COWPEA AND ITS CONTRIBUTION TO HOUSEHOLD FOOD, NUTRITION AND INCOME IN MBARALI AND NJOMBE DISTRICTS

BY

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ABSTRACT

This study investigated contribution of cowpeas to household food, nutrition and income in Mbarali and Njombe districts in the Southern Highlands of Tanzania. Data was collected using structured questionnaire in which random samples of 150 households, 30 traders and 30 street vendors from each district were interviewed. A checklist was used to key informants including the extension workers. The data was analyzed using Statistical Package for Social Science (SPSS) programme. Descriptive statistics such as frequencies, percentages and means were used to make inferences about the studied households. Results showed that 99 and 51% of the respondents in Njombe and Mbarali districts cultivated cowpeas. Cowpeas were grown for food and cash in 72 and 67% of households in Njombe and Mbarali districts. Average of between 2.8-3.3 and 1.1-1.8 acres per household were under cowpea cultivation in Njombe and Mbarali districts, respectively. In Njombe district, where cowpea is more predominant than in Mbarali only 26 and 33% of the households produced sufficient cowpeas for own consumption, respectively. The study also showed that average sales of cowpeas per household per season were 255kg for Njombe and 147kg for Mbarali district. Surveyed traders sold more beans (104kg/day) compared to cowpeas (68kg/day). Street vendor customers preferred stiff porridge or rice with beans. Small businesses contributed about 52.3 and 78.5% of household income out of which 4 and 3% was income from cowpeas, respectively in Njombe and Mbarali districts. Over the four years, production, consumption and sales decreased, due to cropping system, higher prices of agricultural inputs, diseases and pests, lack of different recipes and lack of reliable markets for the produce. Given the potential cowpea has in reducing household malnutrition in resource-poor households this study recommends increased production of

cowpeas and explore market opportunities because cowpeas have big market inside and outside the country.

DECLARATION

I PIA ANDREW URIO do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is the result of my own original work. I further declare that it has neither been submitted nor being concurrently submitted for similar degree in any other institution.

Signature:.....

Date:. ....16.11.2005.....

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DEDICATION

This dissertation is dedicated to Almighty God who gives me strength and lights up my path, to my late father Andrew Fidelis Urio and to my mother Grasiana Urio, who brought me up and gave me the value of education.

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ACRONYMS

AATF	-	African Agricultural Technology Foundation
APO	-	Asia Productivity Organization
ARI	-	Agricultural Research Institute
AIDS	-	Acquired Immune Deficiency Syndrome
CRSP	-	Collaborative Research Support Programme
DALDO	-	District Agricultural and Livestock Development Officer
FAO	-	Food and Agriculture Organization of United Nations
HIV	-	Human Immunodeficiency Virus
IFPRI	-	International Food Policy Research Institute
IITA	-	International Institute of Tropical Africa
ICFI	-	International Committee of the Fourth International
IPM	-	Integrated Pest Management
MAFS	-	Ministry of Agriculture and Food Security
MATI	-	Ministry of Agriculture Training Institute
NARS	-	National Agricultural Research Support
NRI	-	Natural Resources Institute
PEM	-	Protein Energy Malnutrition
PRA	-	Participatory Rural Appraisal
PRSP	-	Poverty Reduction Strategy Paper
RDS	-	Rural Development Strategy
SHZ	-	Southern Highlands Zone
SNAL	-	Sokoine National Agricultural Library
SPSS	-	Statistical Package for Social Sciences

SUA	-	Sokoine University of Agriculture
TARP II	-	Tanzania Agricultural Research Project Phase Two
TFNC	-	Tanzania Food and Nutrition Centre
Tshs	-	Tanzanian Shillings
UNICEF	-	United Nations Children's Fund
USA	-	United States of America
URT	-	United Republic of Tanzania
WFP	-	World Food Programme

CHAPTER ONE

INTRODUCTION

1.1 Background information

Nutrition problems, especially undernourishment remain a major problem in Tanzania. About 30% of the population suffers from protein energy undernutrition and 62% of the children below 5 years and 66% of pregnant woman are anaemic (Kavishe, 2003). Furthermore, according to the author, 25% of all Tanzanians are affected by iodine deficiency disorder, whereas Vitamin A deficiency affects 24% of children aged between 6 months and 6 years. Other nutritional problems that exist include pellagra (9.4%), scurvy, beriberi, rickets and deficiency of some mineral such as zinc (Kavishe, 2003).

Malnutrition is multifaceted. It results from complex set of multiple and interrelated factors. It is usually a result of combinations of inadequate food intake, frequent infection and diseases, household food insecurity, inadequate care for vulnerable groups and inadequate basic services. Others include poor economic situation, inequitable distribution and utilization of services and poor eating patterns related to traditions and customs (Kavishe, 2003).

Cowpea (*Vigna unguiculata* (L.) Walp) is one of the most important grain legume crops in Tanzania that could assist in reducing this malnutrition if widely consumed. While most of the highlands of Tanzania grow beans, the lowlands and coastal areas grow cowpeas. Some 50–65% of the country consists of semi-arid areas plagued with variable rainfall of erratic distribution, where cowpeas, but not beans, can be grown. In Tanzania, cowpeas provide an important food source to a large segment of the population due to its high content of

protein, minerals and vitamins. Its desirability reflects the fact that the leaves, immature pods, fresh seeds, and dry grains can be eaten or marketed. Rural families that make up the large part of the population derive from its production, food and animal feed, alongside cash income (Quin, 1997).

Also, some cowpea varieties have a short cycle and mature early and thus are able to provide food during the "hungry period", the period at the end of the wet season, when food can become extremely scarce in semi-arid regions of Sub-Saharan Africa. The dry grain is also commonly milled and consumed in numerous traditional main dishes of Africa such as porridge and breads, fed to young children as weaning foods, and eaten as processed snack foods. Cowpea grains, as well as the vegetative parts, make major nutritional contributions to diets (Dovlo *et al.*, 1976).

From an agronomic perspective, cowpea is a predominantly being a drought-tolerant crop with better growth in warm climates; it is most popular in the semi-arid regions of the tropics, where other food legumes do not perform well. It can be grown quite successfully under conditions that are totally unsuitable for the common bean, like semi-arid areas. The adaptation to drought is especially important for the dry Sahelian and other Savanna zones of western and eastern Africa. Due to its high adaptability to drought-prone conditions, relative to other crops, cowpea is the crop of choice in these harsh environments (Singh and Sharma, 1996).

Cowpea is also a good cover crop and can be intercropped with taller plants, such as maize, particularly in high rainfall areas due to their exceptional shade tolerance. Cowpeas have the advantage of better weed control, provision of insurance against crop failure and

improved food quality. Also, they contribute to reduction of incidences of chronic diseases, such as heart diseases, which are emerging health problems in developing countries (Waniska and John, 2002). Beans are mostly produced as a cash crop, which limits their availability for household consumption; hence cowpeas can provide suitable option in improving household nutrition (King *et al.*, 1985).

1.2 Problem statement and justification

Protein in the human diet is derived from several sources including cereals, vegetables, legumes and animal products. Although meat is generally considered the best source of protein due to its complete amino acid composition, its cost is rising steadily, making it unavailable to large percentage of Africans. This lack of purchasing power is a direct cause of malnutrition. Legumes are next to cereals in terms of their economic and nutritional importance as human food resources. Regardless of their high nutritive value, the availability of grain legumes over the last few years has dropped because their production has not been very profitable compared to other crops. Consumption of pulses, especially cowpeas is associated with poverty, since most people consider them nutritionally inferior to meat, fish or egg, in spite of the many health–promoting properties of properly processed and cooked legumes (Westpal, 1974). The potential of cowpeas is not fully exploited to combat protein energy malnutrition in the household in the country. Also, the reasons for underutilization have not been established. Therefore, there is a need to investigate and understand the reasons for this situation and develop strategies to promote its production and consumption as a means of reducing household malnutrition and poverty in the country.

Cowpea is a leguminous crop that is rich in protein and micronutrients. Several alternatives to animal protein are being investigated to alleviate malnutrition among resource poor farmers in Africa and cowpea looks to be among the promising potential protein sources in the diet of such rural households in Tanzania, that has been underexploited. Also, the protein found in cowpea has high digestibility as compared to other legumes (Ologhobo and Fetuga, 1983). Due to increasing cost of foodstuffs of animal origin, extensive use of locally grown legumes, and green leafy vegetables in daily home food preparation is necessary to alleviate nutritional problems, especially undernourishment like that of proteins and micronutrients that remains to be a major problem in the country. Cowpea therefore demonstrates potential in solving nutritional problems if its wide cultivation and consumption could be ensured. Consequently, there is urgent need to establish bottlenecks to production, marketing and consumption of the crop as an affordable form of intervention that could make resource poor farmers play active role in fighting malnutrition in Tanzania.

1.3 Objectives of the study

1.3.1 General objective

The general objective of the study was to investigate the contribution of cowpeas to household food, nutrition and income through production, consumption and marketing of cowpeas in the households of rural people.

1.3.2 Specific objectives

i) To investigate and understand the reasons for underutilization and develop strategies to promote cowpea production and consumption

ii) To determine factors those influence the low production and consumption of cowpea in the country and study availability of cowpea in selected villages in Mbeya and Iringa regions.

iii) To identify how cowpeas contribute to household socio-economic status and identify strategies to promote consumption of cowpeas in the area.

iv) To identify and suggest possible improvements needed by farmers in the use of the crop in order to ensure its sustainability.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

According to FAO (2001), in the developing world, 17% of the populations were undernourished during 1997-1999. At regional level, Sub-Saharan Africa had the highest proportion of undernourished population from 1997-1999 that stood at 34%. Among the sub-regions, Central Africa currently ranks highest with 51% of its population undernourished, followed by East Africa and Southern Africa, both at 43%, from 1997-1999. At the country level, there are eight countries that have 1997-1999 prevalence rates of undernourished over 50%, three of which are in Eastern Africa, two in Southern Africa, one in Central Africa, one in the Near East, and one in the Caribbean. They include: Somalia (75%), Burundi (66%), the Democratic Republic of Congo (64%), Afghanistan (58%), Eritrea (57%), Haiti (56%), Mozambique (54%) and Angola (51%). Also, the United Republic of Tanzania portrays a level of undernourishment of 43% of the population.

2.1.1 The concept of food security

Food security is a complex issue, which has recently developed in the field of food, nutrition and economics. It is still undergoing evolution with other authors trying to adopt a multi-disciplinary approach to link to subject with different fields of specialization. Sustainable Development Networking Programme (SDNP) (2003) defined food security as a state when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs had food preferences for an active and healthy life. The two components of food security are food availability (through domestic

production, storage and or trade) and food access through home production and practices in the market (Rukuni and Eicher, 1987). Even if there is food production taking place, there is insufficient income for urban dwellers and a lack of resources in rural African households. These leave them unable to access sufficient food. Action to eliminate food insecurity and malnutrition in Africa, therefore, must focus on rural areas for a long time to come, even though the rates of urbanization in Africa are rapidly increasing (FAO, 1992).

2.1.2 Household food security

It is clear that rural households' food consumption depends on their own production. However, efforts to produce enough are hindered by various factors, unpredictable rainfall being the major among others. The study done by Liwenga (1995), revealed that 92% of the respondents had food shortage within the past years. The same study also revealed that most food problems occurred just before crop maturation. The major reasons for the deficit were rain failure and excessive crops sale.

Lorri (2000) argued that the reasons for food insecurity were due to the fact that the food base has shifted from the use of traditional crops such as millet, sorghum, cowpea and cassava. People prefer maize, rice and beans, which need more rain than millet, sorghum, cowpea and cassava that are drought-resistant crops. This shift in preference of the food staple aggravated quite considerably the food insecurity situation, as communities have nothing to fall back on when the rains are not adequate for the preferred crops.

2.1.3 Food security at national level

The problem of food insecurity at the national level is caused by a number of factors including serious disparities in consumption and production of cereals; lack of access to

food grains and logistical and financial constraints in the transportation and distribution of food grain to deficit areas. For smallholders, income pressure leads to their retaining for domestic consumption and inadequate stocks to ensure food security. These low stocks may further be depleted by losses due to storage, spoilage and pest, which are estimated at up to 40% for food grains and 75% for fruits and vegetables (Kavishe, 1990).

2.1.4 Agricultural situation

The Poverty Reduction Strategy Paper (PRSP) and Rural Development Strategy (RDS) have identified agriculture as a key poverty reduction sector (URT, 2000). Over 40% of the rural people are food poor and most of them are found in the rural semi-arid areas. Tanzania economy depends mainly on agriculture. Apart from accounting for about half of the income and three quarters of merchandise export, agriculture is also a source of employment to about 80% of the population. Also, more than 85 percent of the poor and hungry in Sub-Saharan Africa reside in rural areas and depend on agriculture for their livelihoods, either directly or indirectly (FAO, 2002). Smallholder farmers dominate Tanzanian agriculture with typical farm sizes ranging from 0.9 to 3.0 hectares (URT, 2004a). For rural poverty reduction to become a reality, an agricultural sector growth rate of at least 5% is considered necessary (URT, 2001). Although this way was achieved in 2001 and 2002, it could not be sustained in 2003 when the growth rate dropped to 3.3% due to poor rains in large parts of the country (URT, 2004b). Agricultural production patterns in Tanzania are dominated by rainfall. It is estimated that 98% of the cultivated land in Tanzania is rain-fed and is equivalent to 39.5 million hectares. Most of the arable land (63%) in most regions receives less than 750 mm rainfall per annum and only 144,000 ha are under irrigation. This has caused low food production in rural households leading to food insecurity in most areas of Tanzania. The continuous increase in food crisis in most

regions of Tanzania has called for much research on food security, nutrition and agriculture in general (URT, 2004b).

2.1.5 Limitation to agricultural growth

Dependence on a limited range of staple foods leads to health problems because of the lack of certain micronutrients in such food. In Africa, the four most deficient micronutrients are vitamin A, iron, zinc and iodine (UNICEF, 2002). Between 15,000 and 20,000 African women die each year due to severe iron deficiency anaemia. Hundreds of thousands of children have lowered intellectual capacity due to iodine deficiency. Vitamin A deficiencies in children are common across the continent, reducing their ability to resist infection and contributing to the deaths of more than half a million African children annually. Sub-Saharan Africa child mortality rates are 170 per 1000 live births (Barry, 2004).

An important limitation to agricultural growth is the low use of technology. About 70% of the crop area is cultivated by hand hoe while 20% is cultivated by ox plough and 10% by tractor (URT, 2001). As a result, productivity per unit of labour and land is low. Producing more food per unit of land suited for agriculture, in a manner compatible with sustainable management of natural resources, is an essential component of a successful effort to eliminate food insecurity and malnutrition.

The total area under agriculture in Tanzania is still low. Statistics show that out of 44 million hectares of land that is classified as suitable for agriculture, only 10.1 million ha (or 24%) is under cultivation. This means that there is considerable potential to increase the agricultural area in Tanzania. Food security is further threatened in areas with a single

rainy season. Whilst following the harvest a family might have sufficient food, there is often insufficient amount of provide a secure supply right through to the next harvest.

Finally, risk factors such as drought, pests and market risks and uncertainties contribute significantly to food insecurity and malnutrition. Improving agricultural productivity is a means of increasing both the physical availability of food and the incomes of food-insecure people. However, increased productivity and food availability leading to reduced real food prices are not sufficient to eradicate food insecurity. If the market is to reliably provide people with access to sufficient, nutritious food, the marketing system must both supply food to those who need it and simultaneously provide incentives to those who produce it for sale to increase production. In most parts of Africa, the marketing system is not effective in this regard (IFPRI, 2004).

2.2 Origin and distribution of cowpeas

Cowpea (*Vigna unguiculata* (L.) Walp.) is one of the most ancient human food sources and has probably been used as a crop plant since Neolithic times (Summerfield *et al.*, 1974). The precise location of the centre of origin of a species is rather difficult to determine. Previous speculation had been based on botanical and cytological evidence (Ng, 1995). This procedure of location the place of origin of a crop is correct to a certain degree, but too often it produces erroneous interpretation. Therefore based on the range of variation and number of varieties found in wild cowpea, Padulosi and Ng (1997), speculate that the Transvaal region of the Republic of South Africa was the centre of specialist of *V. unguiculata*, due to the presence of most primitive wild varieties. They further hypothesized that the species moved northwards from Transvaal to Mozambique and Tanzania, where the subspecies *pubescens* evolved. Cowpea is now grown throughout the

tropics and subtropics and has a wide variety of uses including hay, grazing, grain, and green manure and as a vegetable (Padulosi and Ng, 1997).

Tanzania is one of the African countries having the greatest number of indigenous species of *Vigna*. During the exploration in 1987, 12 species of wild *Vigna* were positively identified and collected. The most interesting material gathered in Lindi region, in open grassland, was a large population of perennial wild *V. unguiculata* with creeping stem 2.5 m long. This variety has plant characteristics that resemble those of *V.unguiculata*. Like the known species of V. *unguiculata*, potential uses of wild species are useful as those of the *V. unguiculata* (Padulosi and Ng, 1997).

2.3 World cowpea grain production

It is rather difficult to obtain reliable statistics of cowpea area and production because most countries do not maintain separate records on cowpea. Probably, because of these difficulties, the Food and Agriculture Organization (FAO) suspended formal publication of cowpea production data several years ago. However, based on information available from FAO and via correspondence with scientists in several countries, it can be estimated that cowpea is now cultivated on at least 12.5 million hectares, with an annual production of 3.3 million tonnes worldwide (FAO, 2001), while cowpea is grown on some 80,000 hectares in the USA (Fery, 1990). Central and West Africa account for more than half of the cultivated area, followed by South America (19%), Asia (10%), East and South Africa (6%) (Singh *et al.*, 1997). Average world yield of cowpea grain is quite low at less than 0.3 tonnes/ha (Ng and Maréchal, 1985). Outside Africa, the major production areas are Asia and Central and South America with several smaller areas spread over southern Europe,

southern USA, and Oceania. Brazil is the world's second leading producer of cowpea seed, producing 600,000 tonnes annually (Quin, 1997).

2.3.1 Cowpea production in Africa

Subsistence farmers in the semi-arid and sub-humid regions of Africa are the major producers and consumers of cowpeas. These farmers not only grow cowpeas for dry seed for human consumption and fodder for animal feed, but also utilize the leaves and fruits for vegetables. Cowpea is widely distributed throughout the tropics, and Africa accounts for over 64% of the estimated 12.5 million hectares cultivated cowpea worldwide. Of this area, about 9.8 million hectares are planted in West Africa, making it the region with the largest production and consumption of cowpea in the world. Nigeria, in turn, accounts for upwards of 75% of production in West and Central Africa (FAO, 1999). Other producers are Niger, Mali, Burkina Faso, Ghana and Senegal (Fery, 2002).

In the East and South Africa region, both beans and cowpeas are produced in some countries. Mozambique is the largest cowpea producer in the region while others include Uganda and Tanzania. Within Africa, average cowpea yields vary dramatically from 0.05 to 0.55 tonnes/ha depending upon the varieties planted, the extent of cultural inputs (e.g., fertilizer and pesticides), the cropping system (intercropping versus sole cropping) and the agro-climatic-edaphic conditions (Ng and Maréchal, 1985).

2.4 Pulses production in Tanzania

Pulses are a group of leguminous crops that are grown both as cash crops as well as for home consumption. As cash crops, they are classified in Tanzania as non-traditional export crops in order to distinguish them from the traditional export crops like tobacco, coffee,

cashew nuts and cotton lint. Pulses produced in Tanzania include beans, cowpeas, pigeon peas, green beans, yellow and green grams, bambaranuts and lentils. Some of the crops are important food items in both rural and urban areas. Except for dry beans, pulses are grown marginally in the country. Production of pulses in Tanzania is mainly done in Kagera, Shinyanga, Mbeya, Iringa, Kigoma, Mwanza, Rukwa and Arusha regions Table 1.

