SOCIO-ECONOMICS OF LAND DEVELOPMENT FOR SUSTAINABLE AGRICULTURAL PRODUCTION IN SOME VILLAGES IN MIKESE DIVISION, MOROGORO DISTRICT, TANZANIA.

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EXECUTIVE SUMMARY

The purpose of this study was to examine the socio-economics of resource use in the traditional farming system in selected villages in Mikese Division, Morogoro Rural District. Data collection was based on surveys using a structured questionnaire. Tools of analysis employed included descriptive statistics, gross margins, multiple regression and correlation analysis.

The results reveal that most of the farmers in the survey area have one plot around the homestead and additional plots located away from the households. Households with one plot vary from 35% in Mkambarani to 45% in Fulwe. Forty to thirty five percent in Rubungo and Maseyu respectively have one plot. In basically all villages, households with 2 to 3 plots ranges between 30 and 45 percent. About 25% of the households in the villages have 4 to 5 plots. Households with more than 5 plots range from 4% in Rubungo to 10% in Maseyu.

Thirty five to forty five percent of the households in the four villages have their plots located 1.0 km away from the homesteads. A greater percentage of households from Fulwe and Maseyu however, have their plots located some 2.0 km away from the homesteads. Only 20% of Rubungo and 15% of Mkambarani have their plots located 2.0 km away from the homesteads. Plots located 3-5 km away from the homesteads vary from 10-15% in Rubungo, Fulwe and Maseyu and 10-25% in Mkambarani.

The average cultivated area per family ranged from 10.5 to 23.5 hectares for all crops. The main crops grown in the four villages are maize, paddy, cotton, sesame, sunflower, cowpeas and cassava.

The results indicate that maize was grown in all villages and form the biggest crop farm size. Maize yields per hectare varied from 800 kilogrammes per hectare in Rubungo to 1000 kilogrammes per hectare in Mkambarani. Paddy, which forms the second biggest crop farm size is mainly grown in Mkambarani (3.5 ha per household). The other villages grow about 1.0 ha per household.

Cotton which forms the third biggest farm size in the villages studied yields 2,500 kilogrammes per hectare in Maseyu and 3,500 kilogrammes per hectare in Mkambarani.

Mkambarani has also the biggest hectarage of sunflower with 3.9 ha per household, followed by Rubungo, Maseyu and Fulwe with 1.4, 1.3, and 1.2 hectares per household respectively.

Mkambarani appears also to lead in cassava production, 1.8 ha per household followed by Rubungo and Maseyu with 1.2 ha per household each. Fulwe has an average of 0.8 ha per household.

The yields of both cash and food crops are relatively low in Rubungo, Fulwe and Maseyu, but comparatively higher in Mkambarani. There is, in general, very small variation of yields across village households. The low yields in these villages are attributed to low or no application of improved modern technology e.g. fertilizers, insecticides, improved seed varieties etc.

Apart from land, labour is the second principle resource in agricultural production. Family labour is the most important source of labour in the villages surveyed. The size of the family labour determines the size of the farm and the timing of operations. The household size average ranges from 13 persons (male and female) in Rubungo to 16 persons in Mkambarani. These are distributed into different age groups corresponding to total man equivalent of 10.0 persons for Rubungo and 11.5 persons for Mkambarani. Given the available family labour in the area, it appears that there is no labour constraint throughout the year. The surplus labour is utilized for off-farm activities to generate additional income.

The results indicate that cotton demands the highest amount of labour forming 172 mandays, followed by paddy and maize with 136 and 128 mandays respectively. The study shows that maize, paddy and cowpeas were preferred as the priority palatable crop choices for all the villages. The findings also reveal that farmers practice a combination of traditional farming systems with very few farmers applying tractorization and fertilizer.

Taking all the crop enterprises as a block, the results reveal that cotton gives the highest gross margins per hectare and the highest net returns per manday. Returns per manday are highest in Mkambarani, followed by Rubungo, Fulwe and lastly Maseyu. In terms of food crops, both maize and paddy have relatively good gross margins per ha and net returns per manday.

The results seemingly indicate that the main constraints which affect sustainable increased crop production are low financial capital, unreliable markets and poor marketing policies, low producer prices, problem of wild animals and pests and inadequate extension services. Twenty two to thirty eight percent of the farmers interviewed did not know the major problems affecting food production in their area.

Charcoal making and brewing of local beer were the most abundant off-farm activities in the four villages studied.

The multiple regression analysis and correlation coefficients show that farm size, family labour and technology have a positive impact on crop yields.

The study prescribes some remedial measures to ameliorate the problems and improve sustainable increased crop production in the district.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

In Tanzania the majority of the population directly depends on agriculture as a source of food income and employment. About 85 percent of the population is engaged in agriculture (United Republic of Tanzania (URT), 1992). According to the 1988 population census, population growth rate for Tanzania was estimated at 2.8 percent (URT, 1988). The projection for the year 2000 is at around 33 million people. Agriculture therefore has to meet the challenge of providing for the demands of this growing population. The potential solution to this would be to increase agricultural production in a sustainable framework.

In a logical framework approach, sustainable agricultural production implies a realized need to produce adequate output over time without irreparably damaging the natural resource base and the need for a systems focus.

Basically environmental concerns due to agriculture include eroded soils, overgrazed areas, drought, deforested lands, and polluted water. Some of the indicators of existence of environmental problems are land degradation due to soil erosion and loss of soil nutrients, decline in yields, drought and fuel-wood shortages. Studies conducted in various parts of Tanzania (Rutachokozibwa *et al.*, 1993) have revealed that expansion of land resource either for the purpose of establishing agricultural plantations or increasing area under smallholder subsistence production have sometimes resulted in environmental deterioration.

Todate in Tanzania available statistics indicate that food crop production had been increasing at an average rate of 5 percent per annum between 1972 and 1984 (Ministry of Agriculture and Livestock Development (MALDC), 1984; Bank of Tanzania (BoT) 1991; Due, *et al.*, 1986), while that of cash crop declined by 3.5 percent giving an average growth rate of 3.6 per annum.

The increase in crop production came primarily from area expansions, while yield per unit area has been declining at the rate of 1.4 percent for food crops and 1.2 percent for cash crops. This implies that increased output is mainly determined by increased acreage cultivated.

The performance of the agricultural sector in Morogoro Region and so in Morogoro Rural District has not been better than that of the country as a whole. The agricultural sector is a main source of income in Tanzania. Morogoro Rural District is predominantly agricultural dependent with majority of their people generating their incomes from agricultural production activities.

Nevertheless available statistics from the Regional Office reveal that marketed produce in Morogoro declined during 1978/79, to

1981/82 period (Anandajayasekeram and Shayo, 1984). The decline in agricultural production appears to have been arrested as of 1985/86 due to change in government agricultural and marketing policies.

One of the most commonly discussed problems to agricultural production has been peasant farmers (especially women) limited access to resources to increase production. Certainly, studies have shown that although smallholder farmers use their resources efficiently given their objectives (Schultz, 1964; Anandajayasekeram, 1986), most of the farming systems in Africa are characterized by low agricultural productivity. There is need therefore to improve agricultural productivity which can be brought at farm household level. However, it is the contention of the researchers that there is need to address the causes of low productivity.

Is it that the farmers are irrational? Has research failed to deliver better goods? or have the agricultural policies failed to respond to the needs of the agricultural sector? These questions are vital because the performance and sustainability of any farming system is influenced by the level of technology, policy environment which influences incentives, types of institutions serving agriculture; physical environment such as weather, soils, etc, and socio-cultural factors to which farmers respond.

The researchers argue that despite the fact that many small-holder farmers in Tanzania still practice traditional farming by the slash and burn method of land clearing, most of the commercial farms are adopting some form of mechanized land clearing techniques.

This study intends to contribute to the ongoing farming system studies on land development for sustainable food production in Morogoro. This is the central theme for a research project which is expected to last for 3 years. Experimental site has been selected and set in one of the areas surrounding the villages and the project is on progress.

The study will attempt to address the socio-economics of resource utilization under the traditional farming system in the study area. It will identify the production related constraints to more effective crop production system at the household level. The results of the survey will form the baseline data for the ongoing land development project.

The main objective of this research is to study the socio-economics of resource use in selected villages in Morogoro Rural District around the Kitulanghalo Forest Reserve.

Specifically the baseline study aims:

1. To investigate and identify the various physical, technological and policy factors that influence crop production within the traditional farming system in the villages.

2. To identify the production related constraints and problems to more effective sustainable crop production at the household level.

3. To make recommendations of improving agricultural production and productivity at the household level.

2. BACKGROUND INFORMATION ON THE STUDY AREA

2.1 Location

Morogoro District where the study was based, is one of the four Districts of Morogoro Region. The others are Kilosa, Ulanga and Kilombero. The District is between latitudes 5^0 and 7^0 south and longitude 38° and 40° east of the Greenwich meridian. Morogoro, the capital municipality of the Region, is within the District of the study and is about 220 km west of the city of Dar es Salaam, the biggest town in the country (Fig. 1)

The study was conducted in four villages, Maseyu, Rubungo, Fulwe and Mkambarani (Fig. 2).

2.2 Climatic conditions

Day and night temperatures vary widely within the District. This is attributed mainly to the wide variation in altitude that exists. Temperatures are as low as 14^0C in the high altitudes to as high as 36^0C. The altitude vary from 150 to 2,700 m above sea level.

The District annual rainfall ranges from 400 to 1000 mm. Across the District rainfall distribution is quite uneven and reliability is somewhat higher in the upper altitudes when compared to the lower areas. The rainfall is bimodal in character. However, in the past 5 - 10 years the bimodal nature has become less prevalent because of frequent failure of the short rains. Normally short rains are expected in October to January period and long rains from March through May.

A dry spell is normally observed in February and in some years it extends into the following months causing serious set backs in crop yields. The short rains in the lower altitudes are often unreliable making it difficult to support most crops with the exception of beans. The long rains have their peak in April, and are the main determinant of a good or bad year in terms of crop production.

2.3 Soil types

The soils of the study area are categorized into three groups including (a) very deep, well drained, dark readish brown, sandy loams and sandy clays on the steep convex slopes (b) very deep, well drained, dark brown to dark red, sandy clays on the linear slopes and (c) very deep, well and imperfectly drained sandy loams to sandy clay loams and sandy clays in the valley bottoms (Msanya *et al.*, 1995). The soils show remarkable differences even within short distances, implying that if sound fertilizer recommendations are to be effected, much effort has to be devoted to delineate the areas over which the recommendations apply.

