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Research Report No. 07.1

Rice Production in the Maswa District, Tanzania and its Contribution to Poverty Alleviation

Jerry A. Ngailo
Abiud L. Kaswamila
&
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ABBREVIATIONS

DALDO	District Agricultural and Livestock Development Officer
ECGA	Eastern Cotton Growing Area
FSRP	Farming System Research Program
FAO	Food and Agriculture Organisation
FYM	Farmyard Manure
GDP	Gross Domestic Product
GM	Gross Margin
NBS	National Bureau of Statistics
NAP	National Agricultural Policy
PRSP	Poverty Reduction Strategy Paper
UNESCO	United Nations Education Scientific and Cultural Organisation
URT	United Republic of Tanzania
WCGA	Western Cotton Growing Area

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EXECUTIVE SUMMARY

Agriculture in the Sukumaland has been very dynamic due to several factors, the major ones being climate change, changing market forces both inside and outside of the country and the need to eradicate and exterminate any threats to livestock existence. Recently, not only the preceding factors have come into play but also the need for the resource poor farmers to address poverty.

This study surveyed three villages important for rice production in the Maswa District, namely Shishiyu, Mwanhegele and Bukangilija. The study paid a special attention to the rice based cropping system and its contribution to poverty alleviation relative to other activities in the farming system.

The data was gathered using formal interviews, village meetings, informal discussions and by visiting the fields under cultivation. Formal interviews were also carried out with the extension workers of the three villages. The total number of respondents in both sexes was 167. Initially it was intended to interview 180 farmers i.e. 60 per village but only about 97% of the respondents turned up for interviews. Both qualitative and descriptive methods were used to analyse the collected data.

Major Research Findings

The major findings are:

i. Over 80% of respondents ranked rice as the major cash crop. The other crops grown, being cotton, maize, sorghum, groundnuts, and sweet potatoes were ranked lower. The study found that the returns from rice were sufficient to comfortably pay a minimum wage of Tshs 55,000 for each month for each the family member for over four months. These earnings can be greater when rice is sold in the market during the times of higher demand for this commodity.

ii. Rice was found to be much more profitable than cotton or maize according to gross margin analyses done for the three crops. The socio-economic effect of rice production among the respondents was measured using indicators such as investment, goods bought, expenditure patterns, land utilisation patterns, food security and investment in other economic activities.

iii. Producing rice improved the food security and financial status of the households. School fees and family welfare claimed the largest proportion of revenue from rice sales. The trend is likely to continue as long as cotton prices continue to drop or become unprofitable for the farmer to grow.

Observations and Policy Implications

It was observed that if no efforts were made to improve cotton prices, the farmers would continue to be increasingly dependent on rice cultivation. In order to improve the profit returned from rice the following measure should be taken:

1. Introduce the high-yield rice varieties.
2. The use of drought tolerant and water use efficient varieties should be encouraged.
3. Farmers should be encouraged to combat the weed problem, which occurs especially when organic fertilizers are used, as the control of weeds is a priority.
4. Introduce efficient irrigation methods and water storage systems to minimise water loss.

ABSTRACT

This study was carried out in the Maswa District, Shinyanga Region, to assess the role played by rice for poverty alleviation as compared to other farming activities. Three sample villages, namely Shishiyu, Mwanhegele and Bukangilija were surveyed.

The study emanated from the fact that over the years the world market prices for cotton, previously the most dependable cash crop has been declining. This price instability has greatly affected the farmers' livelihoods. A total of 167 respondents were interviewed, and the data was analysed using both qualitative and descriptive methods.

Gross Margin (GM) analyses done for three major crops rice, maize and cotton have shown that rice occupies a superior position to other crops in terms of its contribution to the welfare of the poor households. It serves both as cash and food crop, improving the food security and financial status of the households. A poor household that cultivated rice on land suited to rice production successfully earnt more money than when it concentrated on growing cotton or another crop. If an average household of six people in the study area divides the proceeds from rice, each member is likely to receive Tshs 240,000/= per season. This amount is sufficient to comfortably pay a minimum wage of Tshs 55,000 for each month to each family member for over four months. When hoarding is practiced and the crop sold at a later period when there is less rice available on the market then the profit can be higher.

It is, therefore, concluded that income from rice significantly provides poor farmers with the financial capability to purchase goods such as ploughs, and services such as school fees, medical services, etc. However, the expansion of rice cultivation is not only due to the effect of the reduced cotton prices, but also the sale of livestock prompts farmers to use excess income from livestock to purchase more land for rice and other crops.

1. INTRODUCTION

For a long time agriculture has remained the backbone of Tanzania's economy and clearly has been the key to both social and economic development. Earlier investments made by the Tanzanian government in agriculture focused on cash crops. Not much has been realised from the vast potential of other resources in the country, for example, minerals. The World Bank Report (2001) indicated that an average of 44.7% of the Tanzanian Gross Domestic Product (GDP) is derived from agriculture, of which the dominant sector is food production. The sector contributes about 55% of the agricultural GDP and it employs over 80% of the population. Consequently, agriculture is the largest single sector of the economy.

A significant contribution to GDP is found from major cash crops such as cotton, tea and coffee. Cotton was the second most important cash crop after coffee. It is produced in Eastern and Western parts of Tanzania. These areas are respectively designated as the Eastern and Western Cotton Growing Areas (ECGA and WCGA). About 90% of cotton is produced in WCGA including Sukumaland (Mwanza and Shinyanga regions). Nevertheless, agricultural output stagnated for the past 20 years; it was from this fact that the government of Tanzania embarked on macro-economic and sector policy reforms aimed at restoring incentives to the agricultural sector[1].

Stagnation was caused by a number of factors including the fact that the traditional cash crops such as cotton, coffee and tea could not deliver the expected returns because of the very low prices in the global market. Partly as a result of economic reforms, which began in the mid-1980s, cotton production in Tanzania rose to nearly 108,600 tons (600,000 bales) during the 1994/95 seasons compared to 79,640 tons (440,000 bales) in 1967[2]. Even before the 1980s, the majority of the farmers in Sukumaland were occupied in the production of cotton[3].

However, despite the economic liberalisation policies of the 1990s, which the government has continued to promote and implement, farmers have not put much emphasis on growing cotton. Because of persistent low producer prices compared to high input costs, farmers have become less and less interested in growing the crop. Instead they have put more attention and efforts to other crops with more economically attractive returns. Crops that are preferred are those that consistently fetch better returns and enhance food security. In light of this, rice became a major candidate; having been estimated to potentially contribute substantially to the economy of the Shinyanga Region and Maswa District in particular[4].

Rice was considered to have a high potential because of its strong demand on the food market with relatively stable price trends. This is clearly indicated by the data of cotton and rice production in the Shinyanga Region, which has shown that rice production is higher than cotton production and continued to increase while that of cotton has decreased. The impetus for this development largely came from the farming community itself[5]. This has led to the present situation where rice is as important a cash crop as cotton. In spite of its economic potential, studies conducted on rice have concentrated on the agronomic aspects only. It is now imperative to evaluate the impact of the rice crop on household economy and food security. Also there is a critical need to find out how long this trend will continue and if both the cash and food requirements of the farmers are simply met by shifting to such practices.

---

1 Mbilinyi, 1996
2 URT, 1996
3 URT, 1996
4 Meertens et. al., 1991
5 Meertens and Ndege, 1993

The strategy for reducing poverty is most likely to be successful if there are intrinsic efforts by the farmers themselves. It is believed that poverty can be alleviated when farmers themselves know and choose what to do.

The Poverty Reduction Strategy Paper (PRSP, 2000) recognises the government's role in assisting resource poor farmers by creating an enabling environment that helps them to alleviate poverty. Similarly, there is also a need to find out for how long the present production system favoured mainly by the poor peasants would continue and spread to others. Also, would they influence other farmers elsewhere?

1.1 Causes of Poverty in the Maswa District and the Objectives of the Study.

Poverty problems in the district are socio-economic in nature mostly caused by lack of sufficient income to meet requirements of food and others needs, lack of means to obtain a reasonable education for children, and also a lack of reliable health services. Agriculture as the main stay of the district has been hit by frequent unfavourable climatic conditions, for example droughts, but more importantly there have been very low returns from the sale of traditional crops.

Agriculture as the mainstay of the rural economy has failed to address adequately most of the preceding issues. In fact there has been very little transformation of agriculture in the district due to the fact that, the various crop enterprises e.g. cotton and maize have not been able to address poverty eradication. Transition from subsistence to commercial farming is still very difficult, as the costs of additional inputs are not compensated for by the returns from increased yields of various crops. It is from this angle that poverty, unemployment and food insecurity have forced the farmers to react differently to various situations.

The focus of this study was to determine the impact of rice production on income and food security of small-scale farmers in the Maswa District. The specific objectives were to assess the impact of rice production on the socio-economic ability of the farmers in the study areas and establish the relationship between rice production and food security in the study area.

Research Questions

There were many issues and questions that needed to be clarified in the present study. Those deemed relevant and major were:

1. What are the major reasons for the gradual shift to rice farming?
2. Does rice cultivation contribute through increased incomes to poverty alleviation in the Maswa District?
3. Is rice acreage really replacing cotton?
4. What role does rice play in food security?
5. What other crops beside rice are important for income and food security in the study areas?

The study analyses the potential direct role of agriculture and its contribution to poverty alleviation in sampled rural areas of the Maswa District.

1.2 Location

The Maswa District is located at the approximate geographical co-ordinates of longitude, 33°30' and 34°7' East and latitudes 2°50' and 3°38'. It is among the five districts of the Shinyanga Region (see Figure 1). The total area of the Maswa District is about 3,398 km^2, of which about 2,475 km^2 are suitable for agricultural production, 177 km^2 are occupied by forestry reserves, and about 846 km^2 is uncultivable land with shrubs and thickets. Nyalikungu, also called Maswa, is the district's capital and is located about 120 Km south east of Mwanza City.

To the Maswa Game Reserve borders the east of the district whereas Kwimba and Shinyanga Districts border it to the west. The northern part is bordered by Bariadi district. Administratively the district is divided into three divisions (*Tarafa*) namely: Sengerema, Nung'hu and Mwagala. The divisions are further divided into wards (*Kata*). Sengerema division comprises of Nyabubinza, Shishiyu, Kulimi, Badi and Malampaka wards. Buchambi, Marela, Isanga and Nyalikungu make up the Nung'hu division, whereas Ipililo, Mpindo, Budekwa, Lubigo and Sukuma wards are in Mwagala division. In total there are 78 registered villages[6].

The population in the district is growing at a rate of about 2.3% per annum[7]. Some of the data are shown in Table 1 below.