Table 1: Pulses production in '000' tones by region

Region/Year	1996/97	1997/98	1998/99	1999/2000	2000/2001
Arusha	19.2	55.7	44.0	37.5	44.0
Coast/DSM	0.8	10.6	34.7	23.0	24.0
Dodoma	2.5	3.8	7.4	18.5	45.0
Iringa	58.9	49.0	68.5	59.5	33.0
Kagera	32.3	47.2	47.2	93.4	45.0
Kigoma	45.2	18.1	39.1	49.2	33.0
Kilimanjaro	12.2	27.3	12.4	22.5	20.0
Lindi	0.0	9.5	9.6	7.1	5.0
Mara	4.3	6.0	6.9	13.1	17.0
Mbeya	26.7	31.0	32.1	50.6	27.0
Morogoro	10.4	1.0	11.0	20.3	36.0.
Mtwara	7.1	17.1	20.0	25.0	10.0
Mwanza	25.7	31.9	32.8	42.9	97.0
Rukwa	35.1	39.9	37.9	55.2	39.0
Ruvuma	20.6	19.2	25.9	33.0	24.0
Shinyanga	35.1	38.2	51.6	42.5	66.0
Singida	5.1	12.9	7.4	18.7	51.0
Tabora	12.7	16.1	18.2	24.0	32.5
Tanga	14.8	27.4	21.4	37.8	30.0
Total	**368.7**	**462.0**	**528.2**	**673.8**	**683.0**

Source: MAFS (2004)

Inadequate support services in terms of research, extension and modern inputs have combined to depress yields and total production. Disorganized domestic and export marketing system, coupled with insufficient information to link domestic market with the export markets have acted against producers and traders, particularly those operating at primary procurement level (MAFS, 2004). Tanzania rural households plant cowpea in small plots for their own consumption and give relatively little attention. In the Southern Highland Zone of Tanzania beans were ranked first due to their importance used as food in most households. It is a cash crop with readily available market. Cowpeas, bambaranuts, green gram and lentils were ranked sixth although they are used as side dishes like other legumes (TARP II SUA, 2003). The International Institute of Tropical Agriculture and the Ministry of Agriculture in Tanzania have been successful in developing several improved varieties of cowpeas but yet the importance of this crop is still questionable (Price *et al.*, 1982).

2.5 Production statistics of cowpeas in Tanzania

Reliable production statistics for cowpea and almost for all grain legumes are very difficult to quantify except beans in Tanzania. This situation has more to do with the system of data storage and compilation within the agricultural sector in the country as a whole. For instance, the basic data, from Agriculture and livestock sector, all grain legumes data except beans are given under one-group name 'pulses'. Under such circumstances it becomes difficult to quantify for a single grain legume, e.g., cowpea. From the scanty data available, cowpea production in Iringa show that the highest production was 9510 tonnes in 2002/03 but declined to 8000 tonnes in 2003/04, for the same season in Mbeya data was not available Table 2.

Table 2: Area (ha) and production (tons) of cowpea in some region of Tanzania

Region	2002/03		2003/04		2004/05*	
	Area (ha)	Tonnes	Area (ha)	Tonnes	Area (ha)	Tonnes
Dodoma	640	110	4940	3740	5750	3520
Kilimanjaro	510	390	270	130	230	220
Morogoro	220	150	1560	1400	1120	NA
Pwani	9500	19300	4750	NA	800	400
Ruvuma	14430	6560	13000	6500	NA	NA
Iringa	11310	9510	8660	8000	5070	7600
Mbeya	1500	4600	NA	NA	NA	NA
Shinyanga	NA	NA	10680	10120	6460	3200

Source: MAFS (2004) NA means not available 2004/05* (projection)

2.6 Botanical description of the crop

It is an annual herb with a strong taproot and many spreading lateral roots in surface soil. Growth forms are often categorized as erect, semi-erect, trailing, climbing or bushy. There is much variability within the species. Growth habit ranges from indeterminate to fairly determinate with the non-vining types tending to be more determinate (Davis *et al.*, 1991).

2.6.1 Leaves and stems

The trifoliolate leaves develop alternately. Leaves are smooth, dull to shiny, and rarely pubescent. Commonly, the terminal leaflet is longer and larger than the lateral leaflets. Leaves exhibit considerable variation in size (6–16 x 4–11cm) and shape (linear–lancelets to ovate) usually dark green. Leaf petiole 5-25 cm long (Fox and Young, 1982). Striate, smooth or slightly hairy. Sometimes tinged with purple (Kay, 1979).

2.6.2 Inflorescence

Cowpea is generally day neutral. Flowers are borne in multiple racemes on 5-60 cm flower stalks (peduncles) that arise from the leaf axial. Two or three pods per peduncle are common and often four or more pods are carried on a single peduncle. The presence of these long peduncles is a distinguishing feature of cowpea and this characteristic also facilitates harvest. Flowers are conspicuous, borne on short pedicels and the corollas may be white, dirty yellow, pink, pale blue or purple in colour and the presence of floral nectarines contribute to the attraction of insects. Cowpea primarily is self-pollinating (Davis *et al.*, 1991).

2.6.3 Fruit

Fruits are pods that are smooth, 15 to 25 cm long vary in size, shape, and colour. They may be erect, crescent-shaped or coiled. As the seeds approach the green mature stage for use as a vegetable, pod colour may be distinctive, most commonly green and yellow or but may also be brown or purple in colour (Fox and Young, 1982).

2.6.4 Seeds

It usually contains 8-20 seeds per pod. Seeds vary considerably in size, shape and colour. They are relatively large (2-12 mm long) and weigh 5-30 g/100 seeds. Seed shape is correlated with that of the pod. Seed develop a kidney shape if not restricted within the pod, but as crowding within the pod increases the seeds become globular. The seed coat can be smooth or wrinkled and of various colours including white, green, cream, red, brown, black, speckled, blotched, eyed (hilum white surrounded by a dark ring) or mottled in colour (Summerfied *et al.*, 1974). Cowpeas vary in maturation period from short

duration about 3 months and green pods may be picked after 50 days mostly for grain, to longer duration may take up to 5 months to mature (Kachroo, 1983).

2.7 Ecology of the crop

Cowpea is adapted to warm weather and require less rainfall than most crops; therefore, it is primarily cultivated in the semi-arid regions of lowland tropics and subtropics, where soils are poor and rainfall is limited (Davis *et al.*, 1991). Thrives on many kinds of soil, from highly acid to neutral; less well adapted to alkaline. Crop grows and yields at relatively low fertility levels, but often responds to Phosphorous fertilization, Nitrogen applications rarely effective on well-nodulated plants. Can withstand considerable drought and a moderate amount of shade, but is less tolerant of water logging. Some plants are indeterminate in growth, and continue to grow until killed by frost (Duke, 1990). In the tropics, such indeterminate plants may be weak perennials and continue growing as long as conditions are favourable. Cowpeas are widely grown in eastern Africa and Southeast Asia primarily as a leafy vegetable. The protein content of the leafy cowpea parts consumed annually in Africa and Asia is equivalent of 5 million tonnes of dry cowpea seeds and that this represents as much as 30% of the total food legume production in the lowland tropics (Steele *et al.*, 1985).

2.8 Cropping system

Intercropping is the most popular crop production system in subsistence tropical agriculture (Willey, 1979). Cowpea has outstanding potential for intercropping. Jodha (1976) estimated that up to 80% of all rain fed crops in many developing countries are planted as intercrops. Most of East African countries where intercropping involves cereals and legumes, the cereals are often considered as the main crop (Willey, 1979). Maize and

cowpea form one of the combinations in this system. However, yield of cowpea in this system are often low due to competition effects from the maize. As farmers usually delay planting cowpea until some weeks after maize, this worsens the competition effect. Late planted cowpea in the intercrop suffers more from maize competition than those sown early. The effect of maize competition on cowpea in the field has not been quantified, although there are reports that cowpea yields are reduced by more than 60% (Karel *et al.*, 1982, May and Misangu, 1982). This could be attributed to several factors including competition for light, nutrient and moisture, reduced plant population of cowpea, time of planting of cowpea, the cowpea and maize cultivars used and the planting pattern of the intercrop.

2.9 Cowpea varieties

Numerous local cowpea types exist in Tanzania is evidenced by the extreme variations of growth habits, shape, colour of leaves flowers, pods and seed. Generally, cowpea has two types of growth habits, determinate and indeterminate. Determinate cowpea plants produce flowers and pods uniformly within 60–68 days. It is this characteristic of the determinate varieties which enables them to be planted during the short rains. Indeterminate cowpea plants produce flowers on lateral branches while the central stem continues to grow. Thus, the flowers and pods are produced over a long period of time 80–90 days (Price *et al.*, 1982).

2.10 Nutritive value

In most developing countries protein-energy malnutrition is fairly prevalent among infants and preschool children. The supply of nutritious foods such as meat, eggs, milk, and milk products is inadequate, and animal sources of protein and commercially manufactured

foods are usually too expensive for most families. The nutritional value of cowpeas lies in their high protein content, which is double that of cereals. The consumption of cowpeas is widespread in Nigeria either alone or in combination with cereals (FAO, 1985). Although such combinations may be too bulky to meet the protein and calorie needs of young children, a number of high quality protein recipes made from cowpeas that are suitable for young children have been described (Dovlo *et al.*, 1976). Table 3 indicates the comparison of price per kilogram of animal origin foods with cowpeas in Nigeria.

Table 3: Comparative cost of protein in selected food sources in Nigeria

Source	Commodity (U$/kg)	Protein (%)
Pork	1.45	12
Beef	1.83	20
Egg	0.92	13
Poultry	1.28	20
Milk powder	4.51	36
Cowpea	0.43	20
Soybean	0.55	40

Source: IITA (1997)

2.10.1 Mature cowpea grains

The mature grain contains 23–25% protein; the proteins consist of 90% water–insoluble globulins and 10% water-soluble albumins, 50–67% starch. It also contains small amount of ß-carotene equivalents, 0.0008% thiamin, 0.00042% riboflavin, 0.00281% niacin, 0.0002% ascorbic acid, 0.005% iron, 1.04% calcium, 41.6% phosphorus, zinc and folic acid which is important in preventing birth defects (Kay, 1979; Tindall, 1983). Furthermore it has the ability to lower serum cholesterol in humans, high fibre content 6.3%, low fat content 1.9% high concentration of polyunsaturated fatty acids, long shelf

life and the diversity of foods that can be made from them (Bressani, 1985). The protein in cowpea seed is rich in the amino acids, lysine and tryptophan, compared to cereal grains; however, it is deficient in methionine and cystine when compared to animal proteins. Therefore, cowpea seed is valued as nutritional supplement to cereals and an extender of animal proteins (Davis *et al.*, 1991).

2.10.2 Immature pods

Immature pods also contain (per 100 g) 85.3% moisture, 47 calories, 3.6 g protein, 0.3 g fat, 10.0 g total carbohydrate, 1.8 g fibre, 0.8 g ash, 45 mg calcium, and 52 mg phosphorus, 1.2 mg iron, 170 μg vitamin A, 0.13 mg thiamine, 0.10 mg riboflavin, 1.0 mg niacin, and 22 mg ascorbic acid. Immature snapped pods are used in the same way as snap beans; often being mixed with other foods provides an inexpensive source of protein in the diet (Tindall, 1983). Green cowpea seeds are boiled as a fresh vegetable, or may be canned or frozen.

2.10.3 Cowpea leaves

Cowpea leaves are good source of protein that ranges from 29 to 43% on dry weight basis and 4.7% protein, 8% starch, crude fibre 2%, (fresh weight basis). Also, minerals like iron, calcium, phosphorus and vitamins like beta-carotene (Barett, 1990). According to Duke (1990) cowpea leaves can produce 9 times the calories, 15 times the protein, 90 times the calcium, and thousands of times more vitamin C and beta-carotene of cowpea seed.

Wild plant leaves cannot be harvested in sufficient quantities for large-scale commercial operations, but the cultivated cowpea appears to be very suitable for such level of commercialization, as its leaves are a popular vegetable. A significant amount of leaves

can be harvested from the plant without detrimentally affecting its seed yields, and thus its potential is very high (Taylor and Moss, 1982). Dried leaves are preserved and eaten as a meat substitute (Fox and Young, 1982).

2.10.3.1 Status of traditional vegetables

Information on traditional vegetables in Tanzania is scanty and dispersed (Mnzava, 1993). Early studies by Manyafu (1971), Fleuret (1979) and Gerson (1989) are exploratory in nature. Table 4 indicates some of the commonly grown vegetable with their respective nutrient composition in Tanzania.

Table 4: Nutritive value (per 100 g edible portion) of some traditional vegetables in Tanzania

Vegetable	Ca (mg)	Fe (mg)	Vitamin A (µg)	Vitamin C (mg)	Protein (g)	Fibre (mg)
African eggplant	523	6.0	NA	67	4.8	24
Amaranthus	410	8.9	2300	50	5.0	24
Cassava (leaves)	300	7.6	3000	310	6.1	20
Cowpea (leaves)	255	5.7	700	56	4.7	20
Hare's lettuce	130	3.1	1430	0	NA	20
Pumpkin (leaves)	475	0.8	1000	70	4.0	20
Sweet potato leaves)	160	6.2	2620	70	3.2	20
Taro (leaves)	98	2.1	1530	11	4.1	12

Source: West *et al.* (1988)

NA – Data not available

On the other hand, indigenous knowledge of the nutritive values, methods of production, preservation and utilization of traditional vegetable is disappearing, as with the young moving to urban centers, systematic transmission of the information from the old generation breaks down. There is also evidence that some wild plant species, which have been used as vegetables, are on the verge of disappearance in some areas owing to:

(i) changes in the ecology of many areas due to prolonged drought, overgrazing bush fires, deforestation,

(ii) introduction of exotic vegetables, resulting in a gradual decline in the use of wild and weedy species.

2.11 Economic importance of cowpea

2.11.1 Provision of food and income

The cowpea has been well documented as a multi-purpose legume crop, especially in eastern and southern Africa. Cowpea is cultivated for its leaves, green pods, grain and stalk. For the purpose of a crop of leaves, cowpeas are sown thickly and the entire plants harvested at three weeks. Seeds may be broadcasted alone or into a grain field, and thinned gradually with the thinning cooked. Some indeterminate cultivars are suitable for harvesting leaves, young pods, and mature seeds, each over a long period, and for feeding the residues to livestock. If seeds are desired, leaf harvesting should cease before the pods begin to expand. In Botswana, researchers have selected triple-purpose landraces for seed, forage, and leafy vegetable production. In Zimbabwe, the leaf and seed are given equal importance, while in the more humid parts of East Africa, cowpeas are grown mainly for leaves (Barrett, 1987). Cowpea grain is consumed directly following boiling, as a component of meals, which also include porridge, made from cereals or root crops. In eastern and southern Africa, cowpea leaves are commonly added to sauces and served with porridge, or boiled and consumed in a manner similar to spinach. The economic values of cowpeas have long been recognized in Africa, particularly as a subsidiary crop to be relied on during the hungry season (Dovlo *et al.*, 1976).

2.11.2 Improvement of soil fertility

As a legume, cowpea can contribute to soil fertility, mainly through its nitrogen fixing abilities with nodule bacteria (*Bradyrhizobium* spp.). Part of the nitrogen fixed will remain in the soil in the roots, and thereby contribute to the soil fertility for subsequent crops. Some fixed nitrogen will eventually return to the soil as manure after residues are fed to livestock. Carsky *et al.* (2002) reported that cowpea could supply 35–40 kg N/ha in cowpea rotations with maize. Also, cowpea acts as cover crop. Cowpeas can be grown as a green manure crop and turned into the ground just before flowering. This adds nitrogen and organic matter and improves soil structure. It also has an unexpected benefit of dramatically lowering aluminum toxicity, which is a very serious problem in many tropical soils.

2.11.3 Cover crop and weed suppression

Cowpeas have a spreading habit (indeterminate or semi indeterminate) and bushy growth of which it provides ground cover, thus suppressing weeds and providing some protection against soil erosion. In addition, some cowpea varieties cause suicidal germination of the seeds of (*Striga hermonthica*), a parasitic plant, which may infest the cereals, often with devastating effects (Quin, 1997).

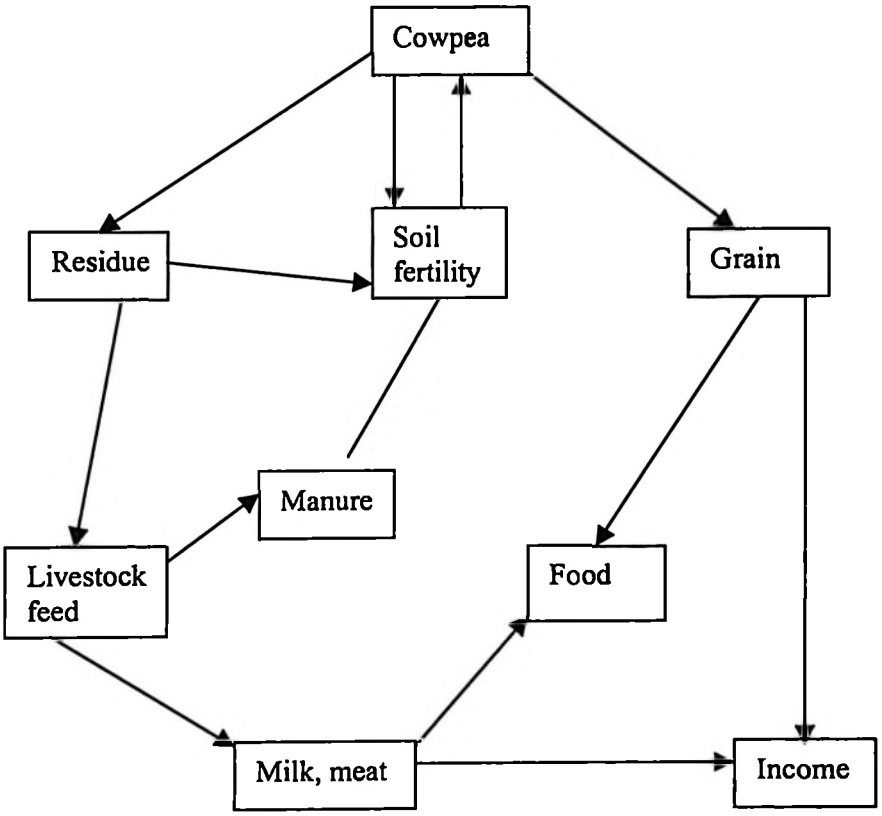
2.11.4 Animal feed

The crude protein content of cowpea hay can compare favourably with that of lucerne. Cowpea is suitable for grazing and may be grazed during the growing season, while still leaving sufficient material for hay or single cut for hay or silage purposes. If cowpeas are cut regularly and early in the season, new leaves are produced continuously. An animal production study (Philips *et al.*, 1996) has shown that the average daily gain of cows and

sheep fed on cowpeas is more than on rye grass and compares favourably with that on clover pastures. Sheep utilizes all the cowpea leaves before grazing on the pods. Good management can, therefore, ensure effective animal production as well as an adequate harvest for used production or human.

Cowpea fodder as a feed supplement increased animal live weight gain during the dry season. In addition to the direct benefits of improved livestock production and health, that result form feeding cowpea fodder, the quantity of manure from such better fed animals will be improved and therefore, when returned to the land at the beginning of the growing season, contribute more towards the maintenance of the soil fertility. A farmer could benefit by extra 50kg meat per annum from better-nourished animals, with over 300 kg more cereal grain as result of improved soil fertility directly from the cowpea and more/better manure from the animals (Tarawali *et al.*, 1997). Also, there is an increased crop yields that would be realized in the next year after the distribution of manure. Cowpea residue is an important fodder resource of ruminant livestock (Tawarali *et al.*, 1997). Farmers in the dry savannas deliberately grow varieties and use management practices that will ensure some cowpea fodder is available for harvest at the end of the growing season, even at the expense of grain production.

These potential contributions of cowpea described and their interrelationship are summarized in Fig. 1



Source: Tarawali *et al.* (1997)

Figure 1: Schematic representation of the potential contributions of cowpea in crop and livestock systems in the dry savanna

This clearly indicates the potentials of this underexploited crop that has economic importance.

2.11.5 Provision of immunity to the body

Beans and cowpeas are among the most nutritionally complete staple foods, constituting the second most important sources of dietary protein in many countries in Africa. Emerging new research indicates that consumption of beans and cowpeas contributes to reduction of incidences of chronic diseases (e.g. heart disease, cancers, and diabetes), which are emerging health problems in the developing world. Recent studies indicate that the onset of AIDS in HIV positive individuals can be delayed by consuming nutritious foods, such as beans and cowpeas, which enhance the immune system. Cowpeas are an important crop mostly consumed by rural family farmers. An increased utilization of cowpeas by families (men, women and children), which consume cereal–based diets, would improve their nutritional status and health (Waniska and John, 2002).

2.12 Harvesting

Cowpea can be harvested at three different stages of maturity, green snaps, green-mature and dry. Depending on temperature, fresh-market (green–mature) peas are ready for harvest 16 to 17 days after bloom (60 to 90 days after planting). The processor normally specifies harvest date for green snap pods. Mechanical harvest requires the use of a snap bean of green pea harvester. Most domestic cowpea production is mechanically harvested, however, hand harvested cowpeas suffer less damage and the harvest season may continue over a 1 to 3 week period (Davis *et al.*, 1991).

