally the bulls are the one sold.

Coping strategies also depend on the length of food shortage period. Preservation of the assets will depend if the food shortage period is short or long. The household will not starve to death in order to preserve the assets. In the short term, households might use other strategies like the reduction of meals and meal frequency but if the food shortage period is long all the household stock can be depleted and thus forcing people to sell their valuable assets and even migrate if there are no relief programmes.

5.5 Causes of food insecurity in the study area.

The question which may now be raised is whether the problem of food insecurity in rural Tanzania is widespread and whether it is an acute or chronic problem. There is evidence to suggest that the problem is widespread and chronic in the sense that there is always a certain degree of food deficit for some households at one time in the year. It is not acute in the sense that no emergency action is required. The high prevalence of stunting is evidence for a chronic shortage (TFNC, 1992). However, there have been cases of acute household food insecurity when there were serious crop failures such as in drought or flood situations. In such cases emergency assistance has to be mobilized. An interesting aspect of the household food insecurity problem is the farmers perception of the reasons and solutions to food shortages. Table 5.30 shows the reasons for food insecurity as ranked by farmers. Chi-square analysis results show that there is highly significant difference ($p < 0.01$) on the reasons of food insecurity between the three villages. The factors limiting the contribution of women to household food security are integrated in this and the next section.

5.5.1 Drought and dependence on rainfall.

Drought and dependence on rainfall was considered by most farmers as the main cause of food insecurity, as when there is not enough rain the crop productivity is lowered. A hundred percent and 80% of the respondents from Mawanjeni, Komakundi and Mbahe villages respectively

ranked drought and dependence of rainfall as the main cause of food insecurity in the study area (Table 5.30).

Table 5.30 Reasons of food insecurity in the study area as perceived by the farmers. (multiple responses)

Reasons	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Limited access to productive land	4	13	16	53	22	73
Drought and dependence on rainfall	30	100	24	80	24	80
Lack of capital	24	80	16	53	19	63
Shortage of labour	14	47	18	60	23	77
Low technology	1	3	8	27	5	17
Local beer brewing and drunkardness [1]	3	10	6	20	14	47
Large families	8	27	4	13	2	7

Chi-square = 32.019 df = 12 p-value = 0.0014 **

[1] The data on drunkardness might not be accurate as farmers do not like to be implicated of drinking too much.

As mentioned earlier, the situation is worse in the lowlands, as the lowlands receive less rainfall than the uplands. Most of the farmers depend on the maize/beans farming system in the lowlands. If the rains fail, however the plains, the midlands and the uplands are affected. This supports the study conducted in Morogoro Region by Mtebe et al (1988) whereby about 93% of the respondents in Morogoro rural indicated drought as the number one reason for food unavailability in their households. As mentioned earlier, 98% of Tanzania's agriculture depends on rainfall. So the role of rainfall in alleviating food insecurity in rural areas can not be over emphasized.

5.5.2 Limited access to productive land

Limited access to productive land was also considered by farmers as another main cause of food insecurity. As mentioned earlier, land fragmentation is the main problem in the slopes of mountain Kilimanjaro. The "Kihamba" are generally small because they are passed down by inheritance and are subdivided several times for distribution among the offspring following patrilineal lineage. Studies conducted by ICRA, (1992) showed that the average household farm size ranges between 0.4 to 1.0 hectare. The average farm size owned currently in the study area

was found to be 0.8 hectares and 1.0 hectares in the village and somewhere else respectively. Table 5.31 shows the originally owned land before fragmentation, the land owned currently and the total land cultivated.

Table 5.31 The average owned and cultivated land per household in the study area.

Village	Originally owned land (Hectares) [1,2]		Land owned currently (Hectares)		Total cultivated land (Hectares)	
	Village	Else where	Village	Else where	Village	Else where
Mawanjeni	1.3	0.2	0.8	0.2	0.7	0.1
Komakundi	0.7	1.3	0.6	1.2	0.6	1.1
Mbahe	0.7	1.2	0.6	1.2	0.6	1.0

[1] One hectare = 2.5 Acres

[2] Values rounded to the nearest decimal point.

Since there is no more unclaimed land in this farming system, people are trying to cope with land shortage through buying (those who can afford), hiring (from individuals and co-operatives) and further subdivision of land. Thus, landlessness is becoming common among the younger generation and has to some extent forced some to migrate to towns to seek for work. High population pressure of up to 700 people per square kilometre (URT, 1994) shows how the land is under heavy pressure. Mamiro (1991) points out that land shortage in the area had forced people to encroach the forest. Figure 5.4 shows the number of people accused for forest encroachment in Moshi District. The number of people accused of encroaching the forest on various offences around the slopes of mount Kilimanjaro is increasing. These included those who did this for agricultural purposes to increase their areas under cultivation and those with various reasons for example timber harvesting. This can best be explained by land shortage and population pressure which causes land shortage as encroachment is mainly by cultivators. The forest offence can also be correlated with good, average or bad years as far as food production is concerned. Figure 2.3 shows the total rainfall mm/year in Moshi District. From this Figure, year 1987 had less rainfall. Because agricultural production and thus food availability depends mostly on rainfall we would expect the encroachment to be high in 1988 because there was less harvest in 1987 which is the case. More data however, is needed in order to make any

conclusion on the connection between poor agricultural performance and increases in forest encroachment.

Ownership of land or access to even small pieces of land for farming has been known to have a substantial effect on the food security status of rural households, even when income level is controlled for. The prevalence of food insecurity tends to be higher among landless households who are much more dependent on riskier sources of income than farm income and on the diversification of the rural economy (Quinn et al, 1990).