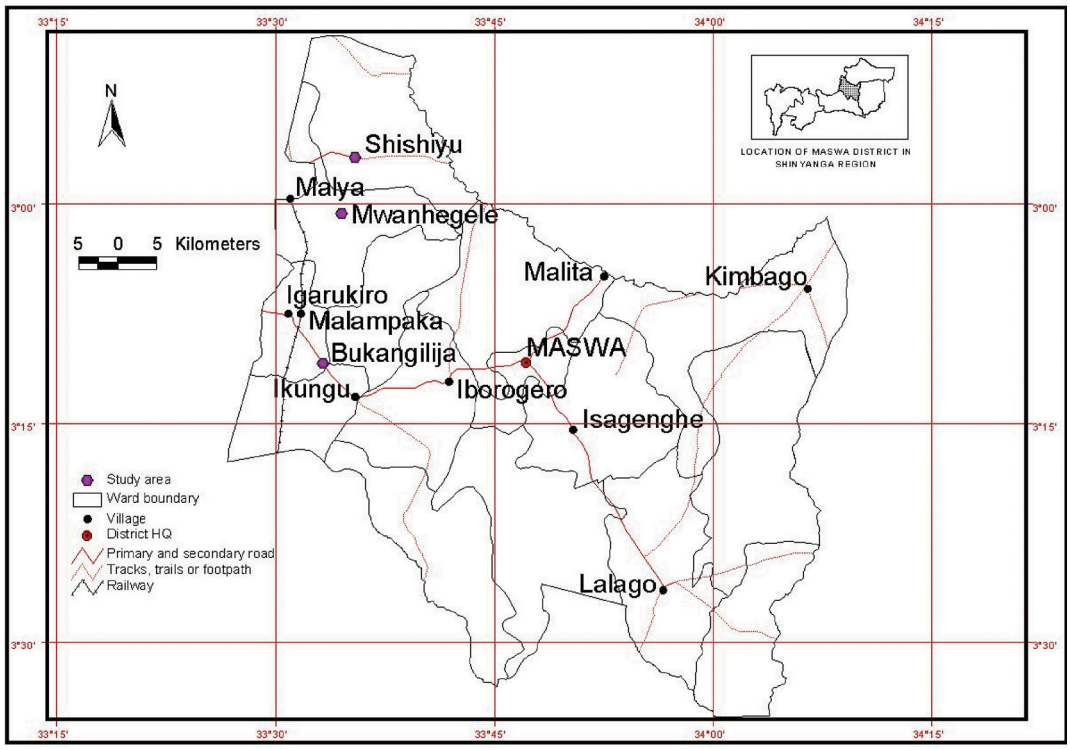
Division	Area Km ^{2}	Number of Villages	Households	Population	Pop./Km^2
Sengerema	1,359	23	14,056	107,617	62
Mwagalla	1,529	33	19,951	87,811	78
Nung'hu	510	22	11,337	70,005	133
Totals	**3,398**	**78**	**45,344**	**265,433**	**78**

Source: Calculated from 2001 Census data

Sengerema and Mwagalla are the most populous; although small in area Nung'hu is the most densely populated of the three divisions. This could be due to the fact that the district capital, Nyalikungu, is also located in this division. On the other hand the population density for the Maswa District is the second highest after the Shinyanga Urban District[8] .

[6] Maswa District Planning Office Data, 2000
[7] National Census, 2001
[8] URT, 1996

Figure 1: Location of the Study Areas in the Maswa District



1.3 An Outline of Agriculture in the Maswa District

The Wasukuma are the dominant ethnic group in Mwanza and Shinyanga Regions. These two regions comprise what is called the Sukumaland. The people are agro-pastoralists growing crops and rearing local breeds of livestock. Cattle are the main form of accumulation. According to their tradition cattle is the main form of convertible wealth. Bride price is commonly paid in cattle, and the herd size largely determines one's social status. Cattle may also provide a buffer against food shortage[9].

Ruminant livestock in the area depend almost entirely on natural pasture. However, during the peak of the dry season, the pastures of most villages are heavily depleted after the farmers have harvested their fields. The animals also graze on the crop residues *in situ***.** However the crop residues available are not enough to make up for the shortage of pasture in the dry season. Therefore, livestock in many cases are in poor condition and the returns are low.

The evolution of the farming and cropping systems in Sukumaland need to be looked into considering some historical development. Migration has played a great role in the evolution and the change of farming systems. Traditionally people grew staple food such as sorghum and bulrush millet. An alternative grain crop such as maize was introduced during the 1940s encouraged many farmers to slowly reduce acreage of these two crops[10]. Even so, in the south of the Maswa District sorghum is still grown as a drought resistant crop.

[9] FSRP, 1991; Wella et al., 1995, Shaka et al, 1996
[10] Rounce, 1946

Alongside the change in the food crop farming systems, another important development after the Second World War was the rapid increase and expansion of cotton cultivation. Cotton was introduced in Sukumaland during the 1930s and gained importance during the 1950's. Since then the crop has become one of the major cash crops of the country, as well as a major foreign exchange earner. In the Maswa District the crop is widely cultivated on loamy sand soils locally known as *Luseni* or *Lusenyi* or equivalent to Haplic Arenosols[11].

Rice is grown mostly on small ridges and some on flat lands. Arab or Asian traders introduced rice during the period[12] of German colonisation (1884-1918). The first rice crop was grown mainly in river valleys and in area fed by seepage or spring water where soils were suitable and able to retain water effectively for a long period. The evolution of rice farming system also went hand in hand with selection of better soils and lands which are suitable for optimum production[13]. Since the late 1950s growing rice has been a major activity alongside cotton cultivation.

1.4 Research Methodology

This study was conducted in three representative villages of the Maswa District. The selected villages are well known for rice production and other crops. A large number of farmers involved in the study area also are engaged in rice production. Before administering the questionnaires relevant pre-testing was done in two villages of Shishiyu and Mwanhegele and slight modifications of the questionnaires including reducing some questions were made. Responses were supplemented by information from extension agents and the village authorities.

1.4.1 Sampling

Prior to the selection of the villages a list of main rice growing villages was sought from the district agriculture offices. The team spent time studying the available data that should assist in making the selection. Maswa District comprises of 78 villages. Out of this large number of villages only three were selected. Three villages were randomly sampled from three localities in the northern part of the district. The three most accessible villages Shishiyu, Bukangilija and Mwanhegele were selected. They are all located within the main rice growing area of the Sengerema division. Coincidentally, they all represented different wards. Shishiyu village is in Shishiyu ward. The other two villages Bukangilija and Mwanhegele are in the Badi and Malampaka wards respectively.

1.4. 2 Individual Sampling Frame

Farmers were selected from the village registers, which were available at the village offices. Rice and non-rice farmers were selected randomly. In total about 168 farmers were requested to attend an interview. Both female and male farmers were considered, giving a sample of 60 respondents; 30 males and 30 females per village. Each female or male farmer had an equal chance of being selected from the village register. Finally, those who were selected were prepared for the interviews in subsequent days of the fieldwork.

[11] FAO-UNESCO, 1990
[12] Shaka et. al., 1996
[13] Ngailo, 1992

1.4.3 Data Collection and Analysis

The major part of the data collection was on socio-economic aspects. Data was also collected relating to crop production, prices, and sales and on other various elements relevant to the farming systems. Some of the data considered very important were those on human population, land use and tenure, topography, soil and cropping systems and patterns and production trends. Also collected was data concerning livestock crop integration, labour arrangements and impact of seasonality, expenditure patterns of the households and agricultural production constraints for both cash and food crops.

1.4.4 Problems Encountered During the Sampling Process

There were some unforeseen problems after the commencement of the fieldwork. First, the original plan envisaged sampling an equal number of male and female farmers. Although every caution was taken in the process, the number of female farmers who did not show up for interview was significant. Our objective of gender balancing could not be achieved. Secondly, although the study had the deliberate intention of comparing socio-economic conditions of both rice and non-rice growers, it turned out that every respondent was a rice grower. The only differentiating factor was the proportion of the respondent's fields, which were planted with rice.

1.5 The Biophysical Environment

1.5.1 Physiography

The physiography and soils of the Maswa District have been described well by Ngailo and associates (1994). The main physiographic units are the granitic hills, peneplains and bottomlands or *mbuga*. The steepest slopes (>16%) are found in the hills. Generally with the exception of the hills, the slopes in the majority of the district do not exceed 6%. The Sengerema division in the Maswa District, the main area covered by this study, is predominantly undulating plains, interrupted by wide and narrow valley bottoms, which are very important for rice cultivation.

1.5.2 Soils

The soils in the Maswa District bear common names similar to those used in the rest of Sukumaland. In fact the natural soil forming processes which seem to have been similar or related in most parts of the Sukumaland, have caused a series of soils to develop in succession from the hilltop to the valley bottoms. Such succession of soils in the same climatic conditions along the toposequence forms the so-called *catena*.

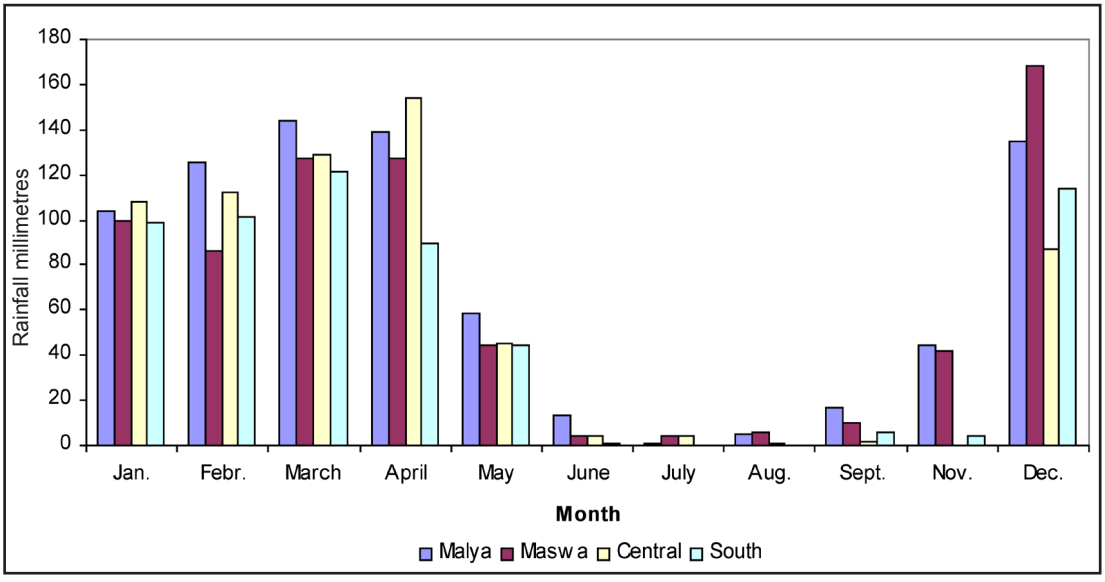
The soils encountered along the *catena* depend on factors such as parent material, water movement and presence or absence of soil salts. The phenomenon has significance in land use in Sukumaland because the different soils on the toposequence have been assigned local names, which also have a bearing on the type of crop farmers plant[14]. However the local names do not in any way indicate the potential of the particular soil.