If an indeterminate crop matures during the rains, the pods should be harvested at intervals of one to two weeks. Even during the dry season, always harvest cowpea pods as soon as they are ripe, because the seed quality will deteriorate rapidly in dried pods stay in the field for a long time whether in wet or dry environment. Uprooting the entire plant at one time is

possible since nitrogen-fixing nodules will have already disintegrated. Thus harvesting determinate varieties is much easier than harvesting indeterminate plants. For hay, crop is cut when most pods are fully developed, and first ones have ripened. If cut too early, hay is difficult to cure, if cut too late, stems are long and woody and seed and leaves shatter badly (Tarawali *et al.*, 1997).

2.13 Consumption of cowpea

Cereals and grains grown for human consumption must possess characteristics that make them acceptable to consumers, such as an attractive appearance and good cooking, eating, and digestibility qualities in addition to desirable growing properties, such as high yield and resistance to disease and insect attack (Taylor and Moss, 1982). The two most widely distributed grain legumes are cowpea [*Vigna unguiculata* (L.) Walp.] and bean (*Phaseolus vulgaris* L.). Bean leaves are consumed in at least eight African countries and Indonesia, while cowpea is consumed in 18 countries in Africa and seven more in Asia and the Pacific. Cowpea is among the top three or four leaf vegetables in many parts of Africa (Bittenbender *et al.*, 1984). The main use of cowpea as a vegetable crop is as a legume, especially for small-scale farmers in rural areas. It is very palatable, highly continuous and relatively free of metabolites or other toxins (Kay, 1979). The use of cowpea seeds as a seed vegetable provides an inexpensive source of protein in the diet. Similarly, fresh, immature pods may be boiled as a vegetable. Fresh leaves and growing points are often picked and eaten in the same way as spinach (Coetzee, 1995; Quass, 1995).

2.14 Antinutritional factors

It has been amply demonstrated by Wagner *et al.* (1977) that legume intake results in flatulence because of the human lack of intestinal α-galactosidase enzyme to hydrolyze oligosaccharides to absorbable monosaccharides. When oligosaccharides escape digestion and absorption in the small intestine, they become exposed to colonic bacterial flora, which ferment them, with gas production usually accompanying this fermentation. This may be a possible explanation for the abdominal distension, hence pain, as well as flatulence occurring in human. Though there is no documentation that this lack also results in diarrhoea, the sequence of digestion of legumes such as cowpeas could afford a suitable mechanism for the development of diarrhoea, particularly in poorly nourished children. Consumption by young children suffering from recurring bouts of intestinal infections exacerbates this problem. However, in populations habitually consuming legumes, some type of adaptation may occur that lessens such undesirable gastro-intestinal effects (Bressani and Elias, 1977).

Seeds contain a trypsin inhibitor, a chymotrypsin inhibitor and cyanogens in concentrations of about 2mg/100 ml extract. Cooking improves the nutritive value, perhaps because the activity of trypsin inhibitors and/or the amount of other toxins are decreased by heat.

2.15 Drying and storage of cowpea

Cowpeas are grown, stored, and eaten by the vast majority of Africans living in the humid west coast area. But in Sierra Leone, very little cowpea is grown and stored by the farmers because the losses due to insects and moulds are too high. Loss estimates are in the vicinity of 40% as storage techniques are climate and crop–dependent (Taylor and Moss, 1982).

The harvested pods should be dried in the sun for 3–4 days and the pods should be turned over periodically for aeration to prevent infection by fungi. Threshing should begin when the pods start cracking and splitting upon gentle touch. The pods should be placed in a hessian cloth bag or in a dry place on the ground and beaten thoroughly with a stick. Winnowing separates the seeds and pods and the few remaining pod are removed by hand. In at least 11 tropical African countries cowpea leaves are dried to store them for the dry season. Usually they are first steamed or boiled, but not in all places. Sun drying requires one to three days. Storage for up to a year is possible since dried cooked leaves are not damaged as much by insects as dried seeds. Excessive losses of carotene, vitamin C, and the amino acid lysine often occur to sun-dried leaves, but can be reduced by minimal cooking followed by drying in the shade (Barrett, 1987).

2.16 Marketing

Dried peas are used for food products. The dried peas and frequently sold directly to the consumer after cleaning and bagging. Another common product is the canned or frozen product, which is cooked with water prior to canning or freezing. Various soups and bean mixes will incorporate this product as well. Cowpea leaves are sold in Ghana, Mali, Benin, Cameroon, Ethiopia, Uganda, Kenya, Tanzania and Malawi (Barrett, 1987).

Although there is improvement in the competitive structure of the marketing system, the market is dominated by a large number of small traders who are not specialized, and lack of transport facilities (Coulter, 1994). Bryceson (1993), found that private larger–scale traders have not emerged because of lack of storage and transport facilities, and extreme variability of harvest volume from year to year, which hinders the earning of profit in this activity. For agricultural market to operate efficiently adequate supply of infrastructure

facilities such as transport and storage are necessary (Aman, 1992). Thus, lack of these leads to inefficient marketing.

2.17 Traditional cowpea recipes

According to Myaka *et al.* (2000), in their survey conducted at Mbwewe (Bagamoyo district) and Mazingira (Handeni district), using Participatory Rural Appraisal (PRA), the major findings on the traditional cowpea recipes were identified. These recipes are divided into three categories, namely cowpea leaves, green cowpea grains and dry cowpea grains.

2.17.1 Recipes based on cowpea leaves

Safe ya kupwaza: These are green leaves boiled with an addition of salt, and when cooked, they may be served with stiff porridge (*ugali*) or rice.

Safe ya nazi: Green tender leaves are boiled with salt, and when cooked there is an addition of onion, tomato and coconut milk.

Safe ya salo: Boiled green leaves are added to a fried mixture of onions and tomato, and then followed by coconut milk.

Safe ya nguju Boiled green leaves are added to onions. Roasted and grounded pumpkin seeds are also added with a salt as seasoning. If groundnuts are added then it is called *Safe ya nkalanga* and if cucumber seeds are added then it is called *Safe ya matango.*

Safe ya nkungu: Green leaves are boiled with an addition of salt and onions. Pounded sun dried k*weme* mixed water is added to the boiling leaves. When cooked can be served as side dish with still porridge (*ugali*) or rice.

2.17.2 Recipes on cowpea green grains

Also, Myaka *et al.* (2000) identified several recipes on cowpea green grains during their survey at Bagamoyo and Handeni districts:

Hombo la makunga mngabwili: This is when cowpea green grains are boiled with salt. *Makunga mngabwili* is cut into four pieces and mixed with cooked green grains. Bitter eggplant can be added. The dish is ready and can be served with stiff porridge (*ugali*) or rice.

Hombo la mnangu: This is when pounded *mnangu* leaves are added to boiled salted green grains, and can be served with stiff porridge or rice.

*Luhudu:*Coconut milk is added to the mixture of boiled green grains, onions and tomato, salt is added to taste. It is then served with stiff porridge or rice.

Hombo la bamia/ Kunde za bamia: Cooked green grains are mixed with okra. Okra are cut into small pieces and mixed with *mnavu*. Salt is added and served with rice or stiff porridge (*ugali*).

Hombo la madinhkula: Green grains are boiled and *bwando* leaves mixed with boiled n*tura ntura*. These are mixed together; salt is added and served with stiff porridge (*ugali*) or rice.

Hombo la bwando: The harvested *bwando/mnghobo* is shredded and added to the boiled green grains. Salt is added and the dish is ready to be served with any staple food.

Kunde za mafuta: Fried onions and tomato are mixed with boiled green grains salt is added to taste.

Hombo la mchole/kisogo: Pounded dried *mchole* leaves are added to the boiled green grains. Salt is added for seasoning and can be served with any staples.

Hombo la chilumbu: Green cowpea grains are boiled with salt. Dried c*hilumbu* leaves are pounded and mixed with boiled green grains. It is served with stiff porridge or rice.

Hombo la mkunungu: Dried m*kunungu* leaves are pounded and mixed with boiled green grains. Salt is added to taste and can be served with rice or stiff porridge.

2.17.3 Recipes on cowpea dried grains

Furthermore, several recipes on cowpea-dried grains were identified by Myaka *et al.* (2000), as listed below:

Lubudu ya kunde kavu: Dried cowpea grains are cooked until soften. Onions, salt, tomatoes are added to make stew. Then coconut milk is added to improve the flavour. It can be served with any staple food.

Lubaje/lubasha: This involve dehulling of the grains, the dehulled cowpeas is boiled with small amount of coconut milk (cooking oil can also used). Salt is added to taste, simmering continues until cooked, and can be served with any staple food.

Pure: Cowpea grains are added to half cooked maize. When the mixture is well cooked, coconut milk or oil can be added. The dish is ready to eat as complete meal.

Kitapwa: Dried cowpeas grain are boiled and green maize are added to the boiling cowpeas. Cucumber pieces and salt (sugar, coconut milk optional) are added. Papaya, which has started to turn yellow, can also be added.

Ndwadwa: Cowpea grains are added to half cooked maize and the mixture is allowed to soften, salt is added to taste.

Mdulu/kimboya: Dried cowpea grains are boiled and cassava/sweet potatoes are added. Salt is added and the mixture is mashed ready to eat. (Cooking oil and onions are optional).

Kunde chukuchuku: Dried cowpea grains are cooked until soften and water is completely dried. This is a complete meal and it is mostly common used during hunger periods.

Msanje: Dried cowpea grains are boiled. Sorghum grains are added and when the mixture is cooked, coconut milk is added.

Futari ya kunde: Cowpea grains are boiled until soften. When cooked, coconut milk and sugar are added. It is normally served with tea.

Bagia: Cowpea flour is sieved and mixed with water/coconut milk/milk to make paste. Green onions and pepper are added to the paste. Small paste by using spoon are deep-fried and served with tea or coffee. This is similar to Ankara in West Africa.

It is therefore gathered from this literature review that low consumption of cowpeas could be a consequence of limited knowledge on possible ways of making acceptable dishes from them in some localities. Also, lack of awareness of their nutritional potential as food (leaves and grains), their ability to increase soil fertility and other highlighted potentials. These facts if address could enhance utilization and popularize further this crop both for food and income. This could assist to a great extent the reduction of malnourished people in Tanzanian communities.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter describes the methodology used for obtaining and analyzing data relevant to this study. The chapter includes a description of the study area, research design, sampling procedures, methods of data collection and analysis.

3.2 Description of the study area

The study was conducted in Mbarali and Njombe districts of Mbeya and Iringa regions in the Southern Highlands of Tanzania.

3.2.1 Location of Mbarali district

Mbarali district is located in the Southern Highlands and is situated between latitudes 7°30' north and 8°30' south and longitudes 33°00' west and 35°40' east. Mbarali is in the northeastern part of Mbeya region. It borders Makete district in the south, Njombe and Mufindi districts in the southeast and northeast, respectively.

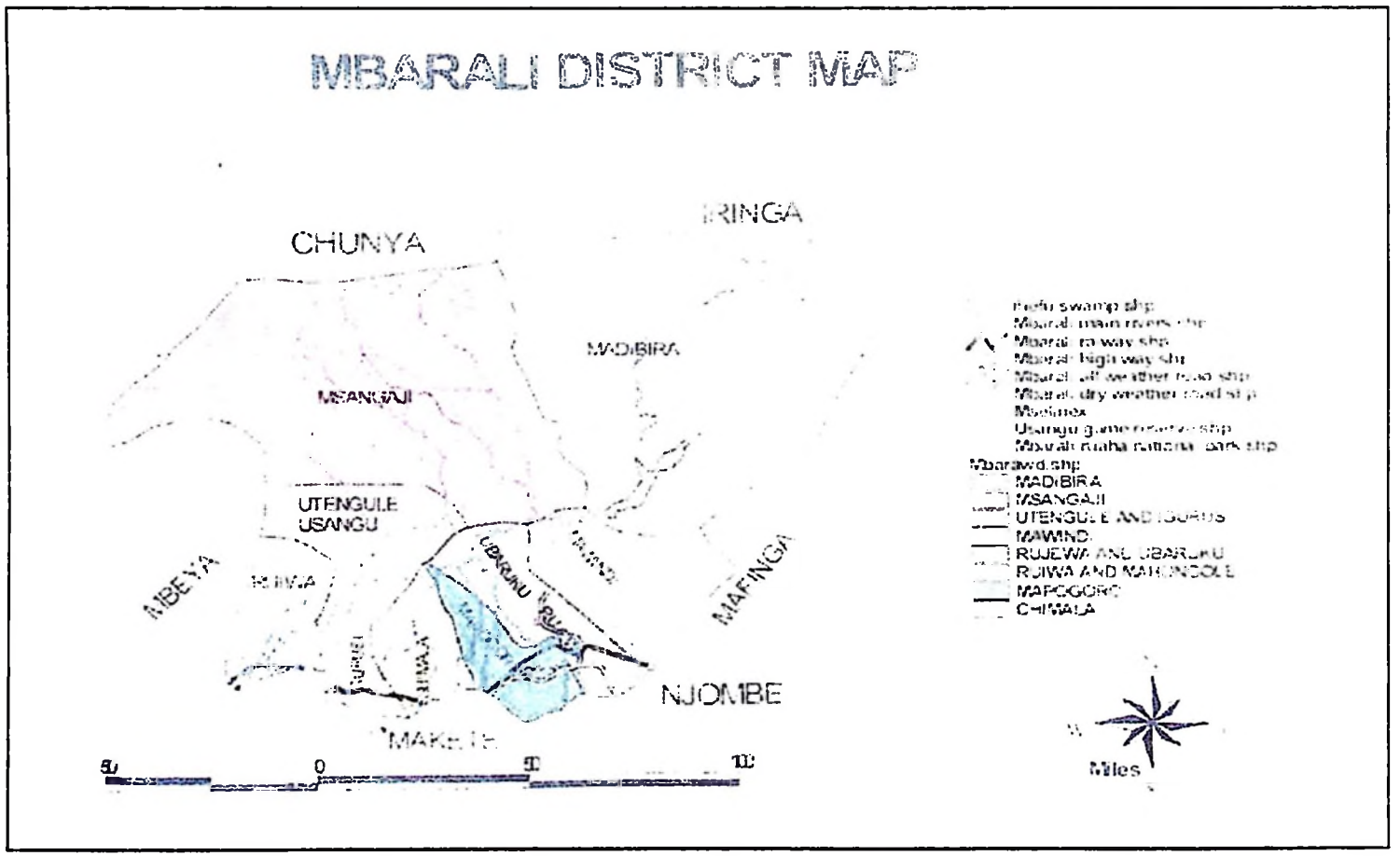


Figure 2: A map of Mbarali district

The total area of Mbarali district is approximately 16,000 km^2 whereby the arable land occupies 1,960 km^2, grazing land 2,590 km^2, forest reserve, game reserve, and woodland occupy 7,780km^2 and others (settlement, hills, swamps etc) occupy about 3,670 km^2. The altitude of this district ranges between 750–1,400 m above sea level.

3.2.1.1 Climate

The climate of Mbarali is generally tropical with marked season temperature and rainfall variations. Temperature ranges from 20°-25°C with warm weather (average minimum temperature was 24.7°C and maximum temperature was 30.5°C), where annual rainfall varies between 650 to 1,200 mm. The rains normally start in November and end in April. The district receives evenly distributed rainfall up to mid-March and after that the remaining months are dry. Rainfall is highly scattered and show variable pattern across the area. Rainfall is generally unreliable, and localized droughts are common. Soils are commonly of moderate fertility, coarse or medium texture and varying from sandy loams to alluvial soils.

3.2.1.2 Economy

The economy of the district depends mainly on subsistence agriculture. About 80% of the population depends on agriculture, and the rest depend on livestock keeping, fishing and petty business. Crops grown in Mbarali district are maize, paddy, sorghum, finger millet, sweet potato, cassava, beans, sunflower, groundnuts, onions and sugarcane. Maize is the dominant cereal crop in the area.

3.2.2 Location of Njombe district

Njombe district is located on the Southern Highlands and is situated between latitudes 8°80' and 9°80' south of the Equator, and longitudes 34°50'–35°80' East. Njombe district is bordered by Ludewa district and Ruvuma region to its south and by Morogoro Rural district to its east. The district is bordered by Makete district to its west, Mbeya region to its north–west and Mufindi district to its north (Fig. 3).

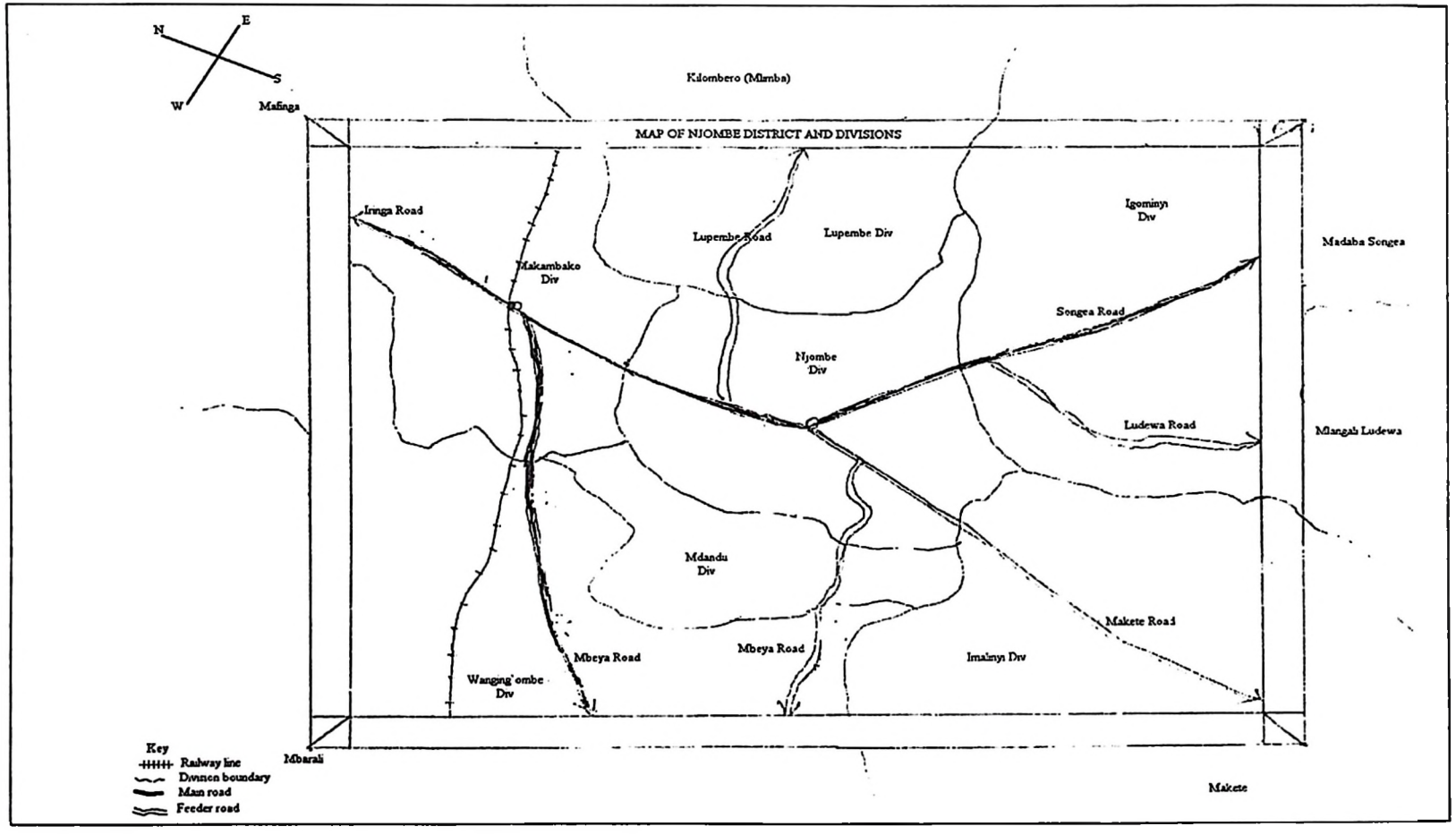


Figure 3: A map of Njombe district

3.2.2.1 District administration, area and population

The district is administratively divided into seven divisions and 25 wards. The divisions include Makambako, Wanging'ombe, Imalinyi, Igominyi, Mdandu, Lupembe and Njombe urban. The district covers a land area of 10,668km^2, (1,024,100ha) which is 15% of the regional total land area. Out of these 768,075 hectares, which accounts for 72% of its total land are being used for cultivation and for grazing (Mussei *et al.*, 2000). The district population has increased from 315,976 (1988 census) to 420,348 inhabitants (196,130 males and 224,218 females) as per 2002 household census and settlement, having a total number of 98,825 households with average size of 4.3. More than 80% of the district inhabitants are engaged in agricultural activities in rural areas (URT, 2003). Despite the potentiality in agricultural production, farmers in Njombe face marketing problems and expensive inputs. Inputs like fertilizer are expensive to the extent that most farmers cannot afford. Farmers do not use industrial fertilizer because even if they get higher production following use of such input they will sell the produce at low prices, which will not cover the production costs. Farmers are forced by prevailing circumstances to sell their produce at any price to get money for meeting their daily demands like buying medicine, paying school fees for their children and other services. Food crops like maize, round potatoes, beans and tomatoes are used as cash crops. They are sold to private buyers at very low prices.