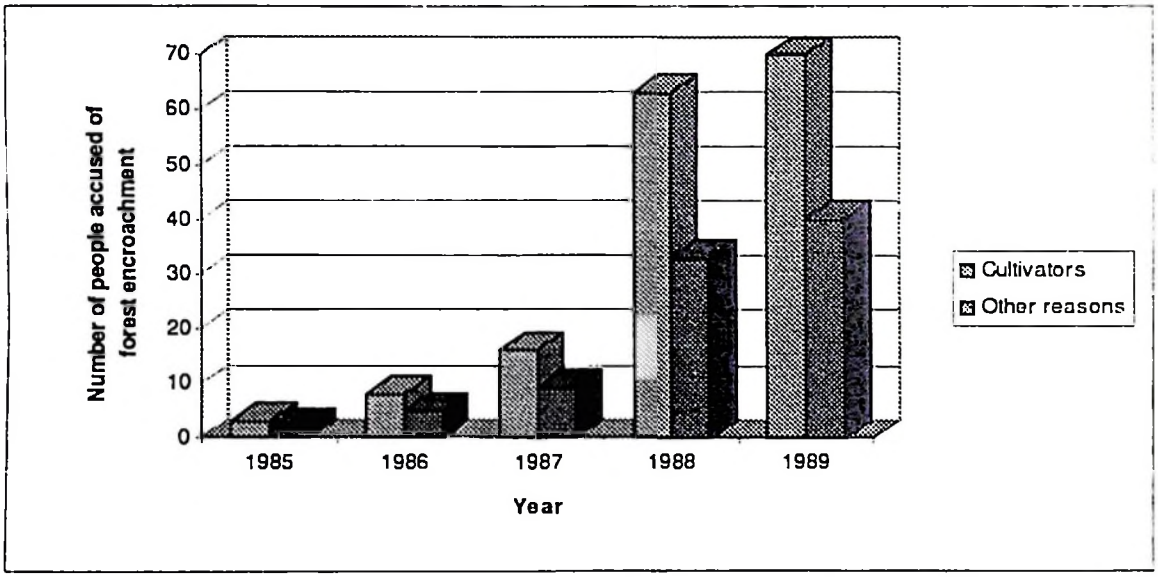


Figure 5.4 Number of people accused of forest encroachment in Moshi District.

In order to address the lack of land resources in some areas, the Government has reallocated land. Some Moshi district households who had severe land shortage were given land in Morogoro district. The country has huge land resources, with average population density of 27 people per square kilometre and about 60% of the land area is cultivable. Moreover, party and government policy permits, encourages and assists people in land-deficit areas to migrate to land-surplus area but people are reluctant to shift due to traditional, tribal and clan ties and cultural beliefs, for instance, witchcraft. Also some areas are seriously infested by tsetse flies.

The net emigration from Kilimanjaro has remained at less than 12,000 people for several decades (Maro, 1988).

5.5.3 Lack of capital and shortage of labour

Since the use of agricultural inputs at the household level is limited, it is reasonable to assume that production is correlated with the area cultivated. In turn the area cultivated is determined by the level of farming technology used and the size of farming labour. The lack of capital was also considered as the main reason which prevented farmers from improving production. As one farmer pointed out, money is everything as money can buy whatever you want; starting from farm inputs like fertilizer and seeds, hiring labour, hiring land, buying new land, hiring a tractor or ox-plough, irrigate in areas where irrigation is possible and he lamented that even the agricultural extension officers are visiting rich farmers. Eighty percent, 53% and 63% of respondents from Mawanjeni, Komakundi and Mbahe villages respectively identified the lack of capital as the main reason which hinders them in producing more.

Forty seven percent, 60% and 77% of respondents admit that labour shortage is a problem. Farmers in the uplands have to manage both the activities in the highlands as well as in the lowlands in order to meet the family food needs. In the rural areas the obsolete and labour intensive hand hoe is still used by more than 95% of the peasants - the majority of which are women (the major food producers). Also with a very young dependent age structure in many of the households, the area under cultivation is very low even in the areas where land is not a problem (Kavishe and Mushi, 1993).

Lack of capital in form of credit was also stressed by women in the group interview. Most of women are interested in getting capital and credit to start small enterprises. They believe with money and access to facilities they could hire or buy land, hire labour, buy inputs and hire premises. There are small enterprises which can be run but capital and knowledge is lacking for instance for cultivating fruits and vegetables. Mawanjeni village has problems of water, so even small gardening around the home yard is not possible. If they could get credit to establish taps from sources of water in the uplands, they could farm around the home yard. It is often the lack

of crucial productive resources such as land, labour and capital which render the image of women farmers as being marginal and inefficient producers. This being the perception, they are neglected by external agencies in their allocation of agricultural resources and services to the farm household (FAO, 1988). So when agricultural resources/credit are offered, women must be given the opportunity as well.

5.5.4 Lack of farm inputs and improved technology.

All the farmers (100%) in Mbahe and Komakundi village use the hand hoe in their homegardens (Table 5.32a). In the homegarden the use of hand hoe is inevitable as the home gardens are on the slopes and they are covered by a permanent crop pattern, so it is difficult to use tractor or ox plough. Despite the fact that Mawanjeni village is situated in the plains where oxinization and tractorization is possible, 77% of the farmers reported using hand hoes in their farms, where as 23% and 47% use tractor and ox-plough respectively (Table 5.32a). Sixty percent and 27% of the farmers from Komakundi and Mbahe villages respectively reported to have used tractor in the lowlands whereas 67% and 60% use hand hoe (Table 5.32b) This showed that the hand hoe is still the dominant tool in rural agriculture.

As it was reported earlier, the land is depleted so application of fertilizer is inevitable. Only 37% of farmers reported using fertilizer in Mawanjeni village, 56% from Komakundi and 53% from Mbahe in the lowlands farms. Because of lack of capital, not all farmers can afford to buy fertilizer. Even those who buy can be using less than the recommended amount. No farmer in Mbahe and Komakundi village reported to be using fertilizer in their homegardens; only manure is applied. Studies by ICRA (1992) show that the recommended fertilizer regime is 50 Kg N and 20 Kg P per hectare for maize and 30 Kg P per hectare for beans. The rates are largely determined by the economic circumstances of the farmer. However, farmers only fertilize maize with about 22.5 Kg N/ha or less in the midlands and lowlands (Mnkeni, 1992). Most of the farmers in the study area do not apply fertilizer or manure on beans.

Table 5.32a. Means of tilling the land in the farms located in the village (multiple responses)

Means of tiling the land	Mawanjeni		Komakundi		Mbahe	
	No.	%	No.	%	No.	%
Tractor	7	23	0	0	0	0
Hand hoe	23	77	30	100	30	100
Ox-plough	14	47	0	0	0	0

Table 5.32b. Means of tilling the land in the farms located somewhere else (multiple responses)

Means of tiling the land	Mawanjeni		Komakundi		Mbahe	
	No.	%	No.	%	No.	%
Tractor	0	0	18	60	8	27
Hand hoe	5	17	20	67	18	60
Ox-plough	2	7	1	3	0	0

Access to relevant new technologies also tends to be a problem. Although Tanzania has a vigorous food crop research program, the majority of agricultural research is directed toward cash crops, which are controlled by men (Jacquette, 1985). The same author argues that some of the cash crop technologies could be utilized by women on their subsistence crops for instance the ultra-low-volume (ULV) sprayer, developed for use on cotton, could as easily be used on maize. However, most cash crops inputs, including sprayers, are distributed through the cash crop authorities to their growers; hence women tend to be neglected.