[14] Ngailo, 1998a

1.5.3 Climate

There are a number of rainfall recording stations in the district with varying lengths of the recorded data (Fig.2). Rainfall data collected for over 15 years from the Maswa and Malya recording stations revealed an average of 900 mm a year for the northern part of the district. The Malya station represents the three areas that were studied. The rainfall pattern decreases from about 1,000 mm a year in the northwest to less than 800 mm/year in the southeast.

Figure 2: Mean Monthly Rainfall Distribution in the Maswa District



The main problem with regard to rainfall is presence of great variation of the yearly amount and its distribution year to year and within the growing season. Since farmers in the district do not practice supplementary irrigation, there are risks and uncertainties, which farmers always face. Supplementary irrigation cannot be practised because the underground water resources have not yet been exploited for agricultural use.

The distribution of rainfall is greatly skewed. It starts in November (40 mm) gradually increases to almost three times (120 mm) the amount in December. There is a slight decrease in the peak in January in most years. March and April receive the highest amount of rainfall. The months of July and August are virtually dry. The rainfall distribution has considerable implications on the various farm activities and success or failure. For instance, land preparation for rice has to start early in October or early November otherwise it always becomes very difficult to carry on land preparation when the soils are exceedingly wet because of the stickiness of the soil.

The temperatures on the average are above 16° C annually. Minimum daily temperature ranges between 16-18°C whereas maximum daily temperature ranges from 28- 31°C. These temperatures are suitable range for most crops in the district. October is the hottest month (32.5°C) and July is the coldest (14.9°C).

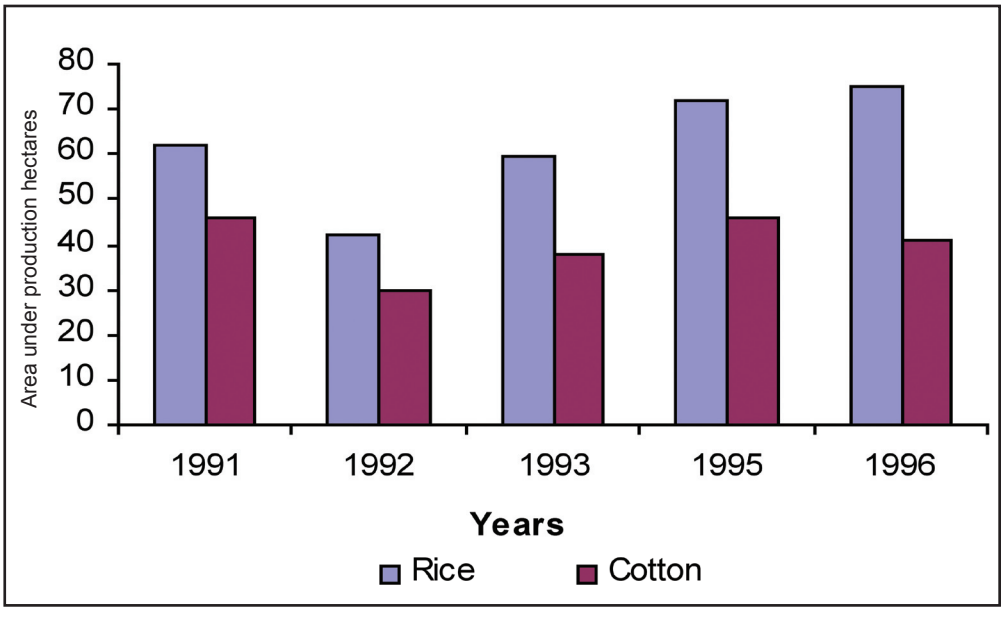
1.6 Agricultural Activities Carried Out in the District and the Socio-economic Status

1.6.1 Crop Production

The district grows both food and cash crops. Food crops include rice, maize, sorghum and sweet potatoes. Maize does not thrive well in the area[15] not because of the low rainfall, but probably due to the poor rainfall distribution sometimes interrupted by pronounced dry spells, which affect the maize crop. Cash crops grown in the area are cotton and rice[16]). For the purpose of this study only rice and cotton crops were studied in greater detail. The first rice crop was grown mainly in river valleys and areas fed by seepage or spring water and depressions and where soils were suitable and able to retain enough water for long periods.

Rice has become an increasingly important cash crop not only in the Shinyanga Region but also in the whole of Sukumaland. This is due to the fact that the crop is considered to have a great potential due its high demand and with relatively stable price trends in the food market. Another reason is that with expanding urbanisation and population increase the demand for rice will be higher than for traditional crops like millet and cassava[17]. Figure 3 show quantities of rice paddy and cotton produced in the Maswa district over a period of five years (1991-1996). The data shows that rice has a growing importance as compared to cotton. However, there are small fluctuations of rice yields between the various years, probably related to fluctuations in rainfall amount or due to changing weather patterns.

Figure 3: Rice and Yield Trends in the Maswa District for a Period of Five Years



[15] URT, 1996
[16] Meertens and Ndege, 1993; Shaka et. al, 1996; Mahoo et. al 1998
[17] Shaka et. al., 1996

1.6.2 Livestock Production

According to the 2002 livestock census, the district had about 314,619 cattle, 133,566 goats, 204,179 sheep and 4,508 donkeys. Livestock growth rate was estimated at 1.6% per annum[18]). It is often reported that the Wasukuma livestock keepers still rear livestock as security for times of need and also for the settlement of bride price[19]. They also act as "live banks" which are very common in many pastoralist societies.

Ruminant livestock in the area depend almost entirely on natural grassland. However, during the peak dry season in most villages, the pastures are heavily depleted, and the animals graze the crop resides *in situ* after the farmers have harvested their crops. Even then the residues available are not sufficient to make up for the shortage of grassland[20]. The livestock population in the district has been increasing despite mass migration of Wasukuma livestock keepers to distant places in search of pasture e.g. the Southern Highlands in Usangu plains in Mbeya, Iringa and Rukwa regions[21].

1.7 Social-Economic Conditions

The majority (96.4%) of the people in the district live in villages where the social economic services like housing; water, health, education and transportation are both inadequate and unsatisfactory[22] (URT, 1996). People have poor housing conditions. Most of houses are made up of temporary material and are without proper sanitation arrangements. About 90% of the population in the district use unsafe water from riverbeds and ponds for drinking and washing. People rarely boil water for drinking purposes.

The district has only one health centre and one hospital. There are 26 dispensaries and of these 17 are public dispensaries. The coverage in the district of these health services is far from being satisfactory. In the Shinyanga Region the illiteracy rate at 39.9% is among of the highest in the country. The majority of the total population in the district are engaged in subsistence agriculture as their main economic activity.

[18] URT, 2002
[19] FSR, 1991
[20] Wella et al., 1995
[21] URT, 1996
[22] URT, 1996

2. FIELD RESEARCH FINDINGS AND DISCUSSIONS

The following section presents some of the major observations of this study for the area. The salient socio-economic characteristics for each village are briefly outlined to provide a broad picture. At a certain level, specific information is discussed for major crop enterprises in the study areas. In order to compare the profitability of the crop enterprises a simple gross margin analysis has been used. At the end of this chapter there is a summary of major observations including how income from rice has been used to address poverty issues in the three sample villages are given.

2.1 Research Findings

2.1.1 Major Characteristics of the Villages Studied

In the sections that follow below, data on different and more general socio-economic characteristics for the three villages are explained. Some of the main findings are presented in Table 2 below.

Table 1: Summary of Household Characteristics for the Villages

Characteristics	Bukangilija	Mwanhegele	Shishiyu
No. of respondents	**52**	**60**	**55**
Sex of Respondents(%)		70	49
Male	63	30	51
Female	37		
Marital Status (%)		88	94
Married	90	-	2
Single	8	4	2
Divorced	2	8	2
Widow	-		
Education Level (%)		4	4
Secondary	4	70	54
Primary	60	4	4
Adult education	8	22	38
None	28		
Age (years) (%)		55	63
Youth (18-35)	88	33	33
Adult (36-60)	10	12	4
Old (>60)	2		

Source: Field data 2000

2.1.1.1 Age of the Respondents

Most (>70%) of those interviewed were youths with an age range of 18-35 years (Table 2) while (25%) were adults and the rest (5%) had reached what we can call as old age (>55 years). This indicates that most of the population is in general still very active and can afford to carry out various productive activities.

2.1.1.2 Education Level

The proportion of respondents with primary school education (Std 1-7, see Table 2) was almost half (>50%). Very few of those interviewed had achieved a secondary school education, while the rest (>25%) had had no formal education. The level of education is an important factor in coping with poverty and particularly coping with risks and uncertainties related to agricultural production. A certain standard of education aids can better equip a person to structure their enterprises to be sure that the family has enough to meet their requirements for cash, food and shelter. Those with secondary education were the ones who acquired more land, bought more agricultural inputs and frequently sought advice from the village extension agents. In this group government employees were not included, because under village standards these belong to the elite group.

On the average people with secondary education make up between 2-4% of the population, with Bukangilija and Mwanhegele having the highest at 4% and Shishiyu with the lowest at 2%. This shows that the youths with secondary education are either no longer engaged in agriculture and have opted for other activities, or that very few youths from these villages attended secondary schools.

2.1.1.3 Marital Status and Family Size

Over 85% of the respondents had a family. Table 3 below gives data on the family sizes of the poor and the rich. There is a difference in the family size between rich and the poor, although not large. The average family size in the study area ranges between four to eight people per household. The family size per household in general is large in both the poor and the rich. The largest family sizes were recorded in Mwanhegele village with an average of seven to eight persons per household. The recorded family sizes are comparable to other densely populated areas in the country, for example Lushoto and Iringa rural districts[23].

Table 2: Average Family Size in Rich and Poor Households

Village	Rich	Poor
Shishiyu	6	4
Bukangilija	7	6
Mwanhegele	8	7

Source: Field data, 2000

2.1.1.4 Gender in the Studied Households

Table 4 below indicates the number of respondents according to their gender. A reasonable number of them were female. The responses from females in Shishiyu were particularly encouraging. Fewer female respondents attended the interviews in Bukangilija because most of them were very much occupied with the preparations for their local markets (*minada)* business, which almost coincided with this study. During these days women prepare many types of commodities for sale. These things include local brew, food and other traditional household items.

