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Socioeconomic Assessment of Pigeonpea and Groundnut Production Conditions – Farmer Technology Choice, Market Linkages, Institutions and Poverty in Rural Malawi

Franklin Simtowe, Solomon Asfaw, Bekele Shiferaw, Moses Siambi, Emmanuel Monyo, Geoffrey Muricho, Tsedeke Abate, Said Silim, NVPR Ganga Rao and Oswin Madzonga

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Socioeconomic Assessment of Pigeonpea and Groundnut Production Conditions – Farmer Technology Choice, Market Linkages, Institutions and Poverty in Rural Malawi

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This study was conducted as part of a series of country-specific baseline assessments, to provide a broad overview of the production, market and socioeconomic conditions, and the constraints and opportunities in the farming systems. In Malawi the main legumes of interest are groundnut and pigeonpea; consequently, much of the analysis in this paper focuses on the two crops, while also providing a broad picture about other crops and livelihood strategies. The main users of this information are expected to be legume project scientists, planners, development agencies, and decision makers interested in the legume sub-sector in Malawi. We would particularly like to thank the International Fund for Agricultural Development (IFAD) for financing the Treasure Legumes project, and for entrusting ICRISAT with this noble assignment of implementing the project, the outcome of which, among others, is a baseline report on the socioeconomic assessment of pigeonpea and groundnut production conditions, farmer technology choice, market linkages, institutions and poverty in rural Malawi. We would also like to acknowledge with thanks the technical support and guidance that was provided by the Centre for Agricultural Research and Development at Bunda College and the National Association for Smallholder Farmers (NASFAM) during the implementation of the baseline survey.

We thank partners from the Ministry of Agriculture and Livestock Development, for their continued support in implementing the project; the households that participated in the survey and the survey team members for the assistance they provided in collecting data and their cooperation throughout the survey.

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1 Introduction

The Food and Agriculture Organization (FAO) of the United Nations (2008) reports that about 850 million people worldwide went hungry each year from the years 2002 to 2007. Furthermore, the United Nations (2008) reports, as the international financial crisis deepens, for the first time in history, one billion people were expected to go hungry in 2009. Agricultural growth is said to be the most effective means of addressing poverty. Consistent with this notion, the Department for International Development (2003) estimated that a 1% increase in agricultural productivity could reduce the percentage of poor people living on less than 1 dollar a day by between 0.6 and 2 percent. No other economic activity generates the same benefit for the poor.

In Malawi, agriculture remains an important component of the economy; employing 85 percent of the labor force, accounting for about 39% of the Gross Domestic Product (GDP) and 83% of Malawi's foreign exchange earnings (Chirwa 2007). The agricultural sector is subdivided into sub-sectors; estates and smallholder farmers. The latter accounts for 78% of the cultivated land and generates about 75% of Malawi's total agricultural output, suggesting that Malawi's agriculture is largely smallholder agriculture.

More than 72% of the smallholder farms are less than one hectare, a size too small to achieve food self sufficiency at the household level with the current rudimentary farming methods. This notion is consistent with the Benin et al.(2008) report, that Malawi is the third most densely populated country in mainland sub-Saharan Africa (at 2.3 rural people per hectare of agricultural land) after Rwanda (3.8 people per hectare) and Burundi (2.7 people per hectare). Such small land holdings are a serious challenge to the transformation of Malawi's agriculture.

The principal crops grown in Malawi are maize, tea, sugarcane, groundnut, cotton, wheat, coffee, rice and pulses[1]. The major exports include tobacco, tea and sugar. Tobacco, tea and sugar are grown mainly on commercial estates by multinational companies. The smallholder sector produces less that 15% of total tea and sugar production (Chirwa 2007).

A significant feature in Malawi's agriculture is the dominance of maize in farming systems. It is estimated that more than 70% of the arable land is allocated to maize production (Government of Malawi, 2004). Figure 1.1 depicts trends in the proportion of land allocated to selected crops. The proportion of land allocated to maize has remained high throughout the period (1983-2006). Substantial increments were observed in the proportion of land allocated to pulses between 1990 and 2006. This can be attributed to a number of initiatives by the government as well as donors and international research institutes such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) that promote the cultivation and marketing of dryland legumes leading to significant growth in productivity as well as the growth in the harvested area.

Dryland legumes offer a great opportunity for reversing the worsening trends in food insecurity and poverty in Malawi. Aside from offering products such as grain, fodder and in some cases

[1] These include several types of beans, pigeonpea, chickpea, bambaranuts, etc.

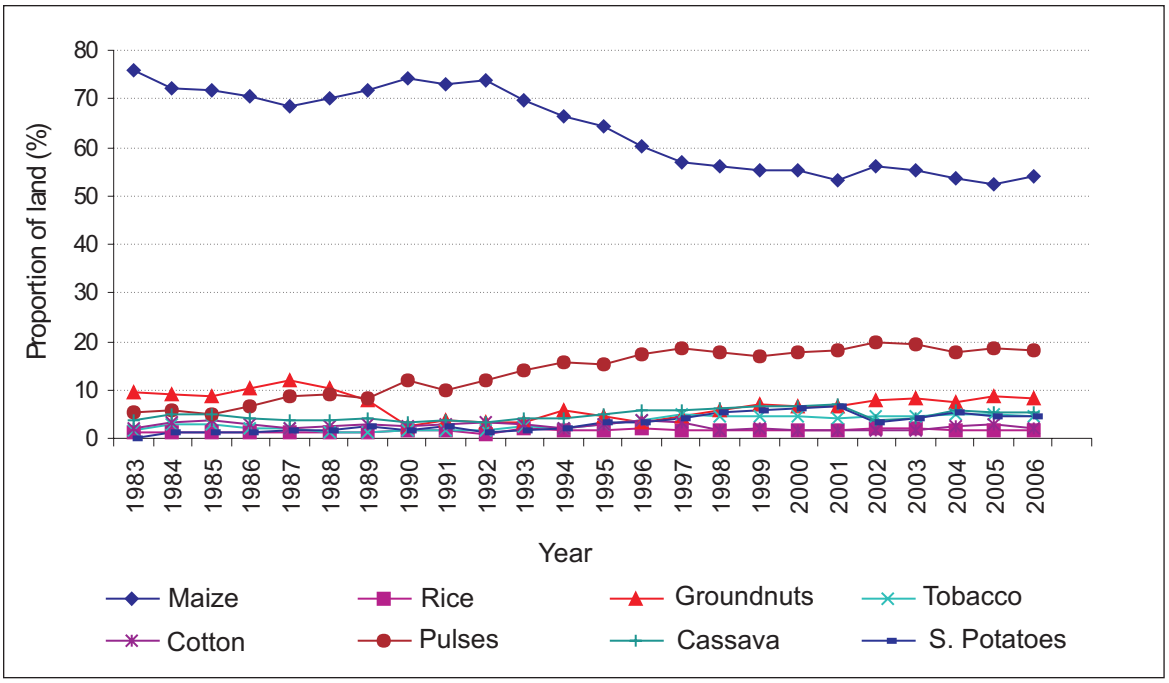

Figure 1-1. Proportion of land allocated to different crops (1983-2006).
Source: Simtowe (2007)

fuel wood, they contribute to soil fertility improvement through nitrogen fixation as well as from the leaf fall and recycling of the nutrients. Most legume perform well in poor soils and in regions where moisture availability is unreliable or inadequate (Reddy et al. 1993 cited in Kimani 2001). Furthermore, they can be incorporated with crops such as maize, sorghum or groundnut without reducing the yield of the main crop significantly. Despite the crucial role of legumes in contributing to food security and poverty alleviation, Shiferaw and Teklewold (2007) report that the growth in the legume sector is constrained by the lack of technology and market imperfections, which constrain producers from expanding the productivity and production.