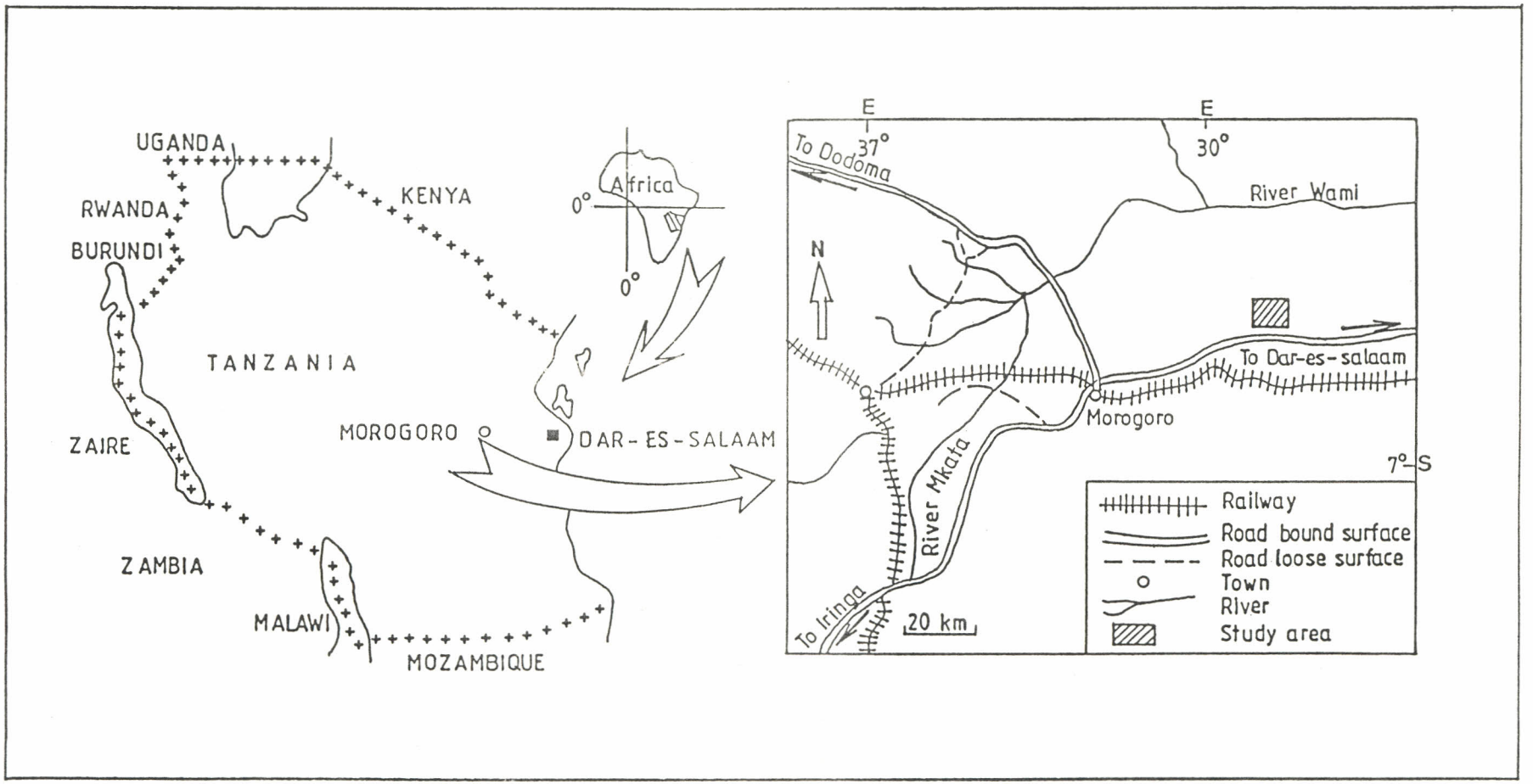
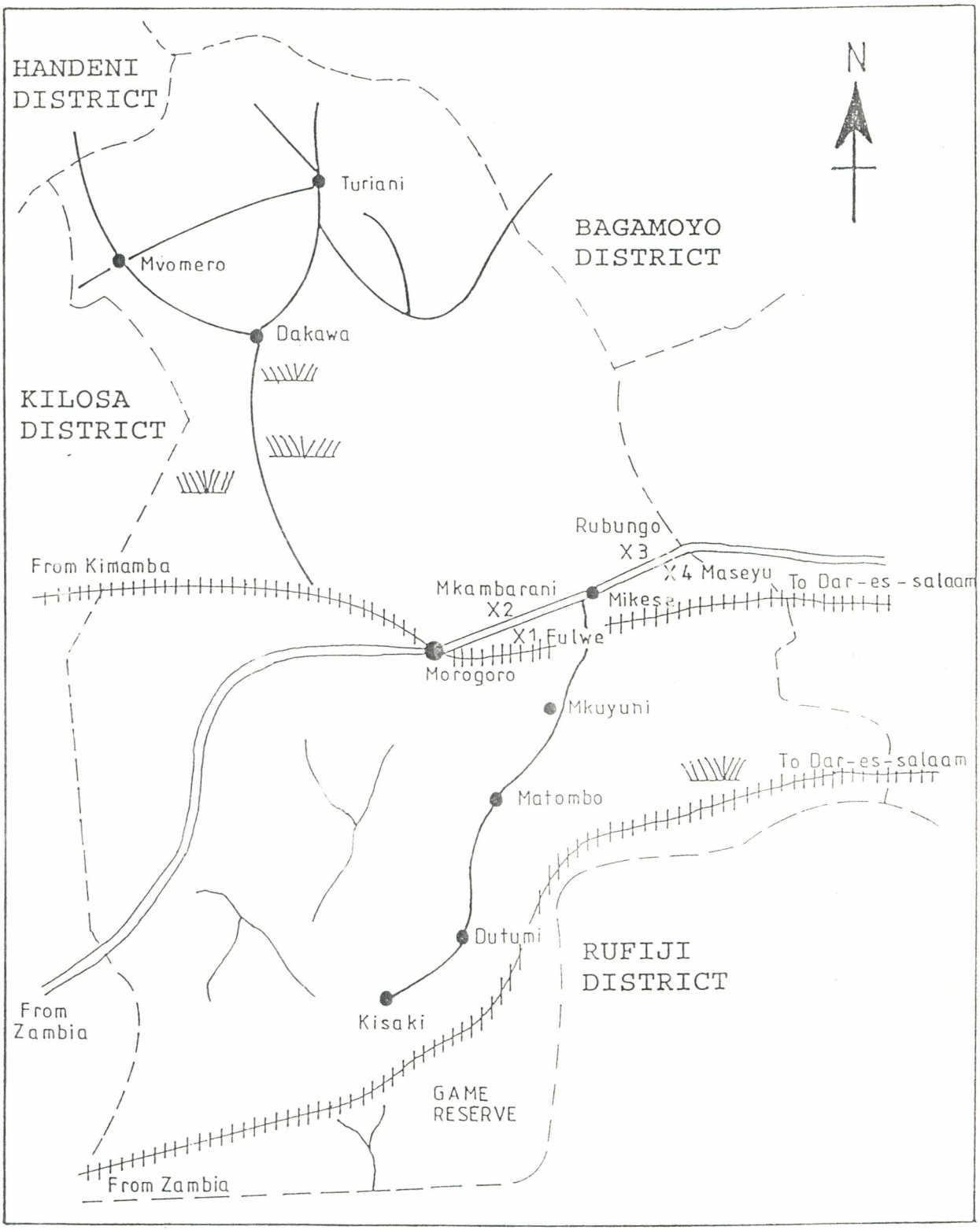


Figure 1. Location of the study area



LEGEND

Railway
Tarmac road
Loose surface road
District boundaries
Swamps
X1 X2 X3 X4 Sample villages
Rivers

Figure 2. Morogoro District: Location of sample villages

2.4 Vegetation

Morogoro District's natural vegetation consists of forests which occur on the higher altitudes and occupy a reasonably large area. In the lower altitudes, woodland covered by the Miombo is predominant. According to the report by Msanya *et al.*, (1995), three main vegetation types were identified: Acacia-Combretum Woodland dominated by *Acacia sp. and Dombeya sp.*; Semi-deciduous Woodland dominated by *Scorodophloeus fischeri, Manilkara sulcata and Dobera loranthifolia*; and Zambezian Miombo Woodland dominated mainly by *Brachystegia spp.* Along the hill slopes, where the soils are rather infertile, grass types including *Hyparrhenia* are common.

2.5 Human population

According to the 1988 population census (Bureau of Statistics, 1988), Morogoro region human population was 1,222,737 of which Morogoro District's share (Morogoro Urban inclusive) was 549,555 implying 431,795 for Morogoro Rural and 117,760 for Morogoro Urban respectively.

2.6 Socio-economic conditions

The transportation network is still poorly developed and those who enjoy quick services are largely in the villages near the truck roads or railways e.g. Mkambarani, Rubungo, Maseyu and Fulwe. Feeder roads especially in the higher altitudes, are impassable with ordinary vehicles during the rainy season. Delivery of inputs and disposal of outputs to markets depends in part on head transport, sometimes for long distances. The Zambia - Tanzania highway that passes through the District is used more for cargo transportation rather than passengers. The Dar es Salaam Kigoma/Mwanza railway built in 1907 also passes through the District. Due to deterioration of the beds and age of the rails, the railway lines are is often troubled with derailment.

Water for irrigation and domestic use is inadequate, notwithstanding the rural water supply projects in operation for over 15 years. Many villages still do not have clean tap water supply. In some locations, women and children walk 5 km just to fetch water for cooking and long distances to reach health clinics in town.

In terms of marketing aspects and channels, a considerable volume of the crops produced are marketed in the parallel markets where pricing efficiency is higher than in the formal sectors such as cooperative unions and designated parastatals like National Milling corporation and Tanzania Cotton Authority.

2.7 Agricultural supportive and extension services

The extension services has a weak linkage with research. To date, it has widely been criticized for failing to conduct effective extension programmes. Since the 1960's there has been an insufficient success in increasing agricultural output through the application of modern farming techniques, (Hulls, 1972). The reasons for failure have been attributed to lack of funding, poor planning, poor logistic support such as transport and credit facilities, low technical and educational competence of the extension personnel. Nevertheless, it is indeed unfair to deplore the extension agents in the District. The government agricultural policy interventions and the failure of the research extensions system to generate technological innovation packages suitable to the farmers conditions have negatively affected the extension services.

3. METHODOLOGY

3.1 Data sources

3.1.1 Primary data

Primary, data were collected from farmers in Maseyu, Rubungo, Fulwe, and Mkambarani villages in Morogoro District during October to December, 1994. These data include household farm sizes, household composition, area cultivated to various crops, distance between household and farm location, crop yields, labour requirements, input supply (in form of seeds, fertilizer, farm manure composite, herbicides) and use, input and producer prices, credit facilities and availability of extension services.

3.1.2 Secondary data

The secondary data pertaining to input supply, credit, producer and input prices, potential yields (based on improved technology levels) and crop marketing arrangements were collected from Cooperative Societies and Unions in Morogoro, Marketing Development Bureau, Ministry of Agriculture and Livestock Development and Cooperative Rural Development Bank.

3.2 Sampling procedures

A purposive sampling technique was used to select the four villages on the basis of (a) existence of a resident village extension worker and (b) accessibility. From each selected village, a list of farmers was obtained using a corrected village register. This list was treated as a sampling frame from which a random sample of farmers was drawn for detailed study. A simple random sampling without replacement technique was adopted to get the sample size needed. The farmers were randomly selected by a system involving writing their names on pieces of paper which were then stuffed. The stuffed pieces of paper with names were then picked randomly one at a time, after each shuffling, until the required sample size was obtained.

3.3 Methods of data analysis

3.3.1 Descriptive analysis

Descriptive analysis involved the use of statistical means, standard deviations, ranges, cross tabulations, graph and frequency distributions, as analytical tools. This technique was used to explain the household farming system in the study area.

3.3.2 Gross margin analysis

Conventionally, gross margin is defined as gross revenue less variable costs. The computational formulae for gross margin (GM) used were gross output multiplied by price less production costs = gross returns, and GM = gross returns - total variable costs (TVcs).

Gross margin analysis was used to assess the annual profitability of the crop enterprises that compete for the resource use in the area. The gross margins were computed for the selected crop mix namely maize, paddy, cotton, sesame, cowpeas, cassava and sunflower.

3.3.3 Multiple regression model

Multiple regression is used to assist in drawing inference on the target household village population using the sample data. Multiple Regression provides a measure of relations among a set of variables for the purposes of predicting the dependent variable or estimation of specified coefficients.

One way of comparing productivity is to look at those factors that influence the value of the total production which forms the dependent variable.

The independent or explanatory variables ($x_i S_z$) were those factors that seem important in affecting the value of total production in the study area. In this case they included land area, female and male labour, small holder farm operating expenses, size of the household and improved technology.

3.3.4 Model specification

The Regression model is specified as follows:

$$Y = B_0 + B_1X_1+B_2X_2+B_3X_3+B_4D_4+B_5D_5+ Ut$$

Where:

Y	=	Average yield output of crop in kg per hectare
X_1	=	Average farm area in ha of crop grown
X_2	=	Average farm operating expenses in Tz. shs.
X_3	=	Average family labour used measured in mandays per ha
X_4	=	Dummy for tractorization
D_5	=	Dummy for fertilizer use
B_0	=	Constant
B_1-B_5	=	Partial coefficients
U_t	=	Human random disturbance term.