[23] Tenge & Kaswamila, 1999; Ngailo et.al, 1999

Table 3: Division of Households into Female and Male Gender

Village	Ward	Male	Female	Total
Shishiyu	Shishiyu	33	19	**52**
Bukangilija	Bukigi	38	22	**60**
Mwanhegele	Nyabubinza	27	28	**55**
Total			**69**	**167**

Source: Field data, 2000

2.2 Major Economic Activities in the Study Areas

2.2.1 Crop Production and Crops Grown

The major economic activity in the study area is agriculture. Other economic activities are a combination of agriculture and employment in petty business. The field results reveal that on average more than 80% of the population depend solely on agriculture, 5% in agriculture and business and 4% in both agriculture and employment.

Crop production yields the largest (95%) part of the household income. The main crops that are considered by farmers as major earners of cash are cotton and rice. This is not to say that other crops are not sold. On the other hand minor crops such as newly emerging crops such as sunflowers are purposely grown for cash. Maize and other crops can also be traded if there is a surplus produced.

Among the most important crops grown in the area were cotton, maize, rice, sorghum, groundnuts and sweet potatoes. New alternative crops such as sunflowers are being introduced[24]. Due to their potential use and importance for the household economy, farmers place priority on major crops to be grown by households, after taking into account the prevailing climatic conditions.

Over 80% of respondents ranked rice, cotton and maize respectively as the major cash crops. Other crops such as sorghum, groundnuts, sweet potatoes are not traditional cash crops but where opportunities for selling them in the market arises, they are also sold to obtain cash for the family. The yields of many of these crops are still very low (Table 5). This is because the production technology is still rudimentary.

In Mwanhegele about 90% depend on agriculture. The major crops in order of importance are rice, cotton, maize, sorghum, sweet potatoes, groundnuts, beans and cowpeas. In Shishiyu 91% are cultivators of rice, cotton, maize, sorghum, groundnuts and sunflower. In all the villages rice, cotton and maize respectively occupied superior positions.

[24] Kileo et.al, 1998

Table 4: Major Crops and Average Yields for the Study Areas

Village	Major Crops in Order of Priority		Average Crop Yields (Kgs/ha)
		% of Farmers Growing	
Bukangilija	Rice	40	3,750
	Cotton	32	2,180
	Maize	15	1,500
	Sorghum	3	1,604
	Groundnuts	4	1,200
	Sweet potatoes	3	1,800
	Sunflowers	2	500
	B/nuts	1	1,600
Mwanhegele	Rice	35	4,200
	Cotton	27	2,225
	Maize	18	2,600
	Sorghum	7	1,500
	Sweet potatoes	7	1,800
	Groundnuts	3	450
	Beans	2	500
	Cowpeas	1	450
Shishiyu	Rice	45	3,050
	Cotton	28	1,068
	Maize	11	672
	Sorghum	7	1,344
	Groundnut	5	1,568
	Sunflowers	4	1,200

Source: Field data, 2000

2.2.3 Seasonality of Labour

In the Maswa District the drought conditions increase with the decreasing rainfall. As the rainfall decreases much of the work force is left without work because agricultural activities depend mostly on rain. The allocation of time by family members to each of the three enterprises i.e. crops, livestock and off-farm activities is undertaken in such a way as to attempt to even out the annual flow of labour. For instance, off-farm activities in the Maswa District during the dry season (i.e. July to October) are substantially reduced during the rainy season (December to May) (see also Appendix 2). Social obligations e.g. marriage ceremonies increase during the dry period. The pattern for social activities does not differ between the rich and the poor as most of them are dependent on the crop cycle. The slack periods of the year are usually used for such social activities.

2.2.4 Livestock Keeping

The availability of much desired consumer goods in the shops e.g. bicycles, radios, or ox-ploughs have attracted many farmers to put more interest and emphasis in earning cash. Livestock plays an important role in Sukuma society. After every good crop harvest, cash obtained from selling of the harvest is invested in livestock. Under normal circumstances livestock are a "live bank" in which money acquired from crop sales are reserved for future use by the family. This is normally done by buying more cows after selling bumper harvests. However, the Wasukuma people have been involved in cash economy for many decades[25].

[25] Malcolm, 1953

Common livestock types kept are cattle and goats (Table 6). Donkeys and chicken are also kept, though most farmers do not put emphasis on them. On the average, more people keep cattle than other type of livestock. A few people and most of them in the group of youth are those frequently found to have no animals. The impact of this condition on youth is that the level of poverty in future will continue to soar if there are no alternatives for them to accumulate some wealth.

More livestock are kept in Bukangilija village than in the other two villages. Data shows that on average each household has over ten cattle with some few goats and sheep (Table 6). According to the Sukuma culture, if one possesses a large number of cattle then you are regarded by the society as rich. During food shortage or in case of an urgent problem such as paying for school fees, livestock are normally sold so as to earn cash. Therefore livestock is the most traditional banking system in Sukumaland. Apart from being a traditional bank and a source of protein, livestock is a major source of farmyard manure. However, this study observed that due to transportation problems farmers do not use most of the farmyard manure.

2.2.4.1 The Role of Livestock in the Society

Keeping and owning livestock is part of the Sukuma culture. More importantly is the role of animal wealth for food security, which according to most respondents is most important to them. Table 6 below shows households with cattle in the three villages. The uncertainty of weather and its effect on crops leaves livestock as a component of the farming system that is sustainable and reliable. In times of famine animals, especially cattle, are either bartered for food grains for human consumption or sold and the cash income used to purchase other utility services.

Table 5: Proportions of Respondents (Farmers) Who Keep Livestock

Village	% of Keepers	Type of Animal	Number of Animals per Household
Shishiyu	75	Cattle	13
		Goats	8
		Sheep	8
Bukangilija	67	Cattle	16
		Goats	10
		Sheep	6
Mwanghele	64	Cattle	15
		Goats	6

Source: Field data, 2000

Most of the farmers own livestock. The exchange of cattle as bride price is an important aspect of marriage. Among the Wasukuma the most important consideration is the quantity, not the quality of the livestock. The drive for a bigger number of animals is acknowledged to be a traditional way of avoiding the impact of losses due to death from diseases, prolonged droughts and other natural calamities. Many farmers have experienced that in case of such circumstances a fraction of the stock may survive.

There is a good mix of livestock in Shishiyu and Bukangilija. The types and the number of animals

relate very well with the wealth of the respondents. Although a critical look was not done for this aspect, one can say that the wealth of the households in the study area is also contributed to by the livestock. Linking to Table 7, the numbers of rich farmers in Bukangilija correlate well with the number and type of livestock owned by the households.

2.3 Differentiating the Rich and Poor Households

2.3.1 Household Categorisation Criteria Used for the Surveys

In order to come-up with two farmer categories i.e. rich and poor (Table 7), villagers and extension officers were asked to rank households in terms of wealth of the different households in their respective villages. Only two main categories of poor and rich farmers were preferred to avoid the uncertainty of placing some of the farmers in groups in which they do not belong. The selection and grouping of the households into appropriate categories was done without the influence of researchers.

Farmers ranked households rich by the following major criteria: -

a) Size of the cattle herd.

   Although most of them owned a cattle herd, a farmer who owned more than 20 animals was considered "rich".

b) Ownership of land holdings per household acreage >10 ha.
   Land that is developed and well managed (e.g. well weeded and fertilised with farmyard manure). Where a farmer possessed a big area of land, but had left it undeveloped for a long time they were relegated to a lower category.

c) Ownership of a plough and a modern house with corrugated iron sheets.

d) Ownership of business e.g. a shop or guesthouse in the village.
   Households can earn extra cash besides agriculture.

2.3.2 Profiles of the Rich and Poor Farmers

Table 7 provides a summary of household categories for the three villages into two groups of poor and rich. Most of those asked indicated that they had only a few things in their possession, which constituted family property. Items included hand hoes, a simple house and the most important for all the farmers was the land that they owned. In Shishiyu and Manhegele the number of poor households exceeded the rich ones. However, two thirds in Bukangilija (66%) of the respondents were rated as "rich" because most of the respondents had small-scale business activities besides cultivating of crops. This was probably due to its location on the main road from Maswa to Mwanza and the easy access to markets for most farm products, (not only rice), compared to the rest of the study areas. Observations also showed that the village is not frequently subject to by drought and therefore realises reliable yields of both food and cash crops.

Table 6: Ranking of Households into "Rich" and "Poor"

Village	Household Category				Total
	Rich		Poor		
Shishiyu	15	29%	37	71%	**52**
Bukangilija	40	66%	20	33%	**60**
Mwanhegele	21	38%	34	62%	**55**
Total	**76**	**45%**	**91**	**55%**	**167 (100%)**

Source: Field data, 2000

Overall 55% of the interviewed households were "poor" based on the standards and criteria selected by farmers themselves in the interviews and researchers' observations. Farmers in any villages in Maswa live in very appalling conditions. Many of the houses are in poor conditions and a significant number (39%) of the respondents have not attended school. Few can afford proper clothes. There are many reasons, but the major one is the paucity of regular income.

In many previous studies in the Sukumaland, cattle ownership has been often regarded as major differentiating criterion among households. At the household level accumulation of wealth takes place in the form of cattle and is expressed in terms of herd size accompanied with plough ownership, this survey also focused not only on these but also on other entities e.g. land size, opportunity to use labour all the time of the year, etc.

When additional observations are made in the villages, it is apparent that people have very little alternatives besides agriculture, for instance:

a) Almost all (>90%) of the respondents rely solely on agriculture for their livelihood. Often when agriculture fails there are no or very few alternatives for earning a livelihood. They still use inferior tools e.g. hand hoe.
b) People who are engaged in alternative business besides agriculture are very few (10%).
c) Food security and the ability to avoid risks are always very difficult decisions for the farmer to make. T his is one of the major indicators of poverty among rural communities.
d) People tend to depend entirely on crops such as rice and cotton as their cash crops.

The household situation is severely affected and stressed if, for example, there is prolonged drought. Dependency on rain-fed agriculture makes the people vulnerable. There is an inability to cope effectively and on sustainable basis on the unpredictable weather situations.

2.3.3 Farm Sizes, Land Acquisition for Crop Production and Tenure

The average farm sizes in the study area range between 1-1.5 ha with most farmers having more than two plots to cultivate different types of crops. Almost all respondents, "poor" or "rich", owned land (Table 8). The largest groups >50% owned land privately through purchase, whereas about >10% rented. A significant proportion also >25% owned land through matrilineal lines of inheritance. As see in the Table 8 below various ways are available in the villages for land acquisition; however, most of people inherit land from their parents

According to the respondents most of the farms in the three villages are located very close to their homesteads. In Bukangilija about 85% of the farms were located up to one kilometre from the farmers' residential areas, whilst in Mwanhegele the figure is 70% and 73% for Shishiyu. Few farms were located at longer distances i.e. between three and four kilometres. In Shishiyu the percentage was 27, while in Mwanhegele it was 14%. The distances noted were easy to reach by both the 'rich" and the 'poor". Distances to farms is an important factor during harvesting where transport costs are added when the produce has to be collected from afar.