3.2.2.2 Climate

The highlands zone of Njombe district experiences reliable rainfall, i.e. 100–1000 mm and the climate is somehow humid. Mostly the area is covered by evergreen plantations of timber forest, fruit trees, and grassland and non–timber trees. The lower zone that covers Makambako and Wanging'ombe division are hot and dry with unreliable rainfall. The land

is covered by thorn bushes mainly used for firewood and as for building materials. The rainfall pattern of Njombe is monomodal with a single and long rain season from November to April and contracting dry season from May to October. The mean average rainfall amounts to 1,170 mm the mean annual temperature is around 16°C.

3.2.2.3 Economy

The economy of the district depends mainly on subsistence agriculture. The major crops grown include maize, sunflower, beans, pyrethrum and plantains like wattle and tea. Others include wheat, peas, cowpeas, vegetable crops, fruits, barley and potatoes.

3.3 Research design

Data for this study were collected by using a cross sectional design. In cross sectional design, data are collected at a single point in time (Cresswell, 1994). This design is considered useful for descriptive purposes and determination of relationship between variables (Babbie, 1990).

3.4 Sampling procedure

3.4.1 Target population

The population of this study consisted of smallholder cowpea growing farmers in Njombe district and less cowpea growing farmers in Mbarali district, who have been consuming cowpea for more than two years prior to the time of the study. The population in Mbarali is organized into eleven wards and 85 villages. The villages are often large, covering up to 16 km^2. Also, the population of Njombe is organized into seven divisions, 25 wards and 71 villages. The villages were selected randomly from the list of potential and less potential cowpea growing divisions in Mbarali and Njombe districts, respectively. Sampling

households followed it from each village by simple random sampling. The sampling units were composed of the heads of the households in the selected villages, obtained from the village registers. The households selected were the representative samples of cowpea producers and less producers in the two districts from which data were collected by interviews. In addition, extension workers, street vendors, traders and key informants were interviewed.

3.4.2 Sampling technique

A multi-stage sampling technique was used in selecting the respondents. The first stage involved the selection of districts, Mbarali in Mbeya region and Njombe in Iringa region. The second stage involved a systematic selection of two divisions, one from Mbarali and one division from Njombe district, respectively. The third stage involved a random selection of six villages from a potential cowpea growing villages in Njombe and seven villages from a less potential cowpea growing villages in Mbarali district making a total of 13 villages. Criteria used based on accessibility of the villages, financial and time constraints and agroecological zones suitable for cowpea production. Selection of respondents was the last stage. For traders, systematic techniques were used. From a sampling frame of market places, a systematic technique was employed to select a sample of three market places in the study area. All traders from Njombe and Mbarali district used these places. Then a simple random sampling technique was employed to select 10 traders from each market, making a total of 30 traders. For street vendors a simple random sampling was used to select 10 vendors around those market places, making a total of 30 participants.

3.4.3 Sample size

According to Boyd *et al.* (1981), a random sample should at least constitute 5 percent of the total households to be represented. Thirteen villages out of 156 villages were thus selected by purposive sampling method based on the cowpeas production. A random selection of one hundred fifty (150) households was made from the village register, representing at least 5% of the total number of households in each of the selected villages (Table 5). The sampling frame was a list of villagers in village registers. In addition, a total number of nine extension workers were interviewed (two subject matter specialists at district level, two division extension officers and five village extension officers. Furthermore, 30 street vendors and 30 traders were interviewed.

Table 5: Total number of households and percentage of sampled household in Mbarali and Njombe district

Name of Village	Total number of household	Number of sample households	Percent of sampled households
Mbarali district			
Kangaga	460	23	5.0
Manienga	395	20	5.0
Itipingi	480	23	5.0
Matemela	420	21	5.0
Ipwani	413	21	5.1
Mkandami	494	26	5.0
Luwango	320	16	5.0
Sub-total	**2982**	**150**	**5.0**
Njombe District			
Mayale	332	23	6.9
Lyabebwe	404	26	6.4
Kijombe	447	23	5.1
Wanging'ombe	500	25	5.0
Ikwavila	520	27	5.1
Utinga	510	26	5.0
Sub-total	**2713**	**150**	**5.5**
Total	**5695**	**300**	**5.3**

3.5 Data collection

3.5.1 Data requirement and source

Both primary and secondary data were required for this study.

3.5.2 Primary data

The primary data were collected by the researcher and field assistant through, personal interview with selected stallholder farmers, street vendors and traders. A checklist was also used for extension workers. Researcher's personal observations and informal discussion with key informants were also conducted for the purposes of enriching and/or corroborating the findings. The questionnaire was designed to capture both quantitative and qualitative data types. The questionnaires contained close and open-ended questions.

Questions were purposively designed so as to collect the basic information required. The questionnaires were divided into three types namely farmers, traders and street vendors.

(i) **Farmer's questionnaire**: Section one comprised of household identification variables, followed by the section of cowpea production and supply. The third section dealt with consumption patterns; storage of the crop, availability, accessibility and the use of agricultural inputs to farmers, while the fourth section was concerned with marketing and marketing constraints as indicated in Appendix 1.

(ii) **Trader's questionnaire**: Section one comprised of the traders identification variables, while section two was mainly, concerned with the collection of information on trading practices and goods availability. The market survey was aimed at determining price and average amount of cowpea/beans sold per day, in order to get the value of the production in monetary terms as indicated in Appendix 2. This was done at market places located in the study area, particularly Makambako, Ilembula and Mnadani in Njombe district.

(iii) **Street vendor's questionnaire**: Section one comprised of the vendors identification variables, whilst section two was mainly concerned with the collection of information on the consumption of cowpea as side dishes compared to other legumes as shown in Appendix 3.

3.5.3 Secondary data

Primary data were complemented by secondary data, which were extracted from reports and other documentary materials from relevant bodies/institutions as indicated on Table 6.

Table 6: Type of information gathered from secondary sources

Source	Information gathered
MAFS	Data on production statistics in Tanzania
SNAL	Data on origin of crop, production storage and marketing
DALDO	Description of the study areas, data on cowpea production and marketing trends in Mbarali and Njombe districts
ARI Ilonga	Data on cowpea cultivars, planting time and harvesting of the crop in Tanzania
MATI/ARI/Uyole	Legumes production in the Southern Highlands

3.5.4 Pre-testing

According to Goldman and McDonald (1987), detailed surveys are an essential part of research after reconnaissance investigations. Prior to the actual surveys, the questionnaires were pre-tested. Pre-testing of the research instruments under field conditions was done using a random selected sample of 10 farmers (for questionnaire) who were not part of the final sample. The aim of pre-testing as pointed by Kajembe and Luoga (1996) was to check the validity and reliability of the questionnaire items. Thereafter the initial draft of the questionnaire was revised basing on the pre-testing results.

3.6 Data processing and analysis

The record of each interview was inspected for its accuracy immediately after it was completed before proceeding to another district. The researcher verified data immediately after the field data collection in order to make sure that questionnaires had been filled

accurately and completed. Data from open-ended responses were summarized; similarities as well as differences in responses were examined and noted. The completed questionnaires were coded and then analyzed using the statistical procedures from the Statistical Package for Social Sciences (SPSS) computer programme. From the analysis, descriptive statistics such as frequencies and percentages and means were used to obtain the variability and central tendencies of variables. Also t-test was used to compare means from the two districts.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents and describes the major findings of the study. It is divided into three broad sections. The first section deals with farmers' characteristics, socio-economic activities (production, consumption and marketing) of cowpeas and other crops, accessibility and use of agricultural inputs by smallholder farmers'. It also studies their contribution to household income, constraints in production, utilization and marketing faced by smallholder farmers. It finally, addresses suggestions by respondents on cowpea improvement. The second section deals with cowpea traders. It begins by describing trader's characteristics, cowpea trading activities and exposes their opinions on the improvement of the crop in terms of transportation, utilization and marketing. The third section deals with cowpea utilization by street vendors. This begins by describing their characteristics, followed by consumption of cowpea as compared to other legumes, problems faced in cooking cowpeas relative to common beans; income obtained and their comments on improvement of the business.

4.2 Household characteristics of the sampled farmers

The household characteristics of Njombe and Mbarali districts were as summarized in Table 7.

Table 7: Characteristics of the households in Njombe and Mbarali districts

Characteristic	Njombe	Mbarali	Total
Household size	(n= 148)	(n= 150)	(n=298)
1- 3 members	20.0 (30)	24.0 (36)	22.0 (66)
4- 6 members	75.0 (111)	67.0(100)	71.0 (211)
7- 8 members	5.0 (7)	9.0 (14)	7.0 (21)
Gender of the head of household	(n= 150)	(n=150)	(n=300)
Male	82.7 (124)	83.3(125)	83.0 (249)
Female	17.3 (26)	16.7 (25)	17.0 (51)
Age of head of the household (Years)	(n =147)	(n=150)	(n=297)
Between 18-25 years (Young adults)	5.4 (8)	11.3 (17)	8.4 (25)
Between 26-55 years (adults)	1.6 (120)	72.7 (109)	77.1 (229)
Above 55 years	12.9 (19)	16.0 (24)	14.5 (43)
Marital status of the household head	(n=147)	(n=149)	(n=296)
Single	1.4 (2)	6.0 (9)	3.7 (11)
Married	89.8 (132)	81.2(121)	85.5 (253)
Widow	8.8 (13)	12.8 (19)	10.8 (32)
Education level of the respondent	(n=150)	(n=149)	(n=299)
No formal schooling	5.3 (8)	13.4 (20)	9.4 (28)
Adult literacy classes	2.7 (4)	6.0 (9)	4.3 (13)
Primary school	2.7 (124)	79.9(119)	81.3 (243)
Secondary school	9.3 (14)	0.7 (1)	5.0 (15)

Figures in parentheses are frequencies and those outside parentheses are percentages

4.2.1 Household size

Majority of the households in Njombe (75%) and Mbarali (67%) had between 4 and 6 members in the household (Table7). The remaining had generally less than these members and only 5-9% had more than 6 members. The average household size of all respondents was 5.0 persons per household. This average was higher than the national average household size of 4.9 persons and that of the district average of 4.3 persons for Njombe and 4.2 for Mbarali (URT, 2003). Tanzania has decreased from 5.2 persons per household in 1988 to 4.9 persons per household in 2002 population and housing census. According to

year 2002 census, average household size in Iringa and Mbeya was 4.3 and 4.2 persons per household, respectively (URT, 2003).

4.2.2 Gender of respondent

From Table 7, majority (82.7%) of respondents in Njombe were males and only 17.3% were females. In Mbarali 83.3% were males, and 16.6% females. This is a common phenomenon in Tanzania traditional societies, where patrilineal system operates in the society making the husband in most cases the household head. This has implications in decision making in farming, accessibility and availability of food within a household and could thus influence cowpeas depending on whether it is a man or woman crop.

4.2.3 Age of respondent

From the interviews the age distribution of the respondents was as indicated in Table 7. This ranged between 18 and 70 years, with an average of 41 years. Majority of these respondents were between 26 and 55 years, (81.6 and 72.7% of respondents in Njombe and Mbarali districts, respectively). The results of sampled data implied that adults were mostly responsible for crop production and thus cowpea production in the study area. The study revealed that there was little involvement of young people in this crop production. Age of an individual has influence on the productivity as well as food consumption. The age group 35 to 44 years comprised of the middle aged people whom Ishengoma and Youngman (1998), regarded as the most active, participative and productive segment of the rural population.

4.2.4 Marital status of the respondents

Table 7 showed that 89.8 % of the respondents were married, while 1.4% were singles, 8.8% were widowed and divorced in Njombe district. In Mbarali, 81.2% were married, 6.0% singles and 12.8% were widowed and divorced. More than 80% of the respondents in both districts were married. This composition suggests that due to their large family size, married people ventured into crop production including cowpea production for livelihood. This included using proceeds from sale of these crops for relieving financial problems facing their families or increasing their family income.

4.2.5 Education level of sampled farmers

In Njombe district (Table 7), most of the farmers (82.7%) had attained primary school education. Only 2.7% attended adult education classes. About 9.3% had attained secondary school education, leaving only 5.3% with no formal education. In Mbarali district, 79.9% had primary school education, 6.0% attended adult education classes. A very small proportion (0.7%) had secondary school education and 13.4% had no formal education. According to the findings, illiteracy was higher in Mbarali than Njombe, but generally most cowpea farmers were knowledgeable. Education is one of the long-term strategies that may be used to improve agriculture in the developing countries, like Tanzania. Aman *et al.* (1989) reported that education in agriculture contributes 50% of the variation in total agricultural output. Also, education level of the household has significant effect on the nutritional well being of the family (Seenappa, 1987). The author further stated that level of education has effect on the capacity of utilizing various means to ensure stable food security at household level. He added that high level of literacy helps in the adoption of technologies and the mechanisms to cope with food shortage. Thus, lack of education

could be among the root causes of hunger and undernutrition for households with food insecurity in the study area.

4.3 Occupation of the head of the sampled households

The main occupation of the respondents in the study areas was peasant farming. Others' occupations were engaging in other activities like petty business, carpentry and oil extraction (mainly at village level). Most of the people in the study area engaged themselves in agricultural production for their household food security and income. According to Corbett (1988), type of occupation influences household food security. A household that is engaged in economic activities other than farming is likely to be safe from risk and uncertainties associated with farming. If a family depends solely on farming, there is an increased vulnerability to food problems for such a household.

4.4 Livestock keeping

The common livestock species found in the surveyed districts were cattle, goat, chicken, duck and pig (Table 8).

Table 8: Type and number of livestock in the sampled households

Type of livestock	Minimum	Maximum	Mean
Njombe district (n= 148)			
Cattle	1.0	350.0	10.8 ±37.4
Chicken	1.0	42.0	12.3 ±10.2
Goat	1.0	100.0	9.1 ±17.4
Ducks	1.0	10.0	5.4 ±2.7
Pig	1.0	18.0	4.0 ±3.3
Others	1.0	7.0	2.1 ±1.6
Mbarali district (n= 148)			
Cattle	1.0	350.0	20.9 ±58.9
Chicken	1.0	42.0	12.2 ±10.3
Goat	1.0	100.0	18.7 ±26.2
Ducks	5.0	10.0	6.6 ±2.1
Pig	1.0	2.0	1.8 ±0.5
Others	2.0	18.0	6.2 ±6.9

Generally, irrespective of livestock, there was a quite big variation between households as indicated by big standard deviation in Table 8. Chicken were the commonest livestock kept in Njombe district, with an average number of 12.3. This was followed by cattle with average of 10.8 cattle per household. However, for those who kept livestock in Mbarali, cattle were the commonest livestock species with an average of 20.9 cattle per household. Unlike Njombe, cattle population in Mbarali was relatively higher per household. However, this value was high from the fact that although the households keeping cattle were few, they had many animals per household. Livestock species are important source of income and protein. These animals give multiple products in return, such as eggs, milk, meat, income and fibres. In addition, they provide emotional attachment, for example the role in social stability and it affects public health both positively and negatively. Still, traditional systems of animal keeping supplied manure for improving crop production. Families, which keep a small number of livestock in rural areas often, rely on additional sources of income (Kudo and Jutzi, 2000). This still showed that cowpea had a role to play in providing households with protein sources.

4.5 Land acquisitions

The sources of land acquisition in the two districts were as detailed in Table 9. The survey showed that land was obtained by inheritance as a family property by 90% of the respondents (n=135) in Njombe and by 80.7% of the respondents (n= 121) in Mbarali.

Table 9: Means of land acquisition in Mbarali and Njombe districts

Means	Proportion of respondents (%)	
	Njombe (n=135)	Mbarali (n= 121)
Inherited	90.0	80.7
Not inherited	10.0	19.3
Total	100.0	100.0

Most of the land inherited was mainly for crop cultivation. For those who did not inherit land, they acquired it from different sources Table 10.

Table 10: Sources of land acquisition

Source	Njombe (n=130)		Mbarali (n=107)	
	Frequency	Percent	Frequency	Percent
Relatives	20	15.0	17	16.3
Renting	71	55.0	82	76.7
Village government	39	30.0	8	7.0

In Njombe district, for those who did not own land it was acquired from different sources like renting (55.0% of respondents). Land was bought from the village government by 30.0% of the households and from relatives (15.0%). On the other hand, Mbarali farmers acquired land for cultivation by renting (76.7%), from relatives (16.3%) and very few (7.0%) bought from the village government. Since ownership of land in Mbarali was low compared to Njombe, most farmers got it from renting. Studies by FAO (1997a) explained that farmers were reluctant to invest cash and labour in land on a long-term basis, partly because effective measures to conserve soil and water and to increase productivity required

considerable inputs. When farmers are no longer certain of their continuing rights of access to community land for food production, they do not invest, as they own it temporarily. Land is the natural resource available for production. This category of resources includes the natural resources used to produce goods and services, like land itself; minerals and nutrients in the ground; water, wildlife and vegetation on the surface and the air above. Traditionally, land in the study areas was divided amongst the sons. Daughters married and cultivated farms of their husbands. It is worth noting that, there has not been land shortage in Tanzania except in few densely populated areas as argued by Rwambali (1990). In many cases, therefore, land shortage may not be the major cause of inadequate food. Instead, the size/fertility of that land for crop production could be the main cause.

4.5.1 Size of land cultivated by household

Table 11 indicated the size of land cultivated by the sampled households.

Table 11: Size of land (acres) cultivated in the season 2003/04

	Njombe (n=148)		Mbarali (n=148)	
Land size (acres)	Frequency	Percentage	Frequency	Percentage
Less than 0.5	5	3.4	7	4.7
0.5-0.8	10	6.8	17	11.5
0.9-1.3	2	1.4	9	6.1
1.4-1.8	4	2.7	12	8.1
1.9-2.3	20	13.5	11	7.4
2.4-6.0	107	72.2	92	62.2

Data from the above table revealed that most of the respondents in both districts (72.3 and 62.2% for Njombe and Mbarali, respectively) cultivated an area between 2.4 and 6.0 acres (greater than 1 ha but less than 3 ha). The results of this study are in agreement with Minjas (1994) who argued that, traditional farming systems in Africa are characterized by small farm size. However, land is not scarce in Njombe district. According to URT (1997),

suitable land for agriculture is 9,727.75 square kilometres while the cultivated land is only 1,441.78 square kilometers (equivalent to 14.8%). Thus, there is an opportunity to expand the area under crop production. According to URT (2004a), smallholder farmers dominate Tanzanian agriculture with typical farm sizes ranging from 0.9 to 3.0 hectares. Furthermore, according to Maliyamkono and Bagachwa (1990), in Tanzania's economy, 3.5 million farm families work on smallholdings with cultivated area averaging 0.9 hectare. About 85% of the agricultural production was carried out by smallholders' farmers on their privately owned plots. Agriculture in Tanzania has continued to be operated by smallholder farmers, owning small farms and using poor equipment technology and know how, attributes, which result into low productivity and income. For this reason, Tanzania has not been able to be self sufficient in food production. Agriculture and the food situation in the country have continued to be adversely affected by dependence on rainfall, which in most times is not regular. Lack of competitive markets, experiences low producer prices and lacks agricultural skills (Shetto and Kwiligwa, 1989).

4.6 Cultivation of cowpeas in the study area

Results from Table 12 show the response against cultivation of cowpeas in the study areas.

Table 12: Cultivation of cowpeas

Household type	Njombe (n= 150)		Mbarali (149)	
	Frequency	Percent	Frequency	Percent
Cultivate cowpeas	149	99.3	76	51.0
Do not cultivate cowpea	1	0.7	73	49.0
Total	150	100.0	149	100.0

From this table it was noted that 99.3% of the respondents cultivated cowpeas in Njombe, that was a potential growing area for cowpeas, whereas in the less growing area, (Mbarali

district) cowpeas were grown in 51.0% of the households interviewed. In both district offices there were no any documented articles showing records of production, consumption and/or marketing of the crop and thus making it a neglected crop, despite its contribution to household food and income for the area. Crops grown in a specific area are determined by a number of factors. Even with adequate precipitation and sunlight, optimal temperatures and fertile soils, it is quite possible that other factors will influence the crops to be cultivated. There may be economic concerns such as commodity prices, transport costs, social factors like consumer taste and preference, religious motivation, tradition or even political reasons, like marketing boards price controls, price stability that determine the crop choices that a farmer makes (Steiner, 1984).