On *a priori* basis it is presumed that expected signs are as follows:-

X_1 X_2 D_4 and X_5 = positive signs (+ve) and
and X_3 = negative signs (-ve).

4. RESULTS AND DISCUSSION

This section attempts to describe succinctly the characteristics and major socio-economic and technological constraints facing the sampled households or farmers. The focal emphasis is placed on the utilization of land resource, labour and capital by the sampled farmers.

4.1 Farmers' objectives, priorities and resource endowments

Farmers' objectives and priorities are manifested in what they perform on their farms. Planning to change farmers' management is best done with priorities in mind. Thus in trying to introduce new improved technologies and technological components in promoting sustainable agricultural production, it is imperative that the researchers and policy makers are aware of farmers' priorities.

Presumably farmers have to satisfy their priorities with the resources at their disposal and if adaptive experimentation is to be relevant, it must result in improved farm management husbandry practices which can be implemented within the level of resource which farmers are able and willing to invest.

4.2 Land availability, use and locations

Land in all locations of the sampled households is not abundant and users' rights predominate and original user has some hold over the land while it is under fallow[1]. Most of the farmers had more than one plot located at different sites around the village as indicated in Table 1.

According to Table 1, about 25 to 45 percent of the sampled households own one plot and the remaining households have additional plots ranging from two to five and above. However, locationally the average distances from each respective household homestead to plots sites, vary considerably across the villages (Table 2). The implication of the distance variance is that the farmers would need to spend additional time and energy to travel to the plots sites which range from one to five kilometres and above. This would invariably have an adverse effect on the labour availability and use. These observations are in conformity with findings reflected by previous studies on farming systems in Morogoro and Tanzania in general (Anandajayasekeram, *et al.*, 1981). Studies conducted in Morogoro and Kilosa districts have also shown that there is a low person/land ratio of approximately 20 hectares available for each family.

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[1] Personal communication with some of the cell leaders whilst administering and supervising the enumerators.

However, it must be realized that notwithstanding that the person/land ratio is relatively low, much land cannot be cultivated because of mountains, steep hills, swamps, woods or forest lands among other factors.

It follows that almost all or part of the land can only be cultivated for specific years consecutively, and then it is left fallow.

In terms of land use *per se* the cultivated area per family in the sampled village households ranged from 10.5 to 23.5 ha (Table 3). On the basis of crop combination across the villages, maize was grown in all villages and constitute the largest crop farm size as compared to the rest of the crop enterprises. Maize dominates as the chief food crop whereas cotton and sunflower usually dominate as cash crop and were grown by all the sampled households. Policy-wise, unless under special conditions pertinent to incurable disease or old age, it is compulsory for every household to plant one acre (0.4 ha) of cotton in all villages where cotton can grow. Cassava is considered to be the alternative crop during drought periods simply because it demands a relatively small amount of moisture after planting time.

Table 1: Distribution of number of plots per household in percentage

No. of Plots	VILLAGES			
	Rubungo (%)	Fulwe (%)	Maseyu (%)	Mkambarani (%)
1	40	45	35	25
2	20	20	30	15
3	15	10	10	30
4	10	10	15	15
5	10	15	10	10
above 5	4	5	10	5
Total	100.0	100.0	100.0	100.0

Source: Own diagnostic survey data, 1994.

Table 2: Average distance from home to sites of plots per average household in percentage

Distance in Km.	VILLAGES			
	Rubungo (%)	Fulwe (%)	Maseyu (%)	Mkambarani (%)
1	40	45	35	35
2	20	40	30	15
3	15	10	10	20
4	10	10	15	15
5	10	15	10	10
above 5	5	5	10	5
Total	100.0	100.0	100.0	100.0

Source: Own diagnostic survey data, 1994.

Table 3: Distribution of main crops average hectarage by village household

Crop	H E C T A R A G E			
	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	2.5	2.3	2.9	5.5
Paddy	0.9	1.1	1.2	3.5
Cotton	1.5	2.0	1.7	4.0
Sesame	1.0	1.0	1.0	2.3
Sunflower	1.4	1.2	1.3	3.9
Cowpeas	2.0	1.1	0.9	2.5
Cassava	1.2	0.8	1.2	1.8
Total	10.5	9.5	10.2	23.5

Source: Own diagnostic survey data, 1994.

4.3 Crop yield levels of major crops and average production input costs

The major crops in the survey area is maize, paddy cotton, sesame, sunflower, cowpeas and cassava. The average yield levels of the selected major crops with recommended yield levels for comparison purposes, are indicated in Table 4(a) and 5 respectively.

Results from Table 4(a) shows that it is only households in Mkambarani village who have achieved relatively high yields compared to the remaining villages of Rubungo, Fulwe and Maseyu. This could be attributed to the high proportion of farmers in Mkambarani village who apply modern farming techniques such as fertilizer application and improved seeds among others.

A considerably small variation existed in yields across village households. Maize yield per hectare for instance varied from 800 kilogrammes per hectare in Rubungo to 1000 kilogrammes per hectare in Mkambarani.

Cotton yields was 2,500 kilogrammes per ha in Maseyu to 3500 kilogrammes per hectare in Mkambarani (Table (4a)

However, based on research station experiments at Ilonga, Tanzania (Table 5), these yields are relatively low with the exception of Sesame in Mkambarani and cotton in all the villages.

The low yields are attributable to lack of adequate moisture and low or no application of improved modern technology like use of fertilizers, insecticide, compost or farm yard manure, improved seed varieties, etc.

The average production input expenses per ha in the study area are summarized in Table 4(b).

Table 4 (a): Average yields per hectare of major selected crops per households.

Crop	Rubungo		Fulwe		Maseyu		Mkambarani	
	No. of Farmers	Yield (Kg)	No. of Farmers	Yield (Kg)	No. of Farmers	Yield (Kg)	No. of Farmers	Yield (Kg)
Maize	20	800	25	600	20	750	30	1000
Paddy	15	900	10	600	15	900	25	950
Cotton	10	2500	10	1800	10	2000	15	3500
Sesame	8	750	9	750	9	800	12	850
Sunflower	9	600	10	600	4	950	10	1050
Cowpeas	2	800	11	800	3	500	5	900
Cassava	20	800	12	950	13	850	25	1500

Source: Own diagnostic survey data, 1994.

Table 4(b): Average production input expenses per hectare reported by the farmers by crop in T.shs.*

Crop	Farmers' responses from			
	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	13,500/=	16,000/=	12,900/=	25,000/=
Paddy	21,000/=	20,100/=	18,100/=	32,500/=
Cotton	13,500/=	11,000/=	10,000/=	33,000/=
Sesame	12,500/=	15,500/=	14,500/=	22,000/=
Sunflower	10,500/=	11,000/=	11,000/=	19,250/=
Cowpeas	2,500/=	3,500/=	18,500/=	14,000/=
Cassava	8,000/=	10,000/=	7,500/=	13,000/=
Total	81,500/=	87,000/=	92,000/=	158,750/=

Source: Own diagnostic survey data, 1994.
(*) The production total variable input costs included seeds hired labour, tractor costs, bags, fertilizer expenses, and transport costs.

Sorghum was only recorded in the sampled households in Mkambarani village but was not recorded in the other villages in the survey. Otherwise it is a potential crop grown in the area and Morogoro at large.

Table 5: Ilonga research station, Tanzania: Yield of selected crops 1983/84

Crop	Variety	Yield per ha (kg)
Maize	Kito	3,000
	Katumani	2,500
	I.C.W. Staha	4,000
	Staha	4,500
Sorghum	Lulu	2,500
	Serena	2,800
	Tegemeo	3,000
Cotton	IL74	2,000-3,500
Sesame	Movana	850
Sunflower	Record	1,500
Cassava	Kigoma	4,200
Cowpeas	Tumaini	1,500-2,300

Source: Ilonga Research Station Kilosa, 1984.

4.4 Labour availability and utilization

Since most of the farmers in the survey area do not use purchased inputs, the principle resource used in agriculture in addition to land is labour. An understanding of the demand and supply for labour is a pre-condition in the design of improvement of small-holder agriculture. Family labour is the most important source of labour. Capital in this situation, is an augmenting resource, it can be used depending on its availability to offset deficiencies in either land or labour to a certain degree. The size of the family labour determines the size of the farm and timing of operations.

The household size averages are presented in Table 6. The size average range from 13 persons (male and female) in Rubungo to 16 persons in Mkambarani village. Male headed households (MHHS)and female headed households (FHHS) do not vary very much across village households in terms of family size and behaviour.

Table 7 which reveals the average number of corresponding man-equivalent by heads of households indicates that sampled man headed households and female headed households has a man equivalent of 10.0 persons for Rubungo village whereas Mkambarani has 11.5 (male and female). The available mandays per months are shown in Table 8.

In calculating labour inputs for different age groups, four major groups have been categorized. Category (1) includes people between the age 0-17 years whose adult-equivalent value is taken to be 0.5 unit. Categories (2) and (3) which include persons between 18-35 and 36-55 years old respectively have adult equivalent taken to be one unit. In category (4) in which people are above 55 years is

assigned 0.5 adult equivalent ratio. This type of approach in computing adult equivalents in the traditional farming system has been practiced successfully by other researchers in Morogoro region (Anandajayasekeram and Shayo, 1985; Mlambiti and Mlay, 1992).

Table 8 indicates the compilation of effective mandays of labour available per family by month bearing in mind the average adult equivalent of farm labour depicted in Table 7.

Rainy days and social events like holidays, sundays, weddings, festivals, funerals, and travelling usually affect labour availability per month for an average family. As such they are deducted from the month total days to arrive at net working days

Table 6: Average number of persons per household by age group

Age group	Rubungo		Fulwe		Maseyu		Mkamba-rani		Household size	
	F	M	F	M	F	M	F	M	Total (FHHS)*	Total (MHHS)**
0-17	3	3	3	4	3	2	3	4	12	13
18-35	2	3	2	2	2	1	3	2	9	8
36-55	1	1	1	1	1	1	1	1	4	4
56 and above	0	0	1	1	0	0	1	1	2	2
Total	6	7	7	8	6	4	8	8	27	27

Source: Own diagnostic survey data,1994.