5.5.5 Inadequate agricultural extension

A further limitation to productivity is the inadequacy or sometimes complete lack of agricultural extension or if available it is concentrated in the cash crops. Table 5.33 shows the frequency of visits from agricultural extension officers. Seventy three percent, 57% and 40% of the farmers from Mawanjeni, Komakundi and Mbahe villages have reported that the extension officer never visited them. This showed that the agricultural education extended to the farmers is inadequate. Two farmers from Komakundi village reported that the agricultural extension officer visited

them weekly because they are friends and they use to drink together. Farmers need to be advised on good crop husbandry practices in order to increase crop productivity and thus increase food availability.

Table 5.33 Frequency of visits from agricultural extension officers.

Frequency of visits	Mawanjeni n = 30		Komakundi n = 30		Mbahe n = 30	
	No.	%	No.	%	No.	%
Never	22	73	17	57	12	40
Once per week	0	0	2	6	0	0
Once per month	1	3	0	0	4	13
Two to three times per year	0	0	5	17	6	20
Once per year	7	23	6	20	8	27

Only men are approached when the extension agents wanted to promote a certain innovation in improving agricultural practices. Out of 36 women interviewed using the formal structured questionnaire, only three had discussed something with agricultural extension officers, six didn't know what agricultural extension is, and twenty seven know that there are agricultural extension officers in the area but they have never met them. Because of their important role in agriculture, however, women should be given the right and the opportunity to learn more about agriculture. It is important that women are given the chance to learn and share what they know with agricultural extension officers.

In fact women are found to be receptive if given a proper chance. In Zimbabwe, where hybrid maize was directly introduced to women farmers, production has increased substantially (Caller 1983, cited in Dey, 1984). In contrast, a programme in Tanzania to encourage the cultivation of hybrid maize through extension and the distribution of subsidized seeds, fertilizers and pesticides to men met with resistance from women farmers who predominate in food-crop production. Women refused because the result was an increased workload for them without concurrent control of the income which will result therefrom.

Women are keen to tell their problems due to their heavy work burden. Moreover, women are the ones who process and cook food and hence are in better position to appreciate the new

varieties of cereals and legumes. They know the cookability, grinding and pounding difficulties of, for instance, cereals and legumes. Thus, it is important that women's knowledge be utilized before large scale intervention is ventured.

5.5.6 Local beer brewing and drunkardness.

Drinking of alcoholic beverages can cause food shortage in four ways; Firstly by using up productive time of mainly adult men (although adult women are drinking as well nowadays). Secondly, by using up available food for instance maize and finger-millet since most of the local brews are made from the staple foods. Thirdly, by selling food crops in order to get money for drinking and fourthly by using any extra income obtained from extra activities for drinking instead of using it for the welfare of the household. Local beer brewing also has a positive effect as an economic activity as it was discussed earlier.

Ten percent, 20% and 47% of respondents from Mawanjeni, Komakundi and Mbahe villages respectively have mentioned local beer brewing and drunkardness as the cause of food insecurity in the household (Table 5.31). As mentioned earlier, the data on drunkardness might not be so accurate. For instance in the case of Mawanjeni village, the interview took place on the local brew bar because that is where most of the people could be found during the evening hours. Villagers were motivated to give information by buying them "kitoochi" (a litre of the local brew). Despite their worse food security situation nobody opted to ask money to buy food instead of kitoochi. Other studies conducted in Iringa region showed that drunkardness was one of the factors causing food shortage in the households as mentioned earlier (TFNC, 1992).

What is a bit queer nowadays as women groups pointed out is, women can go to the local brew bar in the evening hours. In the past, they use to go to local brew bars on Sundays only. Nowadays after finishing what they have planned to do for the day they usually go to bars from 4 p.m. to 6 p.m. This practice is very common for Mawanjeni and Komakundi villages. Normally women have basically no "leisure" time, but here it looks like they are taking some leisure time. Increased leisure time can be a sign of improved quality of life but if women over do it the household welfare can be in jeopardy as the time they previously spent doing evening

activities is now spent in local beer bars. (This social change has not changed their responsibility - so even if they go out drinking their evening activities are waiting for them).

5.5.7 Large families.

Twenty seven percent, 13% and 7% of the respondents from Mawanjeni, Komakundi and Mbahe villages have reported that large families caused household food insecurity. In section 5.1.1, we noted that the average household size for the three villages is; Mawanjeni (6 persons), Komakundi (7 persons) and Mbahe (7 persons) per household. The family size ranged from 2 persons to 11 persons in Mawanjeni, 3 persons to 12 persons in Komakundi and 2 persons to 13 persons in Mbahe village. The more people in the household, the more mouths to feed. Studies conducted by Mamiro, (1991) perhaps confirms this. Family size was highly significant ($p< 0.01$) and negatively correlated with the time it took to exhaust food stocks in the four villages studied in Kilimanjaro and Morogoro regions. This indicated that the higher the number of household members, the fewer the number of months the food stock lasted. It was also observed by the same researcher that food stocks lasted a shorter time in households with more than six members under 18 years. This emphasize the point that members under 18 years old are economically inactive in many instances.

5.5.8 Others causes

Other reasons for food insecurity as pointed in the group interview include witchcraft, poor storage facilities, education/training, employment opportunities, laziness and poor rural transportation. One farmer from Komakundi village believed that she could not overcome food insecurity problems in her household because she is being bewitched. She might be advised on how to reverse the situation by extension officers if they would visit her.

5.6 Improvement of household food security.

Women would like to see that their household food security is improved but the main hindering factor apart from the above mentioned ones is that they are not the main decision maker in the household. Table 5.34 shows how decisions are effected in selected activities related to food. The husband's answers were different from wife's answers. The husbands answers were either

he decides or they decide together except for the matters involving the kitchen; whereas the wife consistently saw her role as more significant than the men did. In most rural areas, men are the head of the family. They are the main decision makers. A woman can decide alone when the husband is not staying at home or when she is a widow.

In relation to decision making, men are categorized into the following in this study.
-Men who thought that they are powerful/head of the family and they have to decide on all matters related to the welfare of the household themselves (gender insensitive).
-Men who always decide themselves but in responding to this question they said they both decide as a camouflage (gender sensitive subordinative)
-Men who always decide with their wives (gender sensitive).
From this study, most men belong to category two, that is, gender sensitive but subordinative.

The participation of women regarding decision making depends on their status and the hierarchy in the system. In the rural area, gender is a major criteria in determining status. The situation is changing today as more women are becoming economically capable. Improved economic capability for women can improve a woman's status.