The legumes of relevance in this study, groundnut and pigeonpea, are also the major dryland legumes grown in Malawi. The average annual cultivated area for groundnuts in Malawi for the period 1991-2006 (171 thousand hectares) accounted for 27% of the total legume land (Simtowe et al. 2009a). Pigeonpea ranked as the third most important legume crop after groundnut and beans in the period of 1991-2006 in Malawi.

Pigeonpea produces a wide range of products such as dried seeds and pods. Immature seeds are used as a green vegetable. Leaves and stems are used for fodder. Dry stems are used as fuel. It also improves soil fertility through nitrogen fixation as well as from leaf fall and the recycling of nutrients (Snapp et al. 2002, Mapfumes 1993). It is an important pulse crop that performs well in poor soils and regions where the availability of moisture is unreliable or inadequate (Reddy et al. 1993 cited in Kimani 2001). The crop can withstand low moisture conditions and performs well in areas with less than 1,000 mm of annual rainfall, depending on the distribution pattern.

A few improved varieties of long and short duration pigeonpea were released and made available to farmers by ICRISAT in collaboration with the Ministry of Agriculture and Livestock Development. Two long duration varieties (ICP 9145 and ICEAP 0040) and two short duration varieties (ICPL 93027 and ICPL 87105), were released for wider cultivation (Appendix 1). Each of the released varieties has economically important traits that make it attractive to smallholder farmers. ICP 9145 (released in 1987) and ICEAP 0040 (released in 2000), are resistant to Fusarium wilt and have a high yield potential. For example, ICEAP 0040 has a yield potential of 1.9 tons/ha. The short duration varieties are less tolerant to Fusarium wilt but have an added advantage in that they can be consumed as a grain as well as a vegetable. Their capacity to mature early also makes them more suited to semi-arid regions. This provides an opportunity for double cropping in regions with long or bimodal rainfall seasons.

Groundnut varieties developed and that are being promoted for commercial production include CG7, ICGV-SM 90704 (Nsinjiro), JL 24 (Kakoma), and IGC 12991 (Baka). The earlier releases include Chalimbana, Chitembana, Mawanga, Manipintar and RG1, among others. However, despite their importance and the availability of new technologies for the two legumes, the rate of adoption of improved varieties by farmers remains low, leading to low productivity. This has led to a lack of competitiveness for legumes and the inability to penetrate high-value markets that offer a premium for quality. Addressing these constraints is extremely important if the untapped potential of legumes is to be harnessed, this requires the setting up of institutional arrangements and partnerships, which could improve local availability; utilization of improved technologies, and effective market linkages that offer stable and better prices to producers.

In order to address the problems of the legume sector – market imperfections and low technology – ICRISAT initiated two major projects; (i)The Treasure Legumes project funded by the International Fund for Agricultural Development (IFAD) and the Tropical Legumes Project (TLII) funded by the Bill & Melinda Gates Foundation.

The two integrated legume improvement projects were initiated to promote the cultivation and productivity of high value legumes in selected countries because of their perceived potential to contribute to both the household income and food security of poor and marginalized farmers.

The Treasure Legumes Project is being implemented in four countries: Ethiopia, Tanzania, Malawi and Kenya. In Malawi, the project focuses on groundnuts and pigeonpea. The goal of the project is to generate opportunities in the semi-arid areas of eastern and southern Africa, for income-growth, diversification and to improve the resilience of livelihoods, through integrated innovations that improve productivity and market linkages for grain legumes.

The project is aimed at assessing the opportunities for diversification and commercialization of production through the introduction of widely adapted grain legume varieties along with best crop and resource management technologies. The project is also expected to develop effective institutional arrangements for technology delivery and market linkages, complemented by tools and methods for risk assessment and mapping to facilitate targeting and up-scaling of successful innovations. The Tropical Legumes project is being implemented in a number of countries in

western and central Africa but it is also being implemented in three countries in eastern and southern Africa; namely, Ethiopia, Malawi and Tanzania.

This report is based on a baseline survey for the two projects conducted in Malawi, which involved the collection of information related to the thematic areas of the two projects. This information is intended to be used as a benchmark to monitor the ex-post impact of the project intervention on the intended project outcomes. The study tries to provide information on the following aspects specifically:

(i) Socioeconomic profile of smallholder farmers, including the distribution of land and other productive assets, also, the poverty and income profiles of the study area using income and expenditure measures
(ii) Main characteristics of farming systems with emphasis on resource use patterns, land productivity and also the current situation of groundnut and pigeonpea grown in the study areas
(iii) The role of market institutions, infrastructure and household assets in determining access to new technologies and markets of small holder farmers
(iv) Profitability of different crop and livestock enterprises in the study regions
(v) Levels of adoption and dis-adoption of new groundnut and pigeonpea varieties
(vi) Constraints and opportunities in the seed production and delivery systems
(vii) Implications of agricultural research and development strategies in order to impact the poor.

The report is organized into nine chapters. Following the introductory chapter, chapter two provides a description of the survey methodology and sources of data as well as the analytical techniques. Household demographic characteristics and asset-ownership are discussed in chapter three, while chapter four discusses access to agricultural and business services. Issues of crop production systems, crop productivity, input-use patterns and profitability are discussed in chapter five, whereas chapter six discusses livestock production focusing on types of livestock owned, crop-livestock linkages and livestock profitability. In chapter seven, issues of non-farm diversification including the access to financial assets are discussed, while the poverty situation of households is described in chapter eight. In chapter nine, we discuss groundnut and pigeonpea technologies used focusing on production, marketing and post-harvest handling, concluding with chapter ten.

2 Data and Analytical Methodology

2.1 Project intervention areas

As mentioned earlier, this report combines data for two projects and therefore, the methodology presented combines both the Treasure Legumes and the Tropical Legumes projects. In Malawi the Treasure Legumes project is being implemented in two districts of Chiradzulu and Thyolo in collaboration with the Rural Livelihoods Support Program (RLSP). The Tropical Legumes project is being implemented in Balaka and Mchinji districts in collaboration with the National Smallholder Farmers Association of Malawi (NASFAM).

2.2 Study sites

The baseline survey sites include two districts for the Treasure Legumes project: Chiradzulu and Thyolo, as well as two Tropical Legumes districts: Balaka and Mchinji. Chiradzulu and Thyolo districts are located in southern Malawi. In 2007 Chiradzulu and Thyolo districts had populations of 290,946 persons and 587,455 persons, respectively. The population densities were 379 persons and 343 persons per square kilometer, for Chiradzulu and Thyolo, respectively, compared to 138 persons per square kilometer for Malawi as a whole (NSO 2008). The two districts (Thyolo and Chiradzulu) are major pigeonpea growing areas while groundnut is also produced moderately.

The two districts selected for the Tropical Legumes project (Mchinji and Balaka) are located in two regions. Balaka is situated in the southern part of the country while Mchinji is situated in the centre. In 2007 Balaka and Mchinji districts had populations of 316,748 persons and 456,558 persons, respectively. The population densities were 144 persons and 136 persons per square kilometer, for Balaka and Mchinji, respectively, compared to 138 persons per square kilometer for Malawi as a whole (NSO 2008). Balaka is a major pigeonpea growing area while Mchinji a major groundnut grown district. Figure 2-1 presents the distribution of the harvested area for pigeonpea and groundnut across the country. Groundnut production is mainly concentrated in central Malawi, while pigeonpea production is concentrated in southern Malawi.