4.6.1 The main reasons of cultivating cowpeas

As gathered from Table 13, it seems that almost all respondents in both districts cultivated cowpeas for the purpose of food as well as earning money.

Table13: Purpose of cowpea cultivation

	Njombe (n=149)		Mbarali (n=149)	
Use	Frequency	Percentage	Frequency	Percentage
Food	30	20.0	37	24.7
Cash	12	8.1	12	8.2
Cash and food	107	71.9	100	67.1
Total	149	100.0	149	100.0

Generally, cowpeas were produced for food and cash (71.9 and 67.1% of the respondents). In the two districts, for some households, it was purposely produced for food (20.0 and 24.7% for Njombe and Mbarali). In others, it was produced mostly for income generation (8.1 and 8.2% of the households in Njombe and Mbarali districts, respectively). For those who reported to cultivate it for the purpose of food, they normally consumed them when

they were fresh and/ or in the form of dried leaves. Increased cowpea production from intensified cropping systems can play a key role in income generation in the study area because of the multiple uses of cowpeas (Rachie, 1985). Other benefits of increased cowpea production include improved nutrition for humans and animals, and improved soil properties to facilitate sustainability. They alleviate food shortages by making more efficient use of water and nutrients, and improve nutrition by providing a source of protein and nutrients not provided by cereals. As a source of protein, cowpeas are less expensive than meat (Subbarao *et al.*, 2000).

The area under cowpea cultivation is presented on Table 14. This area under cultivation of cowpeas was not solely for cowpea production because these farmers practised intercropping.

Table14: Area under cultivation of cowpea (acres)

Year	Njombe district			Njombe district		
	Min	Max	Mean	Min	Max	Mean
1999/2000	1.0	13	3.3±2.4	1.0	8.0	1.8±1.4
2000/2001	1.0	10	3.0±2.0	0.5	8.0	1.5±1.3
2001/2002	0.5	10	3.0±2.0	0.3	6.0	1.3±1.0
2002/2003	0.7	10	2.8±1.9	0.3	8.0	1.3±1.3
2003/2004	0.5	15	2.9±2.4	0.3	4.0	1.1±0.8

The results in Table 14 showed that, generally, between 1999/00 and 2003/04, cowpea acreage decreased as time went on. This varied from 3.3 to 2.9 acres in Njombe and 1.8 to 1.1acres in Mbarali. The production of basic food commodities (roots, tubers and grains) is the basis of smallholder farming in much of sub-Saharan Africa, providing families' staple food and generating income for households. However, yields have remained historically very low, adversely affecting the nutritional status of the poor and limiting their potential

income. Diseases, weeds and pests play a major role in holding back agricultural yields, but poor farmers lack the economic means to afford expensive inputs to overcome these threats. The challenge is thus to provide resource-poor farmers with effective but affordable tools to break out of this circle of low yields and poverty (NRI, 2005a).

4.6.2 Cowpeas production trends

Figure 4 summarizes the mean production per acre of cowpea in the sampled households.

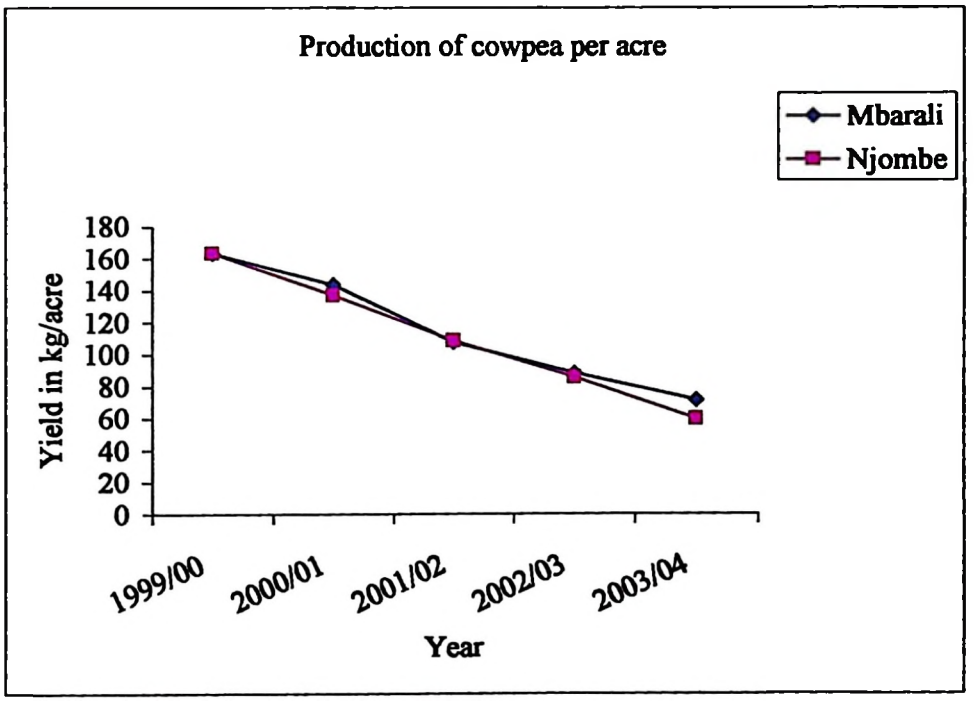


Figure 4: Production of cowpeas in Njombe and Mbarali districts

The maximum production per acre was seen in the year 1999/00 seasons. Since then production trends tended to decrease, being caused by inconveniences like unreliable market, high costs of agricultural inputs and attack of crop by insect pests. The season prior to the study year 2003/04, the production was less than 100 kg/acre per household in a season in both districts. For food supply, this amount was very little. Also, such low

production provided very little income to the household and thus food insecurity, which brings hunger and hunger is a major indication of poverty in any society. Every individual requires first and foremost being free from hunger. Currently, there is an increasing number of people in Tanzania who face periodic food shortages as well as high and moderate levels of malnutrition, especially prevalent among infants, children and mothers in rural areas (FSPRPP, 2001).

Figure 5 indicates the mean production of cowpeas in the sampled households from the season 1999/00 to 2003/04.

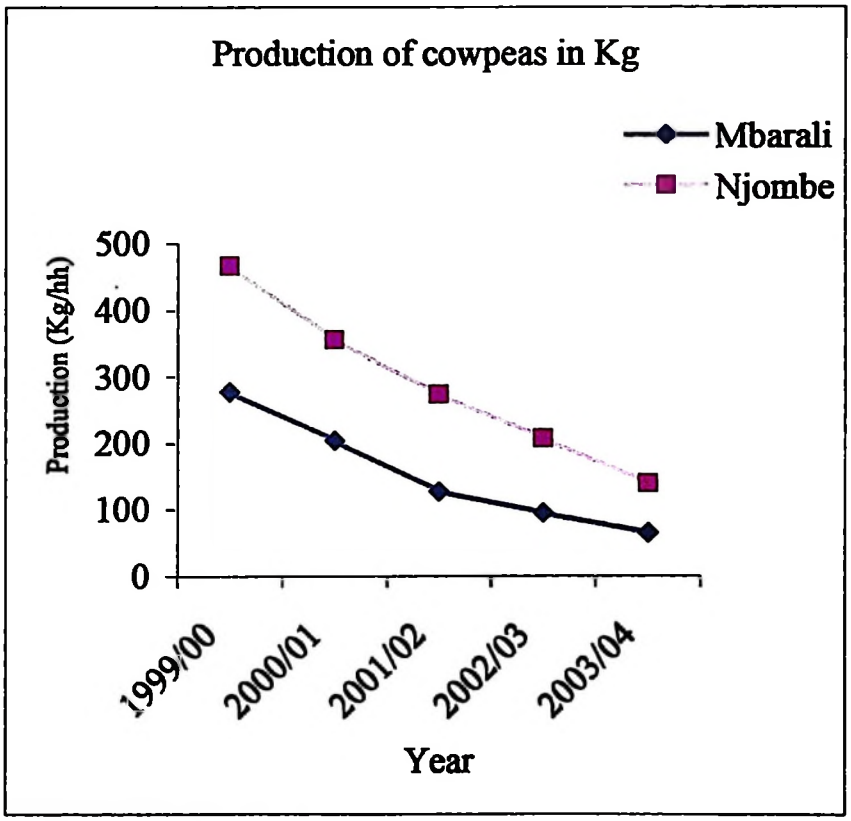


Figure 5: Cowpea production trends from 1999/00-2003/04

Between 1999/00 and 2003/04 production of cowpeas in the selected households decreased. Among the reasons for production decrease as reported by the respondents were lack of market, diseases and insect pests, inadequate knowledge on cowpeas production and high prices of agricultural inputs. This agrees with the study by Tarawali and Singh (1997), which indicated that poor soils and incidences of pests and diseases also had negative effect on crop production. Inputs such as fertilizer and pesticides to counteract these negative forces were generally scarce or priced well above the means of the smallholder farmers. It was further supported by Ng and Monti (1990), that insect pests both in the field and during storage could cause low productivity of cowpea in Africa.

4.7 Availability of cowpeas in the household

Results in Table 15 showed the responses from the farmers regarding the contribution of cowpea to food security in the household.

Table 15: Sufficiency of cowpeas in the household for a year

Extent	Njombe (n=141)		Mbarali (n=105)	
	Frequency	Percent	Frequency	Percent
Not sufficient	119	84.4	70	66.7
Just sufficient	18	12.8	35	33.3
Surplus	4	2.8	0	0.0

The majority of the respondents (84.4 and 66.7% for Njombe and Mbarali, respectively) reported that cowpea production for food was not sufficient for the whole year. Others reported that, the production was just sufficient (12.8 and 33.3%). The reasons for the crop being not sufficient could be due to the low yields since they used poor technology in cowpea production and the little they got was shared between use as food or income source to buy other necessary needs. Food insecurity hits the rural population more frequently

than people in towns because food surpluses are moved from rural to urban centres, where they are stored and sometimes transported further away to bigger cities or even to overseas markets, leaving the countryside depleted. However, in most of the rural areas, transport and communications is poor and chances for diversifying income-generating activities are limited. Speaking of poverty reduction in a country like Tanzania where more than eighty percent of the population is engaged in agricultural production, it means speaking of improving food and agricultural production related activities (FSPRPP, 2001).

4.8 Production of the main leguminous crops in the study areas

Farmers in the Southern Highland Zone (SHZ) produced many varieties of legumes, especially beans, which were important for food and cash income. Table 16 shows the production of common beans in the study area.

Table 16: Production of beans in the season 2004/05

Parameter	Njombe district (n=146)			Mbarali district (n=141)		
	Min	Max	Mean	Min	Max	Mean
Area (acres)	0.3	12	1.5±1.4	0.3	21	1.8±3.6
Amount produced kg	100	1500	480±354.0	100.0	3700	668±885.6
Amount sold (kg)	100	1200	402±313.6	50.0	3600	538±881.7

The area under cultivation of beans varied and so was the amount produced. In the surveyed areas, a household cultivated land of average of 1.5 and 1.8 acres (about 0.5 ha) and the amounts produced per season were 480 and 668kg, that is equivalent to (84%) beans in Njombe and Mbarali districts, respectively. Also, amounts sold per season were 402 and 539kg that is equivalent to (81%) on average in Njombe and Mbarali, respectively. This means that more than 80% of the beans produced in the two districts were sold for cash income. Farmers in Njombe and Mbarali grew crops for the purpose of food and cash.

They did not specialize in growing certain crops specifically for food and others for sale. Leguminous crops grown included beans, groundnuts and bambaranuts. For the purpose of this study common beans were studied in detail because it could affect the production, consumption and marketing of cowpea in the sense that in the southern highland cowpeas and beans are potential crops. Njombe concentrated on beans and bambaranuts while Mbarali cultivated beans and groundnuts as their main legumes.

4.9 Cropping systems

Table 17 indicates the crops commonly intercropped with cowpeas in the study areas.

Table17: Types of crops intercropped with cowpeas

Types of crop	Njombe (n=149)		Mbarali (n=145)	
	Frequency	Percent	Frequency	Percent
Maize	46	30.9	99	68.3
Sunflower	54	36.2	17	11.7
Maize and sunflower	30	20.1	2	1.4
Others	19	12.8	27	18.6

All farmers in Njombe and Mbarali districts practised intercropping. They normally intercropped cowpeas with cereals like maize. They also intercropped this legume with sunflower and sometimes cassava and finger millet. The cropping pattern in this area mainly favoured the taller crops because cowpeas are sown at very low densities with no fertilizer or any other inputs. Therefore, the productivity of this traditional system is very low. Maize is the cereal crop commonly intercropped with cowpeas (30.9 and 68.1% of the households in Njombe and Mbarali districts, respectively). About 20 and 1% of households in Njombe and Mbarali intercropped cowpeas with maize and sunflower. Sunflower was the second priority after maize for intercropping in both districts with 36.2 and 11.6% of the households in Njombe and Mbarali districts, respectively, practicing this kind of

intercropping. This intercropping was therefore a possible explanation of low production and low acreage of cowpeas in the two districts.

As reported by May and Misangu (1982), cowpea yields are reduced by more than 60% when intercropped with maize. This could be attributed to several factors including competition for light, nutrient and moisture, reduced plant population of cowpea, time of planting of cowpea, the cowpea and maize cultivars used and the planting pattern of the intercrop. Cowpeas were mainly grown in small areas around homesteads, often intercropped for a long time with various other crops such as maize, cassava, groundnuts, sunflower and other small grains but they are not found in pure stand (Remison, 1982). Therefore, addressing such constraints to cowpea production could greatly increases cowpea production in the study area.

4.10 Input use

Fertilizer use in the production of cowpeas was very minimal in Mbarali (only 10% of the households used) (Table 18).

Table18: Fertilizer application

Status of fertilizer	Njombe (n=149)		Mbarali (n=120)	
	Frequency	Percent	Frequency	Percent
Used fertilizer	62	41.6	12	10.1
Did not use fertilizer	87	58.4	108	89.9

Only 41.6% of the respondents in Njombe district used fertilizer and very few (10.1%) in Mbarali district applied fertilizer on their farms. This could be the reason for low production of cowpeas in the area. Efforts to increase yield of the crop should be made in

order to exploit the existing land potential. To increase production more area should be put under cultivation and cowpea intercropping should be avoided or minimized.

4.11 Reasons for not applying fertilizers in cowpea production

The reasons for not applying fertilizer in the production of cowpea by respondents are shown in Table 19.

Table 19: Reasons for not applying

Reason	Njombe (n=115)		Mbarali (n=125)	
	Frequency	Percent	Frequency	Percent
High price	23	20.0	12	9.5
Not available when required	1	1.0	0	0.0
Low knowledge	68	59.0	36	28.6
Soil fertility adequate	23	20.0	77	61.9

Table 19 shows the responses by farmers as to why they did not use fertilizers in the cowpea production. Farmers in Njombe district did not apply fertilizer because they had low knowledge about fertilizer use (59.3%). Very few households' did not use fertilizer due to unavailability when required (1.2%). In Mbarali district, majority of the respondents reported that for the cultivation of cowpea, they did not use fertilizer because the soil fertility was adequate to support the crop (61.9%). Others were not aware of fertilizer application (28.9%) in cowpea production and few others did not use because fertilizer prices were high and beyond their purchasing power. Low level of input use is associated with subsistence or small-scale production, low capital investment, manual labour, use of local cultivars, little or no fertilization, no pest control and small farm areas (FAO, 2002). Generally, low level of inputs characterized the study area.

4.12 Types of fertilizer used

The types of fertilizer used in the two districts differed from district to district (Table 20). It was found that less than 50% of the respondents reported to apply inorganic fertilizer alone.

Table 20: Type of fertilizer applied

Type of fertilizer	Njombe (n=135)		Mbarali (n=130)	
Type of fertilizer use	Frequency	Percent	Frequency	Percent
Organic fertilizer	25	18.8	43	33.3
Inorganic fertilizer	38	28.1	43	33.3
Both	72	53.1	44	33.4

Most of the respondents believed that their land was fertile enough; therefore, there was no need of fertilizer application. For those who had at least knowledge on fertilizer use, they combined both farmyard manure and inorganic fertilizer use, which they applied as top dressing. In Njombe district, farmers were aware of fertilizer application (53.1% of the respondents used organic and inorganic fertilizers). In Mbarali district, the use of fertilizers was relatively lower. This study revealed that the use of inorganic fertilizers seems to be a rare practice due to high prices of fertilizer and availability. Even with removal of subsidies, the prices of farm inputs continue to be beyond the reach of ordinary peasant. It has been cited earlier by Myaka *et al.* (2000) that local seed and minimal use or failure to use fertilizer lowered production and worsened household food security.

4.13 Sources of cowpea seeds

The survey findings indicated that the seed sources were mostly from the local markets and recycled traditional seeds from the previous crop (Table 21).

Table 21: Seed sources of cowpeas grown in Njombe and Mbarali districts

Source	Njombe (n=149)		Mbarali (n=150)	
	Frequency	Percentage	Frequency	Percentage
Own source	5	3.4	2	1.5
Local markets	25	16.8	27	17.6
Seed exchange	2	1.3	2	1.5
Gift from relatives	3	2.0	0	0.0
Own source and local markets	114	76.5	119	79.4

In both Njombe and Mbarali districts seeds were obtained from own source/traditional seeds and purchase from local markets in the district. About 76.5 and 79.4% of households in Njombe and Mbarali districts, respectively used own seed source or purchased from the market. Households relying on local market as the only source were 16.5 and 17.6% of the respondents for the two districts, respectively. The remaining small portion either obtained from own source alone, from seed exchange with other farmers or from gifts given by relatives.

There were no farmers who used improved seeds to increase production of cowpea in the study area. Although different varieties were being cultivated the respondents did not distinguish them by names and it was difficult even to get their characteristics. It was cited by Lowenberg-DeBoer (1999) that improved seed has little unless it is in the hands of growers. Seed systems in most cowpea-producing countries in Africa are poorly developed. But cowpea and other, genetically modified cowpea varieties will put additional stress on these weak seed systems. The results encountered in this study clearly indicate the facts that have led to negligence given to research and production of cowpeas in the country and even in other parts of the world.

4.14 Control measures of field pests and diseases

Results presented in Table 22 show that most farmers did not use any control measures to protect the cowpeas from attack by insect pests and diseases in the two districts.

Table 22: Ways to control insect pests and diseases in the field

Control measure	Njombe (n=149)		Mbarali (n=145)	
	Frequency	Percent	Frequency	Percent
Industrial chemicals	8	5.4	2	1.4
Botanicals	7	4.7	4	2.7
Cultural practices	16	10.7	28	19.2
No measure	118	79.2	111	76.7

Although use of industrial chemicals is common in this country, less than 10% used this method as a control measure. About, 79.2 and 76.7% of households in Njombe and Mbarali district did not use any control measure at all. Around 10.7 and 19.2% of the households used cultural practices to control pests and diseases. Very few households used botanicals as a control measure. Myaka *et al.* (2000) also observed this situation in the study conducted in Bagamoyo and Handeni districts. Insect pests are a major cowpea production constraint and control strategies have mainly involved use of chemical insecticides, which are expensive besides other negative environmental effects. Recent studies have recommended integrated pest management (IPM) options so as to minimize the use of chemical insecticides (Karungi *et al.*, 2000).

Other studies also showed that some botanical products (bio-pesticides) such as tobacco have some measure on cowpea pests' control (Agona *et al.*, 2000). There is therefore need to determine their role as an IPM component. Although bruchids damage cowpea grain during storage, initial infestation begins in the field thus control should begin at this level. Negligence in control of field and storage pests could also be among the potential reason

for low production of cowpeas in the study areas. This could also discourage involvement in production of this crop.

4.15 Staple foods in the study area

In the study areas the main food staples are summarized in Table 23.

Table 23: The main staple for home consumption

Type of staple	Njombe (n= 148)		Mbarali (n= 143)	
	Frequency	Percent	Frequency	Percent
Maize	74	49.7	65	45.5
Rice	28	19.1	56	39.2
Sorghum	9	5.7	6	4.2
Cassava	15	10.4	8	5.5
Sweet potatoes	17	11.7	4	2.8
Legumes	5	3.4	4	2.8

Maize and rice were the outstanding staples in the two districts 85 and 69% with the former being the most important. Another cereal although not as important as the previous was sorghum that was probably cultivated in the dry parts of the region as it is more drought-tolerant than maize and rice.