Both the husband and wife decide on matters related to the farming in the kihamba and shamba, though decision is taken according to the husband's answer. However, the wives do make decisions sometimes since they are responsible for the care of crops in the farms.

What to sell, the use of the income from sale and who controls the income depends on the type of the products. Husbands control the income from the sale of grains (maize), coffee and livestock. Most wives do not have access to the money from such items. The women get income from selling bananas, fruits and vegetables, milk and milk products and decide and control the income therefrom. The men reported that they do not expect any income from such sales because it is quite small in amount and they know that the women spend it for the daily needs of the household.

Table 5.34 Percentage respondents on decision making related to selected activities.

Activity	Decision taken by					
	Husband's answer n = 57			Wife's answer n=47		
	h	w	b	h	w	b
Land preparation	65	13	22	48	20	32
How to cultivate	59	9	32	42	25	33
When to plant	40	18	42	30	36	34
Crops grown	46	14	41	41	24	34
When to harvest	38	16	45	21	44	34
What to sell	47	4	49	25	21	54
What to cook	11	79	10	0	96	4
When to cook	0	99	1	0	100	0
What to eat	16	56	28	4	81	15
To buy food	43	19	38	29	41	29
To slaughter animal	83	0	17	79	10	11
To buy livestock	72	0	28	62	15	23

h = husband, w = wife, b = both wife and husband.

The kitchen domain still remains in the women's hands in most rural areas of Tanzania. Women decide most on the affairs related to food preparation and consumption. What to process, what to cook and at what time for the daily meals, and how much to prepare is mostly decided upon by the wife. However the men expect the wives to conform to their likes and dislikes as much as possible. The husbands have a lot of indirect ways of making the wives do what they prefer. The findings in this study are in agreement with those of Nkhomwa-Wamunza et al, (1989) conducted in Iringa and Kagera regions (Cited in Kavishe and Mushi, 1993).

On buying food, men thought that they mostly make the decision (43%) or they take the decision together (39%). Women thought that they decide (41%), the husband decides (29%) or they decide together (29%). Even if women decide to buy food they have to consult their husbands sometimes as they are the ones who always controls and keep money unless the women buy from their own money.

Women thought that they should be given more opportunity to decide on what food should be bought and prepared. The most important decisions which immediately affect the food situation of individuals are made at the household level. But while women usually have information about

these needs (from women groups, clinics and MCH) they do not control essential resources which are needed for effective action. These are usually controlled by men who are not very much involved in the day to day activities which affect the food security. Thus while women receive information they are constrained in taking action, men can take action but have limited information. This basic contradiction in gender relations and decision making is a major constraint in improving food security and nutrition at the household level. Men must have some more information about food and nutrition and the consequences of their actions in improving the household food security situation. Women must be empowered to have more control over resources and the decisions about allocation of these resources to improve the household food security.

Most women suggested that the extra income obtained from selling cash crops or from off- farm activities should mostly be used to buy food after deducting the money for other household needs. Alcoholic drinking which was considered to be consuming most of the household income and time should be discouraged. Drinking of alcoholic beverages should take very little of the household budget. One women lamented that in the area nowadays people prefer beer than the local brew. One bottle of beer was sold at a price equal to the price of half a kilogram of meat. So it is unwise to drink a bottle of beer while the household is in food deficiency.

Selling of food should be minimal unless there is a serious need or the harvest is good. Food should be bought to supplement what has been produced. Food should also be bought during on season period and with good storage measures it can be stored to cater for the household needs as food is cheap on-season. Food should not be sold after harvest as most farmers assume that they have harvested a lot. Instead, proper storage methods should be employed to store the food for the household consumption. Other needs of the family should be taken care off by the income from off-farm activities, selling cash crop and from selling animal products. The disadvantage of selling food is that it is sold at a low price and being bought later at a higher price and with uncertain incomes, the household which sells the food can be in food deficit.

As explained above, there are a lot of small enterprises to run given the money and opportunity. The Government and NGO's should give people the opportunity of improving their farm production by providing credits. Credits can facilitate buying of improved seeds and fertilizer and bringing water to Mawanjeni people.

Improved cattle breeds are also important especially in Mawanjeni village where the local breeds are dominant. With improved breeds the household is assured of milk and money from selling extra milk. Together with this, adequate veterinary services should be available for proper management of the improved breeds.

To summarize the chapter, one can conclude that food security is about food availability and the ability to acquire it, and includes food production as well as food distribution and effective purchasing power. Food security is not only a question of producing more food, but a question of more food being produced, retained or purchased by the poor and the food should be available for consumption. As long as global food availability is not a problem, the attention should be towards how to address the problems, of poverty causing household food security.

As the discussion reveals, people depend mostly from their own production for food. An important element in the attainment of household food security is food self-sufficiency and agricultural development. A nation's poor and hungry people are unlikely to have access to enough food throughout the year to lead an active and healthy life unless they produce their own food in adequate amounts. As Swaminathan (1992) points out, neither could their poverty and hunger be eliminated in the absence of widespread agricultural and rural development. Also, in order to ensure food security, societies must have good traditions and customs and a sound economic base to ensure food availability. Furthermore, food security depends on the existence of appropriate strategies for food production, harvesting, preservation, processing, distribution, preparation and proper intra-household utilization of that food. The challenge of improving food security in Africa would, therefore include actions aimed at improving the procurement system and the food marketing system as well as actions aimed at providing the people at risk of hunger with income that would permit

them to purchase the food they require. Furthermore, it should be known that "there is no food chain without women" (ILO, 1987).

Table 5.35 summarizes the food security determinants for the three villages surveyed. When the studied factors are combined, it is found that the upland villages (Mawanjeni and Komakundi) are in a better food security situation than the villages in the lowlands (Mawanjeni). So any food security improvement programme in Moshi District should focus most in the lowlands although something have to be done in the uplands as well especially in average and bad years.