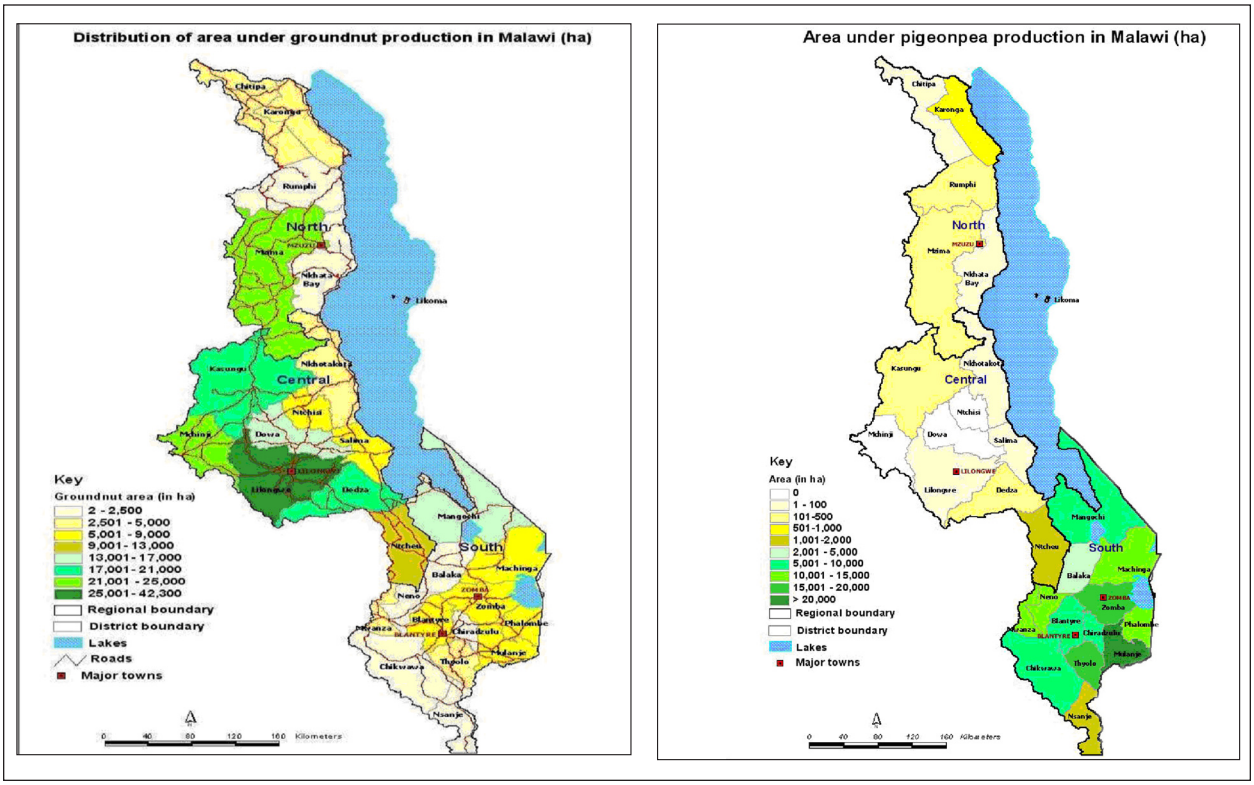

Figure 2-1. Map of Malawi showing distribution and area under pigeonpea and groundnuts.

2.3 Data sources sampling methods

The study is based on data collected by ICRISAT, in collaboration with the Centre for Agricultural Research and Development (CARD) of the University of Malawi and the National Smallholder Farmers' Association (NASFAM) in April-May 2008 in Malawi. The primary survey was done in two stages. First, a reconnaissance survey was conducted by a team of scientists to have a broader understanding of crop and livestock production and marketing, in the survey districts. During the reconnaissance survey, discussions were held with different stakeholders including farmers, traders, and extension staff working directly with the farmers. The findings from this stage were used to refine the study objectives, sampling methods and the survey instrument. Survey instruments were prepared, and trained enumerators collected the information at group and household levels.

A combination of stratified and purposive sampling methods was used to select the four districts (Chiradzulu, Thyolo, Balaka and Mchinji) included in the survey. In each of the selected districts, the first stage in household selection involved the purposeful selection of the four largest groundnut-producing Sections[2] (for the groundnut producing zones), or the four largest pigeonpea producing sections (for the pigeonpea producing districts). This led to the selection of four (4) sections in each district and consequently 16 sections for the study area. Second, a complete list of all the villages in each section was drawn with the help of the heads of Extension Planning Areas (EPA) and their staff. Three villages were randomly selected from each section. Third, a complete list of all farm families was then drawn for each of the randomly sampled villages. Thirteen farmers were randomly sampled from a list of farm families in each village. This led to the sampling of 594 households for the household survey. The summary of the districts, EPAs and the number of households interviewed in each district is presented in Table 2-1.

Table 2-1. Distribution of sampled communities and households.

Name of district	Name of Extension Planning Area (EPA)	Number of sections	Number of villages	Number of households
Chiradzulu	Thumbwe	4	12	152
Thyolo	Khonjeni	4	14	144
Balaka	Bazare	4	12	144
Mchinji	Chiosya	4	14	154
All		16	52	594

Source: ICRISAT Treasure Legumes/ TLII Study (April- May 2008).

A focus group discussion was held in each of the selected villages with key informants using a pre-designed questionnaire/check list. The information collected during focus group discussions included price trends in inputs (non-labor), seed and grain output prices, price trends for livestock and livestock products, trends in labor input costs, the value of farmland, key physical features in the village, as well as the village size. Aside from focus group discussions, a household survey

2. Malawi is divided into eight Agricultural Development Divisions (ADDs) that form different agro-ecological zones. These ADDs lie within the three regions of the country. The ADDS constitute the primary management unit of extension services. The ADDs are subdivided into Rural Development Projects (RDPs), which are further subdivided into Extension Planning Areas (EPAs). Extension agents called Field Assistants supervise at the EPA level. Each EPA is further subdivided into Sections.

was conducted in each of the selected villages. A household questionnaire was then administered to each of the selected households in the village. The information collected using a household questionnaire included, membership in farmer organizations/clubs, household composition and characteristics, household farm assets other than land, crop and livestock production, crop and livestock marketing and, access to information and participation in technology transfer. Also collected was information on financial assets and sources of credit, collective marketing activities and information on annual food and non-food expenditure.

2.4 Analytical methods

Descriptive statistics including simple mean, graphs, frequency tables, and cross tabulation were used to analyze household socioeconomic characteristics, cropping patterns, crop utilization, and market linkages. In some cases the analysis has been disaggregated by the district and in some cases also by gender to capture the trends across the study districts and gender. Gross margin analysis was used to assess the farm level competitiveness of crop and livestock production. The analysis of poverty is done using the Foster-Greer-Thorbecke (1984) class of poverty measures. Our analysis in this paper only focuses on assessing the incidence of poverty disaggregated by the gender of the head of household.