Table 7: Major Ways of Land Acquisition for Crop Production

Land Tenure	Name of Village	Household Category		Total
		"Rich"	"Poor"	
Rented	Shishiyu	3	8	**11**
	Bukangilija	10	7	**17**
	Mwanhegele	2	15	**17**
Total		15	30	**45**
Inherited /private	Shishiyu	8	14	**22**
	Bukangilija	17	7	**24**
	Mwanhegele	5	10	**15**
Total		29	31	**60**
Communal	Shishiyu	3	8	**11**
	Bukangilija	2	-	**2**
	Mwanhegele	4	6	**10**
Total		9	14	**23**
Purchased	Shishiyu	8	5	**13**
	Bukangilija	12	6	**18**
	Mwanhegele	3	4	**7**
Total		23	16	**38**
Grand Total		**76**	**91**	**167**

Source: Field data 2000

Poor farmers, as we have already indicated above, cannot purchase or rent enough land because their resources are not adequate. Communal land is largely available for grazing and not for cultivation. Expanding land through clearing uninhabited land particularly for the villages studied was not common because there was not enough available land. More importantly, the land was not only used for agriculture, but also for raising livestock. The competition of land between livestock and crops had become a common problem, which the people needed to discuss to resolve frequently occurring conflicts on land rights.

Keeping the land fallow is not common practice because there was a high demand for land for production of various crops, livestock grazing and for human habitation. According to most respondents, as population and family size increased, other types of land tenure, such as purchasing and renting became more common. These changes in land tenure arrangements were obviously a response to increasing land scarcity, which in turn raised the issue of changes in soil fertility. Frequent changes in land tenure relationships exacerbated the problem of deteriorating soil fertility. Through informal discussions it was discovered that people who rented land were discouraged from applying fertilizers. Apparently, such application gave rise to the suspicion that the renter intended to control the land. During discussions, cases were cited where the landowner recalled back the land back into their possession because of these fears.

2.3.3.1 Land Ownership and Gender

Most males and females questioned highlighted that the land belonged to the family and not solely to the respondent. Only for a single parent household were the decisions about the land made by a single person. All the villages' respondents, showed that land was owned jointly, that men had no greater share, rather the land was the family's property.

2.3.4 Farmer Categories Growing Rice, Cotton and Maize

Which major crops the respondents grew are shown in Table 9 below. A large proportion of "rich" respondents always grew more of the three crops than the poor. Probably they had more resources to invest in agriculture than the "poor." However, it was also observed that although the "poor" made a small proportion, more rice was grown than cotton and maize. They find rice cultivation more appropriate in addressing their needs than the other two crops. The "rich" households had more land resources to carry out farming activities on a larger scale. Whereas the "poor", besides growing little of the three crops, were also involved in selling their labour to "rich" farmers. They are the major source of farm labour for "rich" farmers.

Table 8: Proportion of the Farmer Categories Growing Rice, Cotton and Maize

Village	% of "Rich" and "Poor" Farmers Growing the Crop					
	Rice		Cotton		Maize	
	"Rich"	"Poor"	"Rich"	"Poor"	"Rich"	"Poor"
Bukangilija	97	45	89	21	82	25
Mwanhegele	87	36	87	15	79	11
Shishiyu	91	24	91	18	89	28

Source: Field data, 2000

Table 9 below shows the average land sizes owned by the "poor" and "rich." As usual, the "poor" households owned smaller land portions than rich households. The "poor" households in Shishiyu owned the largest plots (3 ha). On the average, the "poor" in the three villages own about 2 ha of land and the "poor" in Bukangilija own the smallest plots (1.2ha). In Bukangilija village there was a clear agenda by the "rich" farmers to acquire more land, the tendency was for the "poor" to have their land outside of the village. There had been efforts by the "poor" to find more land and expand, but the "rich" had done the same and due to their ability to mobilise resources, the "rich" households had always gained the upper hand in the exercise.

Table 9: Average Size of Land (ha) Owned by "Rich" and "Poor" Households

Village	"Rich"	"Poor"
Shishiyu	6	3
Bukangilija	4	1.2
Mwanhegele	2.6	1.8
Average for the Group	**4.2**	**2.0**

Source: Field data 2000

2.4 Discussion

2.4.1 Farmers' Perceptions About Trends of Rice and Cotton Production

The long-term production trends of rice and cotton in the district pose several problems. Yields of rice and cotton have not always been steady over the years but have been fluctuating. For instance, the reasons for declining yields for Bukangilija were given as low rainfall and lack of improved seed varieties for the rice crop (Table 11). The village was hit hard by drought from 1998 to 2000. The prices of cotton continued to drastically drop from Tshs.200/kg in 1997 to Tshs. 145/kg in 1999 and 2000. This trend is expected to continue in the future.

In Mwanhegele, the yield trends for rice were viewed as low by 47% of the respondents and as very low by 5% of them, this shows that close to half of the population perceived a trend of declining yields. Those who perceived the trend to be increasing were 27%, but 21% viewed it as not changing. For cotton 40% indicated that yield was low, and 9% as very low, indicating that more than half have noted that yields of cotton were falling. The yield trend was viewed as high by 25% of the population and 20% said the trend was medium.

Among the reasons given by the farmers for the declining production trend in Mwanhegele were drought, low fertility and poor seeds for the rice crop. For cotton, the reasons given in order of importance were the low prices given in recent years, buying on credit, lack of good quality seeds, and high labour demand. Low fertility was also common for all the crops.

Of the respondents from Shishiyu, 60% viewed the yield trend of rice as low, 15% as high and 25% as medium. For cotton 18% perceived the production trend as high, 60% as medium and 22% as low. The low rice yields were a result of the unreliable rainfall (drought) in recent years. For cotton the prominent reasons were the selling on credit and at low prices, persistent climatic changes, pests and diseases.

There is no doubt that, there are multiple factors affecting the production of the two crops in the study areas. For cotton it is not only the low prices that cause people to refrain from producing it, but also the weather situation. Other factors could be lack of necessary inputs e.g. good planting seeds and chemicals for spraying. On the other hand, for rice there seems to be adequate runoff water as the major constraint besides lack of improved seeds and weeding problems.

Table 10: Perceptions of Farmers of the Trends in the Yields of Cotton and Rice

Village	Crop	Perception of Production Trends		Reasons for Decline	% of Farmers Giving Reason
		High; Medium Low and Very Low(%)			
Bukangilija	**Rice**	High Medium Low Very low	20 - 65 15	• Unreliable rainfall • Lack of improved seeds • Low prices	90 8 2
	Cotton	High Medium Low Very low	20 - 80 -	• Low prices • Low fertility	80 20
Mwanhegele	**Rice**	High Medium Low Very low	27 21 47 5	• Unreliable rainfall • Low fertility & poor seeds	98 2
	Cotton	High Medium Low Very low	25 20 46 9	• Low price & buying on credit • Lack of good seeds & high labour demand	97 3
Shishiyu	**Rice**	High Medium Low Very low	20 30 36 14	• Unreliable rainfall • Low prices • Don't know	71 18 11
	Cotton	High Medium Low Very low	18 60 22 -	• Low price & buying on credit • Lack of good seeds & high labour demand	69 31

Source: Field data, 2000

Though the data on Table 11 below show that many farmers apply farmyard manure (FYM) to cotton, maize and sorghum in the study villages, the frequency for application in fields, quality and quantity of manure applied leaves much to be desired. During field observations the quality of FYM used was seen to be of very poor quality, the stuff was normally collected from the open kraals and spread on the soil. When it is left in the open, manure loses most of the nitrogen element by volatilisation.

Of the quantity applied, the number of ox carts of manure applied was variable, but most farmers said they normally apply one to two cartloads per hectare. This is less than one ton and the recommended rate is almost 20 ton per hectare. Farmers mentioned no other type of manure in use, and no other soil management strategies were mentioned. Taking into account the diverse nature of the soil types and the fertility status, the need for fertilisation is indispensable. The sandy soils (Luseni/Lusenyi) need much fertilisation because cotton is one of the most important crops grown in such soils.

Table 11: Use of Fertilisers in Crop Production

Villages	Status of Fertiliser Use	% of Farmers Using	Fertiliser Used	Major Soil Types		%	Crops Where Fertiliser Used	%
				Local*	FAO-UNESCO Equivalent			
Mwanhegele	Use Don't use	82 18	FYM	Lusenyi Itogoro Ikungu Ibushi	Eutric Arenosols Calcic Regosols Haplic Acrisols Calcic Luvisols	47 31 4 18	Cotton Maize Groundnut Rice Sorghum	40 38 4 6 12
Bukangilija	Use Don't use	56 44	FYM	Luseni Itogoro Ikungu Ibushi	See above	67 10 - 23	Cotton Maize Rice Sorghum	59 40 - 1
Shishiyu	Use Don't use	81 19	FYM	Luseni Itogoro Ibushi	See above	60 20 - 20	Cotton Maize Rice Sorghum	40 38 22 -

Source: Field data, 2000

* *The various soils in the Sukumaland are well known by local names and can easily be identified in the field. Farmers understand very well the management requirements of the different soils including those that need FYM most.*

Itogoro- are moderately deep soils somewhat poorly drained, sodic, dark grey sandy clay to clay with a hard pan within 15-30 cm and a thin outwash sand on the surface.

Ikungu – are moderately deep, well-drained dark reddish brown clay loams to clays with a weathered rock fragments in deeper subsoils.

Ibushi- moderately deep well drained calcareous, black to dark grey clay loams over gravel and marls

Mbuga- deep somewhat poorly drained calcareous, black to dark grayish brown cracking heavy clays to sandy clays with whitish concretions of calcium carbonate in the deeper subsoils.

Luseni- moderately deep well drained dark brown sandy loams with thick sandy surface horizons, very gravely in the deeper subsoils over ironstone.

Low application of FYM may also be one of the reasons why the cotton and rice yields have not improved significantly beyond the current levels. Application of nitrogen fixing technology by using algae e.g. Azolla sp in rice farming systems could be tested in this regard. This should be tested to increase the available nitrogen, which is in high demand, not only for the rice crop, but also for many other crops. It is not known by the authors whether this technology can be used in non-irrigated rice systems, but the technology has worked best in the irrigated rice farms in many parts of the world, particularly in Asia.

In summary, the causes for decline in rice and cotton production as recognised by the farmers were: low prices, selling on credit, climatic changes, pests and diseases, lack of good quality seeds, restricted use of fertilisers, poor extension services and high labour demand attached to the production of

the crops.

Table 13 below indicates the importance and relationship of rice over cotton for seven years consecutively, (1990-1997). The mean area in hectares of both crops has been decreasing over the years due to many reasons, but the area under rice has been larger than that under cotton during the same period. It seems that the importance of growing rice to farmers is not a phenomenon recognised recently, but has been there for a long time. We can observe that it is gaining importance while cotton is gradually losing ground. There is a tendency every year for farmers to grow more rice than cotton regardless of the prevailing conditions.