Table 5.35 Summary of the food security determinants in the study area (combination of several factors)

Food security determinants	Villages		
	Mawanjeni	Komakundi	Mbahe
Food crop production	-Limited due to climatic conditions -Suitable for maize/beans farming system	Diversified due to predictable rains thus allowing permanent homegardens around the homeyard	
Cash crop production	No important cash crop but sunflower is gaining popularity	Coffee is the main cash crop in the uplands	
Gender labour in agricultural production and housework	It is almost the same in the three villages- women work more hours than men in agricultural production and housework		
Animal husbandry activities Gender labour in animal husbandry activities	Extensive Men and boys are responsible for animal grazing whereas women are the ones most responsible for other activities, for instance, fodder collection and milking	Intensive (zero grazing)	
Availability of non-cereal foods -bananas - root crops	None None	Very good Good	Good Very good
Performance of the main food crops for the past five years	Decrease	Fluctuation	Fluctuation
Food and energy adequacy -Good year -Average year -Bad year	Bad Very bad Very bad	Very good Average Very bad	Very good Average very bad
The use of the main food crops	All the villages sell some of the food produce to cater for other needs		
Availability and consumption of relish foods	The most important relish food for the three villages is common beans and green vegetables		
Storage methods employed	Use sacks most	Use hermetically sealed containers most	
Preservative methods employed	Chemicals and traditional methods	Chemicals, hermetically sealed containers and traditional methods	

Table 5.35 *continue*

Income generating activities	Sell labour most	Sell animal and animal products most	Sell labour most
Average monthly income	Very low	High	
Young child feeding -on-season -off-season	Very few meals Very few meals	Medium feeding Medium feeding	
Most used weaning foods	Maize flour porridge with milk	Maize flour porridge with milk and banana foods	
Food deficit in the households	Mawanjeni village have more households in food deficit per year followed by Komakundi village then Mbahe village		
Coping strategies	Three most important ones are; begging from relatives, reduction of meal frequency and relying on food aid	Two most important ones are; buying food from the local markets and sale of animals	Two most important ones are; Buying food from the local markets and seeking employment
Causes of food insecurity	Four most important ones; -Drought and dependence on rainfall -Lack of capital -Shortage of labour -Large families	The four most important ones are; - Drought and dependence on rainfall -Limited access to productive land -Lack of capital -Shortage of labour	

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

This study was undertaken to investigate the household food security situation in the rural areas of Tanzania. Three villages were selected from Moshi Rural District-Kilimanjaro region. Assessment of household food and energy adequacy based on the production data alone shows that on aggregate, the three villages studied are not food deficit on a good year. However, when the villages are treated individually, the Mawanjeni village does not reach the food and energy requirement in a good year. On an average and bad year, all the three villages are food and energy deficit. When the marketed food is considered, the three villages could not meet daily food and energy adequacy even on a good year. When the calorific values are calculated based on the individual households, it is found that members of the rich households could consume as much as 4500 Kcal/capita/day whereas the very poor could consume as low as 500 Kcal/capita/day. These findings emphasize the importance of studying food security at household level.

Agriculture is the main factor determining household food availability in the surveyed area as people virtually depend mostly on their own production for food. They also get access to food items they could not produce from the market using income from selling food and cash crops and from off-farm activities. The total food production based on quantifiable food produce only is high in uplands (Mbahe and Komakundi villages) as compared to the lowlands (Mawanjeni village). Several factors contribute to this but climatic difference is the main factor. The main staples in the three villages are; maize and sorghum for Mawanjeni village, bananas, maize, rice and cocoyams for Komakundi village and maize, bananas and cocoyams for Mbahe village. The main cash crop in the uplands is coffee whereas in the lowlands there is no main cash crop. However, sunflower is gaining popularity as a cash crop in the lowlands. The role of plantains/bananas and root crops is emphasized in this study as many precarious studies tended to concentrate only on cereal grains when discussing food availability. The main relish foods for the three villages

surveyed are common beans and green vegetables. Bean is the most important source of protein that can be afforded by most households. Animal husbandry is an important activity mainly for manure, milk, eggs, meat and extra income.

Labour is gender differentiated from the process of food and cash production to the final procurement of food at household level. In all agricultural tasks, women perform more than half of the work except in land preparation and application of pesticides. In animal husbandry activities, women also play bigger role than men except in grazing and slaughtering of the animal. Child and family care is the domain of women. Women are solely responsible for the household chores except in some cases where they are helped by girls and boys.

Use of main crops in the households also affect food availability. Not all food crops produced are meant for direct consumption in the households. Different crops are used for different purposes, for instance, some varieties of bananas are used for making local brew (alcoholic beverage). Farmers also have to sell some of food crops in order to cater for other needs. Most farmers have indicated a state of decrease and/or fluctuation of their main staples for the past five years. This is due to drought, shortage of labour, lack of capital to buy agricultural inputs, poor soils and lack of technology. Coffee yields totals have also been declining steadily as a result of substitution with other crops due to low coffee prices and coffee berry disease (CBD) which damage immature coffee berries.

The amount of stored food and the storage and preservation methods employed also affect food availability at the household level. Several storage methods are employed in the study area. Most of the households from Mawanjeni used sacks, whereas the farmers from Komakundi and Mbahe used hermetically sealed containers (drums). The Mawanjeni farmers used sacks because they are cheap to manage but farmers from Komakundi and Mbahe used the drums specifically as a security against pests/rodents. Most of the farmers in Mawanjeni village have to redry their produce and also apply chemical preservatives as the sacks are easily infested with pests. Several traditional preservatives are also used

especially with beans. On average storage losses as high as 19% are caused by rodents while losses as high as 33% are caused by other pests. Most of the losses originate from all the other methods of storage but rarely from the hermetically sealed containers.

Several different off-farm income generating activities are conducted in the study area. Mawanjeni and Mbahe villages depend mostly on selling labour while Komakundi village depends on sales of animals and animal products. Other activities performed are, selling local brew, formal employment, owning a black smith business, petty trade, masonry, carpentry and handicraft. Some relatives, husbands and children employed/working in towns also send money to the households. Women also run small enterprises in order to get money; for instance selling local brew, petty trade, selling cooked foods, selling fruits and vegetables, selling sisal ropes, selling sugar cane, sewing clothes and selling bananas. The average monthly income from off-farm activities, selling cash and food crops for the three villages was found to be 5000, 28,000, and 33,500 Tshs for Mawanjeni, Mbahe and Komakundi villages respectively. The farmers reported that they use up to 50% of the income to buy food and use the rest for other household needs.

The feeding practices for the under-five's indicated that the average meal frequency on season is 1.9, 3.1 and 3.3 meals per day for Mawanjeni, Komakundi and Mbahe villages respectively whereas the meal frequency on off-season is found to 2.5, 3.5, and 3.5 meals per day. The main weaning foods given to children is maize flour porridge with milk (for Mawanjeni) and maize flour porridge with milk and banana foods for Komakundi and Mbahe villages respectively.