3 Household characteristics and assets

3.1 Household structure, size and employment status

Demographic characteristics of the households in the study area are presented in Table 3-1. About 24 percent of the sampled households were female-headed (range from 14 percent in Mchinji to 30 percent for Thyolo). The incidence of female-headed households for the study area is slightly lower than the national figure of 28 percent reported in the 1998 Population and Housing Census. The average household size for the study area was 4.8 persons per household. This is consistent with the national average of 4.4 persons per household reported by the National Statistics Office. The mean age of the household heads is 45 years.

Table 3-1. Demographic characteristics of households.

Characteristic	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Sex of household head (%)					
Female	26	30	27	14	24
Household size					
Average household size	4.2	5.0	5.0	5.1	4.8
Dependency ratio (All)	1.3	1.4	1.3	1.1	1.3
Dependency ratio (Male-hh)	1.2	1.2	1.2	1	1.2
Dependency ratio (Female-hh)	1.6	1.7	1.7	1.7	1.7
Age of household head (%)					
Mean age of head (years)	46 (18)	46 (63)	45 (19)	43 (15)	45 (17)
Age distribution (%)					
Less than 20 yrs	3	2	2	2	2
20-30	25	17	27	23	23
31-40	20	24	24	26	24
41-50	12	22	10	19	16
51-64	13	18	15	17	16
65 and above	27	17	22	12	20
Marital Status (%)					
Married living with partner	66	63	68	86	71
Widow/widower	13	14	18	7	13
Divorced/separated	16	17	10	5	12
Married but partner away	2	5	1	1	2
Never married	3	1	2	1	2
Education of head (%)					
None (illiterate)	13	18	17	23	18
Adult education	6	3	6	4	5
Lower primary	29	26	24	21	25
Upper primary	35	43	34	36	37
Junior Secondary	5	3	14	6	7
Senior secondary	11	6	6	9	8
Average education of head (yrs)	5.3	4.7	5.1	4.8	5.0
Average education of spouse (yrs)	4.2	4.2	4.0	3.7	4.0
Average household education (yrs)	3.6	3.8	3.7	3.5	3.6
Children attended school (%)					
All children	93.3	95.8	93.7	88.7	93.0
Females	96.43	97.22	96.04	89.90	94.90
Males	90.6	94.4	91.4	87.5	91.1
Occupation of head (%)					
Farming(crop/livestock)	90	71	92	99	88
Formal employment	6	21	6		8
Self employed	1	6			2
Casual laborer	2	1		1	1

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

The dependency ratio, defined as a ratio of the number of persons in the household outside the economically active population (children under 15 or adults over 64 years of age) to prime-age adults was also computed for the study area. This statistic provides an indication of the level of responsibility of economically active persons in providing for dependants. In the study area, the average dependency ratio is 1.3, implying that every 10 working persons support 13 dependents, which is slightly higher than the national average where every 10 working persons support 11 dependents (NSO 2001). The dependency ratios across districts are almost similar; however, female-headed households tend to have a larger dependency ratio (1.7) than male-headed households (1.2). The difference in dependency ratio between male- and female-headed households is consistent across all the districts. These findings are consistent with reports by the World Bank (2007) in which they observe that female-headed households in Malawi have a larger dependency ratio than male-headed households due to a consistently large number of children among female headed households. Furthermore, the World Bank (2007) reports that the dependency ratio tends to be larger among the poor households and that female-headed households tend to be vulnerable and poorer than male-headed households. These findings are also at par with the national level trend in which a strong correlation between dependency and gender of the head of household was reported. The majority of heads of households (71 percent) are married. Consistent with prior expectation, the majority of households (88 percent) are full time farmers while 8 percent are reported to be employed in off-farm jobs. Nonetheless, a much larger proportion of households in Thyolo district (21 percent) rely on formal employment as their source of livelihood, against 6 percent for Chiradzulu and Balaka, and none for Mchinji.

3.2 Land size

Land is an important determinant of household food security in agrarian economies such as Malawi. Lack of land can lead to immense poverty and in some cases, destitution. Table 3-2 shows land holding size by location. The mean land holding size for the study area is 1.05 hectares. Households from Mchinji have significantly larger land holdings (1.44 ha) than households from Chiradzulu (0.82 ha), Thyolo (0.86 ha) and Balaka (1.06 ha). Based on these statistics, it can be noticed that land is very scarce. More than half of all households in the survey area have land holdings of less than 0.5 hectares. This is consistent with national land holding sizes reported by the National Statistics Office (NSO), where over half of Malawian rural households reportedly cultivate/own less than one hectare while one-quarter cultivate/own less than 0.5 ha. The study further reveals that most of the land owned (98%) was cultivated in the 2007/2008 cropping season.

Land fragmentation

Land fragmentation was assessed by examining the number of parcels/plots per holding. For this study, a land parcel was defined as piece of land physically separated from others. In general, land holdings become smaller in area over time, because of the breaking up of holdings through inheritance and other factors. Land fragmentation has both advantages and disadvantages. With regards to disadvantages, land fragmentation could lead to sub-optimal usage of factor inputs, and thus to lower overall returns to land. The factors contributing to this could be losses due to extra travel time, wasted space along borders, inadequate monitoring, and the inability to use certain types of machinery such as harvesters. Consistent with this notion, Ellis (2001)

reports that land fragmentation in densely populated areas can create farm holdings that are insufficient to provide their owners with a means of subsistence, which results into a push reason for household diversification. This may also result in a decline in land productivity and technical inefficiencies due to suboptimal plot sizes and land fragmentation (Edris and Simtowe 2002). However, it is important to also point out that land fragmentation per se may not be a problem. It becomes a problem when we do not know the optimal or economic plot size. However, if research organizations and others provide technologies that fit plot size of households, land fragmentation may not be a problem. The problem of most developing countries is that technology and policy are not dynamic, while the environment farmers are working in, is dynamic. Policies and technologies are not adjusted to environmental settings and household endowments. Land fragmentation also has a number of benefits. For example as a result of fragmented plots, farmers may reduce the risk of total crop failure as they are likely to succeed in at least one of the plots, especially if they are further apart; consequently land fragmentation acts as an insurance mechanism. In cases where farmers grow a diversity of crops, farmers may allocate different crops to different plots based on differences in crop and soil fertility requirements as soil fertility varies over space.

The results on land fragmentation are presented in Table 3-2. In the study area, farmers reported owning an average of 3.5 plots. In a sample with an average land holding of 1 hectare, this is equivalent to a land fragmentation of 3.5 parcels per hectare. However, there is significant variation in the degree of land fragmentation across districts. Farmers from Balaka, Thyolo and Chiradzulu districts registered higher land fragmentations than farmers from Mchinji. The renting in and out of land is a common practice in some parts of Malawi; however, in this study, this was minimal. The renting and borrowing of land has been reported to be common among households who do not own much land or households that have inadequate land.

Table 3-2. Natural capital – land holding and fragmentation.