Table 12: Relationship Between Rice and Cotton Production (ha) in the District

Year	Crop		% Increase of Rice over Cotton Each Year	Difference in Area (ha)
	Rice	Cotton		
1990/91	75,000	52,000	31	23,000
1991/92	64,000	38,313	40	25,687
1992/93	80,000	36,626	43	43,374
1993/94	20,000	32,459	-62	-12,000
1994/95	45,000	32,080	29	12,920
1995/96	45,001	25,225	44	19,775
1996/97	25,225	19,740	22	5,485
Mean	51,000	33,778	95	48,177
Standard Deviation	59,052	16,729	-	-

Source: Data calculated from URT, 1996. Shinyanga Regional Socio-economic Profile.

2.4.2 Some Major Observations on the Variations and Decline of Cotton Production

For several decades the Shinyanga region has been one of the most prominent cotton growing areas in Tanzania, after the Mwanza and Tabora regions respectively[26]. For the period of three years, since 1998 to 1999 season (DALDO Maswa pers. com) the farmers have witnessed a fall of 66% in price of cotton from Tshs. 200/kg in 1996 to Tshs. 124/kg in 1999. Worse still, was that the crop was sold on credit.

[26] NBS, 2001

Taking the many pressing needs of the poor peasant farmers, the need to opt for other alternatives is clear. The alternatives are to reduce the number of plots under cotton, engage in petty business, or shift to rice production, as it seems to be more promising and more profitable than cotton.

2.4.3 The Contribution of Livestock to Expansion of Rice Production

Creating a livestock herd is a gradual process where one needs to sell his/her labour, or through some other source generate the cash to buy animals. In some cases, particularly in the years with good harvest, a barter system of trade operates, allowing those with surplus harvest to acquire animals or vice versa. A farmer with many cattle for example, is considered rich because he or she is able to cultivate relatively big fields. Owning cattle is positively associated with ownership of ox-drawn farm implements such as ploughs.

Besides animal traction, other potential benefits include some degree of integration between crop and livestock husbandry. These benefits include: permitting the more efficient use of land unsuitable for crop production; providing manure; providing sources of power; income, savings and investment and providing alternative uses for crop residues and products. Livestock, particularly oxen, are the backbone of the Maswa farming system. More than 80% of the respondents use ox-ploughs for land preparation. With the advancement and diversification of livestock use, the use of oxen for weeding is now gaining popularity in the society. Animals are fed on communal lands. Oxen are used to transport water, firewood and produce home from the fields. It was observed during the study that the use of oxen for transport is available to every member of the community through acceptable social arrangements or agreements, irrespective of the ownership of the cattle.

Crop residues from maize, rice and sorghum are not burnt after harvest but fed to the animals. Dung is also used as a source of fuel in combination with firewood, but the use of manure as fertiliser in farms is limited owing to a lack of transport. However, 70% of respondents indicated that the only source of fertiliser available within their reach is the farmyard manure because inorganic fertilisers were firstly not available in shops and secondly, when available, were very expensive.

2.4.4 Off-Farm Employment

Agriculture remains the dominant sector in the district, employing the majority (92%) of the population. During the slack period the most important place to utilise this large labour force is in off-farm employment. This is where farmers can engage in gardening, charcoal making and other artisanal activities. Not many people take part in off-season business and according to them this is the time for visiting and travelling to relatives living elsewhere. Many farmers are more satisfied with the income derived from agriculture than from off-farm employment. It is unfortunate that the income derived from off-farm activities was not analysed for those few who engaged themselves in such activities, because the responses were highly variable.

Although the respondents had experienced food shortage at least once during the past decade, they had not engaged in off-farm activities. Many (85%) of them avoided/escaped acute hunger periods because they owned livestock, which they disposed of during a period of food scarcity. The unemployment rate in the region during the dry period is estimated at around 80%[27]. However during the farming season the unemployment rate drops to 20 to 30%.

[27] URT, 1996

2.4.5 Major Forms of Capital, Investment and Credit in the District

Taking the three villages as major sample areas from the District, it can be stated that the investment of capital in the traditional systems of agriculture has tended to be low. This may have been due to either low savings capacity, or absence of savings, and/or low return on investments in many households. The capital owned by farming families in the District has consisted, apart from livestock, principally of goods produced by them through their labour. Examples of production of durable capital by farmers include constructing grains stores, land clearing and improvement. A significant point concerning all these types of capital are that much of it was produced when the opportunity cost of labour was low, that is, during the dry season in the months of July through October each year.

The other form of traditional capital, which is not a direct embodiment of labour, is the ownership of livestock. Livestock have multiple uses including being a form of savings, and investment and sources of meat, manure, and by-products. Apart from cattle, livestock ownership tends to be widely dispersed both between and within families. It is evident that with the introduction of improved technology there is significant change in the character of some of the capital used by farmers.

New types of capital goods are purchased in the markets e.g. open markets (*minada*), or in big towns or cities like Mwanza, rather than being produced with local labour at village level. Such goods include most types of animal ploughs, inorganic fertilizers etc, which are normally purchased after the sale of crops especially rice and cotton. The use of such capital is likely to continue to increase as farmers adopt for improved technology.

2.4.5.1 Cash Expenses and Flow in the Study Area

In a poor society cash flow is limited by low purchasing power. Cash expenditure among the Sukuma on agriculture have always been minimal. Nowadays non-family labour is increasingly being hired and being remunerated in cash or in kind. There are other traditional methods of barter, which do not involve cash. This is where there is continuation of traditional labour groups that are used in farm activities. However, cash payments are common after some crops are harvested.

Nevertheless, hired labour is the principal component of cash expenses, especially if the labour resources within the family are inadequate. The time when the level of agricultural activity is approaching its peak, usually between November and May, is also the period of major demand for expenses in agriculture and this coincides with the time when cash resources are at their lowest ebb (see Appendix 2). There are also variations in cash flow for all families and therefore the ability to engage labour besides family labour is also different.

The problem of variations in the seasonal cash flow is made worse by the fact that the business of farming and the family itself are not separated. Therefore, extra pressures arise during periods of peak agricultural cash demand, because of the need to also purchase food during the hunger period.

2.4.5.2 Savings and Credit

To have enough savings and credit is a sign of being well off compared to the others in the community. Credit and the accruing of savings are obvious ways of overcoming problems of the seasonal cash flow. In the District savings have been accrued mainly by selling livestock and agricultural products e.g. rice or cotton. On the other hand there are very few opportunities that farmers can rely on for financing agricultural production.

Traditionally credit obtained from local sources e.g. from a farmer or a colleague was used primarily for consumption purposes. In the light of the preceding discussion this is not surprising. On the one hand the expenditure of cash in crop production seems to be minimal while other social obligations e.g. marriages and other ceremonies, and more recently the need to pay taxes, and/or school fees have somehow contributed towards the use of credit.

2.4.5.3 Institutional Access

Farmers have no control over external socio-economic circumstances. For instance farmers have no control on issues such as infrastructure, produce markets, credit and extension. Input markets are supposed to be available in towns and in big centres e.g. Malampaka and Maswa. But often inputs are not found when required. Pesticides for cotton are sometimes provided in town from cotton-buying agents. However, these sources are unreliable because in some seasons they do not provide them.

2.4.6 Gross Margin Analyses for Rice, Cotton and Maize

In order to investigate the profitability of the major enterprises in the study area, the only direct and simple approach was to use gross margin analyses (GMA). Table 14 gives the gross margin analyses for these three crops. These are only indicative average figures and may vary from one place to another in the same district depending on the market situation and distances from or to the market etc. But the general trend is the same for the various places. In the study area rice was perceived as being the most profitable crop relative to other crops e.g. cotton. In Mwanhegele, 77% of the farmers asserted that rice was most profitable and in Bukangilija and Shishiyu the number was 73% and 67% respectively. This assertion is in agreement with the gross margin analysis for the two crops.

The gross margin analyses for the years 1999-2000 show that in a good season rice had a gross margin of Tshs. 719,500 when compared to cotton, which had Tshs. 333,850. This is about Tshs 384,650/= or more than 50% lower to that of rice (Table 14). During scarcity or when the hoarded rice is sold, the price of rice normally doubles or triples, increasing the gross margin substantially. There is no possibility for hoarding cotton because the season for selling the crop and the price for the season are specified and fixed. The prices for the year 1998 and 1999 were comparable to those of the 2000 season. This situation clearly shows the importance of the two crops for the economy of the individual farmers and the country at large. Looking critically on the various cost items, there are more costs for cotton than for rice production. The use of pesticides in cotton is a must and can never be avoided if reasonable harvests are to be expected.

The most demanding activities in rice crop are land preparation, weeding and harvesting. For comparison sake, major farm operations such as land preparation weeding and harvesting of cotton constitute over 50% of input total costs whereas for rice, the same activities consume a figure close to 70% of total costs. Labour required for rice is over 50% higher than for cotton. There is every reason for a person to ask why people prefer to grow rice despite its high labour requirements. Nevertheless, it is also very clear that in the final analysis, rice income is much higher than that of cotton by a figure close to 80%. This means that with those many man-days invested in growing rice the returns are almost 50% higher as compared to cotton or maize.

It is now clear that even if one applies fertilisers in the fields of rice and cotton or maize yields the returns will be higher but different for the different crops. However, in the wake of the very low and highly fluctuating cotton prices, rice will continue to be ranked higher than the rest of crops. This seems to be the major reason that has made many farmers put more effort in rice. Needs for rice lands are specialised and this is the most important determining factor for selecting a good rice pasture.