Most of the households surveyed reported food deficit in their homestead before the next harvest. Most households are food deficit from March to June in Mawanjeni village, April to June in Komakundi village and April to July in Mbahe village. Mawanjeni village has the largest number of food insecure households followed by Komakundi then Mbahe village. Different groups in the household get sub-optimal amounts of food during food shortage periods. Most of male respondents reported that the whole household experience the

shortage whereas the female respondents reported that women and children are the most hit. Farmers used different coping strategies during the period of food shortage. Coping strategies vary significantly between the study villages. Mawanjeni village had a high proportion of poor farmers and thus had different coping strategies from Komakundi and Mbahe village.

Based on the data on food production alone, most households were food insecure. The main cause of food insecurity as perceived by most farmers is drought and dependence on rainfed agriculture. Other causes were, limited access to productive land, lack of capital and shortage of labour, lack of farm inputs and improved technology, lack of agricultural extension, local beer brewing and drunkardness, large families, witch-craft, poor storage facilities, lack of education/training, lack of employment opportunities, laziness and poor rural transportation. When households were asked how they could improve their household food security, women were of the opinion that they should be given more power to decide. They also suggest that food should not be sold during the peak harvesting period - instead it should be bought to supplement what has been harvested. Household budget should focus more on buying food and household necessities instead of being used for alcoholic drinking. Credit schemes should be established to help farmers improve their crop and animal productivity.

The long term assumption that the Kilimanjaro region is self-sufficient as far as food production is concerned is challenged by this study. The region is comprised of different agro-ecological regions and food production and thus food security differ in those regions as this study reveals. It can therefore be concluded that, although the three villages are situated in the same region, same district and same division, they are different ecologically and thus have different food security situation. Komakundi and Mbahe villages are better off as far as food security situation is concerned compared to Mawanjeni village

RECOMMENDATIONS.

- Cereals and other starch foods provide the energy consumed in the households in the study area. There is little fat in the diet and pulses provide some substantial part of the energy and protein intake. Use of high energy density oils such as sunflower oil and groundnuts in diets and weaning food should be promoted.

- Appropriate policies are needed to promote food consumption of cereals instead of using them for brewing to combat food insecurity and reduce drunkardness, especially for Komakundi and Mawanjeni village where drinking habit was high.

- Climatic problems in the lowlands (Mawanjeni village) require the development of skills in water harvesting and management and execution of irrigation projects to enable more intensive use of the land. Together with this, drought tolerant crops should be promoted in lowlands. If the agricultural potential of the lowlands is ascertained under irrigation, the number of people without land in the uplands can move to the lowlands.

- From the present study, one cannot deny that women are important in household food security. So the rural development programmes aimed at augmenting the agricultural and food sector have to take into consideration the contribution of women, their time-use pattern and their knowledge in agriculture and the food system and thus integrate them in decision making concerning food and agriculture.

- As long as global food availability is not a problem, the attention should be towards household food security. Scientists/researchers studying food security should study individual households and avoid presenting results on aggregate based on villages, regions or countries. It was clearly shown in the present study that different food security situations prevail at different levels.

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APPENDIX A.

A QUESTIONNAIRE FOR STUDYING HOUSEHOLD FOOD SECURITY SITUATION IN THE STUDY AREA

SECTION A: GENERAL INFORMATION

1.0 (a)Respondent Serial Number (b) Date (c)Year (d) Village

2.0 Respondent sex
01. Male 02. Female

3.0 Marital Status
01. Single 02. Married 03. Widow 04. Widower

4.0 Respondent
01. Husband 02. Wife 03. Daughter 04 Son

5.0 Respondents status
01. Head of the family 02. Not head of the Family

6.0 Respondent level of education
01. Not educated
02. Primary education

New system	*1*	*2*	*3*	*4*	*5*	*6*	*7*	-
Old system	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

03. Secondary education 04. University education
05. Adult education (specify what you have studied)

7.0 (a) How many people live in the household?

Years	*Above 18 years*	*5-18 years*	*Below 5*
Female			
Male			

(b) How many are in school? (c) When do they start school (school age)

SECTION B: FOOD AVAILABILITY.

1.0 (a) How many acres of cultivable land do you own (Originally before fragmentation?)
01. Here in the village (Hectares) 02. Somewhere else (Hectares)
(b) How many acres of cultivable land do you own (currently?)
01. Here in the village (Hectares) 02. Somewhere else (Hectares).

2.0 What is the total cultivated area?
01. Here in the village (Hectares) 02. Somewhere else (Hectares)

3.0 If somewhere else. how far is it from home?

4.0 Why don't you cultivate the rest of the land here in the village? (multiple answers allowed).

01. Left for fodder 02. Low fertility 03. Labor shortage 04. Low capital.
05. Others (specify)

5.0 Why don't you cultivate the rest of the land somewhere else? (multiple answers allowed)

01. Low fertility 02. labor shortage 03. Low capital 04. Theft
05. High travel expenses 05. Theft 06. Wild animals destroy crops
07. Others (specify)

6.0 How do you usually go to the other farm? (multiple answers allowed)

01. On foot 02. Public transport 03. Own car 04. Hired car
05. Motorbike 06. Bicycle 07. Others (specify)

7.0 How do you till your land here in the village?

01. By tractor 02. Hand hoe 03. Ox-plough 04. Others (specify)

8.0 How do you till the land somewhere else?(multiple answers allowed)

01. By tractor 02. Hand hoe 03. Ox-plough 04. Others (specify)

9.0 What are the four most important staple foods of the family?

01. Bananas 02. Maize 03. Millet 04. Rice 05. Sweet potatoes
06. Sorghum 07. Taro 08. Others (specify)

10.0 What are the most important relish foods of the family? (list)

11.0 (a) What are the important sources of protein for the family? (list)
(b) How frequent do you eat protenous foods? (Explain)

12.0 How much food crops do you produce approximately on a good, bad, and average year ?(Kg of quantifiable food products)

01. Maize (local and improved varieties) 02. Bananas 03. Sorghum 04. Rice
05. Finger-millet 06. Beans 07. Sweet potatoes 08. Sunflower

13.0 How much cash crops do you produce approximately on a good, average and a bad year?

01 Coffee 02. Others (Specify)

14.0 Why can't you produce more?

01. Lack of access to productive land 02. Drought 03. lack of capital
04. Shortage of labour 05. Lack of technology 06. Witchcraft 07. Others (specify)

15. (a) Do you use chemical fertilizer? 01. Yes 02. No
(b) Do you use farm yard manure? 01. Yes 02. No

16.0 Indicate the type of crops where fertilizer and/or farm yard manure is applied.

17.0 (a) Does the agricultural extension officer visit you? 01. Yes 02. No
(b) If yes how frequent?

18.0 (a) Do you experience pre-harvest losses in the field? 01. Yes 02. No
(b)If yes, which main foods do you lose?