Category of land (acres)	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Number of plots	3	3.6	4.4	2.9	3.5
Average plot size (ha)	0.32	0.27	0.26	0.50	0.34
Total land owned (ha)	0.82	0.86	1.06	1.44	1.05
Land operated/cultivated (ha)	0.87	0.88	1.08	1.42	1.07
Borrowed out (ha)	0.02	0.02	0.00	0.02	0.02
Borrowed in (ha)	0.01	0.01	0.00	0.01	0.01
Rented out (ha)	0.03	0.00	0.00	0.05	0.02
Rented in (ha)	0.07	0.05	0.04	0.06	0.06

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

3.3 Livestock capital

The livestock industry of Malawi comprises a large traditional sector and only a small but important commercial sector. Most smallholder farmers rear livestock, using traditional systems as an important household asset that provides both food and income. The presence of livestock in a household decreases household vulnerability to shocks and helps in consumption smoothing. Livestock can be used as draught power and also as a source of manure for the farm. As indicated

in Table 3-3, in the study area, almost all households rear some livestock. Chickens (52%), goats (29%) and pigs (7%) are the predominant types of livestock reported to be reared by households. Ducks, cattle, and rabbits are the other forms of livestock kept by 3 percent, 2 percent and 1 percent of the households, respectively. Significant variations exist in the proportion of households rearing livestock across the districts. For example, although chicken is the most predominant form of livestock across all the districts, a significantly larger proportion of households in Thyolo (71 percent) rear chicken, against 47 percent in Chiradzulu, 58 percent in Balaka, and 32 percent in Mchinji. However, the information on the proportion of households rearing livestock does not inform much about the intensity of livestock keeping. In the study area the average TLU per household is 0.37. This is considerably lower than the national average, a factor that may be attributed to the fact that the study areas are not major livestock producing regions in the country. Devereux et al. (2007) report that Malawians owned 8.9 Tropical Livestock Units (TLU)[3] per capita between 2000 and 2002 compared with 24.9 TLU per capita in the neighboring Zambia, 45.1 TLU per capita in Zimbabwe, and 157.5 TLU per capita in Botswana. Households from Mchinji district have a larger value of livestock units (0.47) than farmers from other districts.

Table 3-3. Proportion of households (%) keeping livestock and number kept.

Type of livestock kept	District								Total (n=594)	
	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)			
	% owning	number owned	% owning	number owned	% owning	number owned	% owning	number owned	% owning	number owned
Chicken	46.7	4.3	70.8	8.8	58.3	7.0	31.8	3.0	51.5	5.7
Goat	44.7	1.6	34.0	1.4	17.4	0.9	20.1	0.8	29.1	1.2
Pigs	4.61	0.1	8.33	0.3	4.86	0.2	11.0	0.5	7.24	0.3
Duck	2.0	0.1	2.8	0.1	2.1	0.3	3.9	0.4	2.7	0.2
Cattle	2.6	0.1	0	0	1.4	0.0	5.2	0.3	2.4	0.1
Rabbits	0	0	0	0	1.4	0.3	0	0	0.5	0.1
Tropical Livestock Units (TLU)		0.34		0.37		0.30		0.47		0.37

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

Note: Tropical Livestock Units conversion factors: oxen=1.0; cattle=0.7; small ruminants (goats and sheep)=0.10; pigs=0.20; poultry=0.01; rabbits=0.01; turkeys=0.10.

3.4 Production equipment and housing

In this study, physical capital refers to all households' productive and non-productive assets, such as agricultural machinery, communication materials, as well as the housing condition. Results in Table 3-4 indicate that that there is a universal ownership of agriculture machinery such as plough and axes, while bicycle and radio are owned by 46 percent and 54 percent of the households, respectively. Bicycles are one of the major means of transportation in Malawi. They are used to transport goods as well as people. The proportion of households that own bicycles in the study area is higher than the national proportion of 33 percent reported by the World Bank (2008). Very few own a mobile phone (5 percent) and television (3 percent).

3. A TLU is a common unit used for describing livestock numbers of different species; this unit expresses the total amount of livestock present as a single value regardless of the specific composition. This is achieved by assigning conversion factors to different species to reflect their relative value (Malawi Government and World Bank 2006).

Table 3-4. Physical capital owned and its value.

Type of Asset	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)		Total (n=594)	
	%	Total value (MWK)	%	Total value (MWK)	%	Total value (MWK)	%	Total value (MWK)	%	Total value (MWK)
House with Iron sheets (%)	25		51		8		19		26	
Agriculture machinery	100	744	100	1,146	100	1,236	100	2,449	100	1,406
Bicycle	43	5,125	45	5,011	46	5,300	51	6,705	46	5,593
Radio/radio cassette	50	1,046	61	2,478	53	1,861	49	1,483	53	1,747
Mobile phone	5	8,771	7	5,000	6	6,938	3	5,380	5	6,460
Television (TV)	1	4,500	6	10,625	3	21,750	1	7,000	3	12,700
Others	1	17,575	2	64,333	27	11,679	14	4,109	11	12,672

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Table 3-5. Physical capital – buildings in the homestead.

Form of physical capital building	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Type of building					
Residential	100	100	100	100	100
Livestock pen/kraal	10	30	14	21	19
Store	5	6	12	26	12
Toilet	32	38	1	1	18
Kitchen	20	24	11	8	16
Bathroom	2	3	0	2	2
Pigeon house	0	0	1	1	0
Chicken house	0	0	5	0	1
Walling materials					
Burnt bricks	33	100	65	79	70
Stone	0	1	1	1	1
Earth	18	2	13	29	16
Unburned bricks	100	84	67	44	77
Poles	14	24	3	5	11
Grass	0	1	0	1	0
Roofing materials					
Grass thatch	100	100	100	100	100
Iron sheet	25	51	8	19	26
Tiles	1	0	0	0	0
No roof	12	6	1	3	5

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

With regard to housing and housing conditions, there is a universal ownership of residential houses in all sampled households (Table 3-5). About 70 percent of the households have a house made from burnt brick, while 77 percent of the households were constructed using bricks that are not burnt. Almost all households have a house roofed with a grass thatch. 26 percent of the

households dwell in houses with iron sheet roofs. Ownership of livestock house/kraal was reported by 19 percent of the respondents. The ownership of a latrine is low in the study area, only 18 percent of the respondents reported that they had pit latrines. This proportion of latrine ownership is lower than the national figure of 62 percent reported by the National Statistics Office (2001). However, there appears to be an under-reporting of toilet ownership, particularly for Balaka and Mulanje districts. Low use of latrines is sometimes associated with a high incidence of diarrhea and other water-borne diseases.

3.5 Human capital – education and family labor

In the developing world, a major constraint to technological improvement in the agricultural sector is the farmers' low level of literacy and knowledge of the basic concepts of cost accounting and business administration. Empirical evidence from a number of developing countries has shown a strong relationship between agricultural productivity and literacy. Human capital is viewed as the most strategic factor in agricultural development, especially as new technologies emerge; markets demand higher quality, safer products and timely delivery as consumer requirements.

In this study we assess the human capital of households, with a focus on labor availability and education. As depicted in Table 3-6, the average size of a household is 3.5 adults (ranging between a 3 adult equivalent in Chiradzulu to 3.8 adult equivalents in Mchinji). With regard to education, the average number of years of education for the household is 3.6 years. However, male-heads of households have more years of education (5 years) than female spouses (4 years). The levels of education across the districts are similar. There are interesting results with regards to school attendance of children of school going-age. About 93 percent of all children of school going age attended school and the distribution is quite similar across districts. With regard to the education of the head of household, 5 percent had attended adult literacy education, 25 percent had attended lower primary education (class 1-4), 37 percent had attended upper primary education (class 5-8),while about 18 percent of the heads of household had no education and 15 percent attained secondary education. Since four years of primary education is considered the minimum level required to enable one to acquire lasting literacy, it implies that nearly 43 percent of the heads of household in the study area are illiterate. The district level statistics show a fairly consistent pattern in levels of literacy, with literacy levels ranging between 41 percent and 44 percent.