* Female Headed Households (FHHS)** Male Headed Households (MHHS)

Table 7. Average number of person per household by age group and the corresponding adult-equivalent

Age group distri-bution (years)	Rubungo				Fulwe				Maseyu				Mkambarani			
	Av. no. FHHS	Av. man equiv. FHHS	Av. no. MHHS	Av. man equiv. MHHS	Av. no. FHHS	Av. man equiv. FHHS	Av. no. MHHS	Av. man equiv. MHHS	Av. no. FHHS	Av. man equiv. FHHS	Av. no. MHHS	Av. man equiv. MHHS	Av. no. FHHS	Av. man equiv. FHHS	Av. no. MHHS	Av. man equiv. MHHS
0-17	3.0	1.5	3.0	1.5	3.0	1.5	4.0	2.0	3.0	1.5	2.0	1.0	3.0	1.5	4.0	2.0
17-35	2.0	2.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	3.0	3.0	2.0	2.0
36-55	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
56 and above	0.0	0.0	0.0	0.0	1.0	0.5	1.0	0.5	0.0	0.0	0.0	0.0	1.0	0.5	1.0	0.5
Total	6.0	4.5	7.0	5.5	6.0	5.0	8.0	5.0	6.0	4.5	4.0	3.0	8.0	6.0	6.0	5.5

Source: Own diagnostic survey data, 1994

FHHS=Female Headed Households
MHHS=Male Headed Households

Note: (1) 0-17 and over 55 are assigned an adult equivalent value of 0.5 unit
(2) 18-35 and 36-55 are assigned 1 unit man equivalent

Table 8: Calculated available mandays per month for an average family in Rubungo

	Total days available	Less sundays	Less holidays and occasions	Net working days	Total mandays in (MHHS)*	Total mandays in (FHHS)**	Grand total mandays
Month	1	2	3	4 {1-(2+3)}	5	6	7 (5 + 6)
January	31	4	1	26	143	117	260
February	28	4	1	23	126.5	103.5	230
March	31	4	1	26	143	117	260
April	30	4	2	24	132	108	290
May	31	4	1	26	143	117	260
June	30	4	1	25	137.5	112.5	250
July	31	4	1	26	143	117	260
August	31	4	2	25	137.5	112.5	250
September	30	4	1	25	137.5	112.5	250
October	31	4	1	26	143	117	260
November	30	4	1	25	137.5	112.5	250
December	31	4	2	25	137.5	112.5	250
Total	365	48	15	302	1661	1359	3020

Source: Calculated from table 7

* MHHS = Male Headed Households
** FHHS = Female Headed Households

Table 8 (contd.): Calculated available mandays per month for an average family in Fulwe

Month	Total days available	Less sundays	Less holidays and occasions	Net working days	Total mandays in (MHHS)*	Total mandays in (FHHS)**	Grand total mandays
	1	2	3	4 {1-(2 + 3)}	5	6	7 (5 + 6)
January	31	4	1	26	143	130	273
February	28	4	1	23	126.5	115	241.5
March	31	4	1	26	143	130	273
April	30	4	2	24	132	120	252
May	31	4	1	26	143	130	273
June	30	4	1	25	137.5	125	262.5
July	31	4	1	26	143	130	273
August	31	4	2	25	137.5	125	262.5
September	30	4	1	25	137.5	125	262.5
October	31	4	1	26	143	130	273
November	30	4	1	25	137.5	125	262.5
December	31	4	2	25	137.5	125	262.5
Total	365	48	15	302	1661	1510	3171

Source: Calculated from Table 7

* MHHS = Male Headed Households
** FHHS = Female Headed Households

Table 8 (contd.): Calculated available mandays per month for an average family in Maseyu

Month	Total days available	Less sundays	Less holidays and occasions	Net working days	Total mandays in (MHHS)*	Total mandays in (FHHS)**	Grand total mandays
	1	2	3	4	5	6	7 (5 + 6)
January	31	4	1	26	78	117	195
February	28	4	1	23	69	103.5	186
March	31	4	1	26	78	117	195
April	30	4	2	24	72	108	180
May	31	4	1	26	78	117	195
June	30	4	1	25	75	112.5	187.5
July	31	4	1	26	78	117	195
August	31	4	2	25	75	112.5	187.5
September	30	4	1	25	75	112.5	187.5
October	31	4	1	26	78	117	195
November	30	4	1	25	75	112.5	187.5
December	31	4	2	25	75	112.5	187.5
Total	365	48	15	302	906	1359	2265

Source: Calculated from Table 7

Table 8 (contd.): Calculated available mandays per month for an average family in Mkambarani

Month	Total days available	Less sundays	Less holidays and occasions	Net working days	Total mandays in (MHHS)*	Total mandays in (FHHS)**	Grand total mandays
	1	2	3	4	5	6	7 (5 + 6)
January	31	4	1	26	143	130	273
February	28	4	1	23	126.5	115	241.5
March	31	4	1	26	143	130	273
April	30	4	2	24	132	120	252
May	31	4	1	26	143	130	273
June	30	4	1	25	137.5	125	262.5
July	31	4	1	26	143	130	273
August	31	4	2	25	137.5	125	262.5
September	30	4	1	25	137.5	125	262.5
October	31	4	1	26	143	130	273
November	30	4	1	25	137.5	125	262.5
December	31	4	2	25	137.5	125	262.5
Total	365	48	15	302	1661	1510	3171

Source: Calculated from Table 7

* MHHS = Male headed households
** FHHS = Female head households

Presumably for household that grows one crop of the seven selected crops in the survey area, it was observed that the most labour demanding months are December to July. During this period, farmers are obliged to look for extra labour outside the family household. Usually traditional system of labour exchanges is the common approach used in obtaining additional labour.

Given the available family labour (MHHS and FHHS) in the area, it appears from Table 11 that there was no labour constraints throughout the year. The surplus labour is utilized for off-farm activities to generate leisure or additional income. This is the additional labour which is usually exchanged for assisting neighbouring villages and in return they are renumerated by material proceeds to beef up their social desire and aspirations.

The premise for crop labour demand is that it is taken as a gauge or indicator of crop labour requirements for operations which will necessarily be retained in a replanned system and an indicator of the rates of work on operations which may be changed partially within the short run period but may be undertaken in a similar way.

Based on Tables 9 and 10 it is implicit that because of disparity in climatic situations in the area, and time of planting, labour requirements vary from village to village and from household to household within a village and also according to the farming techniques and practices adopted.

The most labour demanding operations are weeding, land clearance, and harvesting.

Table 9: Required labour input mandays by crop enterprises and operations

Crop	Operations	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	Land preparations	35	30	26	10
	Planting	10	14	18	7
	Weeding	35	29	40	30
	Fertilizer/ Herbicide	0	0	0	8
	Harvesting	44	39	33	25
	Marketing/ Transport	4	5	6	4
	Total	128	117	123	84
Cotton	Land Preparation	38	36	30	38
	Planting	2	4	5	0
	Weeding	28	0	30	6
	Fertilizer	12	26	25	52
	Harvesting	20	21	23	35
	Grading	20	19	16	35
	Marketing/ Transport	12	15	14	6
	Total	132	106	127	172
Paddy	Land preparation	40	45	30	30
	Planting	6	5	15	10
	Weeding	45	35	39	35
	Fertilizer	0	0	0	11
	Harvesting	30	34	36	40
	Marketing	15	7	8	4
	Total	136	126	128	130
Sesame	Land preparation	25	26	23	35
	Planting	15	10	13	10
	Fertilizer	0	0	0	0
	Weeding	42	32	29	30
	Harvesting	40	34	31	23
	Marketing	4	6	8	8
	Total	126	104	104	106
Sunflower	Land preparation	25	26	23	35
	Planting	16	10	13	10
	Weeding	0	0	0	0
	Fertilizer	42	32	29	30
	Harvesting	40	34	31	23
	Marketing	4	6	8	8
	Total	127	108	104	106
Cowpeas	Land preparation	35	30	29	25
	Sowing	12	10	14	10
	Weeding	40	34	25	45
	Harvesting	34	22	20	19
	Marketing	4	3	5	7
	Total	125	99	93	106
Cassava	Land preparation	33	29	24	25
	Planting	11	18	16	20
	Weeding	25	35	34	35
	Harvesting	13	17	12	18
	Marketing	6	4	5	8
		88	103	91	106

Source: Own diagnostic survey data, 1994.

Table 10: Labour requirements per average household per crop area in ha by months in Rubungo

Crop	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Maize	19.0	4	18.0	6.0	0.0	20.0	305.0	0.0	5.0	10.5	10.0	12.4	139.9
Paddy	22.5	11.0	17.0	0.0	3.5	30.0	29	4.0	7.5	15.3	8.4	11.0	159.2
Cotton	20.0	11.0	25.0	4.0	0.0	19.0	33.0	0.0	5.0	9.0	8.0	6.5	140.5
Sesame	8.0	9.5	13.4	6.5	0.0	12.5	20.4	6.0	4.0	4.0	3.5	15.6	103.4
S'flower	13.5	16.5	18.5	0.0	0.0	2.5	0.0	7.3	0.0	0.0	4.0	8.3	73.6
Cowpeas	0	0	12.5	15.0	13.0	0.0	6.5	4.3	3.0	0.0	7.0	8.0	69.3
Cassava	6.0	10.0	10.4	13.5	9.0	0.0	0.0	5.5	6.0	0.0	3.0	13.4	76.8
Total	89	62	114.8	45	25.5	87	123.9	27.1	30.6	38.8	43.9	75.2	762.7

Source: Own diagnostic survey data, 1994.

Table 10 (contd): Labour requirements per average household per crop area in ha by months in Fulwe

Crop	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Maize	19.7	24.3	15.5	17.0	12.0	18.8	16.5	0.0	0.0	0.0	16.5	24.5	164.8
Paddy	18.0	21.5	16.0	36.0	23.0	38.0	22.0	0.0	0.0	0.0	0.0	28.5	203
Cotton	22.5	26.0	25.0	16.5	8.3	6.4	12.5	24.5	21.5	25.0	0.0	21.0	209.2
Sesame	10.5	21.0	19.5	14.0	0.0	24.6	13.5	5.0	0.0	0.0	0.0	25.9	133.4
S'flower	17.5	20.0	23.0	0.0	0.0	4.0	0.0	6.5	0.0	4.0	0.0	10.0	89.5
Cowpeas	0	0	11.5	10.0	14.0	0.0	8.5	6.5	0.0	0.0	5.0	4.0	57
Cassava	0	0	5.4	15.4	4.0	2.5	0.0	0.0	0.0	0.0	2.5 7.5	14.6	49.4
Total	87.7	112.8	115.9	108.9	61.3	94.3	733.9	42.5	21.5	29.8	31.5	128.5	906.3

Table 10 (contd): Labour requirements per average household per crop area in ha by months in Maseyu Labour requirements per average household per crop area in ha by months in Maseyu

Crop	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Maize	24.5	18.0	13.6	15.0	10.0	14.5	4.0	6.0	5.4	21.0	5.0	11.6	138.6
Paddy	21.0	14.0	16.5	3.6	25.2	32.5	6.0	8.0	11.4	9.0	11.0	14.5	172.4
Cotton	18.0	26.3	12.0	19.0	20.4	16.6	13.8	22.0	17.3	8.0	0.0	16.2	189.6
Sesame	16.0	11.5	20.5	7.5	3.0	16.4	18.5	5.5	4.0	3.3	0.0	9.5	115.7
S'flower	27.0	17.0	20.3	13.0	6.0	9.3	0.0	2.3	1.5	4.0	7.0	6.5	113.9
Cowpeas	10.0	16.0	9.5	3.0	2.0	1.5	12.7	1.3	0.0	7.7	2.5	5.0	71.2
Cassava	4.5	11.6	9.3	6.0	7.0	2.5	3.0	0.0	5.0	8.0	4.3	11.5	72.7
Total	121	114.4	101.7	67.1	73.6	92.8	58.2	45.1	44.6	61.0	29.8	74.8	874.1

Table 10 (contd): Labour requirements per average household per crop area in ha by months in Maseyu Labour requirements per average household per crop area in ha by months in Mkambarani

Crop	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Maize	16.5	20.5	8.5	13.0	11.3	9.0	16.5	23.0	2.5	10.4	15.5	16.3	163.
Paddy	14.0	23.0	10.4	16.0	3.0	4.5	20.0	12.0	0.0	0.0	6.5	5.0	114.4
Cotton	10.6	17.5	8.5	18.0	19.4	8.0	30.5	27.0	18.4	34.0	2.5	13.5	197.9
Sesame	9.0	16.0	32.0	10.0	4.5	11.5	15.0	6.0	2.0	3.0	0.0	20.0	129.0
S'flower	18.0	24.0	6.3	12.0	3.0	5.0	8.5	3.0	2.3	4.4	0.0	5.5	92.0
Cowpeas	20.0	26.0	8.5	0.0	0.0	0.0	22.0	0.0	0.0	4.0	3.0	0.0	83.5
Cassava	0.0	11.0	3.0	0.0	10.0	5.0	0.0	0.0	0.0	2.0	2.0	4.0	37.0
Total	88.1	138	77.2	69	51.2	43	102.5	71	25.2	57.8	29.5	64.3	816.8

4.5 Gross margin by selected crop enterprises based on 1993 yields and prices

Based on Neoclassical Production Theory, gross margins (GMS) are defined as group returns/revenues less variable costs of production. These have been computed on per hectare basis for each crop enterprise per household in the respective sample villages. The GMS were computed for the selected seven crop enterprises, namely, maize, paddy, cotton, sesame, sunflower, cowpeas and cassava.