Other food staples were cassava and sweet potatoes that in total were cultivated by 22.1 and 8.4% of the households in Njombe and Mbarali districts. The results therefore, showed that these two crops were more important in Njombe than in Mbarali district. The position of beans and cowpeas was not clearly revealed indicating that for food the cereals and cassava were more important than legumes.

As food staples cowpeas and beans were highly marginal being cultivated by 2.5-3.4% of the households in Njombe and Mbarali districts, respectively. Even with this small

percentage such crops were also used as cash crops to some households, thus worsening household food availability. Although cowpeas are needed in the diet of the household members, it seems cultivation of these legumes was neglected. This was proved by the survey data on traders. This survey showed that more beans were sold than cowpeas in terms of kilograms. Street vendors also reported that the most preferred combinations of foodstuff were stiff porridge (*ugali*) with beans and rice with beans thus discriminating the use of cowpeas. A food production system, in which the main food crop is also a cash crop, as is the case of maize in the study area, is open to considerable risks, especially for resource poor subsistence farmers. For those farmers, crop failure will mean loss of both income and food for home consumption (FAO, 1997a). Therefore, establishment of reasons for marginalized cowpea production and consumption will contribute greatly to its popularization in production, consumption and trade in the two districts.

4.16 Consumption of legumes in Njombe and Mbarali districts

The legumes consumed in the two districts are summarized in Table 24

Table 24: Type of legumes consumed as side dish in order of preference

Legume	Njombe (n= 148)		Mbarali (n= 147)	
	Frequency	Percent	Frequency	Percent
Common beans (dried)	63	42.7	70	47.4
Cowpeas (dried)	64	43.2	63	42.8
Soybeans (dried)	3	2.0	4	2.8
Others	18	12.1	10	7.0

Beans and cowpeas were the legumes commonly consumed in the area. In total 86.1 and 90.2% of the households in Njombe and Mbarali consumed beans and cowpeas, respectively. While beans and cowpeas were consumed at the same level in Njombe district, beans were favoured more than cowpeas in Mbarali district. Very few farmers (1.9 and 2.8%) consumed soybeans. This was due to the fact that beans were grown mainly for

cash and the market was readily available, therefore consumption within the household was limited. Cowpeas were regarded as inferior crop when consumed as dried grain. Cowpeas were mostly consumed after being transformed to other products. APO (2003), reported that, legumes are next to cereals in terms of their economic and nutritional importance as human food resources. The ability of legumes to fix atmospheric nitrogen in soil-crop ecosystem is one of their unique and beneficial characteristics among all plant species. In addition to being relatively inexpensive source of dietary proteins, legumes possess other desirable attributes such as abundance of complex carbohydrates, ability to lower serum cholesterol in humans, high fibre content, low fat content (excluding oilseeds), high concentration of polyunsaturated fatty acids, long shelf life and the diversity of foods that can be made from them (APO, 2003). There is therefore; need to establish reasons for this negative attitude on cowpea consumption in order to chart out strategies for promotion of production and consumption of the crop. If it is limited to few cooking options, then experiences from other parts of the country, region, continent or world could help to change positively the image of cowpeas in Tanzania.

4.16.1 Consumption of cowpeas

From Table 24, consumption of beans and cowpeas were similar in both districts (42.9 and 47.4%) for common beans and (43.2 and 42.8%) for cowpeas in Njombe and Mbarali districts. Cowpeas are an important crop mostly consumed by rural families. An increased utilization of cowpeas by families who consume predominantly cereal-based diets would improve their nutritional status and health.

The consumption pattern of cowpeas in Njombe and Mbarali districts was as shown in Fig. 6

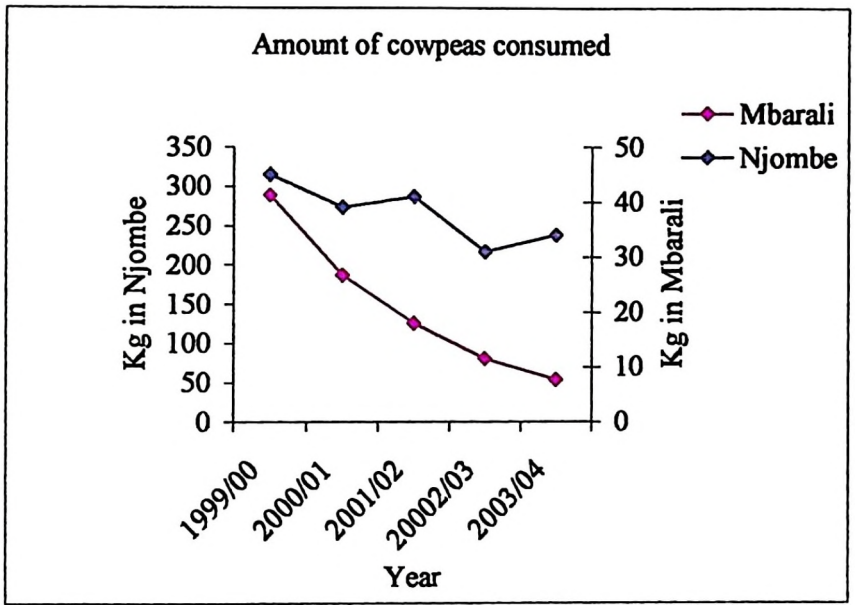


Figure 6: Consumption trends of cowpeas from 1999/00-2003/04

Between the year 1999/00 and 2003/04, there was generally a declining trend of cowpeas consumption in Njombe and Mbarali districts. The decline in Mbarali (a weak grower) was sharper than Njombe (a strong grower) districts.

4.16.2 Frequency of consumption of cowpea grain per week

During the survey respondents estimated the frequency of cowpea consumption in their households per week (Table 25).

Table 25: Consumption of cowpea grain per week

Frequency	Njombe (n=149)		Mbarali (n=147)	
	Frequency	Percent	Frequency	Percent
Once per week	72	48.3	69	46.9
Two or three times	67	45.0	65	44.1
More than three times	10	6.7	13	9.0

In both districts, the consumption of cowpeas by majority of the households was once per week. Also, consumption twice or three times per week was outstanding. In aggregate, consumption once to thrice per week was by 93.3 and 91.9% of the households in Njombe and Mbarali, respectively. These results showed that despite low production, this crop was important in the area, although not consumed on a daily basis. Consumption of cowpea grains in the study areas was not very common, not only because they were considered inferior commodity, but also very few sampled household (9%) reported to know different recipes incorporating cowpeas. The available recipes for cowpea in the study areas were boiled cowpeas sauce incorporating onions and little oil (15%); mixture of cowpea grains added to partially boiled maize (*kande*) (35%) and boiled green grains or vegetable (30%). Another recipe, which was not very common, was as a snack (*bagia*)(20%). This was contrary to a research done in Handeni and Bagamoyo districts in which farmers were able to identify some 25 recipes on cowpeas based on leaves, green and dry grains (Myaka *et al.*, 2000). Farm families in Iringa and Mbeya could benefit from such recipes if they are exposed to them. Therefore, limited recipes can be among the constraints to cowpea use in the study area.

4.16.3 Forms in which cowpeas were consumed in the study area

Table 26 shows forms in which cowpeas were consumed in the study areas.

Table 26: Forms of cowpeas consumption in Njombe and Mbarali districts

Category form	Njombe (n=137)		Mbarali (n=131)	
	Frequency	Percent	Frequency	Percent
Fresh leaves	46	33.6	52	39.8
Dry leaves	48	35.0	41	31.6
Green peas	43	31.4	38	28.6

Cowpeas were consumed in three forms: fresh leaves (33.2 and 39.8%), dried leaves (35.1 and 31.6%) and green cowpeas (31.6 and 28.6%) for Njombe and Mbarali districts, respectively. These three forms seemed to be almost equally important. The young leaves and shoots were consumed as spinach and provided one of the most widely used pot herbs in Tropical Africa. They are often dried and stored for dry-season use. The value as a pot herb is due to the fact that cowpeas do not mature in a definite period, but continue to produce new leaves if cut back regularly from an early stage. Green leafy vegetables are well known as a source of protein, vitamins (A and C) and minerals, especially iron (Nielsen *et al.*, 1997). For this reason, promotion of cowpea consumption implies increasing supply of these vital nutrients in the community to fight protein energy malnutrition (PEM), anaemia and vitamin A deficiency. Therefore, even consumption of dried grains (potential protein source) need to be promoted in households not used to this form of consumption.

Also, consumption of all forms agrees with Bittenbender (1992), that cowpeas are grown most commonly for their edible seeds, their young leaves and green grains. The leaves are consumed as spinach and served boiled. Leaves also are often dried and stored for dry season use. All forms were considered important, as they provided vitamins and minerals. The vitamins and minerals needed to prevent micronutrient malnutrition are present in variety of foods. Micronutrient-rich foods include both foods that contain high levels of the respective micronutrient. Foods that contain lower levels of micronutrients but are eaten in large quantities may also be considered to be micronutrient-rich foods (FAO, 1997b).

4.16.4 Consumption of other green vegetables

The results in Table 27 show the alternative green vegetables, which were consumed by the farmers in the study areas.

Table 27: Substitute for cowpeas leaves

Type of vegetable	Njombe (n=147)		Mbarali (n=141)	
	Frequency	Percent	Frequency	Percent
Amaranthus	32	21.7	77	54.7
Cabbage	38	25.8	24	16.7
Spinach	28	19.3	14	9.8
Green peas	0	0.0	2	1.3
Others/ wild leaves	49	33.2	24	17.5

According to the survey, cowpea leaves were harvested mainly for home consumption and thus, very few respondents harvested them for sale. These cowpea leaves were consumed only whining the rainfall season. In Njombe many farmers relied much on indigenous vegetables (33.2% of the households) because of existence of natural forests. In Mbarali only 17.5% consumed these indigenous vegetables. In Mbarali district farmers depended more on amaranthus (54.7%) than in Njombe district (21.7%). These indigenous vegetables included cassava leaves (*kisamvu*) and pumpkin leaves (*tetere*). In the study area, households also consumed cabbage (25.8 and 16.7%); spinach (19.3 and 9.8%) in Njombe and Mbarali, respectively. These vegetables were obtained through purchase from the market or some farmers had them in their home gardens. These vegetables were consumed when available, especially during the rainy season sometimes consuming them as side dishes without any other protein source. This is a common practice in many families in the rural areas.

4.16.5 Problems associated with consumption of cowpeas

Table 28 summarizes the problems that were reported by the sampled households.

Table 28: Problems in cowpeas consumption

Problem	Njombe (n=117)		Mbarali (n=122)	
	Frequency	Percent	Frequency	Percent
Palatability	74	62.8	44	35.7
Cookability	8	7.0	4	3.6
Flatulence factor	35	30.2	74	60.7

While Njombe cited palatability as the main problem limiting cowpea consumption (62.8%) the main problem in Mbarali was flatulence (60.7%). However, in the two districts palatability and flatulence were the main problems that hindered wide utilization of cowpea grains. Such problems have solutions. For example, APO (2003), cited that, cooking impart a soft texture, improves palatability, enhances digestibility and also increases the nutritive value by destroying certain antigrowth factors and enzyme inhibitors.

Flatulence problem affected 30.2 and 60.7% of the households in Njombe and Mbarali districts, respectively. It caused discomfort as also reported by Wagner *et al.* (1977) that the production of gas caused distension as well as stomach pain. Although beans are popularly accepted in both districts, they have a similar problem as cowpeas. So, flatulence cannot be a strong reason for refraining from consuming cowpeas.

Some respondents (7.0 and 3.6% in Njombe and Mbarali districts) reported cowpea cooking ability as a problem. The respondents complained that cowpeas did not make a good soup due to hard seed coat. From the literature review very little work has been done

in promotion of consumption of cowpeas. There is a need to explore alternative uses of the crop both at household and commercial levels in the country and elsewhere. Households need to be trained on preparation of various recipes from cowpeas. This will give a wider choice of food menu in the household based on cowpeas and thus promote more consumption of this food crop and eventually better nutrition of household members.

4.17 Comparison of production, consumption and sales of cowpeas in the study area

T-tests were carried out on variables for as production, consumption, marketed amount and income generated against districts to test if there was any statistical difference between the two districts (Table 29).

Table 29: T-test results on production, consumption and sales

		Average amount produced (kg)	Results of t-test	Average amount consumed (kg)	Results of t-test	Average amount sold (kg)	Results of t-test
1999/00	Njombe	467	**	45	**	407	**
	Mbarali	278		52		289	
2000/01	Njombe	357	**	39	*	312	*
	Mbarali	205		47		187	
2001/02	Njombe	274	**	41	*	242	*
	Mbarali	129		34		126	
2002/03	Njombe	208	**	31	*	187	**
	Mbarali	96		37		80	
2003/04	Njombe	140	**	34	*	128	**
	Mbarali	66		27		54	

** Significant $p < 0.01$ * Significant $p < 0.05$

In all the years between 1999/00 and 2003/04 Njombe produced significantly ($p<0.01$) more cowpeas than Mbarali. The amount consumed by the studied households was variable between years between the districts. As for production, the average amount of sold

cowpeas for Njombe district was significantly ($p<0.05$) higher than for Mbarali district. This indicated that cowpea was both a food and cash crop in the area. The reasons for the difference could be due to the fact that the area under cowpea cultivation as intercrop with other crops was large in Njombe district as compared to Mbarali district. It is also possible that farmers in Njombe were more knowledgeable about cowpea production and controlling storage pests. Intercropping cowpeas with other crops definitely lowered crop yields as also supported by Willey (1979). Therefore, farmers need to be educated so that they grow a sole crop instead of intercrop if they are to increase yield of cowpeas in the household. Mbarali consumed and sold more beans than Njombe and Njombe consumed more cowpeas than Mbarali. Therefore, in Mbarali district cowpeas produced were more for cash crop than for food. Also, more farmers in Mbarali district cited flatulence as a problem during cowpeas consumption and this could thus limit the amount of cowpeas consumed in the district.

4.18 Methods used in cowpeas storage

Table 30 indicates the common grain storage facilities in the study areas.

Table 30: Storage methods

Method	Njombe (n=149)		Mbarali (n= 149)	
	Frequency	Percent	Frequency	Percent
Sacks (plastic)	65	43.4	93	62.4
Plastic container	60	40.3	21	14.5
Traditional granaries	10	6.9	20	13.3
Drums	10	6.9	4	2.6
Others	4	2.5	11	7.2

The common grain storage facilities in the study areas were polyethylene sacks (62.7% and 43.4% in Mbarali and Njombe, respectively). Plastic containers (40.3 and 14.5%) were the

second option for storage facilities in Njombe and Mbarali respectively. Traditional granaries accounted for only 6.9 and 13.3% in Njombe and Mbarali districts, respectively. Households make choices on how much to store and how much to sell depending on the market price, there own consumption needs, storage facilities and their needs for immediate cash. According to Singh *et al.* (1997), low resource farmers often sell their cowpeas at harvest, when prices are lowest in the year, partly because they anticipate storage losses. Being aware of the storage problems, they are interested in better techniques for preserving their grain after harvest. Presently, farmers have no systematic methodology for assessing the economics of storage losses of cowpea grain. This situation calls for more education to the farmers to have simple but durable traditional granaries to protect their produce from being attacked by insects. Cost of manufactured storage structures availability and affordability by rural households is to believe that education on construction of improved granaries could be a sustainable way of protecting cowpeas in the area.

4.18.1 Storage losses

Most of the farmers reported to have crop losses during storage (Table 31).

Table 31: Losses during cowpea storage

Loss	Njombe (n= 149)		Mbarali (n= 141)	
	Frequency	Percent	Frequency	Percent
Loss encountered	136	91.3	105	74.6
No loss	13	8.7	36	25.4

About 91.3 and 74.6% of surveyed households in Njombe and Mbarali suffered crop loss in 2002/03 seasons. Grain legumes remain in edible condition for several years if properly stored. However, they are susceptible to infestation both in the field and during storage and cause serious deterioration in the nutritive value of the grain. The grain damage ranges

from 30 to 70% of the grain (APO, 2003). Also, according to AATF (2004), losses can be as high as 90% in severe cases. This problem can be addressed through conventional breeding and genetic enhancement of the crop. With appropriate technologies, it is expected that farmers will achieve higher yields of better quality cowpea that would impact on the trading volumes and general livelihoods of the producers, traders, processors and consumers, especially in the study area.

4.18.2 The main causes of storage loss

The major causes of the storage loss were the insects and rodents (Table 32).

Table 32: Causes of the losses during storage

Cause	Njombe (n= 136)		Mbarali (n= 106)	
	Frequency	Percent	Frequency	Percent
Rodents	27	19.9	28	26.4
Insects	109	80.1	78	73.6

Insect pests affected cowpeas in 80.1 and 73.6% of the respondent's households in Njombe and Mbarali districts, respectively indicating that it is one of the main causes of post-harvest losses in cowpeas. Rodents were to a lesser extent also a problem. More findings were observed by FAO (1985) that once the crops have been harvested, the grains continue to be damaged by insects, particularly weevil (bruchids, which can destroy or induce quality degradation in a granary full of cowpeas within two or three months). For ensuring household food security there is still a big challenge to enable farmers extend shelf life of cowpeas over 12 months period between successive harvests.

4.18.3 Measures used to control storage pests

The control measures for the storage pests differed from place to place. The most commonly used pest control measures in the study areas were the use of agrochemicals, botanicals, and construction of raising storage structures (Table 33).

Table 33: Measures used to control losses

Measure	Njombe (n= 136)		Mbarali (n= 108)	
	Frequency	Percent	Frequency	Percent
No measures	19	14.0	68	63.0
Industrial chemicals	92	67.6	26	24.1
Botanicals	23	17.0	8	7.4
Raised storage structures	1	0.7	6	5.5
Others	1	0.7	0	0.0

Whereas in Njombe district use of industrial chemicals (67.6%) was outstanding measure to control the losses, most Mbarali respondents did not use any measures at all (63.0%). It is possible that they sold the crop in the few months after harvest. The study found two major problems associated with the storage of grain legumes in the study area that caused serious economic losses to the farmers. These were partly because of poor storage practices and lack of simple processing methods to add value and extend cowpeas storage period. Therefore, the processing of cowpeas into acceptable and long shelf life products can be one approach that will help to reduce the excessive loss and deterioration due to storage. In addition, it is envisaged that a process to produce a marketable, easy to handle food using a method already known might stimulate the cultivation of cowpeas. Increased production with its associated monetary gains can lead to increased consumption and therefore a general improvement of the protein nutrition of the population. Pest management in cowpeas is problematic because the economics of chemical control and pesticides availability are major constraints (Mangalu, 1998).

4.19 Cowpea marketing

Table 34 shows the time in months that elapse before farmers sell their produce.

Table 34: Sales time of the crop after harvesting

Period	Njombe (n= 149)		Mbarali (n= 136)	
	Frequency	Percent	Frequency	Percent
Less than a month	7	4.7	20	14.7
1-2 month	29	19.5	52	38.2
3-4 month	55	36.9	48	35.3
5-6 month	40	26.8	8	5.9
7-8 month	4	2.7	4	2.9
9-10 month	2	1.3	2	1.5
Above 10 months	12	8.1	2	1.5

Around 90% of the households in Njombe and Mbarali districts sold their crop within 4 to 6 months. Farmers in Mbarali district sold much earlier than those in Njombe district. This early sale could be due to need for cash, and/or failure to control the storage pests. Selling cowpeas at the time of harvest or during the first months of the harvest does not benefit the farmer. This is because; at this time prices are generally low and thus lower the income that the farmer gets from the sales. Also, early sale threatens food security in the households because it reduces the amount stored and there is no assurance that the returns from this sale will be used to buy the same cowpeas or other food when such food will be needed.

Farmers sell their produce to village traders and middlemen while some send to distant markets. The sole important market for cowpea is believed to be Makambako, which is the regional largest receiver of cowpeas. Low marketability opportunities and high input prices were the major bottlenecks in production of cowpeas. According to farmers, the market problem was more serious for the Mbarali district than Njombe district. This was because the potential market (Makambako) was within Njombe while Mbarali was a bit far from it,

thus making cost of transport a problem. The only time when there were market opportunities was during famine periods.

The amounts of cowpeas sold in five seasons were as presented in Fig. 7.