19.0 What are the causes of these pre-harvest losses? (multiple answers allowed)
01. Rodents 02. Birds 03. Wild animals 04. Theft 05. Insects
06. Micro-organisms 07. Rain 08. Others (specify)

20.0 What do you do to prevent such losses?

21.0 Which means do you use to bring your produce home?(multiple answers allowed)
01. Family labor 02. Hired labor 03. Hired vehicle 04. Own car
05. Use of public transport 07. Others (specify)

22.0 Did you sell some of your food produce? 01. Yes 02. No.

23.0 If yes why did you sell some of your food produce?
01. Surplus 02. Immediate cash needs 03. Better prices. 04. Lack of storage facilities 05. Others (specify)

24.0 Which staples do you always sell? (list).

25.0 How much did you sell?

26.0 (a) What is the performance of your main staples for the past 5 years?
01. Increase 02. Same 03. Decreases .04. Fluctuation
(b) What are the reasons for the observed trend? (Explain)

27.0 Which produce do you store? (multiple responses)

28.0 Which methods do you use to store your produce after harvest (multiple answers allowed also specify crops)
01. Sacks 02. Drums 03. Hanging on the Ceiling. 04. Traditional granary
05 On the floor 06. Hanging on the trees 07. Calabash 08. Tins 09. Others (specify)

29.0. Why do you use these particular storage methods?
01. Traditionally inherited 02. Security against theft
03. Security against pests/rodents 04. Cheap to manage 05. Others (specify)

30.0(a). Do you take preservative measures against storage pests? 01. Yes 02. No
(b). If yes. which one?
01. Traditional herbs (specify) 02. Drying 03. Chemicals 04. Use of hermetically sealed containers

31.0 (a)Did you experience some storage losses last year? 01. yes 02. No
(b)If yes. last year which staples did you lose. how much and what was the cause?

SECTION C: FOOD ACCESSIBILITY.

1.0 Where do you get extra income outside the farm?

2.0 What is the average monthly income from selling of food and cash crop and from supplementary activities (Tshs)?
01. Below 1000 02. 1000 to 5000 03. 5000 to 10000 04. Above 10000 (specify)

3.0 What proportion of your monthly income is used to purchase food?

4.0 What is the main source of your daily food? (multiple answers allowed)
01. Own produce 02. Purchase from the market 03. Wild gathering

5.0 (a)How many times per day do under-five's take the meal (on season)?
01. Once per day 02. Twice per day 03. 2-3 times per day
04. 4 times per day 05. Above 4 times per day
(b)How many times per day do under-five's take the meal (off season)?
01. Once per day. 02. Twice per day 03. 2-3 times per day
04. 4 times per day 05. Above 4 times per day

6.0 What type of weaning foods do you give to your under-five's?
01. Maize flour porridge 02. Maize flour porridge with milk
03. Finger-millet flour porridge 04. Finger-millet flour porridge with milk.
05. Malted finger-millet flour porridge 06. Mixed flour porridge with milk.
07. Mixed flour porridge without milk 08. Banana foods
NOTE: In case milk is given state if it is fermented milk or fresh milk.

7.0 (a)Do you experience food shortage in this household? 01. Yes 02. No
(b) Which months and how often? (explain)

8.0 If yes. how do you cope during food shortage? (multiple answers allowed)
01. Reduction of meal frequency 02. Reduce amount of food
03. Borrowing of food or money 04. Sale of animals
05. Buying food from others/local markets 06. Migration. 07. Wild gathering
08. Resort to low quality foods. 09. Seek employment 10. Relying on food aid
11. Begging from relatives 12. Sell trees. 13. Others (specify)

9.0 What are the main groups in the family which face the problem during the food shortages? (multiple answers allowed)
01. Women 02. Men 03. Both men and women 04. Female children.
05. Male children 06. Under-five's 07. The whole household 08. Old and disabled

10.0 What are the main causes of food insecurity in the household? (multiple answers allowed)

01. Dependence on rainfall 02. Poor storage. 03. Poor rural transportation.
04. Local beer brewing 05. Drunkardness 06. Large families
07. Shortage of labour 08. Lack of knowledge 09. Land shortage and poor soils
10. Lack of capital 11. Others (specify)

11.0 How could you improve your household food security? (Explain).

SECTION D: GENDER ROLES.

1.0 Division of labor: Who does the work?

(a) Agricultural work (cash and food crops)

01. Land preparation 02. Ploughing 03. Hoeing 04. Manuring/fertilizer
05. Weeding 06. Harvesting 07. Put pesticide 08. Transporting form the field
09. Threshing 10. Selecting and keeping seeds

(b) Animal husbandry

1.0 Do you own animals? 01. Yes 02. No
2.0. If yes who does the following activities?
01. Fodder collection 02. Fodder purchasing 03. Feeding 04. Milking
05. Milk processing 06. Slaughtering animals

(c) Housework.

01. Prepare/cook food 02. Cleaning 03. Child care 04. Doing laundry
05. Collecting firewood 06. Collecting water.

NB: Time spent by men. women. boys and girls was used to estimate who does the work. The information obtained is given in percentages to render comparable results.

2.0 What are the factors limiting the contribution of women to household food security?

01. Access to land 02. Access to capital/credits/inputs 03. Decision making power
04. Time 05. Knowledge about food and agriculture 06. Education/training
07. Employment opportunities 08. Drunkardness 09. Laziness

3.0 Who decides?. Decision-making related to selected activities.

	Decision taken by					
	Wife's answer			*Husband's answer*		
Activity	*h*	*w*	*b*	*h*	*w*	*b*
Land preparation						
Crops grown						
When to plant						
When to harvest						
When to cultivate						
What to sell						
What to cook						
When to cook						
What to eat						
To buy food						
To buy clothes						
To slaughter animal						
To buy livestock						

h = husband w = wife b = both husband and wife

APPENDIX B.

AMOUNT OF FOOD PRODUCED AT HOUSEHOLD LEVEL IN THE THREE VILLAGES FOR THREE YEARS.

The Food and Energy adequacy in section 5.2.4 were computed from Tables B1 to B9 using the formulae indicated in Chapter 4 section 4.3.