Table 12(a) shows summaries of gross margins per hectare and net cash return per manday for the respective crops in each sample villages based on 1993 yields and current prices. It can be inferred from the table that by taking all the crop enterprises as a block, which reflects a selected crop menu, cotton gives the highest gross margin per hectare and highest net returns per manday forming shs. 161,500/= (Rubungo); shs. 115,000/= (Fulwe); shs. 130,000/= (Maseyu) and shs. 212,000/= (Mkambarani). On the other hand the returns per manday is highest in Mkambarani accruing shs. 1232.65, per manday, followed by Rubungo shs. 1223.48, Fulwe shs. 1084.91 and lastly Maseyu with shs. 1023.6 per manday.

In terms of food crops the findings confirm that across the households per sampled village both maize and paddy have relatively good gross margins per ha and net returns per manday. There is a clear revelation by the results that cowpeas which is grown across all households accounts for good returns of income but usually it is taken as a complementary crop for generating protein for the village community[2].

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[2] This is an implicit feeling by the village community as noted by the researchers, since animal protein is hardly available and could not be afforded by most of farmers in the sample area.

Table 11: Total available labour versus labour requirements per month by village based on one ha of each crop enterprise

Month	Rubungo			Fulwe			Maseyu			Mkambarani		
	Labour Avai-lable (a)	Required labour (b)	Diffe-rence (a-b)	Labour avai-lable (a)	Required labour (b)	Diffe-rence (a-b)	Labour avai-lable (a)	Required labour (b)	Diffe-rence (a-b)	Labour avai-lable (a)	Required labour (b)	Diffe-rence (a-b)
January	260	89.0	171.0	273.0	87.7	185.3	195.0	121.0	74.0	273.0	88.1	184.9
February	230	62.0	168.0	241.5	112.8	128.8	186.0	114.4	71.6	241.5	138.0	103.5
March	260	114.8	145.3	273.0	115.9	157.1	195.0	101.7	93.3	273.0	77.2	195.8
April	240	45.0	195.0	252.0	108.9	143.1	180.0	67.1	112.9	252.0	69.0	183.0
May	260	25.5	234.5	293.0	61.3	211.7	195.0	73.6	121.4	273.0	51.2	221.8
June	250	87.0	163.0	262.5	94.3	168.2	189.5	92.8	94.7	262.5	43.0	219.5
July	260	123.9	136.1	273.0	73.0	200.0	195.0	58.2	136.8	273.0	102.5	170.5
August	250	27.1	222.9	262.5	42.5	220.0	189.5	45.1	142.4	262.5	71.0	191.5
September	250	30.6	219.4	262.5	21.5	241.0	187.5	44.6	142.9	262.5	25.2	237.3
October	260	38.8	221.2	273.0	29.0	244.0	195.0	61.0	134.0	273.0	57.8	215.2
November	250	43.9	206.1	262.5	31.5	231.0	187.5	29.8	157.7	262.5	29.5	233.0
December	250	75.2	174.8	262.5	128.5	134.0	187.5	74.8	112.7	262.5	64.3	198.2
Total	3020	762.8	2257.2	3171	906.9	2264.1	2278.5	884.1	1394.4	3171	816.8	2354.2

Source: Calculated from table 7 and 10.

Table 12(a): Calculated net cash flows/returns per mandays per Crop enterprise in Rubungo

Crop	Yield (kg)	Unit price/kg (1993/94)	Gross returns/ ha (Tshs)	Cost of produ-ction/ha	Gross margin/ ha	Total mandays used	Net cash return/ month
Maize	800	47.44	37,952	13,500	24,452	128	191.03
Paddy	900	52.50	47,250	21,000	26,250	136	193.01
Cotton	2,500	70.00	175,000	13,500	161,500	132	1,223.48
Sesame	750	100.00	75,000	12,500	62,500	126	496.03
Sunflower	600	40.00	24,000	10,000	13,500	127	106.31
Cowpea	800	80.00	64,000	2,500	61,500	125	492.00
Cassava	800	25.00	20,000	8,000	12,000	88	136.36
Total	7,150		443,202	81,500	36,702	862	2,838.22

Source: Computed or derived from Tables 4, 10 and 11.

Table 12(a) (Contd): Calculated net cash flows/returns per mandays per crop enterprise in Fulwe

Crop	Yield (kg)	Unit price/kg (1993/94)	Gross returns/ ha (Tshs)	Cost of produ-tion/ha	Gross margin/ ha	Total mandays used	Net cash return/ month
Maize	600	47.44	28,464	16,000	12,464	117	106.52
Paddy	600	52.50	31,500	20,000	11,500	126	91.27
Cotton	1,800	70.00	126,000	11,500	115,000	106	1,084.91
Sesame	750	100.00	75,000	15,500	59,500	108	550.92
Sunflower	600	40.00	24,000	11,000	13,000	108	120.37
Cowpea	800	80.00	64,000	3,500	60,500	99	611.11
Cassava	950	25.00	23,750	10,000	13,750	103	133.49
Total	6,100		372,714	87,000	285,714	767	2,698.59

Source: Computed or derived from Tables 4, 10 and 11.

Table 12(a) (Contd): Calculated net cash flows/returns per mandays per crop enterprise in Maseyu

Crop	Yield (kg)	Unit price/kg (1993/94)	Gross returns/ ha (Tshs)	Cost of produ- ction/ha	Gross margin/ ha	Total mandays used	Net cash return/ month
Maize	750	49.44	35,580	12,900	22,680	123	184.29
Paddy	980	52.50	47,250	18,100	29,150	128	227.73
Cotton	2,000	70.00	140,000	10,000	130,000	127	1,023.60
Sesame	800	100.00	80,000	14,500	65,500	104	629.80
Sunflower	950	40.00	38,000	11,000	27,000	104	259.61
Cowpea	500	80.00	40,000	18,500	21,500	93	231.18
Cassava	850	25.00	21,250	7,500	13,750	91	151.09
Total	6,750		402,080	92,000	309,580	770	2,707.40

Source: Computed or derived from Tables 4, 10 and 11.

Table 12(a) (Contd): Calculated net cash flows/returns per mandays per crop enterprise in Mkambarani

Crop	Yield (kg)	Unit price/kg (1993/94)	Gross returns/ ha (Tshs)	Cost of produ- ction/ha	Gross margin/ ha	Total mandays used	Net cash return/ month
Maize	1,000	47.44	47,440	25,000	22,440	84	267.14
Paddy	950	52.50	49,875	32,000	17,375	130	133.65
Cotton	3,500	70.00	245,000	33,500	212,000	172	1,232.56
Sesame	850	100.00	85,000 42,000	22,000	63,000	106	594.34
Sunflower	1,050	40.00	72,000 37,500	19,250	22,750	106	214.62
Cowpea	900	80.00		14,500	58,000	106	547.16
Cassava	1,500	25.00		13,000	24,500	106	231.13
Total	9,750		578,815	171,750	420,065	810	3,220.60

Source: Computed or derived from Tables 4, 10 and 11.

Table 12(b): Calculated gross return per manday per crop in Tshs.

Crop	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	37,952/=	28,464/=	35,580/=	47,440/=
Paddy	47,250/=	31,500/=	47,250/=	49,875/=
Cotton	175,000/=	126,000/=	140,000/=	245,000/=
Sesame	75,000/=	75,000/=	80,000/=	85,000/=
Sunflower	24,000/=	24,000/=	38,000/=	42,000/=
Cowpeas	64,000/=	64,000/=	40,000/=	72,000/=
Cassava	20,000/=	23,750/=	21,250/=	37,500/=
Total	443,202/=	372,714/=	402,080/=	578,815/=

Source: Own diagnostic survey data, 1994.

Table 12(c): Sampled villages gross margin per crop per ha in Tshs.

Crop	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	24,452/=	12,464/=	22,680/=	22,440/=
Paddy	26,250/=	11,500/=	29,150/=	17,375/=
Cotton	61,500/=	115,000/=	130,000/=	212,000/=
Sesame	62,500/=	59,500/=	65,500/=	63,000/=
Sunflower	13,500/=	13,000/=	27,000/=	22,750/=
Cowpeas	61,500/=	60,500/=	21,500/=	58,000/=
Cassava	12,000/=	13,750/=	13,750/=	24,500/=
Total	361,702/=	285,714/=	309,580/=	420,065/=

Source: Own diagnostic survey data, 1994.

Table 12(d): Calculated net cash return per manday per crop in Tshs.

VILLAGE	Rubungo	Fulwe	Maseyu	Mkambarani
Maize	191.03	106.52	184.39	267.14
Paddy	193.01	91.27	227.73	133.65
Cotton	1,223.48	1,084.91	1,023.62	1,232.56
Sesame	496.03	550.92	629.81	594.34
Sunflower	106.31	120.37	259.61	214.62
Cowpeas	492.00	611.11	231.18	547.16
Cassava	136.36	133.49	151.09	231.13
Total	2,838.22	2,698.59	2,707.43	3,220.6

Source: Own diagnostic survey data 1994.

The wide variation of income generated by different crops and between villages can be attributed to the differences in rainfall distribution, soil types, acreage cultivated for each crop, the type of technologies adopted by the farmers among other factors as reflected in the latter sections. Presumably gross margins per ha are of value when ascertaining the degree of profitability and enterprise budgeting of returns per manday in assessing the relative allocation of resources by the smallholder farmer within his traditional farming system environment. Indeed a high gross margin in the survey area does not automatically authenticate the phenomenon that high priority is deliberately accorded to the crop (cotton etc). Small holder farmers normally condition themselves in growing food crops at whatever costs in order to first and foremost meet basic food needs and food security (Anandajayasekeram *et al.*, 1981). The above gross margins therefore, should be interpreted cautiously bearing in mind farmers goals and priorities.

4.6 Subsistence objectives of farming and food preferences

The primary objective of smallholder farmers in the developing countries is to produce adequate food for their families. In this study the researchers attempted to establish the prime objectives of farmers as producers and how they allocate their land resource base between various crop enterprises.

The findings reveal that about 45 to 75% of the farmers interviewed in Rubungo, Fulwe, Maseyu and Mkambarani villages favoured a sufficient and palatable food supply as their first objective (Table 13). Cash income normally carries a second priority. The other important objectives in undertaking farming as indicated by majority of the farmers includes availability of cheap labour, good soil fertility and the ability of the crops to tolerate drought.

About 35 to 54 percent of the sampled farmers interviewed in Mkambarani to Maseyu including Fulwe and Rubungo preferred paddy followed by maize, cassava and cowpeas (Table 14).

The main reasons given by farmers for the low crop yields were presence of wild animals, pests and diseases, poor farming technology, poor farm implements and drought (Table 15). The manifestations of such problems has been documented elsewhere in Morogoro District (Anandajayasekeram, Mtoi and Rugambisa, 1981).

Table 13: Reasons given by households for choice/objectives of growing certain crops

Reasons	Rubungo		Fulwe		Maseyu		Mkambarani	
	No	%	No	%	No	%	No	%
. Sufficient and palatable	18	45.0	19	47.5	30	75.0	25	62.5
. Staple food security	5	12.5	5	12.5	2	5.0	10	25.0
. Cheap labour	10	25.0	7	17.5	1	2.5	5	12.5
. Good soil fertility	2	5.0	5	12.5	2	2.0	0	0.0
. Tolerance to drought	5	12.5	4	10.0	5	12.5	0	0.0
Total	40	100	40	100	40	100	40	100.0

Source: Own diagnostic survey data, 1994.

Table 14: Household food priorities and preferences in percentage by crops

Crop	Rubungo (%)	Fulwe (%)	Maseyu (%)	Mkambarani (%)
Maize	35.0	40.0	36.0	44.0
Paddy	45.0	50.0	54.0	35.0
Cassava	15.0	7.0	6.0	15.0
Cowpeas	5.0	3.0	4.0	6.0
Total	100.0	100.0	100.0	100.0

Source: Own diagnostic survey data, 1994.