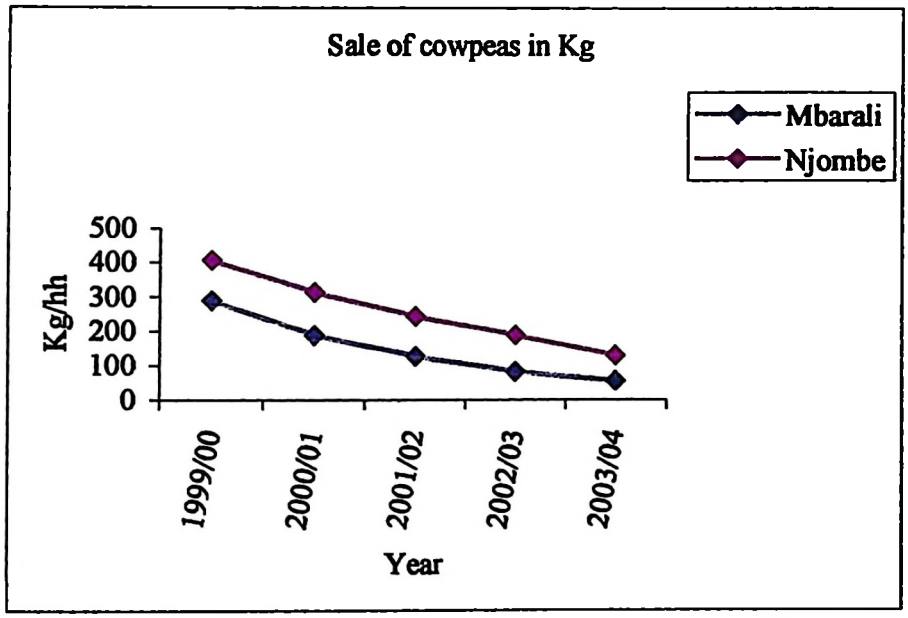


Figure 7: Trend of sales of cowpeas from 1999/00-2003/04

The amounts of cowpea sales decreased for both districts between 1999/00 and 2003/04. The average sales per household per season were still very low about 255kg for Njombe and 147kg for Mbarali district. According to the key informants, lack of markets was a big discouragement that made farmers produce at subsistence level, thus resulting in declining sales between the season 1999/00 and 2003/04.

4.19.1 Cowpeas marketing constraints

Results in Table 35 showed the problems encountered by farmers in marketing of cowpeas in the study area.

Table 35: Problems in cowpea marketing

Problem	Njombe (n= 131)		Mbarali (n= 102)	
	Frequency	Percent	Frequency	Percent
Price is low	88	67.3	23	22.0
Market is very far from home	36	27.6	67	66.0
Buyers not available	7	5.1	12	12.0

In Njombe district low cowpeas price was the major problem encountered (67.3%) of the households while in Mbarali district, the major marketing constraint was the long distance from the market (66.0%). The later problem in Njombe district (27.6%). In aggregate, price of the commodity and distance from the market were the major problems in marketing of cowpeas. Also, lack of reliable buyers was a constraint affecting 5.1 and 12.0% of the households in Njombe and Mbarali districts, respectively. As cited earlier by Coulter (1994), that lack of transport facilities and extreme variability of harvest hinder trading activity. Therefore, in order to improve marketing of cowpeas in the study districts, the low prices need to be addressed. This can be done through value adding and improved storage. Also in order to alleviate long distance market outlet, there is a need to improve linkage with markets and traders.

4.20 Income generating activities apart from farming

Table 36 summarizes the types of activities carried out as off farm activities in the two districts.

Table 36: Type of other activities carried in the study area

Type of activity	Njombe (n=127)		Mbarali (n=130)	
	Frequency	Percentage	Frequency	Percentage
Small business	67	52.3	102	78.5
Oil extraction	29	23.3	16	12.3
Carpentry	28	22.1	12	9.2
Others	3	2.3	0	0.0

Majority of farmers in Njombe and Mbarali were full time farmers. However, some were reported to have some off-farm activities as complementary sources of income to their households. Therefore, the majority of households depended on both farm and non-farm sources of cash income. The non-farm income sources included small business that accounted for about 52.3 and 78.5% of the households in Njombe and Mbarali, respectively. This was followed by oil extraction (23.3 and 12.3%) of the households in Njombe and Mbarali districts. Carpentry was also reported to contribute some income in the household (22.1 and 9.2% of the households in Njombe and Mbarali districts). Additional employment and income was also derived from livestock sale, development of small-scale agro-industries involving post-harvest activities like milk processing and marketing of foods and other agricultural crops (2.3 and 4.0%) in Njombe and Mbarali districts. This is a key factor both in overall development and improving income of the poorer sectors of the population.

4.20.1 Cowpeas contribution to household socio-economic status

Figure 8a shows the proportions of various crops and other activities in the household income in the potential cowpeas growing area.

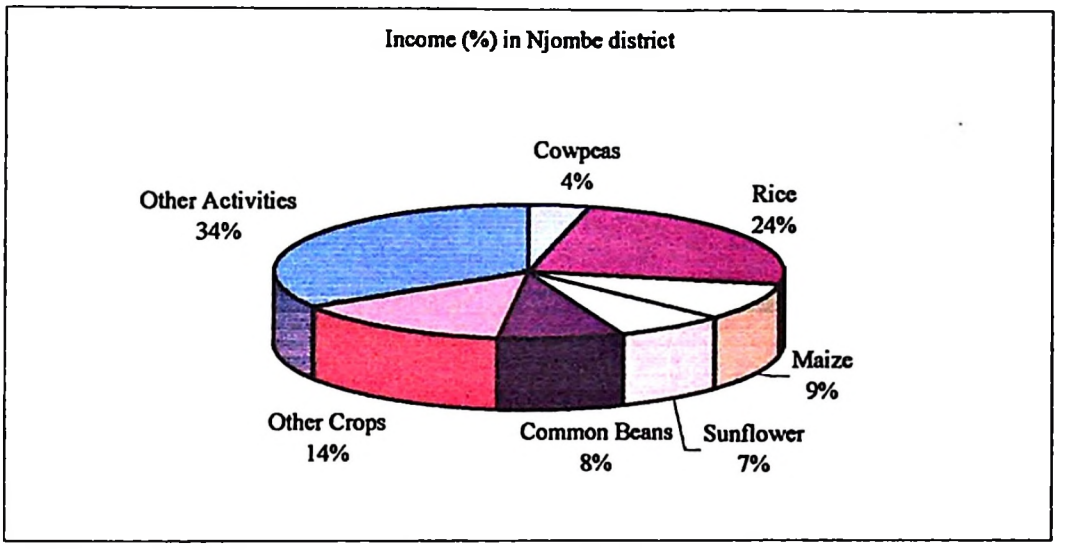


Figure 8a: Proportion of income from different activities in Njombe district

In Njombe district other activities contributed more to the regular household income (34%), followed by paddy (24%), other crops (14%), maize (9%), common beans (8%), sunflower (7%) and lastly cowpea (4%). Cowpea had the least contribution to the household income. This figure was a bit higher than the other findings obtained by Mwanga (2002) in Kondoa district where cowpea had very little contribution to the household income (about 3.3%).

Figure 8b shows the contribution of various crops and other activities in the household income in the less potential growing cowpeas area (Mbarali district).

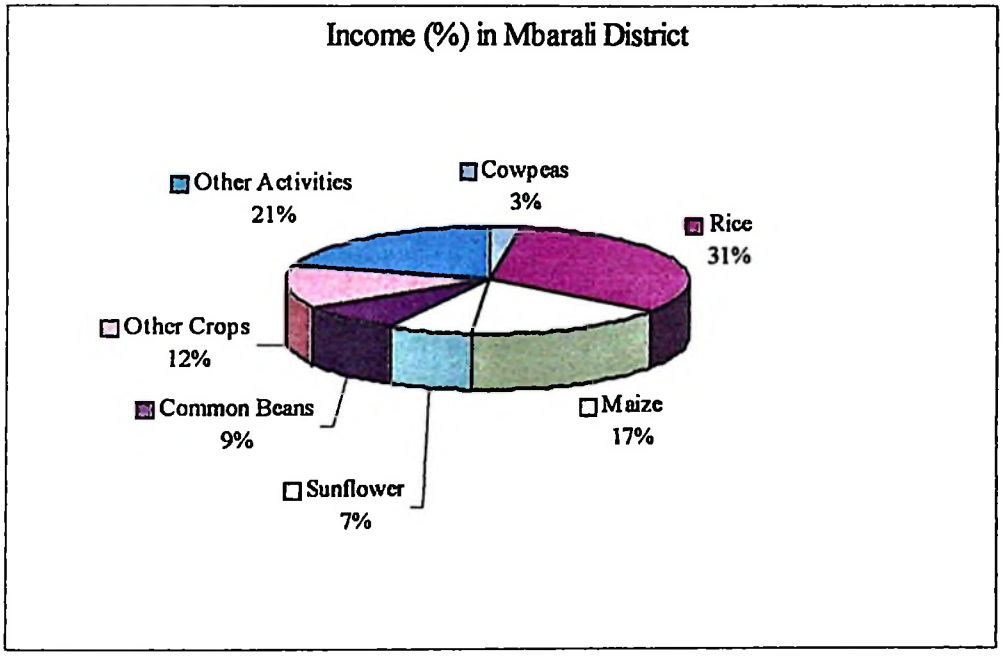


Figure 8b: Income contributions from different activities in Mbarali district

The study found that in Mbarali, paddy/rice contributes more in the regular household income (about 31%), followed by other activities (21%), maize (17%), other crops (12%), common beans (9%), sunflower (7%) and cowpea (3%). As for the case of Njombe district, cowpeas contributed the least in the household income in Mbarali district. According to Mwanga (2002) the findings in Mbarali were quite similar to those observed in Kondoa district.

More than 50% the farmers in Njombe and Mbarali districts would be considered as small-scale farmers. Such farmers are mostly engaged in producing for both domestic markets and for their own consumption.

Most of the farmers in the study area may be described as poor. Some of the main factors responsible for the low income were their limited access to inputs, lack of reliable markets, the limited access to support facilities such as storage, processing, transportation, access to improved varieties developed specifically for the area and lack of appropriate technological packages required for optimizing yield.

4.21 Comparison of income generated from different crops in Njombe and Mbarali districts

The relationship of income contributed by different sales is indicated in Table 37.

Table 37: Income generated from different crops for the season 1999/00-2003/04 in Njombe and Mbarali

Income source	Name of district	Mean (Tshs)
Income from cowpeas (Tshs)	Mbarali	25,445
	Njombe	49,628
Income from rice (Tshs)	Mbarali	312,762
	Njombe	334,333
Income from crop maize (Tshs)	Mbarali	160,509
	Njombe	127,466
Income from sunflower (Tshs)	Mbarali	63,442
	Njombe	90,736
Income from common beans (Tshs)	Mbarali	85,189
	Njombe	109,279
Income from other crops (Tshs)	Mbarali	120,240
	Njombe	197,593
Income obtained from other activities by the household (Tshs)	Mbarali	201,800
	Njombe	469,920**

** Significant level p= 0.01 * Significant level p= 0.05

The comparisons of income contribution to the household by different crops in the period from season 1999/00 to 2003/04 were negatively and statistically not significant. This was

unexpected except for the income contributed by other activities. The average income contributed by other activities in Njombe district (Tshs 469,920.00 in the households) was highly significant as compared to Mbarali (Tshs 201,800.00). This was due the presence of many respondents in Njombe district engaged in other activities than Mbarali district.

4.22 Major problems in cowpea production

Results in Table 38 showed that diseases and insect pests were the major problems in cowpeas affecting about 63% of the respondents.

Table 38: Major problems in cowpea production

Problem	Njombe n= (150)		Mbarali (n= 149)	
	Frequency	Percent	Frequency	Percent
Diseases and insect pests	95	63.0	95	63.6
High prices of inputs	31	20.5	32	21.4
Inadequate technical know how	15	10.2	14	9.0
Availability of inputs	7	5.0	7	4.8
Inadequate extension services	2	1.3	2	1.2

Other problems such as high prices of inputs affected 20.5 and 21.4% of the households. Availability of inputs (5.0 and 4.8%) and inadequate extension services (1.3 and 1.2%) were also less important. These constraints could influence yield thus resulting in many farmers neglecting the crop. This study also observed that almost all farmers from the two districts had similar problems. Farmers complained that high prices of inputs for controlling insect pests and diseases was the cause for prevalence of pests and diseases. Majority of the farmers could not afford the prices, and as results, they used traditional methods of crop production thus realizing poor yields. Furthermore, lack of market to sell their produce, markets instability and low crop prices were the additional problems affecting cowpeas production.

4.23 Farmers' suggestions on how to improve cowpea production

Farmers in Njombe and Mbarali districts gave their suggestion on how to improve cowpea production as follows:

i) Improving farmers awareness on the importance of cowpea (25.9%)

ii) More research on the crop to release varieties resistant to insects and diseases (25.0%)

iii) Availability of pesticides at affordable prices (23.6%)

iv) Search for more markets for their produce (23.2%) and

v) Provision of training on improved cowpea production and storage techniques (2.3%)

4.24 Market traders

4.24.1 Overview

These were the people sampled from the places where cowpeas and other legumes were sold. This group indicated the sale of cowpeas as compared to beans in the study areas. Majority of the traders were males, married and had primary school education (Table39).

Table 39: Socio-economic characteristics of the sampled traders

Characteristic	Frequency	Percent
Size of the household		
1.00 – 2.00	6	19.2
3.00 – 4.00	17	61.5
5.00 – 6.00	4	15.5
7.00 – 8.00	2	3.8
Gender of the head of household		
Male	24	80.0
Female	6	20.0
Age of head of the household (years)		
Between 18-25 years old (young adults)	9	30.0
Between 26-55 years old (adults)	19	63.3
Above 55 years old (old)	2	6.7
Marital status of the head of the household		
Single	6	21.4
Married	23	75.0
Widow	1	3.6
Education level of the respondent		
No formal schooling	3	10.7
Primary school	23	75.0
Secondary school	3	10.7
Above secondary school	1	3.6

This may be explained by the fact that cowpea trading activity is a time consuming activity, therefore, traders find it convenient to have wives to take care of household chores while they are away for trading activities. Also, since married men have family obligation, they engage in trading activities in order to generate income o met various family cash requirements. This is an indication that the literacy level of cowpea traders was good enough for them to carry out cowpea trading.

4.24.2 Business establishment

Majority of the respondents were familiar with their business because the period at the time of study, they had been in business was more than five years. The reasons for establishing

the business were mainly for income generation and as a source for employment (Table 40).

Table 40: Reasons for establishing the business

Reason	Frequency	Percent
Source of income	23	76.7
Employment	7	23.3
Total	30	100.0

Most traders (76.7%) decided to start the trade so that they could earn income for their daily requirements and 23.3% as a source of employment. Engaging in different activities at household level or any level so as to sustain life can increase household incomes. Investment in post-harvest systems is essential in order to maximize benefits gained from improvement in crop yields (NRI, 2005b).

The findings showed that a large number of traders engaged in selling cowpeas in the year between 2001 and 2002 (Table 41).

Table 41: Start of cowpea sales

Year	Frequency	Percent
1995	2	6.7
1997	1	3.3
1998	1	3.3
1999	5	16.7
2000	2	6.7
2001	6	20.0
2002	7	23.3
2003	3	10.0
2004	3	10.0
Total	30	100.0

Although there was an increase of traders in cowpea sale, this had nothing to do with the production, consumption and marketing from the farmers except for Njombe district, where there was an increase of cowpeas consumption in 2002. This increase was just a temporal service.

Table 42 shows the consumer of cowpeas in the study areas.

Table 42: Sources of customers

Customer	Frequency	Percent
Street vendors	7	23.3
Home consumption	12	40.0
Hotel and restaurant	2	6.7
Total	30	100.0

Most of the customers (40.0%) came from the households. Others were street vendors (23.3%), and hotels and restaurants (6.7%). Others (30%) were from those areas where this crop did not grow well. The consumption of cowpeas by street vendors and hotels was mainly in the form of preparation of snacks like *bagia*. The same findings were found in West Africa. Currently, at-home consumption was approximately 250g/person-week. Street vendors produce many flour-based products. A recent survey indicates that street vendors used cowpea flour exclusively to make *akara* (*bagia*). Based on an estimated typical adult meal of 5-6 *akara* pieces per person (12g of flour per piece), therefore it was estimated that consumption of cowpea flour was about of 100g (0.1kg) per person per week (CRSP, 2002).

4.24.3 Sources of supply

Majority of traders indicated that their main supply of cowpeas was within the district. This indicated that these traders were the ones who went to farmers and bought their produce, normally at very low prices. Male traders dominated this business with stock ranging between 500 and 1,000kg of cowpeas. The average price was 500.00 Tshs per kilogram. The traders sold their stock to individual consumers who visited the market place. Urban and peri-urban consumers got their needs from these traders but the amount demanded was quite small, ranging between 0.5 and 20kg per individual. On average, the surveyed traders sold about 68kg of cowpeas per day. Compared to common beans, the amount sold per day was 104kg, and the average quantity of beans purchased by an individual per day is 11kg. This indicated that consumption of common beans was more than cowpeas. According to Lowenberg-DeBoer *et al.* (1999), both beans and cowpeas are produced in all countries in the region and appear together and are often sold by the same vendors. Beans are more traded than cowpeas thus appearing to be more of a subsistence crop.

Table 43 summarizes the comments drawn from the traders on the strategies to improve cowpea marketing in the districts.

Table 43: Comments by the traders on the improvement of cowpea marketing

Comment	Frequency	Percent
Beans are highly demanded for consumption than cowpeas	22	73.3
Demand varies according to seasons	4	13.3
No response	4	13.3
Total	30	100.0

4.25 Street vendors

Street vendors are the people who are working in the informal sector dealing with the preparation of food to different people. For the purpose of this study they were sampled to show the consumption of cowpeas.

4.25.1 Socio-characteristics of the street vendors

These characteristics were as summarized in Table 44.

Table 44: Social characteristics of the street vendors

Characteristic	Frequency	Percent
Household size		
1- 2	14	46.7
3- 4	11	36.7
5- 6	2	6.6
7- 8	3	10.0
Gender of the head of household		
Male	25	83.3
Female	5	16.7
Age of head of the household (years)		
Between 18-25 years old (young adults)	8	26.7
Between 26-55 years old (adults)	21	70.0
Above 55 years old (old)	1	3.3
Marital status of the head of the household		
Single	8	26.7
Married	17	56.6
Widow	5	16.7
Education level of the respondent		
No formal schooling	2	6.7
Primary school	27	90.0
Secondary school	1	3.3

4.25.1.1 Household size

From the findings (Table 44) street vendors had big family sizes (1-4 persons/family). It is possible that such big family sizes prompted the search for income generation activities, besides farming, as a coping strategy.

4.25.1.2 Gender of the sampled street vendor

Survey findings Table 44 indicated that women, who constituted 83.3%, mostly performed street food trading activities leaving 16.7% as male vendors. In rural areas, women are often major producers and processors of family food. In urban areas, women are involved in both the marketing and purchasing of food supplies as well as in the sector of street food production and sales. In Africa 90% of the street food business is conducted by women (FAO, 1999) and this fully support the findings of this study where 83.3% were females. This section need full support if is to produce safe food since most of the key actors in such business are primary school leavers.

4.25.1.3 Age of sampled street vendor

Findings (Table 44) showed that majority of the vendors' (70.0%) were aged between 26 and 55 years. This is the active population in the community who in many cases has dependants in their households hence to work hard so as to ensure food availability within the household. For this reason, also the young adults (26.7%) participated in food trade to sustain life. Another study reported that women who engaged in street foods are mainly women between 30 and 39years (Nattrass, 1987).

4.25.1.4 Marital status of the sampled street vendor

The study findings (Table 44) indicated that 56.7% of the street vendors in the study area were married. Also, the results further indicated that single, widowed and divorced accounted for 26.7% and 16.7%, respectively. This may be explained by the fact that street food preparation activity is time consuming, therefore, vendors found it convenient to have partner so that the workload would be distributed among them. Also, since married

men/women have family obligations, they engaged in food preparation activities in order to generate income to meet various family requirements. Women often face difficult choices in time allocation decisions. Although caution is needed in generalizing about people's time allocation patterns and burdens, data from different areas supported the popular belief that women not only work longer hours than men but also spend more hours in productive activities per day than men. Data from Mbeya revealed that women worked 12 to 14 hours during the dry season and 14 to 17 hours during the wet season, without rest. In these areas men worked 8 to 10 hours during dry season and 10 hours in the wet season, with a rest period of 3 to 4 hours (Mwalemba, 1995).

4.25.1.5 Education level of the sampled street vendor

The education level as indicated in Table 44 shows that only 6.7% of the sampled traders had no formal education, the remaining (more than 90%) had formal education. This is an indication that the literacy level of street vendors was good enough for them to carry out food preparation. However, they did not study to beyond primary school level. In order for these vendors to perform their job properly, more food-related knowledge need to be imparted to them, especially on food preparation and hygiene Ferguson (2005) indicates that when women are empowered through education and inclusion in the research and development process, their well-being and that of their children is often enhanced.