Table 13: Analysis of the Cost of Production and Gross Margins (per ha) for Rice, Cotton and Maize

Crop	Rice		Cotton		Maize	
Inputs	**Quantity**	**Cost (Tshs)**	**Quantity**	**Cost (Tshs)**	**Quantity**	**Cost (Tshs)**
*Seeds 1 kg =	200 kg	15,000	175 kg	12,250	10 kg	2,000
Pesticides 3 lt @ 400/=	-	-	3 lt	12,000	-	-
	**Labour (man-days)					
Land preparation	16	25,000	16	25,000	20	30,000
Seeding	2	3,000	8	12,000	-	-
Thinning	10	15,000	4	6,000	-	-
1st –3rd weeding	48	120,000	20	30,000	13	20,000
Spraying	-	-	6	9,000		
Harvesting	16	25,000	13	20,000	4	6,000
Transport	10	15,000	4	6,000	3	5,500
Grading	-	-	4	6,000	-	-
Field clearing for next season	-	-	5	7,500		-
Sub-total		218,000		145,750		63,500
Total Cost		218,000	-	145,750		63,300
Yield kg/ha	3,750	-	2,180	-	1,500	-
***Gross Margin (GM)	-	719,500	-	333,850	-	101,700

Source: Field data, 2000

*The prices for buying seeds per kilogram for rice, cotton and maize are respectively:

Tshs 70-100/=, 100-150/= and 150 –200/=

The prices for selling produce per kilogram for rice, cotton and maize are respectively:

Tshs 250-300/=, 150-220/= and 100 –150/=

**The average wage per man day prevailing at the time of the study was taken as:

Tshs 1,500/=-1,800/=

***Gross margin = (Average yield/ha x Average price (Tsh) per unit (kg)) of produce- (total costs)

E.g. for rice: gross margin =(Average yield/ha x Average price (Tsh) per unit (kg)) of produce- (total costs)= (3,750 x 250/=) –218,000=Tsh 719,500

2.4.7 Division of Income from Rice

Traditional norms of the Wasukuma govern the use of land resources and the produce from labour thereof. This also applies to the income that is earned through crop sales. In most cases the men, being the heads of the households, are the sole custodians of the family's property including proceeds from crop sales. This is not the case where the crops under considerations are grown by the women, such crops include sweet potatoes.

However, during the interviews most female respondents could not clearly indicate that they do not have equal access to the gains from rice. We, (the authors of this report), think this emanated from fear and is not a reality. In all cases it is the father's responsibility to sell the produce in the market, this implies that the father also may be free to misappropriate a lion's share of the income from rice. In female-headed households there were no problems because there is freedom to use the income for various uses according to her wish. The authors would like to recommend educating man on the importance of fair distribution of income.

2.4.8 Expenditure Pattern of Proceeds From Rice by Gender

The rice crop has improved food security and financial status to both genders in households. It is also apparent that school fees and family welfare claimed the largest proportion of revenue from rice sales. Many farmers commented that education at all levels was nowadays very costly, yet educating children to reach at least a higher class at primary school level was of high priority for household expenditure.

From Table 15 below it is evident that the expenditure patterns of men and women differed. Women spent much more (40%) of the money earned from rice sales to purchase family needs. They also spent a substantial amount (31%) of cash on meeting medical costs. On the other hand, men spent a lot (45%) of their income on family needs, paying the community levy and a small portion (10%) on medical expenses for themselves and their families. From the table we can also note that the welfare of a family depended very much on the financial ability of the women. A poor family was most likely to be affected very much in securing clothes, food, and medical care if women were very poor. It indicates also that a wealthy mother will use most of her wealth to keep the family healthy. Investment on cattle also receives a good deal of the income from the sale of rice. Men spend about 25% of proceeds from rice for purchasing or replacing the lost animals. This means that during bumper harvests men and women consider also purchasing livestock for the household.

Table 14: Contribution of Rice Production by Gender

Nature of Effect	Men (%)	Women (%)
Family needs (clothes, food, etc.	30	40
School fees	29	20
Pay community levy	5	-
Pay medical costs	10	31
Pay dowry	1	-
Buy livestock	25	9

Source: Field data, 2000

Income from rice is also invested in some long-term assets for the households. Some of the respondents used the income to purchase additional land, livestock, building a new house, or roofing it with corrugated aluminium sheets. Over 50% of the respondents used the proceeds from rice for domestic uses e.g. clothes, food, etc.

Considering the gross margins in Table 14 and the available average area of 4.2 ha and 2 ha owned by rich and poor households (Table 10) in the study area, it is possible using very simple mathematics to compare the relative significant contribution made by the two crops to the household economy.

For rice: -

Given the fact that average area is about 4.2 hectares per "rich" household, one hectare of paddy fetches about Tsh 719,500 after deducting all costs. Assuming that the whole area is under paddy then:

ha x Tsh 719,500= Tsh. 3,021,900. This is the total amount of money per season.

For the "poor" households it is 2 hectares x Tsh 719,500= Tsh 1,439,000 per season.

This amount is enough to pay the one member of the "poor" household with an average of six members, a total of nearly Tsh 240,000 per season, which is equivalent to the minimum wage of Tsh 55,000 paid by the government for over 4 months.

For cotton: -

If the whole area of 4.2 hectares is cultivated in cotton, the "rich" households earn each season 4.2ha x 333,850 = Tsh 1,402,170.

For poor households 2 ha x 333,850= Tsh 667,700 only and over 50% lower than earnings from rice.

These are simplistic figures, but they serve us with the hard evidence and the rationale as to why households concentrate more on rice production. Even if a farmer cultivates the same area, e.g. 1 hectare, he/she profits more from rice than cotton.

It is clear from above that a family that effectively cultivates its rice land can successfully earn more money than when it concentrates on growing cotton. The simple calculations above assume that the whole amount harvested is sold. The amount goes higher if the hoarded commodity is sold when there is a high demand in the market. As most of the respondents were in the poorest group, it seems that efforts towards increasing the production of rice could largely relieve this group from poverty. Therefore, women should be enabled to plant rice by providing them with loans that can assist them to increase production through increased use of agricultural inputs e.g. fertilisers, herbicides and the like.

On the other hand, the income from cotton was able to provide for a family for less than a month for the same family size. The advantage is that rice growers also prefer to grow other crops e.g. cotton, sorghum and beans. Therefore, where the farmer has a small harvest of other crops he/she is mostly likely to be food sufficient and secure accompanied with an additional income from these other crops e.g. sorghum, maize etc which are also being sold. The gross margins for maize is the lowest and though the crop is one of the food crops, it can easily are substituted by other crops such as rice, sorghum or sweet potatoes.

Each year/season, the gross margins for rice changed substantially, depending on factors such as: -

- Time of year/season,
- Rice Variety, and
- Proximity to markets.

Market forces of supply and demand as confirmed by farmers have shown that rice prices are normally lower just after the harvest season in May each year. The highest prices are obtained before harvest in April the following year. After the harvest in May, it may continue to be low up to November when it picks up again. During all this time the household is supplied with enough quantity of food and cash. There are rice varieties which sell at higher prices, for example the *Supa India* and *Turiani* varieties. This flexibility, i.e. hoarding the commodity during times of low prices cannot be practiced for cotton, but can so slightly for maize. Not all farmers produce surplus rice. Other households produce only enough rice for food consumption. When the crop harvest is very low, especially during a year of prolonged or harsh drought, the amount produced cannot even fulfill the food requirements of the affected households.

The distance from markets determines the price of the crop. The major market points for the study areas are Malya, Malampaka and Maswa Township. They all receive supplies from different parts of the district and act as centres where businessmen and women from various parts of the district or the country converge to buy the commodity. The local open markets (*minada)* also provide easily available and accessible market centres. In the prices do vary and the price quoted for gross margins in Table 14 are the averages.

A very unfortunate thing for cotton is that there is no or very little room for higher prices once the cooperative society or the private buyers have set the price. Both private buyers and societies provide low prices. The researchers and some of the farmers interviewed believe that private buyers want to put the cost of running their business on farmers and sometimes collude in reducing the gross margin. A bumper harvest does not mean that the farmer has increased income or is food secure, because of there is often a delay in making the payment for the crop, which frequently occurs, despite the many pleas from the farmers for payment.

2.4.9 Food Deficits and the Role Played by Rice in Food Security

The Food and Agriculture Organisation (1984) defines household food security, as the ability of a household to obtain sufficient food at all times so as to be able to live a healthy and sustainable active life. Food security can involve the whole production cycle from land preparation up to the point the food is ready for serving.

Food insecurity problems are a common phenomenon for some households in the District. This is due to the fact that the area is semi-arid. Table 16 below presents the general food situation in the District and in the study area. According to the respondents, the situation was worse particularly during 1996 to 2000 for those who did not grow rice, because other crops did not perform better in most places in the District. The main cause for food scarcity has been drought and this was for both the "rich" and "poor" farmers. There were many other intervening family problems, too many contributions leading to bankruptcy and delayed payments from the sale of cotton. Those who escaped famine had surplus rice from previous seasons, which could be stored successfully as a reserve.

Rice contributes better to food security due to its better storage qualities than many other crops in the study area. Then there are storage problem under the local situations for maize, sorghum and beans. Also, rice can be stored for a longer period. For instance the rice bumper harvest, which followed the El-Nino rains of 1997, could be found in stores during the field survey (April, 2000).

Table 15: Food Deficit Experiences in Study Areas from 1996-2000

Village	Year 1996-2000	% of Farmers	Main Reasons for the Deficit or No Deficit (frequently mentioned)
Mwaneghele	No (deficit)	90	Surplus rice from previous seasons
	Yes (deficit)	10	Bad weather, family problems
Shishiyu	No (deficit)	89	Surplus rice from previous seasons
	Yes (deficit)	11	Bad weather
Bukangilija	No (deficit)	99	Surplus rice from previous seasons
	Yes (deficit)	1	Drought, delayed payments from sales of cotton

Source: Field data, 2000

It is estimated that 250 kg of rice is the usual annual food requirement for a person and so the average household with six persons in the District will need about 1,500 kilograms of rice. On the basis of these calculations and a total average yield of 3,600 kilograms for the three villages (36 bags of 100 kg each) per hectare, the six person household will consume 6 x 250 kg = 1,500 kg. The amount of rice which remains, i.e. 3,600 – 1,500 kg= 2,100 kg can be traded.

In the market, the surplus can either be sold within the village or district, or outside the region and the country. Middlemen to neighbouring countries e.g. Rwanda, Burundi, and Zanzibar transport some of high quality rice. Alternatively, the surplus can be exchanged or bartered for maize, therefore flexible trade is possible, which allows for the exchange of produce.

The higher prices which farmers enjoy depend on factors such as variety and the time of selling the produce, as mentioned before. Rice has been the most important crop as seen in Table 16, when taking into account its advantages over other crops.

On the other hand, maize is also one of the food crops in the District consumed by many households. The price of this crop also varies during the season. Prices normally rise in the months of October to December. The gross margin for maize is comparatively the lowest than for cotton and rice. The price is an average of i.e. Tshs 140/= per kg. The calculations have taken into account the costs of inputs such as seeds and labour in man-days that are used in carrying out the various operations for maize cultivation.

Post harvest destruction by pests is very common as few farmers use modern techniques or improved traditional storage techniques. The most common pests include maize borer known as *Dumuzi* (*Prostephanus truncatus*) or *Scania* (colloquial Swahili) and *Kibungi* in Sukuma. This pest normally attacks maize and sorghum produce. Other pests include *Ngino* a Sukuma word meaning pests**,** which attack rice produce, such as birds and termites.

Table 16: Proportion of Respondents Ranking Various Crops as the Most Important Cash Crop

Crop	Rank	Respondents (%)
Rice	1	90
Cotton	2	75
Maize	3	65
Sorghum	4	60

Source: Field data, 2000

The popular storage methods are known locally as *Malogoto, Luli, Igologoto, or Ibelele. Luli* is a Sukuma word indicating a traditional storage hut made from trees whereas *Malogoto* are made from sorghum stems. A small percentage of farmers use bags for storage purposes, these are popularly known as *Sandalusi*.