Table B1. Total amount of quantifiable food product produced at household level in Mawanjeni village in 1995/96. (Good year)

Crop	Energy [1] (Kcal/Kg)	Ratio[2]	Total Yield (Kg)	Sold food[4] (Kg)	Maize equivalents[3] (Computed from Total Yield) (Kg)	Maize equivalents (Computed from the sold food (Kg)
Maize (improved)	3450	1.0	9855		9855	
Maize (local)	3450	1.0	6039	4140[5]	6039	4140
Sorghum	3350	0.97	2572	1780	2495	1727
Finger-millet	3200	0.93	260	160	242	149
Beans	3200	0.93	2047	330	1904	307
Sunflower oil	9000	2.6	1708	912	4441	2371
Total			**22,481**	**7322**	**24976 (a)**	**8694 (b)**

[1] Energy content in Kcal/Kg of the edible portion of each crop

[2] Ratio = Energy density of the food produce (Kcal/Kg) / Energy density of maize (Kcal/Kg)

[3] The amount of maize needed to supply the same amount of calories as from a given amount of another source (Ratio x Yield/Sold food)

[4] Sold food was for 1995/96 year only.

[5] Total maize sold from both improved and local varieties

NOTE: Food left for consumption is equal to (a-b)

Table B2. Total amount of quantified food product produced at household level in Komakundi village in 1995/96. (Good year)

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Sold food (Kg)	Maize equivalents (Computed from Total Yield) (Kg)	Maize equivalents(Computed from sold food) (Kg)
Maize (improved)	3450	1.0	12490		12490	
Maize (local)	3450	1.0	21244	14664	21244	14664
Bananas [1]	1300	0.37	94308	32292	34894	11948
Finger-millet	3200	0.93	3850	2650	3581	2465
Beans	3200	0.93	8202	4230	7628	3934
Sunflower oil	9000	2.6	1220	-	3172	-
Total			**141314**	**53836**	**83009**	**33011**

[1] The big varieties of East African bananas are reported to weigh 16-23 Kg (whole) (Acland 1975). In this study, 12 Kg is the assumed figure for the edible portion of banana.

(-) Negligible

Table B3. Total amount of quantified food product produced at household level in Mbahe village in 1995/96. (Good year)

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Sold food (Kg)	Maize equivalents3 (Computed from Total Yield) (Kg)	Maize equivalents(Computed from sold food) (Kg)
Maize (improved)	3450	1.0	7514		7514	
Maize (local)	3450	1.0	28680	13731	28680	13731
Bananas	1300	0.37	72420	16657	26795	6163
Rice [1]	3350	0.97	1700	600	1649	582
Irish potatoes	750	0.22	1482	620	326	136
Finger-millet	3200	0.93	200	130	186	121
Beans	3200	0.93	3887	1324	3615	1231
Sunflower oil	9000	2.6	890	160	2314	416
Total			**116773**	**33222**	**71079**	**22380**

[1] Rice was cultivated somewhere else, not in the village

Table B4. Total amount of quantified food product produced at household level in Mawanjeni village in average year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	4091	4091
Maize (local)	3450	1.0	2650	2650
Sorghum	3350	0.97	1237	1200
Finger-millet	3200	0.93	68	63
Beans	3200	0.93	855	795
Sunflower oil	9000	2.6	836	2174
Total			**9737**	**10973**

Table B5. Total amount of quantified food product produced at household level in Komakundi village in an average year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	4890	4890
Maize (local)	3450	1.0	10728	10728
Bananas	1300	0.37	59196	21903
Finger-millet	3200	0.93	1530	1423
Beans	3200	0.93	2995	2785
Sunflower oil	9000	2.6	629	1635
Total			**79968**	**43364**

Table B6. Total amount of quantified food product produced at household level in Mbahe village in an average year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	3581	3581
Maize (local)	3450	1.0	13232	13232
Bananas	1300	0.37	45444	16814
Rice	3350	0.97	840	815
Irish potatoes	750	0.22	431	95
Finger-millet	3200	0.93	-	-
Beans	3200	0.93	1588	1477
Sunflower oil	9000	2.6	260	676
Total			**65376**	**36690**

Table B7. Total amount of quantified food product produced at household level in Mawanjeni village in a bad year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	526	526
Maize (local)	3450	1.0	1135	1135
Sorghum	3350	0.97	580	563
Finger-millet	3200	0.93	15	14
Beans	3200	0.93	133	124
Sunflower oil	9000	2.6	259	673
Total			**2648**	**3035**

Table B8. Total amount of quantified food product produced at household level in Komakundi village in a bad year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	1700	1700
Maize (local)	3450	1.0	3492	3492
Bananas	1300	0.37	42579	15754
Finger-millet	3200	0.93	414	385
Beans	3200	0.93	780	725
Sunflower oil	9000	2.6	94	244
Total			**49059**	**22300**

Table B9. Total amount of quantifiable food product produced at household level in Mbahe village in a bad year

Crop	Energy (Kcal/Kg)	Ratio	Total Yield (Kg)	Maize equivalents (Kg)
Maize (improved)	3450	1.0	1401	1401
Maize (local)	3450	1.0	4873	4873
Bananas	1300	0.37	34980	12943
Rice	3350	0.97	-	-
Irish potatoes	750	0.22	225	49
Finger-millet	3200	0.93	-	-
Beans	3200	0.93	399	371
Sunflower oil	9000	2.6	40	104
Total			**41918**	**19741**

APPENDIX C.

ANOVA TABLES FOR QUANTITATIVE DATA.

Table C1. Analysis of Variance for Food Adequacy in the three villages in a good, average and bad year

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Village	2	7952.7	7952.7	3976.3	10.61*	0.025
Year	2	11774.0	11774.0	5887.0	15.71*	0.013
Error	4	1499.3	1499.3	374.8		
Total	**8**	**21226.0**				

Table C2. Analysis of Variance for Energy Adequacy in the three villages in a good, average and bad years

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Village	2	6089.6	6089.6	3044.8	10.52*	0.026
Year	2	8884.2	8884.2	4442.1	15.35*	0.013
Error	4	1157.8	1157.8	289.4		
Total	**8**	**16131.6**				

Table C3. Analysis of Variance for quantifiable food produce expressed as maize equivalents for three villages in good, bad and average years.

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Village	2	2257378048	2257378048	1128689024	10.62*	0.025
Year	2	3090532352	3090532352	1545266176	14.54*	0.015
Error	4	425123008	425123008	106280752		
Total	**8**	**5773033472**				

Table C4. Analysis of variance for the average monthly income from various sources in the three villages

Source	DF	Seq SS	Adj SS	Adj MS	F	P
Village	2	103135416	55229168	27614584	26.69*	0.012
Income sources	2	47229168	47229168	23614584	22.82*	0.015
Error	3	3104167	3104167	1034722		
Total	**7**	**153468752**				

NOTE: For the Chi-square results stated under appropriate Tables in the text and ANOVA results (*) = Significant difference at p-value 0.01 to 0.05 and (**) = highly significant at p-value < 0.01