Table 15: Reasons for declining of crops yield by households

Reason	No. of Farmers							
	Rubungo		Fulwe		Maseyu		Mkambarani	
	No.	%	No.	%	No.	%	No.	%
Wild Animals	17	42.5	15	37.5	20	50.0	10	25.0
Pests and disease	5	12.5	10	25.0	3	7.5	15	37.0
Poor farming techniques	9	22.5	5	12.5	6	15.0	5	12.0
Poor farm implements	4	10.0	6	15.0	5	12.5	4	10.0
Drought	5	12.5	4	10.0	6	15.0	6	15.0
Total	40	100	40	100	40	100	40	100

Source: Own diagnostic survey data, 1994.

4.7 Technological components shaping sampled villages farming system

Based on the survey data, there is a marked difference between farmers' views on the use of expected technologies in boosting sustainable agricultural production and maintaining land productivity and soil fertility.

Table 16 summarises the farmers' responses on the type of technologies used in the traditional farming system. The results reveal that the farmers practice the following technologies: namely applying mulching (32 farmers or 20%); using pangas (bush knives) (19.4%); using handhoe (18%); burning (24%); practicing tractorization (9.1%); applying ridging (8.1%); using stones (7.5%); and using improved seeds 5 %).

Table 16: Farmers' views of response on expected technologies on agricultural production and sustainable land use

Type of technology	Rubungo		Fulwe		Maseyu		Mkambarani			
	No. of farmers	%	No. of farmers	%	No. of farmers	%	No. of farmers	%	Total farmers	% Total
Using pangas	8	20	7	18	10	25	6	15	31	19.4
Using stones	6	15	4	10	2	1	0	0	12	7.5
Mulching	6	15	8	20	8	20	10	25	32	20.0
Fire or burning	4	10	8	20	7	18	1	3	20	24.0
Plowing										
-tractor	2	5	2	5	2	5	9	22	15	9.1
-handhoe	10	25	8	20	8	20	3	8	29	18.0
Ridging	4	10	2	5	2	5	5	12	13	8.1
Use of improved seeds	0	0	1	2	1	6	6	15	8	5.0
Total	40	100	40	100	40	100	40	100	160	

Source: Own diagnostic survey data, 1994.

Maintenance of soil fertility in the sampled villages almost solely depends on mulching application since more than 97% of the farmers do not apply chemical fertilizers. Indeed it was only about 45.5% of households in Mkambarani location who attempt to use chemical fertilizers whereas 54.5 percent do not apply fertilizesr (Table 17 category A).

The results suggest that the yield output per unit as indicated in the preceding sections, is very small due to the fact that the technology applied is basically rudimentary and inefficient.

Table 17: Application of chemical fertilizers by household in crop production and availability of extension agents

Response	Percentage			
	Rubungo	Fulwe	Maseyu	Mkambarani
CATEGORY A:				
Fertilizer use				
Yes	3.5	1.5	3.0	45.5
No	97.5	98.5	97.0	54.5
Total	100.0	100.0	100.0	100.0
CATEGORY B: Availability of extension				
Yes	4.0	5.6	7.9	35.5
No	96.0	95.4	92.1	64.5
Total	100.0	100.0	100.0	100.0

Source: Own diagnostic survey data, 1994.

An underpinning observation and assumption is that the findings prompt one to argue convincingly that it is possible that farmers have not been exposed or even availed the services of extension officers who are required to educate the farmers on the different types of appropriate improved husbandry practices like availability and use of organic as well as inorganic fertilizers and improved seed varieties. Indeed 64 to 96 percent of the farmers interviewed indicated that there was no available extension agents in the area (Table 17 category B), or if any, their services are not extended to farmers.

It can also be postulated or maintained that if improved farm inputs or generation of technologies of reducing labour demand for the agricultural operations could be provided and delivered at reasonable cost, farmers could spend more time for off-farm activities to generate additional income.

The above arguments and findings on the lack of appropriate technological packages and lack of extension services to assist the farmers have been echoed and demonstrated elsewhere in Morogoro and Tanzania at large {Sokoine University of Agriculture (SUA) and International Development Research Centre (IDRC), 1985}.

4.8 Problems and constraints to increased sustainable crop production

Farmers in the survey area like other farmers in many developing countries are faced with a lot of different problems either man made or naturally occasioned.

All families in Rubungo, Fulwe, Maseyu and Mkambarani have cited low financial capital (25 to 37.5%) unreliable markets, poor marketing policy and lower producer price (25 to 55%) as the major problems and constraints hindering increased crop production (Table 18). The results also reveal that to some considerable degree a few number of households (2.5 to 12.5%) indicated that wild animals were an obstacle in boostering crop production.

Table 18: Problems and constraints faced by farmers in sustainable increased crop production

Type of problem and constraint	Rubungo		Fulwe		Maseyu		Mkambarani	
	No.	%	No.	%	No.	%	No.	%
. Low financial capital	10	25.0	14	35.0	10	25.0	15	37.5
. Unreliable markets, pricing and lower producer prices	15	37.5	10	25.0	20	50.0	22	55.0
. Wild animals	0	0.0	5	12.5	1	2.5	3	7.5
. No response	15	37.5	11	27.5	9	22.5	0	0.0
Total	40	100	40	100	40	100	40	100

Source: Own diagnostic survey data, 1994.

These range of problems are typical in traditional farming systems in Tanzania and the developing countries (Anandajayasekeram, *et al.*, op. cit 1981). The implication of these findings is that there is need to give an incentive to farmers in form of credit and highly attractive producer prices to guarantee and motivate the farmer to increase crop production. Such an incentive would among other positive spill overs enable the smallholder producer to improve the availability of farm inputs thus adopting recommended appropriate technologies at the farm level instead of embracing and practicing the traditional farming technologies which seemingly generate very low yields output per hectare and relatively low farm sizes under cultivation simply because a majority of small households cannot afford to hire tractor services to expand agricultural production (Ishuza, 1989 and Mwenda, 1993).

Indeed the prevalence of unreliable markets and relatively low producer prices force farmers to channel their produce into the parallel markets which offer lucrative prices.

4.8.1 Price and marketing policy decisions: its impact on crop output at the smallholder household

The purpose of this subsection is to incorporate in the discussion the macro parameter of price and marketing policy decisions as reflected in the specific study objectives, by addressing its impact on crop output at the small holder farmers.

This has been prompted by the fact that state intervention through price and marketing policies have both a direct and indirect impact on the farmers response in increased crop production.

In the survey area, the results revealed that apart from lack of financial capital, the second most important issue was the problem of unreliable markets, poor marketing policy and low producer prices (Table 18). Similar studies done in Morogoro and other parts of Tanzania have shown in general that pricing and marketing policies disproportionately benefitted the state sector at the expense or sacrifice of the smallholder crop sector (Anandajayasekeram and Shayo, 1985; Ellis, 1988; Donge, 1992).

Marketed crop output trends through official channels generally display a strong positive correlation with trend in real official prices. Thus the volume of most export crops sooner or later declined in the face of persistent falling real prices (Marketing Development Bureau, 1993).

The crude elasticity of response to a large change in the real price of an individual crop often appears to be greater than unity, suggesting that a given percent change causes a greater percent change in the volume marketed through the official channels in the same direction.

The implication is that peasants adjust very rapidly to relative opportunities between different individual crops, and also as regards the various choices of disposal sale through official channels (namely crop parastatals, cooperative unions, National Milling Corporation), sale in the parallel markets[3]), or retention in the village for food security purpose which is by all practical terms the first and top most priority for the subsistence farmer or household.

The sensitivity is highest for annual crops which can be readily substituted for each other on the same area of land resource. It is usually lowest for perennial export crops like coffee, cashewnuts etc. with a long gestation period.

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[3] To date, since trade liberalization of all food and minor crops have been disconfined and farmers sale at competitive open market prices.

It is often argued that in countries like Tanzania, Zimbabwe, Zambia, Mozambique etc. (Ellis, 1988) the impact of positive price policy is limited due to the problems and constraints of existing technology.

It could be stated here that policy events of the past 10 years in Tanzania (1980s-1990s) have provided little motivation to use available land resource and labour at the smallholder farm level to maximize crop output and productivity. It also seems plausible that a deteriorating infrastructure, such as poor means of transport communication etc, has become a more important constraint on expansion of marketed supply than the inherent limitations of existing technology.

4.8.2 A synopsis of producer price and marketing policy decisions since 1980

1981

Decision taken in principle to reintroduce marketing cooperatives following a task force report.

Export taxes lifted on coffee and cotton.

Regional price differentials introduced for some main food crops.

Government takes over T.shs. 2 billion debt arrears from National Milling corporation (NMC).

1982

Cooperative and Local Government Act provides legislative framework for the creation of cooperative societies, regional cooperative unions, and an apex organization.

Export tax on tea lifted.

Price support subsidies for export crop parastatals introduced in order to permit higher producer prices, for export crops than would otherwise have been possible, fixed at T.shs. 960 million for the 1982-83 season.

1983

Price support subsidies for export crop parastatals continued, and estimated at T.shs. 500 million for 1983 - 1984 season.

Registration of primary cooperative societies and regional cooperative unions begins.

1984

Subsidies removed on all agricultural inputs, this being compensated by producer price increases (50 percent for food crops, 40 percent for export crops,) intended to be greater than inflation for the 1984-85 crop year.

Price support subsidy for export crops parastatals removed.

Government takes over T.shs. 2.5 billion debt arrears from seven crop parastatals.

Price of maize flour decontrolled, but government continues for one year, to fix an official sales price for maize.

Functions previously devolved to other Ministries, the regions, and the parastatals, are centralized again in the Ministry of Agriculture.

1985

All remaining export taxes on agricultural crops are eliminated in the 1985-86 Government Budget.

Prices of 5 oilseed crops and 16 minor crops hitherto purchased by NMC and GAPEX (General Agricultural Export Produce Corporation) are decontrolled.

1986

Agreement is reached with the IMF on a financial package including stand-by credit, structural adjustment facility, and World Bank structural adjustment loan.

Domestic cost of foreign exchange increased by 126 percent to 40 T.shs. per US $ in June 1986, with provision for subsequent monthly upward adjustments in line with domestic inflation.

1986-87 Government Budget adopts the principle that producer prices of export crops should be set at a level equivalent to 60 to 70 percent of free on board prices, or be increased by 5 percent per annum in real terms, whichever is higher.

The new cooperative marketing system commences operation.

1988-1994

Cementing the Economic Recovery Programme by effecting more macro-policy changes on both crops and consumer goods. In 1994, financial crisis reached climax since independence and for the first time government coffers dried up. The economic purchasing power of all Tanzanians declined terribly.

4.9 Income generated from off-farm activities

Most economists working in Africa assume that off farm employment opportunities for members of farm households are very limited as are incomes generated from sales of small quantities of fruit and vegetables, brewing of beer and gifts (Due, *et al.*, 1985).

It was found that charcoal making and making local brew were the most abundant off-farm activities for the survey farmers in all the sample villages. Most of these activities were concentrated in the villages of Rubungo and Fulwe (Table 18). Charcoal making as observed by the researchers constitute the most physically difficult off-farm activity. Charcoal making involves working in a harsh environment both in humid and hot weather. The required resources to accomplish this task include labour, axes, bush knives, hoes, spades, and gunny bags for carrying the charcoal. The process of charcoal making involves felling of trees (a potential source or case for deforestation), cutting them into short pieces, erecting a furnace, firing it, permitting the furnace to cool, and then bagging the charcoal. Once the charcoal is bagged, it is ready for sale. It is carried to road side (Morogoro Dar-es-Salaam highway) by head to await buyers. Demands for charcoal in the survey area and even in the whole rural area is relatively small, mainly because firewood is the most common source of energy for cooking.