Table 3-6. Human Capital – Education and labor availability.

Characteristic	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Labor availability and education					
Adult equivalent household size	3.0	3.6	3.5	3.8	3.5
Average education of head (yrs)	5.3	4.7	5.1	4.8	5.0
Average education of spouse (yrs)	4.2	4.2	4.0	3.7	4.0
Average household education (yrs)	3.6	3.8	3.7	3.5	3.6
Children school attendance %					
All children	93.3	95.8	93.7	88.7	93.0
Females	96.4	97.2	96.0	89.9	94.9
Males	90.6	94.4	91.4	87.5	91.1

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

3.6 Social capital – collective action

The World Bank defines Social capital as the institutions, relationships and norms that shape the quality and quantity of a society's social interactions. A broader understanding of social capital, accounts for the positive and negative aspects, by including vertical as well as horizontal associations between people, this includes behavior within and among organizations, such as firms that have an effect on community productivity and well-being. This view recognizes that horizontal ties are needed to give communities a sense of identity and common purpose, but also stresses that without "bridging" ties that transcend various social divides (eg, religion, ethnicity, socioeconomic status), horizontal ties can become a basis for the pursuit of narrow interests, and can actively preclude access to information and material resources that would otherwise be of great assistance to the community (eg, tips about job vacancies, access to credit). Increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable.

In this study we assess the strength of social capital by assessing the presence of the associations within the community and between the community and the external organization. As depicted in Table 3-7, about 20 percent of the households reported membership in some organization or a social grouping. Memberships in faith-based organizations is the most frequently reported (12 percent), followed by membership in farmer clubs and producer marketing organizations, which were reported by 6.4 percent and 2.4% of the households, respectively. Significantly higher proportions of households from Chiradzulu (20.4 percent) and Thyolo (27.8 percent) reported that they belong to some faith-based group as compared to almost none in Balaka and Mchinji districts. The length of period one lives in a particular location may also have an effect on social ties. Respondents also provided information on the number of years they resided in the village. The average number of years that respondents had resided in the village is 30 years. Significant variations exist between districts regarding the membership in faith based organizations.

Table 3-7. Proportion of households (%) with membership in organizations or social groups.

Group	District				Total (n=594)
	Chiradzulu (n=152)	Balaka (n=144)	Thyolo (n=144)	Mchinji (n=154)	
Faith based organization	20.4	0	27.8	0.6	12.1
Farmer club	9.9	6.9	6.9	1.9	6.4
Producer marketing club	1.3	0.7	6.3	1.3	2.4
Welfare association		2.1	2.1	4.5	2.2
Water management group	2.6	2.1	0.7	0.6	1.5
Village Aid Committee		6.3			1.5
Input association		3.5	0.7	0.6	1.2
Local administration	0.7	0.7			0.3
Number of years stayed in the village (years)	32.6	25.1	33.4	29.0	30.1
Responsibility in the village (%)	25.0	16.7	18.8	26.6	21.9

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

3.7 Financial capital and savings

Financial capital comprises savings, as well as funds borrowed or owned. In this study, farmers provided information for both variables.

About 69 percent of the respondents reported saving part of their income in the house while around 20 percent of the respondents reported depositing savings in commercial banks, SACCOs and other microfinance institutions. Financial capital from borrowing is also quite prevalent in the area. About 16 percent of the households borrowed money from either a microfinance institution or from informal lenders such as friends and relatives.

4 Access to agricultural and business services

Improving smallholder farmers' access to agricultural and business services is one of the major challenges facing governments in the developing world. A number of policy reforms were proposed by the World Bank in the later 1980s and the early 1990s to improve smallholder agricultural productivity and improve access to markets through structural adjustment programs. In most cases adhering to structural adjustment programs also meant a commitment to market-based agricultural development, which reduced the direct role of the state in providing services. While this led to the disappearance of public-funded marketing boards and subsidized agricultural inputs, there has been a re-emergence of public financing in the agricultural sector recently. The main difference in the recent paradigm has been the advocacy for private and public partnerships. In this subsection, we describe farmers' access to agricultural and business services, focusing on access to markets and market information, access to extension services and credit, and the inter-linkage with gender.

4.1 Proximity to markets

The livelihoods of rural farmers are most often constrained by poor access to markets. Indeed, improving market access of rural farmers enhances their ability to diversify their links with markets. One way of improving access to markets is to improve the proximity of farmers to the markets. A number of proxies are used in our survey to capture proximity to markets, such as the nearest village market and the main markets, the presence, or not, of a paved road, and road conditions, among others.

4.1.1 Village market

Presented in Table 4-1 - the average distance to the nearest village market in the study area is about 2 km.

Households in Thyolo and Chiradzulu districts have the furthest average distance to the village market of about 4 km and 3.1 km, respectively. Respondents were asked to provide information on access to roads to the nearest village market. Access to non-paved roads was reported by about 23 percent of the sample households. A larger proportion of respondents in Chiradzulu district (48 percent) reported that they only had access to non-paved roads, suggesting that sampled households in Chiradzulu were exposed to worse road conditions than those from the other districts. About 43 percent of the total sampled households reported that they only had access to a dirty paved road, which is much better than the non-paved road. More households in Thyolo (91 percent), than the other three districts have access to a paved road. About a third of households concentrated in Balaka and Mchinji, do not have village markets close to their homes.

Road Quality - about a quarter of respondents reported that the quality of their access roads to the nearest village market were bad, whereas the rest indicated that their access roads were either good (39 percent) or very good (3 percent). The roads to the nearest village markets are passable for an average period of nine months in a year. Mchinji district has the lowest number of months (6 months) in which the village roads are passable, compared to 10 months for Chiradzulu, and 11 months for Balaka and Thyolo. The average transport cost per person to the nearest village market was reported to be MWK 36.00/trip. The transport cost was significantly higher in Thyolo district (MWK 70/trip), compared to the three other districts. The apparent high transport costs in Thyolo are correlated with the long distances to the nearest market that households in the district have to cover. This can have a negative effect on the household's economic status in general, and specially on food security. Consistent with this observation, the World Bank (2008) reports that a key issue for development and enhancement of food security, is to make product and input markets work better. A reduction in transaction costs though, for example investments in infrastructure and market information systems, are crucial in improving access to input and output markets for farmers, hence improving access to food. The World Bank (2008), further reports that in the sub-Saharan Africa, for example, market failures of seed and fertilizer continue to be pervasive, because of high transaction costs, risks, and economies of scale. Consequently, low fertilizer use is one of the major constraints to increased agricultural productivity.

4.1.2 Main Market

The average distance to the nearest main market (Table 4-1) in the study area is about 8 km. Households in Mchinji district have the furthest average distance to the nearest main market of about 11 km compared to 8 km for Thyolo, 7 km for Chiradzulu, and 5 km for Balaka. With regards to road access to the main market, 38 percent of the respondents reported that they used a non-paved road to the main market. More respondents from Balaka (67 percent) reported access to the main market through a non-paved road. Subsequent to that, about half of the respondents from Mchinji also reported that they used a non-paved road to the nearest main market. About 61 percent of the total respondents reported accessing the main market through a paved dirty road; the variation across districts is quite high. A significantly higher proportion of respondents from Thyolo (95 percent), reported accessing the main market using a paved dirty road. These findings are consistent with the general road conditions in most rural parts of Malawi.