4.25.2 Comparison of the traders and street vendors

The sample size consisted of 60 respondents (30 traders and 30 street vendors). Tables 39 and 44 show that in the sample, there were more males in market trading activity and more females in street food vending activity. Their education level for traders (75.0%) and street vendors (90.0%) was at the level of primary school leaver but street vendors having higher

percentage. Household sizes in the two districts on average were 3 and 4 persons per household.

4.25.3 The most preferred foodstuff in the study areas

Preference of most preferred foodstuff was judged by price or availability (Table 45).

Table 45: Reasons to those preferences

Category label	Frequency	Percent
Low price	15	48.3
Availability	12	41.4
Traditional	3	10.3

The most preferred foodstuff by most customers was stiff porridge (*ugali*) with beans and rice beans accompanied by vegetables. The reasons for the preference were that prices were low (48.3%) and the food items were readily available (41.4%). Other combinations like rice/stiff porridge (*ugali*) with protein source like meat and fish as a side dish proved to be too expensive. The consumption of cowpea grains as side dish was negligible since nobody reported to prepare it.

4.25.4 Comparison in fuel consumption

Table 46 compares the fuel consumption during cooking of common beans and cowpeas.

Table 46: Comparison in fuel consumption by beans and cowpeas

Type of foodstuff	Frequency	Percent
Beans consume more fuel	19	61.5
Cowpeas consume more fuel	11	38.5
Total	30	100.0

According to the survey data, common beans consumed more fuel (61.5% of households) than cowpeas, (38.5% of households). In contrary, Waniska and John (2002) reported that food that required less preparation time and that which had diverse textures and flavours would have significant positive impacts on women's role in society and quality of life. In the present study this was not the case because cowpeas require less time but their consumption was little as compared to that of beans. More findings, by Duke (1981), indicated that legumes require a very long cooking time ranging from one to four hours in the case of whole bean grains in order to reach an acceptable soft consistency but cowpeas require less time, thus being more favoured.

4.25.5 Profit from the business by street vendors

Incomes generated from selling street food are presented in Table 47.

Table 47: Profit earned from daily sales

Category label	Frequency	Percent
Less than Tshs 1,000.	10	33.3
1,000-5,000 (Tshs)	11	36.7
5,000–10,000 (Tshs)	5	16.7
Above 10,000	3	10.0
No response	1	3.3
Total	30	100.0

The results indicated that 33.3% of the street vendors earned an income of Tshs less than 1,000 per day, whereas about 36.7% were in the range of between Tshs 1,000 and 5,000; 16.7% earned between Tshs 5,000 and 10,000 and 10.0% earned Tshs 10,000 or more. The expansion of the street food trade has been largely a result of the substantial demand for readily prepared food by school children, urban workers and homemakers, who had limited time and often lived in housing where cooking was difficult because of overcrowding. This

need has been recognized and met by the growing number of urban unemployed or underemployed, who have found a livelihood in informal street food activities. The street food sector contributes to the maintenance of food traditions by offering local dishes. The sector provides a valuable service for urban consumers and is a source of cash income for vendors many of whom are women (FAO, 1999).

Table 48 shows the comments and suggestions regarding the selling of street foods.

Table 48: Comments regarding the business by street vendors

Category label	Frequency	Percent
Street food vendors should unite into groups	6	20.0
Loans should be directed to street food vendors	7	23.3
Low profit	6	20.0
High initial running cost	2	6.7
No response	9	30.0
Total	30	100.0

From the findings 23.3% suggested the provision of credits and loans to street food providers, 20.0% commented that due to low profit, street vendors could unite to form a group so as to operate efficiently. A few (6.7%) commented on the high running costs and 30% had no response. Literature reported that street vending activities offer women economic independence such that they can escape the gender oppression so common in patriarchal society (Nattrass, 1987). The level of income has been shown to be an important determinant to success of these vendors.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents the conclusions and recommendations based on the findings of the study. The chapter is divided into two sub-sections: conclusions and recommendations.

5.2 Conclusions

Based on the findings of the study, the following conclusions can be drawn:

i) The cultivated land varied considerably in Njombe and Mbarali districts. This could be the reason for low production of cowpeas in the area. Land shortage was not the major cause of inadequate food. Fertility of the soil for crop production could be the main cause of low cowpea production.

ii) There was a decrease in production of cowpeas from 1999 to 2003. Among the reasons for production decreasing as reported by the respondents were lack of reliable market, diseases and insect pests, inadequate knowledge on cowpeas production and high prices of agricultural inputs. The reasons for the crop being not sufficient could be due to the low yields since they used poor technology in cowpea production and the little cowpea they produced was sold to get cash to buy other necessary household needs.

iii) Majority of farmers in Njombe and Mbarali districts practised intercropping. They normally intercropped with cereals, sunflower and sometimes cassava and

finger millet. The cropping pattern in this area mainly favoured the taller crops because cowpeas were sown at very low densities with no fertilizer or use of other inputs. This intercropping was therefore a possible explanation for low acreage and thus low production of cowpeas in the two districts.

iv) Fertilizer application was very minimal and could have an impact on the yield expected. This could be the reason for relatively low production. Low level of input use is associated with subsistence farming and could have consequently prompted negligence in research and production of cowpeas in the study area.

v) The consumption was once to thrice per week in Njombe and Mbarali, respectively. These results showed that despite low production, this crop was important in the area, although not consumed on a daily basis. Consumption of cowpea grains in the study area was not common, because very few sampled household knew how different recipes could incorporate cowpeas in their preparation.

vi) Cowpeas were consumed in three forms that seemed to be almost equally important that could be vital in reducing malnutrition. These increased supply of vital nutrients in the community to fight PEM, anaemia and vitamin A deficiency.

vii) Cowpea leaves were harvested mainly for home consumption, and rarely for sale. These leaves were consumed only when they were in season. There is

therefore potential for extending their use in dry form through processing to ensure availability of this important food at the time of scarcity.

viii) The common grain storage facilities in the study areas were polyethylene sacks, plastic containers and local granaries. These exposed the produce to storage pests, particularly insects and rodents. Poor storage practices and lack of simple processing methods to convert the grains into easily stored products could be responsible for increasing loss of produce and discouraging production of cowpeas in the area.

ix) The average amount of cowpeas sold in Njombe district was significantly higher than for Mbarali district, indicating that cowpea could be a promising cash crop in the area.

x) Price of the commodity and distance from the market were the major constraints facing sale of cowpeas. Lack of reliable buyers added to the problems of marketing cowpeas.

xi) The non-farm income sources included small business; oil extraction, carpentry that contributed to increased household income. Cowpea contributed very little to the household income. Major reasons for low contribution were limited access to inputs, lack of reliable markets, limited access to support facilities such as storage processing, transportation, access to improved varieties, lack of appropriate technological packages required for optimizing yield and limited

knowledge on recipe formulations. Also, the low acreage due to intercropping cowpeas with other competitive crops was among the reasons.

xii) Farmers in the two districts had similar problems constraining cowpea production. The most important were high price of inputs for controlling insect pests. Limited access to markets led to low market prices for cowpeas. These constraints caused low production and perpetuated neglect of the crop by households in the study area.

xiii) Findings from the market traders indicated that cowpeas main supplies were within the district, while their main customers were from the households, street vendors and people from hotels and restaurants. Male traders dominated this business. The traders sold their stock to individual consumers who visited the market place, but the amount demanded was quite small. Compared to common beans, the amount of cowpeas sold was less. Also, consumption of common beans was more than that of cowpeas indicating more preference for common beans than cowpeas.

xiv) According to the street vendors, common beans consumed more fuel to cook than cowpeas, implying advantage of cowpeas over beans. The most preferred foodstuff by most customers was stiff porridge (*ugali*) with beans and rice with beans. Consumption of grain cowpeas as side dish was negligible due to consumer preferences. The sector provides a valuable service to many consumers and was a source of cash income to rural women. In this regard,

cowpea was mostly consumed as vegetables or fresh cowpea grains but little consumption was from preparations starting from dry grains.

5.3 Recommendations

Based on the conclusions drawn from the findings, the following recommendations are made:

i) Greater use of inputs such as fertilizer and improved seeds and pesticides are key to increased food crop productivity, which will consequently lead to greater food availability and improved nutrition. In marginal areas where fertility and rainfall are limiting factors to crop production, cowpea could be a legume of choice, if appropriate promotion is done.

ii) To assist the majority of the farmers who fail to purchase agricultural inputs, there is need to link them to credit facilities.

iii) There is a need to make an intensive production campaign for the benefits of cowpeas as household food as a measure to combat malnutrition in the rural areas. Also, explorations of market opportunities within and outside the country seem essential.

iv) The problems of storage call for more education to the farmers on simple but durable and improved affordable traditional granaries to protect their produce from attack by insects and other pests, especially the rodents.

v) There is need to explore alternative uses of the crop both at household and commercial levels. Households need to be educated on preparation of various recipes from cowpeas to give them a wider choice of cowpea-based food menu in the household, thus promoting consumption of this food crop.

vi) Processing of the legumes into acceptable products that can be stored easily will be one approach that will help to reduce excessive loss and deterioration associated with legumes including cowpeas storage in the study areas. This value addition to the crop could open new markets for cowpeas in the area.

vii) Improved seeds from research stations need to be available to cowpea farmers as a way of increasing cowpea production and yield.

viii) To improve marketing of cowpeas in the study districts, the low prices need to be addressed. Value adding and improved storage of cowpeas are recommended as strategies to avoid low prices and give financial empowerment to farmers. Strengthening linkage with traders (networking) will help to reduce the problem of distance from market.

ix) Street vendors need to be linked to credit facilities because they provide a valuable service to urban consumers and the business give them financial empowerment in addition to assisting farmers to get market for their produce.

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APPENDICES

Appendix 1: Farmer's Questionnaire on Cowpeas and its Contribution to Household Food, Nutrition and Income in Mbarali and Njombe Districts

1.0 GENERAL INFORMATION

1.1 Name of Interviewer: ..... Date of interview..... Name of District: ..... Division..... Ward Name ..... Village name: ..... Head of household name.....

1.2 Household head characteristics .....

1.2.1 Respondent's name.....

1.2.2 Gender of the head of the household.....

1.2.3 Age of head of the household

.....01 under 18 years old (children)

.....02 between 18-25 years old (Young adults)

.....03 between 236 – 55 years old (adults)

.....04 above 55 years old (old)

1.2.4 Marital status of the head of the household

.....01 Single .....02 Married

.....03 Widow ..... 0-4 Divorced/Separated

1.2.5 Education level of the respondents

.....01 No formal schooling

.....02 Adult literacy classes

.....03 Primary school

..... 04 Secondary School

.....05 Beyond Secondary School

1.3 What is your occupation?

02 Peasant

03 Civil Servant

04 Village leader

06 Others (specify)

1.4 What is the size of the households?

1.5 Livestock keeping

1.5.1 Do you keep any livestock?

01 Yes 02 No

1.5.2 If you how many of the following animals does your household own?

Type of livestock	Number	Remarks
Cattle		
Chicken		
Goats		
Ducks		
Pigs		
Others (specify)		

2.0 FOOD PRODUCTION AND SUPPLY

2.1 Do you own land?

01 Yes

02 No

2.2 If Yes; what is the purpose of the land.....

.....If No, how do you acquire the land?

01 Relatives 02 Rent

03 Bought 03 Others (Specify)

2.2 What is the purpose of the land?

2.3 If it is for crop cultivation how many hectares of cultivable land do you have?

01 Les than 0.5 02 0.5 – 1.0

04 1.1 – 1.5 03 1.6 – 2.0

05 2.1 – 2.5 06 above 2.6

2.4 How much land (acres) has your household cultivated this season (2003/04) in total?

01	Less than 0.5	02	0.5 – 1.0
03	0.9 – 1.3	04	1.4 – 1.8
05	1.9 – 2.3	05	Above 2.5

2.5 Have you ever produce cowpeas?

01 Yes

02 No

2.6.1 If Yes, when did you start producing? .....

2.7 Do you still cultivating the crop?

01 Yes

02 No

2.7.1 If Yes, what is the purpose of the crop?

01 for food

02 cash

03 both

2.8 How much have you been producing for the past years?

Year	Area cultivated (acres)	Amount produced	Amount consumed	Amount sold	Remarks
1999/2000					
2000/2001					
2001/2002					
2002/2003					
2003/2004					

2.9 Is this production sufficient for your household for a year (12 months)?

01 Not sufficient

02 Just sufficient

04 Surpluses

2.10 What other leguminous crops have you been cultivating?

Type of crop	Year under cultivation	Area under cultivation	Amount produced	Amount sold	Remarks

2.11 What is production pattern do you use in cowpeas?

01 Sole crop

02 Intercropping

2.12 If you intercrop, with what type of crop?

01 Maize

02 Sorghum

03 Others (Specify)

2.13 Do you use fertilizer on your farms?

01 Yes

02 No

2.13.1 If No, why?

01 High price

02 Not available when required

03 Low knowledge

04 Soil fertility adequate

05 Others (Specify)

2.13.2 If Yes what kind of fertilizer did you apply last year?

01 Organic fertilizer

02 Inorganic fertilizers

2.14 Where do you get cowpea seeds?

Type	Own source	Local markets	Research station	Seed exchange	Gift from relatives	Others (Specify)
Local						
Improved						

2.15 What are the constraints facing cowpeas production

01 Diseases and insect pests

02 Thieves

03 Long growing season

04 Inadequate technical know how

05 Inadequate extension services

06 High prices of pesticides

2.16 How do you control insect pests and diseases?

01 Using industrial chemicals

02 Using botanicals

03 Cultural practices

3.0 CONSUMPTION PATTERNS

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

01 Maize

02 Rice

03 Sorghum

04 Cassava

05 Sweet potatoes

06 Yams

07 Others (Specify)

3.2 What type of legumes do you eat to accompany the above item? (List in order of importance)

01 Common beans

02 Cowpeas

03 Soybeans

04 Peas

05 Others (Specify)

3.3 In which form do you consume cowpeas?

01 Dry grain

02 Fresh leaves

03 Dry leaves

04 Green pods

3.4 How many times you consume cowpea per week?

01 Once per week

02 Two to three time

03 More than three times

3.4.1 Did you know any recipe on cowpea preparation?

01 Yes 02 No

3.4.2 What are those recipes?

3.4.3 Do you face any problem(s) in selecting cowpeas grains for consumption?

01 Yes

02 No

3.5 If yes what kinds of problem(s) do you face?

01 Palatability

02 Colors

03 Cookability

04 Flatulence factor

05 Others (Specify)

3.6 What do you consider as substitutes for cowpea leaves?

01 Amaranthus

02 Cabbages

03 Spinach

04 Green peas

05 Others (Specify)

4.0 STORAGE OF THE CROP

4.1 In which form do you store cowpea?

01 Dried grains in pods

02 Shelled grains

03 Dried leaves

4.2 Which method(s) do you use to store your food crops after harvesting?

01 Plastic container

02 Drums

03 Traditional granaries

04 Sacks

05 Others (Specify)

4.3 Do you experience some losses, during cowpea storage?

01 Yes

02 No

4.4 What were the causes?

01 Rodents

02 Insects

03 Others (Specify)

4.5 What measures do you use to control losses?

01 Non measure

02 Industrial chemicals

03 Botanicals

04 Raised storage structures

05 Others

5.0 MARKETING OF COWPEAS

5.1 After how long do you sell your grain? (Specify months after harvesting)

01 Less than a month

02 1 – 2 month

03 3 – 4 month

04 5 – 6 month

05 7 – 8 month

06 9 – 10 month

07 Above 10 months

5.2 Do you harvest cowpea leaves during the last season?

01 Yes

02 No

5.2.1 If Yes for what purpose?

01 Household consumption

02 Needed to sell to get income

03 Is my tradition

04 Others (Specify)

5.2.2 If needed for income how much did you sell as green vegetables?

01 All of it

02 Most of it

03 Others (Specify)

5.3 Why did you sell as vegetable?

01 No grain obtained

02 More profitable

03 Others (Specify)

5.4 To whom you are selling you produce?

01 Market sellers

02 Street vendors

03 Hotels and Restaurants

04 Others (Specify)

5.5 Do you have any problems in cowpeas marketing?

01 Yes 02 No

5.5.1 If Yes what kind of the problems?

01 Price is low

02 Market is very far from home

03 Buyers not available

04 Others (specify)

6.0 OTHER SOURCE OF INCOME

6.1 What are the other sources of income does your household obtain from?

01 Crop sales

02 Small businesses

03 Sales of livestock

04 Salaries

05 Others

6.2 The proportions of income from cowpeas as compared to other crops?

Name of crop	Amount sold (bag)	(Tshs)
01 Cowpeas		
02 Rice		
03 Maize		
04 Sunflower		
05 Potatoes		
06 Vegetables		
07 Common bans		
08 Others (Specify)		

6.3 Do you have other members of the household doing some economic activities?

01 Yes 02 No

6.3.1 If Yes specify where they work and income

Family member	Sex	Age	Relation to the head	Education level	Place of work	Income per month

6.4 What are the comments do have in order to improve cowpea production, consumption and marketing in the district

.....

.....

Thank you for your cooperation

Checklist for key informants

Village leaders

- Village population
- Coverage of the village (area km^2/hectares)
- Number of households in the village
- General crop production in the village
- Food shortage
- Markets for the produce
- Farmland production problems in the village
- Solutions for the problems
- Training for farmers what is the situation of the extension services in the village

Extension workers

- What are the major activities carried out
- What are the important food crops in the village
- How does the community accept advice
- What are the food problems existing in the village
- Problems concerning markets and prices of crops
- Comments on crop production, food security in the area

Thank you for your cooperation

Appendix 2: Trader's Questionnaire on Cowpeas and its Contribution to Household food, Nutrition and Income in Mbarali and Njombe Districts

1.0 Background information

1.1 Name of Interviewer..... Date of interview.....

1.2 Name of Interview.....

1.3 Age.....

1.4 Gender of the head of the household.....

1.5 Marital status.....

1.6 Education level of respondent

01 Informal education

02 Primary education

03 Secondary education

04 High education level

1.7 What is the size of the households?

2.0 ESTABLISHMENT OF THE ENTERPRISE

2.1 When did you start your business?

01 Less than 5 month

02 6 – 1 year

03 Above one year

2.2 Why did you decided to establish this business?

01 Source of income

02 Employment

03 Others (Specify)

2.3 Are you engaged in selling cowpeas?

01 Yes 02 No

2.3.1 If Yes, when did you start selling this crop? .....

2.4 Reasons for your decision;

01 Customer requests

02 To get income

03 Others (Specify)

2.5 What are your sources of supply?

01 within the district

03 from the nearby District

04 from the nearby Regions

05 others places (Specify)

2.6 How much are you selling per kilogram?

01 Less than 300/=

02 Between 350/= - 500/=

03 More than 500/=

2.7 How many kilograms' of cowpeas do you sell per day?.....

2.8 How many kilograms' of beans do you sell per day?.....

2.9 Who are the customers?

01 Street vendors

02 Home consumption

03 Hotels and Restaurants

04 Others (Specify)

2.10 What is the average quantity of cowpeas/beans purchased by an individual per day?

01 Cowpeas.....

02 Beans.....

2.11 Give comments regarding your business

.....

.....

.....

Thank you for your cooperation

Appendix 3: Street Vendors Questionnaire on Cowpeas and its Contribution to Household Food, Nutrition and Income in Mbarali and Njombe Districts

1.0 General Information

1.1 Name of interviewer..... Date of interview:.....

1.2 Name of Interviewee.....

1.3 Age.....

1.4 Gender of the head of the household.....

1.5 Marital status.....

1.6 Education level of respondent.....

01 Informal education

02 Primary education

03 Secondary education

04 Higher education level

1.7 What is the family size.....

2.0 BUSINESS ESTABLISHMENT

2.1 When did you start your business?

01 Less than 5 months

02 6 – 1 years

03 Above one year

2.2 Why did you decided to establish this business?

01 Source of income

02 Employment

03 Others (Specify)

2.3 What type of foodstuffs do your costumer prefer most?

Foodstuff	Beans	Cowpeas	Meat	Fish	Green peas	Other (specify)
Ugali						
Rice						
Banana						
Potatoes						
Others (specify)						

2.4 Give reasons to those preferences above:

.....Can you sense any difference in fuel consumption when cooking cowpeas/beans?

01 Yes 02 No

2.5 If yes give reasons:

.....How much profit do you earn from your daily selling?

01 Less than 1000 (Tsh.)

02 1000 – 5000 (Tshs)

03 Above 5000 (Tshs)

04 Others

2.6 Do you have any comments regarding your business:

.....

Thank you for your cooperation