Table 19: Other source of income (off-farm income) by households

Types of other source of income	No. of Farmers			
	Rubungo	Fulwe	Maseyu	Mkambarani
Making charcoal	10	8	4	5
Making local brew	4	1	1	10
Petty business	2	2	3	0
Milling machine	1	0	0	4
Shop	0	0	0	6
Total	17	11	8	25

Source: Own diagnostic survey data, 1994.

The making of brew on the other hand depends largely on the availability of sorghum, but other ingredients include maize flour, sugar and water. Sorghum local beer form a significant part for the rural culture, especially during family festivals. Brewers are required to get a permit from the village council to make the local beer.

The overall results showed that a small proportion of the households were involved in petty business which constituted 7 persons, whereas milling machine and shop business form 5 to 6 persons respectively. The small number of farmers engaged in milling machine and shop business can be attributed to the low income-cash capital possessed by the smallholder farmers since these undertakings demand a sizeable amount of financial investment. However, the farmers in Mkambarani village are better off in terms of capital portfolio mainly because they generate a great amount of income from their large farms which are technologically better placed compared to the rest of the villages which are nested into the traditional farming system.

4.10 Estimation and results of the multiple regression model

Multiple Regression Analysis has been applied in order to provide sound picture of the nature and extent of the explanatory or independent variables on crop yield. Two regression equations for all the four villages were estimated using SPSS Computer package programme. Regression equation 1 (shown below), was estimated without including dummy variables whereas regression equation 2 (shown on the next page) incorporated two dummy variables-dummy one (D_1) represents tractorization and dummy two (D_2) represents use of fertilizer to increased crop production. The following prediction equations were obtained.

Prediction equation and interpretation of multiple regression results for all the villages without improved technologies is given by:

$$Y = \underset{(-2.023)}{-1401.7525} + \underset{(1.478)^{***}}{168.943X_1} + \underset{(3.035)^{**}}{19.477X_2} - \underset{(0.331)}{0.007X_3}$$

R^2 (Adjusted) = 0.61 Standard Error of Estimates (SEE) = 553.44

** Significant at P = 0.01
*** Significant at P = 0.1

The t-statistic values of the estimated coefficients are in parentheses.

As indicated in the above prediction equation, only two variables were statistically significant in influencing crop production on the individual small holder farms in the survey area.

These factors are area under crop production and the available family labour used per hectare. From these results the multiple correlation coefficient R^2 (adjusted) indicates that 61 percent of the variation observed in crop yield is explained by the variables included in the estimated model. This is a good fit for the model.

The signs of the explanatory variable coefficients associated with the total average yield output conform to prior expectations, X_1 and X_2 are positive whereas X_3 is negative. Total land hecterage (X_1) and family labour (X_2) are statistically significant at 0.1 and 0.01 levels respectively. Farm operation expenses (X_3) are not statistically significant.

The farm size (X_1) and labour resources (X_2) suggest that an increase in land would definitely lead to increased output and additional labour *ceteris paribus* implies increased yield output. The results reveal that, if other factors in the model remain unchanged, an increase in crop area by one hectare will increase total crop yield output in an individual small holder farm by 168.9 kilogrammes whereas one increase in mandays of family labour (X_2) would increase yield output by 19.5 kilogrammes allowing other factors in the equation to be constant.

Operating farm expenses (X_3) though not statistically significant imply that with an increase in one hectare of crop area, it is expected to reduce crop yield output per hectare by 0.01 kilogrammes. This suggests that operating farm expenses have reached the level beyond maximum output in production *ceteris paribus)*.

Prediction equation and interpretation of multiple regression results for all the villages with improved technologies is given by:

$$Y = -1430.74 + 198.07X_1 + 17.98X_2 + 89.87D_1 - 0.01X_3 + 202.43D_2$$
$$(-1.992) \quad (1.642)^{***} \quad (2.586)^{**} \quad (0.384) \quad (-0.430) \quad (0.887)$$

R^2 (adjusted) = 0.63

Standard Error of Estimates (SEE) = 565.82

** Significant at P = 0.01*
*** Significant at P = 0.1*

Where Y X_1, X_2, X_3, variables are the same as shown in the earlier prediction equation.
D_1 = Technology one - Use of tractorization
D_2 = Technology two - use of fertilizer.

The t-statistic values of estimated coefficients are in parenthesis. The results in the above prediction equation indicates that there are only two variables which are statistically

significant at P = 0.1 and 0.01 in explaining the observed variation in crop yield output per hectare under the incorporation of two technological packages in the traditional farming system. These factors are average total farm hectarage and average available family labour used by an individual household.

According to the above results, an increase in crop by one hectare on average is expected to increase average total yield in an individual farm by 198.1 kilogrammes after allowing other factors in the equation to remain constant.

Alternatively, under *ceteris paribus* conditions in the equation, a one increase in mandays per ha is expected to increase crop yield by 18.0 kilogrammes.

The multiple correlation coefficient, R^2 (adjusted) shows that 63 percent of the variation in crop yield output per hectare observed among individual small holder farmer is explained by the parameters embodied in the estimated regression model. The F-test for the obtained R^2 was statistically significant at P = 0.05 ; F = 2.9818. This means that it is unlikely that the factors incorporated in the estimated model do explain or do account for the observed variations in crop yield output in the small holder farms. However, the most important parameter determining these variations is available family labour used in crop production. This appears to be logical since in both estimated equations the high significance levels at P = 0.01 strongly suggests that labour resource is a relatively big contributor to increased crop yield output per hectare.

4.11 Simple correlation coefficients between the regressed variables

The results for the simple correlation coefficients between the regressed variables for the small holder farmers with the application of technology are summarized in Table 20.

The results reveal that average total crop yield per hectare is highly correlated with family labour (X_2). It is significant at P = 0.01. Average crop farm area or farm size in hectare is positively correlated with operating farm expenses. Again this conforms with the increase in the amount of farm investment expenses.

Table 20: Person correlation matrix for factors influencing crop production

Correlation	Yield (Y)	Farm size (X_1)	Family labour (X_2)	Operating expenses (X_3)
Yield (Y)	1.0000	0.3209	0.5511*	0.3197
Farm size (X_1)		1.0000	0.1232	0.5733**
Family labour (X_2)			1.0000	0.4086
Operating expenses (X_3)				

Source: Computer print out of survey data
* Significant at P = 0.01 (1 - tailed test)
** Significant at P = 0.001 (1 -t ailed test)

5. CONCLUDING REMARKS.

This section summarizes the objectives and methodology of this study. Results, conclusions and policy recommendations are then briefly summarized.

5.1 Objectives and methodology

The purpose of this study was to examine the socio-economics of resource use in the traditional farming system in selected villages in Mikese Division, Morogoro Rural District.

The specific objectives were:

a) to identify and investigate the various physical, technological, policy factors that influence crop production within the traditional farming systems at the village household level.

b) to identify the production and marketing related constraints and problems to more effective sustainable crop production.

c) based on the above, to prescribe recommendations for improving agricultural production and productivity at the farm household level.

The study focuses on four sampled villages in Morogoro Rural District namely Rubungo, Fulwe, Maseyu and Mkambarani. Data needed for the survey were obtained by interviewing 160 farmers (40 from each village) which were randomly selected from the four villages using the village register as the sampling frame.

Data collected using a structured questionnaire embraced farm sizes, area cultivated to various crops, distance between households, farm location, crop yields, labour requirements for different crops enterprises by sex and age, and other inputs such as seeds, fertilizer, farm manure, input and producer prices, credit facilities and extension services.

The tools applied in data analyses for all four villages included descriptive statistics such as percentages and proportions. Tabulations were used to compute man-equivalents and contribution by gender to compute gross margins. Gross margins were applied to assess the profitability of the crop enterprises that compete for the resource use in the area.

Multiple regression model was also applied as an alternative means of drawing inferences on the factors influencing crop production in the survey area. It provided a measure of the reactions among a set of chosen parameters or variables for the aim of predicting the dependent variable.

The dependent variable Y was the average total crop yield per ha and the explanatory variables (X_{is}) were farm size (X_1) family labour (X_2) farm operating expenses (X_3), and improved technology (X_4 & X_5).

5.2 Results and conclusions

Regarding household factors, results indicate that most of farmers in the area, have one plot around the homestead and additional shambas or plots located away from the households which constitute more than five plots.

However it was observed that despite the low person/land ratio in the area, much land cannot be cultivated because of mountains, steep hills, swamps, woods and forest lands. The average cultivated area per family in the survey area ranged from 10.5 to 23.5 hectares. Also results reveal that in terms of crop combination across villages, maize was grown in all four villages and form the largest crop farm size.

Cassava is considered to be the alternative bankable crop during drought periods in all village households. With respect to crop yields, a considerable variation existed in yield across village households. Maize yields per hectare varied from 800 kg per ha in Rubungo to 1000 kg per ha in Mkambarani. Cotton yields ranged from 2,500 kg per ha in Maseyu to 3,500 kg per ha in Mkambarani village respectively. The implication is that the low yields are attributed to lack of adequate moisture and low or no application of improved technology like seeds and fertilizers use, among other factors.

The results indicate that the household size average range from 13 persons (male and female) in Rubungo village to 16 persons in Mkambarani village. It reveals that the man-equivalents for Rubungo are 4.5 (FHHS) and 5.5 (MHHS) persons, whereas Mkambarani has 6.0 (FHHS) and 5.5 (MHHS) persons.

In terms of labour utilization, the results show that cotton demands the highest amount of labour forming 172 mandays followed by paddy and maize with 136 and 128 mandays respectively. The results also confirm that there was no labour shortage in the area. This implies that farmers have an additional surplus labour to engage themselves into off-farm activities.

The findings logically indicate that cotton gives the highest gross margin per hectare and highest net returns per manday forming shs. 16,500/= for Rubungo, Shs 115,000 for Fulwe, Shs. 130,000/= for Maseyu and T.Shs 221,000/= for Mkambarani.

The results also revealed that given the farmers objectives in farming and food preference, maize, paddy and cowpeas were preferred as the priority palatable crop choices for all the households.

It was also indicated that farmers practice a variety of traditional farming techniques with very few farmers applying tractorization and fertilizer plus improved seeds.

The findings seemingly reveals that the main constraints which affect sustainable increased crop production are low financial capital, unreliable markets, poor marketing policies, low producer prices; and problem of wild animals. Also extension services are not adequately provided. On the other hand, the multiple regression analysis and correlation coefficients reveal that farm size, labour and technology packages have a positive impact on crop yields whereas farm operating expenses as expected on a priori basis reduced the level of crop yield output per ha within the traditional farming system.

5.3 Policy recommendations

Based on the findings of this study, it is proposed that future plans aiming at improving sustainable crop production in the District and the sampled households should accommodate the following prescriptive remedial measures:

Technical and financial assistance in form of credit should be given to the villages to boost their low income earnings, and be able to adopt improved technological packages like fertilizer, seeds, herbicides, and hiring tractor services. This would eventually increase crop production at the smallholder farm level and alleviated the unnecessary energy lost by the peasant farmers.

The traditional farming practices of the present smallholder farmer were designed "by him" to produce sufficient food for his family in the situation where very few goods and services were required from outside sources. However, with the improvement in living standard, better health services, education, increased demand household needs, the situation calls for the subsistence farmer to produce more from the "same piece of land resource". Thus the farmer has to modify some of his "socio-cultural practices" in order to increase production.

It is therefore recommended that research based on constraints that the farmer face and feel more restrictive in a particular area, for optimizing crop yield output with minimum possible extra resources be further pursued. The improved techniques should then be tested on some small farmers' fields in the area or related areas before recommendations are made for adoption of the practices by the farmers.

Some of the problems identified should be handled by the farmers themselves but in other cases pertinent to constraints it is necessary for institutions and policy makers to assist them. Since not so much has been done on the crops grown by the farmers in the survey area, it is imperative to carry out some on-farm

experimental research on site on a continuous period in order to select some technological components for adoption by the farmers.