Nonetheless, a substantial proportion of respondents (63 percent) rated the roads to be in good condition. The roads to the nearest main markets are passable for an average period of ten months in a year. The average transport cost per person to the nearest main market was reported to be MWK 157.00 per person per trip. Mchinji reported the highest transport cost per person per trip of MWK 285.50, which is attributed to the long distances to cover to the nearest main market.

4.2 Access to market information

Farmers' access to market information such as prices and the quality of products was captured for both input and output markets. As depicted in Table 4-2, about 39 percent and 41 percent of the farmers received information on input markets and output markets respectively. A significantly larger proportion of farmers from Thyolo district received information on input markets (72 percent) and output markets (74 percent). Market information access is lowest in Balaka (15.3 percent for input markets and 22 percent for output markets) and Mchinji (17.3 percent for input markets and 12.3 percent for output markets). About half of the farmers reported having access to market information in Chiradzulu.

Table 4-1. Proximity to markets.

Characteristics	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Distance to the nearest village market (km)	3.1	4	0.1	0.4	1.9
Types of roads to the village market (%)					
Non-paved road	48.0	9.0	18.8	16.9	23.4
Paved dirty road	51.3	91.0	9.0	21.4	42.9
Paved gravel road	0.7				0.2
Have no village market			72.2	61.7	33.5
Quality of the village road					
Bad	55.9	22.2	3.5	16.9	24.9
Good	41.4	67.4	24.3	22.7	38.7
Very good	2.6	10.4			3.2
Not applicable			72.2	60.4	33.2
Number of months road to village market is passable for trucks in a year	10	11	11	6	9
Transport cost (per person) to the village market	35.5	70.7	3.2	37.1	36.6
Distance to the main market	6.8	7.9	5.2	11.0	7.8
Types of road to main market					
Non-paved road	30.9	2.1	67.4	51.9	38.2
Paved dirty road	68.4	95.1	32.6	47.4	60.8
Paved gravel road	0.7				0.2
Tarmac		2.8			0.7
Have no main market				0.6	0.2
Quality of the main road					
Good	54.6	67.4	81.9	49.4	63.0
Bad	43.4	16.0	17.4	46.8	31.3
Very good	2.0	16.7	0.7	3.2	5.6
Have no main market				0.6	0.2
Number of months road to main market is passable for trucks in a year	10	11	10	7	10
Transport cost (per person single trip) to the main market using bus/pick-up	94.6	139.9	100.6	285.5	156.5
Length of stay in the village (yrs)	32.6	33.4	25.1	29.0	30.1
Distance to cooperative	0.1	0.3	0.0	1.6	0.5
Distance to extension agent office	4.4	4.4	5.0	5.6	4.9
Responsibility in the community	25	19	17	27	22

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

Table 4-2. Percentage of households receiving market information.

	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)		Total (n=594)	
	Input markets	Output markets	Input markets	Output markets	Input markets	Output markets	Input markets	Output markets	Input markets	Output markets
Households that received input markets information (%)	53.2	50.2	72.1	74.3	15.3	22.3	17.3	12.3	38.5	41.2
Major sources for those that received market information										
Government extension agent	29.6	21.1	23.1	18.7	9.5	3.1	52.6	15.4	26.7	17.0
Seed traders/ agro-dealer	17.3	15.8	27.9	15.0	4.8	3.1	5.3	3.8	20.0	12.4
Other private shops	1.2	2.6	7.7	1.9	0.0	0.0	5.3	3.8	4.0	2.1
Radio/TV	50.6	56.6	53.8	58.9	76.2	78.1	0.0	88.5	56.4	63.9
Neighbor/other farmers	40.7	39.5	48.1	57.9	47.6	28.1	73.7	15.4	44.4	43.6
NGOs	2.5	2.6	2.9	0.9	4.8	6.3	36.8	0.0	3.1	2.1
ADMARC	0.0	0.0	0.0	0.9	0.0	0.0	5.3	3.8	0.0	0.8
Chief	0.0	0.0	1.0	0.9	0.0	0.0	0.0	0.0	0.4	0.4

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

There are four major sources of information - they include radio, neighboring farmers, government extension agents and seed traders. Overall, about 64 percent and 44 percent of the sampled farmers reported that they received output market information through the radio and the neighboring farmers, respectively. Similarly about 56 percent and 44 percent of the sampled farmers reported receiving input market information through the radio and neighbors/ or other farmers, respectively. Government extension agents and agro-dealers or seed traders were reported as major sources of output market information by 17 percent and 12 percent of the farmers respectively, however, the role of government appears to be more pronounced in the provision of input market information (26 percent) than it is in the provision of output market information (17 percent). In sum, these findings highlight the declining role of government as source of market information, or as a provider of extension services. The main goal of the agricultural extension services department in Malawi is to provide professional agricultural extension services including research, extension farmer training, technical and advisory services. The finding, that the role of government extension in Malawi has declined, is not entirely surprising, considering the evolution process that the government extension system has undergone since independence.

After independence, government was the main provider of agricultural extension services and agricultural credit through the Ministry of Agriculture. Extension was based mainly on the transfer of technology approach whereby information and training were disseminated through a supply driven program, while agricultural credit was subsidized through the Smallholder Agricultural Credit Administration. However, since the early 1980s, Malawi has been pursuing market liberalization policies and the restructuring of the government marketing board (ADMARC), this entailed allowing the private sector to participate in input and out marketing of smallholder produce.

Consequently, and also as reported by Kumwenda and Madola (2005), these economic reforms have had a major impact on government extension/agricultural credit, which in turn has affected the performance of smallholder agricultural production negatively. The reform process, which required government to cut back expenditure, including funding to the Ministry of Agriculture, greatly affected the government provision of extension services. Comparing districts, we find that government extension agents play a more important role as a source of input market information in Mchinji district, than in the other districts. Other minor sources of information include private shops, NGOs, traditional chiefs and the government funded grain trading board, the Agricultural Development and Marketing Corporation (ADMARC).

4.3 Access to credit

The provision of financial services such as savings, credit and insurance to low-income clients, also known as microfinance, has been widely publicized as a key ingredient to pro-poor economic development. Expanding the existing rural credit system to more smallholder farmers will be crucial in fostering investment in high return enterprises and consequently reducing poverty. Investment behavior changes in a number of ways with access to credit. First, access to credit alleviates the capital constraints on households, enabling them to acquire inputs for investments that they would otherwise not acquire. Diagne and Zeller (2001) observe that access to credit also reduces the opportunity costs of capital-intensive assets relative to family labor, thus encouraging labor-saving technologies and raising labor productivity. Credit access increases household risk-bearing ability and alters its risk-coping strategy. Through intra-group insurance, which also increases one's risk bearing abilities, a household may take up investments with higher risks and higher returns. World Bank (2001), cited in Chirwa (2002), note that access to credit may help the poor avoid distress sales of assets and replace productive assets destroyed in a natural disaster.

Households seek loans, savings, insurance, payment services and pension services. However, in Malawi as in most of the developing countries, there is excess demand for the microfinance services by both households, and the formal and informal sector enterprises. In the study area, for example, although 71 percent of the households reported that they needed credit for different purposes, only 16 percent reported that they borrowed on credit (Table 4-3). Consistent with this observation results from the national GEMINI Micro and Small Enterprise baseline study (2000), indicate that about 19.8 percent of rural households and 10.5 percent of urban households acquired a loan of some sort from either the informal or the formal sector. There is a consistent pattern in the demand for credit across the four study districts.