The Maswa respondents said that they normally grew crops that served a dual (food and cash) purpose. Sometimes varieties with differing maturing times and different physiological needs were grown to reduce the risk of the effect of a dry spell at the most sensitive stages of the crop's growth.

Livestock ownership is also an insurance against food shortage, because many (60%) of the respondents in the study areas mentioned that income from the sale of livestock was used to buy food when crop failure has occurred. In this case, livestock was essentially one of the most important components of food security in the District.

In the past the role of cotton as the most important cash crop and an important buffer against food insecurity in the district was undisputed. Other crops such as sweet potatoes, cassava, legumes, sorghum, millet and maize were often inter-cropped with other crops or sometimes are grown in pure stand, have their share in the food security role. Most women grow sweet potatoes and dry (*mchembe*) them in the sun. This dried foodstuff is easy to store and is useful during periods of food shortages.

2.4.10 Status of Availability and Use of Inputs for Rice and Cotton Production in the District

There are several input supply points in the District. However most of these are based in the district headquarters. The input supply network is very poor in the District and therefore needs to be established and strengthened, while at the same time sensitizing the resource poor farmers to use them in their rice and cotton fields.

The problem of poor extension services and the unavailability of agricultural inputs have played big roles in lowering cotton production. The field results show that in Mwanhegele village 55% had not received advisory services, 57% for Bukangilija and 69% for Shishiyu. As for agricultural inputs, 64% of the population said the inputs (fertilizers, seeds, and pesticides) were available in Mwanhegele, the percentage was 56% for Shishiyu and 38% for Bukangilija. According to farmers the prices were too high for them to afford. The pesticides and fertilizers are not used by most of the small-scale farmers.

2.5 Suggestions for Increasing the Production of Cotton

In order to increase the production of cotton not only in the study area, but also in other areas where cotton grows well, the following is suggested:

- Farmers should organise themselves to form strong primary societies and start opening agricultural input shops.
- Where necessary, farmers should be given credit from relevant organisations e.g. co-operative banks, National Microfinance Banks, credit organisations etc. The Government of Tanzania should also reconsider providing loans for agricultural inputs.
- An improved incentives package for agricultural extension workers should be mandatory. This should include provision of transport (motorbikes), working gear (e.g. boots) and reasonably higher salaries.

In the National Agricultural Policy[28] the Maswa District is considered a semi-arid area, more suitable for drought-resistant crops only. Recommended food crops are millet, cassava, and sorghum. The last two crops are traditional food crops in the Wasukuma culture. What we observe now in the district is a contradiction of the national policy. Rice and maize are grown by more than 70% of the population now in the study areas, instead of the recommended drought resistant crops.

[28] NAP, 1982

3. OBSERVATIONS AND CONCLUSIONS ON FIGHTING POVERTY IN THE MASWA DISTRICT

3.1 Observations

The following are the general observations concerning rice and other crops in the area:

1. Rice has an upper hand in the economic contribution and in food security. It is an important component for improving the socio-economic contribution of livelihoods. There is a possibility of increasing its production by introducing improved varieties not presently available. Experience has shown that high yielding varieties are not the only solution; peoples' preferences and tastes need to be considered. There is a great potential to increase production and the market value of rice produced when improved varieties with good smell, taste, flavour and other attributes are introduced.
2. Drought tolerant and water use efficient varieties of crops need to be encouraged for production. They will improve production, because the lack of water as it normally occurs in drought years, will not drastically affect yields. Farmers need to be guided into the selection of best drought tolerant rice varieties.
3. The most essential element in rice farming is water run-off, but at present water is collected locally using very crude and uncoordinated traditional methods. Designing better ways of collecting water is recommended, especially the proper management of the catchments for the rice growing pastures.
4. For all crops, including rice, there is lack or limited access to advisory services within the study area. This affects the households leading to lack of improved production skills. It is recommended to device flexible and comprehensive extension services for all households in the District. The household should be the point of focus. There should be provision of inputs on credit, this will have an effect on the process of revamping productivity per unit area of land.
5. It has been observed that income from rice is used to purchase more livestock whereas income from livestock sales is used to acquire land for crop production including rice. Livestock has a major part to play in the household poverty alleviation strategies. This means that a correlation exists that those with more livestock own also larger areas of land.
6. Land and water shortages for both rice and livestock production are a reality. Farmers in the Maswa District need to think of alternative sources to reduce their dependence on rice and livestock. It is now important to the farmers and the district authorities to think of livestock production systems that efficiently use the diminishing water and land resources.

3.2. Conclusions

Briefly, the main conclusions of this study are:

1. Rice has significantly contributed to poverty reduction. Income from rice provides poor farmers with the financial capability to purchase goods and services such as ploughs, pay school fees, medical service, etc. However, production of rice relies heavily on rainfall and availability of suitable land. Major improvements in rice production are possible.

2. Gradual replacement of cotton pasture by rice is taking place where the same soil e.g. *Itogoro* used mainly for rice, suits both cotton and rice cultivation. However, when prices of cotton improve there is the possibility for many farmers to cultivate more drought tolerant cotton than a water-dependent crop such as rice. Despite the present disincentives caused by low prices of cotton, it is still possible to produce more cotton if farmers are motivated by the provision of better prices and timely payments by crop purchasing agents. Cotton has the advantage over rice that it can better withstand drought.

APPENDICES

Appendix 1: Features Of The Wasukuma Farming System

1.1 Major Economic Activities

The major economic activities in the Maswa district are small-scale agriculture and livestock keeping. Small-scale holders dominate the farming system. Almost all rural households in the district are engaged in subsistence rain-fed agriculture[29]. The level of technology is low and mainly hand hoe and draught animals are commonly used in the cultivation activities.

1.2 Rice Cultivation Practices in the Maswa District

Rice as a crop is cultivated by majority of farmers on a considerable scale. The timing of planting and transplanting of rice is of major importance in relation to the availability and usage of rainwater for rice production. It determines the yields of the crop.

The preparation of nurseries is delayed as late as February due to flooding or insufficient early rains. Under such circumstances and in anticipation of late rains the *supa* variety of rice is grown because of its shorter growing season. Except for those few who grow large areas (say in excess of ten hectares), farmers who cultivate with oxen spend only a few days preparing their nurseries for planting. Farmers who cultivate by hand also spend only a few days in nursery preparation, as the final cultivated area would be up to a hectare. Because of the short preparation time and of the harmful effects of late planting, rice growers are encouraged to prepare nurseries early in the rainy season. The time of preparation of rice plots depends on availability of labour and, perhaps to a lesser extent, by water. During December/January, the rainy season is at its peak and the amount of moisture in the soil is usually adequate to undertake wet cultivation.

To plough 0.4 hectare (an acre) of *Mbuga* land, a team of four oxen and two adults (usually men) with one plough will take about two days; hand ploughing would require up to about 15 man-days (in practice often 'woman-days'). Land levelling often follows ploughing by oxen and the time and resources necessary could equal that for ploughing[30]. (Fewer man-days are needed if the soil is of *Itogoro* type.

Transplanting follows immediately after field preparation. This is a labour intensive activity. Particularly among hand cultivators, the sequential nature of preparation and transplanting requires the farmers to work only on small areas at a time, often on a plot-by-plot basis. The time lag between the first and the last transplant could be as long as two months. This brings the last transplanting well into the month of February.

In February and March there are usually dry spells, sometimes lasting as long as four weeks, when neither transplanting nor preparation of wetland can be undertaken. At about this time the maize planted in December or early January increases the demand for labour even further. This means that during harvest some rice plants have to remain in the nurseries for up to about four months, two thirds of the crop duration.

[29] URT, 1996
[30] Patel and Charugamba, 1981

This is of course detrimental to obtaining good yields, although, since most of the rice varieties being used are slow maturing, the delay in transplanting is less harmful than it would otherwise be. Transplanting delays, inherent in the current agricultural calendar, preclude the potential use of high-yielding varieties.

Due to too much labour required most do not grow transplant rice as in other areas such as Tabora, which is capable of yielding about 20% more than broadcast rice[31]. Transplanting of rice is done at the onset of rain. Flooding caused by heavy early rains often delays planting in the lower-lying parts of the *Mbuga*. At the same time such rains favour early planting on the upper parts, i.e. the seepage zone. There is evidence that some rice growers respond by shifting their cultivation from one zone to another at the beginning of the crop season. However, in some cases land tenure can prevent this. While the above analysis points to labour constraints as the cause of delay in transplanting, others, for example Mansfield (1982) and Moorman and Breemen (1978), suggest that farmers deliberately extend the period of transplanting to reduce the overall risk of crop failure due to droughts.

1.2.1 Labour Arrangements for Rice Cultivation

Throughout the District, except perhaps in a few villages, labour shortage is a constraint to increasing agricultural production. Other crops compete with rice for the limited available labour. Only a small proportion of the extensive *Mbuga* and *Itogoro* lands in the District are cultivated because additional labour is needed for growing maize and other upland crops.

Labour is available in some villages where a 'poverty trap' exists. In the absence of agricultural credit facilities or individual savings (e.g. cash, food and livestock), some people in those villages with low per capita upland agricultural productivity remain trapped in a poverty cycle. Poverty prevents them from cultivating their own land because they are unable either to buy seeds and other inputs in time and/or to survive without any income while waiting for the harvest. Such people offer their labour for wages, often to those in other villages.

1.2.2 The Use and Availability of Draught Animals

Draught animals are used for crop cultivation, and in doing so compensate for a labour shortage. Their use is widespread for rice cultivation and consequently eases the labour constraint. The Wasukuma tribe combines ownership of large numbers of cattle with extensive crop production. The families that own work animals usually spare some of them for renting only after their own fields have been prepared. The cost of hiring oxen, which is usually based on area cultivated, varies from village to village[32].

1.2.3 Mechanisation

Fields cultivated by motorised equipment are very few or extremely rare. There is much preparation to be done before many people opt for mechanisation. Their need for mechanisation is hampered by high costs of the tractors, spares and fuel. Also maintenance costs are high.

[31] Patel and Charugamba, 1981
[32] Meertens et al, 1991

APPENDIX 2: ACTIVITY CALENDAR FOR COTTON AND RICE

2.1: Activity Calendar for Cotton

Crops & Activities	Months / Activities											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Land Preparation									■	■	■	■
Planting											■	■
Weeding	■	■										■
Harvesting				■	■							

2.2: Activity Calendar for Rice

Crops & Activities	Months / Activities											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Land Preparation									■	■	■	
Planting										■	■	■
Weeding	■	■									■	■
Harvesting			■	■	■	■						

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