The extension agents should concentrate on ensuring wide access to information on cultivation techniques and improved varieties currently available to farmers.

As regards institutional and environmental factors in the area, it is recommended that the District authorities should make efforts to ensure that the smallholder farmers in the district get the required inputs in time and at a reasonable price.

The government should review its price and marketing policies periodically to provide more lucrative markets and competitive prices to farmers.

From the stated objectives,it is quite obvious that this study has contributed significantly to the knowledge and understanding of the families and farming systems in the sample villages.

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APPENDIX

STRUCTURED QUESTIONNAIRE

SOCIO-ECONOMICS OF LAND DEVELOPMENT FOR SUSTAINABLE AGRICULTURAL PRODUCTION IN SOME VILLAGES IN MIKESE DIVISION, MOROGORO DISTRICT, TANZANIA.

* VILLAGE NAME .....
** FARMER'S NAME .....

BASIS: A DIAGNOSTIC SINGLE VISIT SURVEY FOR OCTOBER TO DECEMBER, 1994 CALENDAR YEAR

A: FARMER'S OR FARM HOUSEHOLD PARTICULARS

1. List the number of Persons in the Household.

● Farmer	Persons	Age	Months in Household	Formal Education	Informal Education
- Male - Female					
● Children					
- Male					
- Female					
● Others					
- Male					
- Female					

2. What is the farmer's marital status?
   .Married = 1 No of Wives = ...
   .Widowed = 2
   .Divorced = 3
   .Never Married = 4

3. How many years have you been farming?
   .....

4. Land use and cultivated area in (acres)

Crops Grown	Total available land area (acres)	Land under crop (acres)	Fallow land (acres)	Non arable land (acres)
1. Maize				
2. Paddy				
3. Sorghum				
4. Cotton				
5. Sesame				
6. Sunflower				
7. Cowpeas				
8. Cassava				
9. Beans				
10. Castor oil seeds				
11. Finger millet				
12. Cocoyams				
13. Coffee				
14. Bananas				
15. Pineapples				
16. Cabbage				
17 *Others specify				

5. Do you have plots outside of this village?

Yes = 1
No = 2

5.1 If no, state reasons:

.Not easy to get	=	1
.Have no capital	=	2
.Have other activities (off-farm)	=	3
.Input prices are two high	=	4

5.2 If Yes:

.(a) How far away_____ (km)

.(b) How long does it take to walk there?
_____(Hours/Days)

.(c) What is the fare for transportation?
.....(Tz. shs)

.(d) How often was the plot visited by you this year?

.Once	=	1
.Twice	=	2
.Thrice	=	3
.Four Times	=	4
.Five times	=	5
.Six times	=	6
.Seven times	=	7
.Eight times	=	8
.Nine times	=	9
.Ten times	=	10

6. What food crops are preferred by your family? List preference.

	Husband	Wife
(a)	.....	.....
(b)	.....	.....
(c)	.....	.....
(d)	.....	.....

7. What are your objectives in farming in order of priority?

.adequate food supply & security for family	=	1
.generate food and income	=	2
.generate income only	=	3
.for leisure and show off	=	4

8. Indicate which of these you have (and number if relevant):

.house with thatch roof	=	1
.house with metal roof	=	2
.concrete floor	=	3

.radio = 4
.bicycle = 5
.beds = 6
.lantern = 7

9. If there are plots planted with more than one crop per year indicate plot number

	Acreage
.Plot No. 1	
-maize - beans mixture	.....
or	
-maize - cowpeas	.....
.Plot No. 2	
-maize - Sesame	.....
or	
-maize - Casava	.....
.Plot No. 3	
-sorghum - cassava	.....
or	
-maize - sunflower	.....

10. What is the land classification of your plot?
11. In deciding on the crops planted on each plot, who are involved in the decisions?
.husband and wife = 1
.husband only = 2
.wife only = 3
.others (specify) = 4

12. Which are the busiest months of the year on the farm (state months)?

13. What type of husbandry practices do you adopt when managing your farm land resource for cropping purposes?
.Use bush knives = 1
.apply mulching = 2
.apply burning or fire = 3
.ploughing by tractor = 4
.use hand hoe = 5
.apply ridging = 6
.apply manure = 7
.use improved seeds and fertilizer = 8
.use local seeds = 9
.use recommended spacing for each crop = 10
.apply herbicides = 11
.others (specify) = 12

14. How much did you harvest from your crops last season?
year .....

Crop	Area In acres	Yield in bags/kg	Eaten & stored (bags)	Bags sold	Price unit T.Shs)
1. Maize					
2. Paddy					
3. Sorghum					
4. Cotton					
5. Sesame					
6.Sunflower					
7. Cowpeas					
8. Cassava					
9. Beans					
10. Maize Beans					
11. Maize-* cassava					
12. Maize - * sorghum					
13. Maize - Cowpeas					
14. Maize - Sesame					
15. Maize - sunflower					
16. Castor oil eeds					
17. Finger millet					
18. Cocoyams					
19. Coffee					
20. Bananas					
21. Pineapples					
22. Cabbage					
23. Others (specify)					

15. What was the per acre cost you incurred or expect to incur; for each crop this year for each of the following operations or tasks?

Operation	Crop type	Costs T.shs.	Remarks
1. Land Preparation	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	Other (specify)		
2. Seed Purchases	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		

	*Others (specify)	Costs T.Shs	Remarks
3. Planting	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others (specify)		
4. Fertilizing	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others specify		

5. Weeding	Maize	Costs T. Shs.	Remarks
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Other (specify)		
6. Guarding	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others (specify)		

7. Spraying	Maize	Costs TShs.	Remarks
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others (Specify)		
8. Harvesting	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Other (specify)		

9. Threshing or Sorting	Maize	Costs Tshs.	Remarks
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others (Specify)		
10. Transporting and marketing	Maize		
	Paddy		
	Sorghum		
	Cotton		
	Sesame		
	Sunflower		
	Cowpeas		
	Cassava		
	Beans		
	Finger millet		
	Cocoyams		
	Coffee		
	*Others (Specify)		

16. What are your annual calendar of major crops?

Crop	Land prep.	Planting	Weeding	Harvesting
	(Months)	(Months)	(Months)	(Months)
Maize				
Paddy				
Sorghum				
Cotton				
Sesame				
Sunflower				
Cowpeas				
Cassava				
Beans				
Finger Millet				
Cocoyams				
Coffee				
*Others (Specify)				

17. List labour inputs this past year for each crop. Enter the number of days worked by males (M) and females (F) each month. If intercropped group the crops intercropped.*Convert adult and child labour as:
    0-17 - 0.5 unit
    18-38 - 1.0 unit
    39-55 - 1.0 unit
    above 55 - 0.5 unit

Crop Operation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct.	Nov.	Dec.
A. Land Preparation												
Maize M												
F												
Paddy M												
F												
Sorghum M												
F												
Cotton M												
F												
Sesame M												
F												
Sunflower M												
F												
Cowpeas M												
F												
Cassava M												
F												
Beans M												
F												
F/Millet M												
F												
Cocoyams M												
F												
Coffee M												
F												

PLANTING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct.	Nov.	Dec.
Maize M F												
Paddy M F												
Sorghum M F												
Cotton M F												
Sesame M F												
Sunflower M F												
Cowpeas M F												
Cassava M F												
Beans M F												
F/Millet M F												
Cocoyams M F												
Coffee M F												
Others (Specify)												

3. WEEDING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Maize M F												
Paddy M F												
Sorghum M F												
Cotton M F												
Sesame M F												
Sunflower M F												
Cowpeas M F												
Cassava M F												
Beans M F												
F/Millet M F												
Cocoyams M F												
Coffee M F												
Others (Specify M F M F												

UTILIZING AND SPRAYING 4. Maize M F	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Paddy M F												
Sorghum M F												
Cotton M F												
Sesame M F												
Sunflower M F												
Cowpeas M F												
Cassava M F												
Beans M F												
F/Millet M F												
Cocoyams M F												
Coffee M F												
*Others (specify) M F M F												

5. HARVESTING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Maize M F												
Paddy M F												
Sorghum M F												
Cotton M F												
Sesame M F												
Sunflower M F												
Cowpeas M F												
Beans M F												
F/Millet M F												
Cocoyams M F												
Coffee M F												
*Others (Specify) M F M F M F M F												

TRANSPORT AND MARKETING	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Maize M F												
Paddy M F												
Sorghum M F												
Cotton M F												
Sesame M F												
Sunflower M F												
Cowpeas M F												
Cassava M F												
Beans M F												
F/Millet M F												
Cocoyams M F												
Coffee M F												
*Others (specify) M F M F M F M												
M F M F												
M F												

18. State the specific reasons which warrants or compels you to choose the growing of certain crops on your farm?

.Easy to Weed = 1
.Provides high yield = 2
.Demands cheap labour = 3
.Good soil fertility = 4
.Land shortage = 5
.Tolerant to drought = 6
.Assured of enough food = 7

19.Have you experienced decline in crop yields over the years since you started farming?

Yes = 1
No = 2

*If yes state the reasons
.poor farm implements = 1
.prevalent pests and disease = 2
.poor farming techniques = 3
.wild animals = 4
.drought = 5
.inavailability of seed varieties = 6
.lower producer prices = 7
.lower soil fertility = 8

20.What kind of farming implements do you own.

Type	Number	Life years	Cost per implement T.shs.
Axe			
Showel			
Hoe			
Tractor			
Pangas (machete or bush knife)			
Disc plough			
Planter			

21. What problems do you encounter in crop production?
.wild animals = 1
.unreliable markets = 2
.lower producer price = 3
.lack of extension services = 4
.unreliable rainfall = 5
.outbreak of pests and diseases = 6
.high costs of Farm inputs = 7
.lack of capital and credit = 8
.lack of good seed varieties = 9
.others (specify) = 10

22. Do you apply fertilizer in farming?
*If yes what type?
Yes = 1
No = 2
.chemical fertilizer = 1
(nitrogen, phosphorus, potassium)
.herbicides = 2
.compose = 3
.farm yard manure = 4
.others (specify) = 5
*If no, give reasons:
.land is fertile = 1
.can't afford to buy = 2
.no advice in applying it = 3
.labour Demanding = 4
.others (specify) = 5

23. What is your own views and response on government policies on crop production and marketing?
.poor and ineffective = 1
.not attractive = 2
.no proper targets = 3
.others specify = 4

24. Would you increase acreage crop production if the government increased producer prices?
. Yes = 1
. No = 2
* If no, give reasons
.parallel market price are reliable = 1
.no adequate land = 2
.no capital = 3

25. Given your experience in farming, has yield been declining or increasing?
.declining = 1
.increasing = 2

*If declining, give reasons?
.inadequate rainfall = 1
.poor seed variety = 2
.lower producer prices = 3
.pests and disease outbreak = 4
.low soil fertility = 5
.soil erosion = 6
.poor crop husbandry practice = 7
.drought = 8

26. What are your other sources of income apart from farming?
.petty business = 1
.making charcoal = 2
.making local brew = 3
.running a shop = 4

27. List the types of inputs you apply in crop production per acre.

Type	Amount used	Cost or price	Crop
1. Planting materials - seeds - seedlings - cuttings - suckers			
2. Fertilizers - chemical - compost - manure - others (specify)			
3. Herbicides and insecticides			
4. Others (specify)			

28. Do you get advice on crop husbandry for practices like wedding,spacing etc.from extension agents?
.Yes = 1
.No = 2
* If no give reasons
.no extension agents = 1
.not easy to contact him/her = 2

29. *If packages of new technologies are provided would you accept and apply them on your farm?
.Yes = 1
.No = 2
*If no why?
.expensive = 1
.destroys environment = 2
.not used = 3
.others specify = 4

30. What measures do you take to control soil erosion and land degradation?
.apply minimum tillage = 1
.plant suitable trees = 2
.apply crop rotation = 3
.practice fallow = 4
.apply mulching = 5