Credit is demanded for various reasons. As depicted in Figure.4-1, the majority (51 percent) need credit to purchase fertilizer followed by 48 percent who need credit to start up a non-farm business enterprise. 34 percent of the households demanded credit for the purchase of seed. Other major purposes for which credit demand was expressed include credit for the purchase of other agricultural inputs (25 percent), credit for purchasing livestock (22 percent), credit for purchasing food (13 percent), credit for health care (8 percent) and credit for the purchase of equipment (7 percent). The high demand for agricultural credit is consistent with the structure of Malawi's economy, which is largely agro-based. Smallholder households, therefore, see more opportunities for investment in agriculture as compared to other non-agricultural activities.

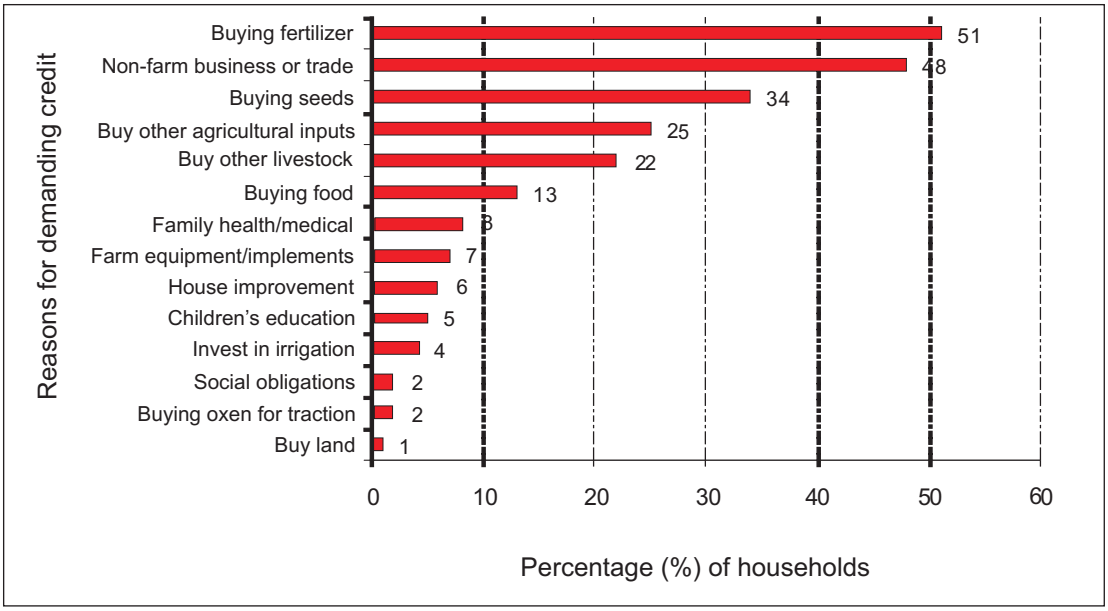

Figure 4-1. Purposes for which credit is demanded.

The results in Table 4-3 further indicate that households demand credit for multiple purposes. Credit was demanded for an average of three purposes among the surveyed households (ranging from two purposes in Balaka to four purposes in Chiradzulu). This is consistent with observations by Alastair Orr and Sheena Orr (2002) in which they observe that rural households in Malawi engage in multiple businesses to reduce the risk associated with over reliance on a single business enterprise. With regard to the actual borrowing, a few more farmers in Thyolo and Mchinji (20 percent) borrowed money from the informal or formal sources than farmers in Chiradzulu (18 percent) and Balaka (15 percent). As depicted in Figure 4-2 households that managed to borrow money used it mainly to purchase fertilizer (5 percent), to pay for medical costs (5 percent), for non-farm business start-up and expansion (3 percent), and for buying food (3 percent).

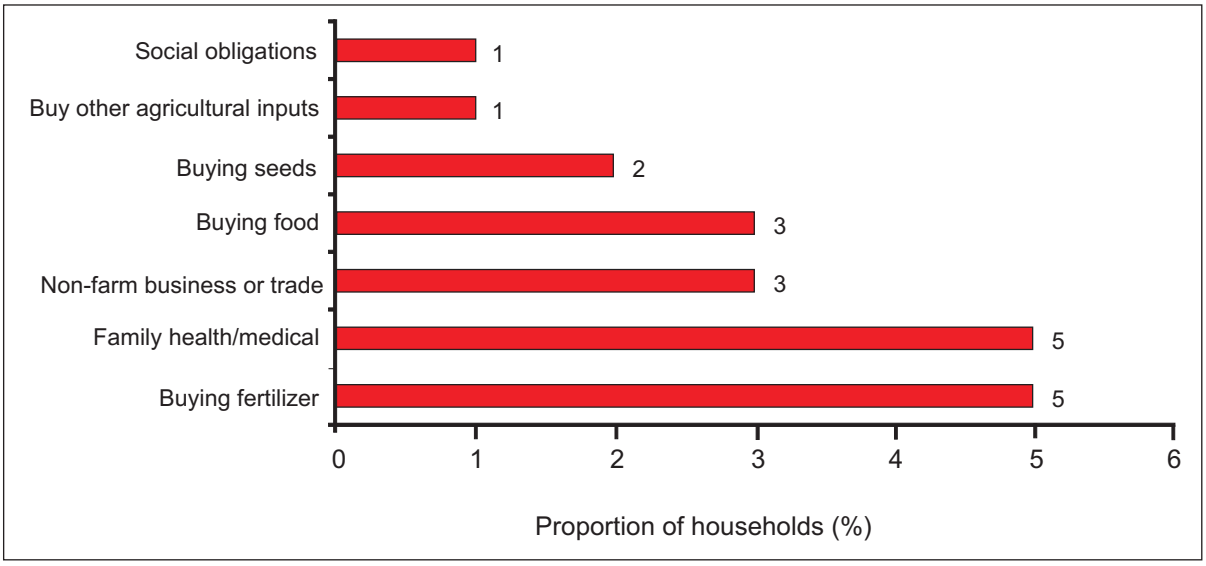

Figure 4-2. Proportion of households that actually borrowed money for different purposes.

Table 4-3. Proportion of households (%) that needed and borrowed credit for various purposes in 2006/2007 season.

Purpose of credit	District								Total (n=594)	
	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)			
	Needed credit	Got credit	Needed credit	Got credit	Needed credit	Got credit	Needed credit	Got credit	Needed credit	Got credit
Proportion that needed credit (%)	70	18	78	20	65	15	71	20	71	16
Average number of purposes for which they needed credit	4.0		3.0		2.1		3.9		3.3	
Purpose of credit demanded (%)										
Buying seeds	41	3	27	3	12	1	56	1	34	2
Buying fertilizer	45	5	48	6	33	3	79	3	51	5
Buy other agricultural inputs	29	3	24	0	19	1	29	0	25	1
Farm equipment/implements	12		1		4		10		7	
Buying oxen for traction	4		1		0		2		2	
Buy other livestock	30	0	31	1	6	0	22	0	22	0
Soil and water conservation	5	1	0	0	0	0	0	0	1	0
Invest in irrigation	7		1		1		7		4	
Non-farm business or trade	48	1	62	6	42	6	42	1	48	3
Buying food	24	7	19	4	5	0	6	0	13	3
Children's education	6		7		1		7		5	
Family health/medical	9	2	3	3	10	10	9	5	8	5
Buy land	2		0		0		3		1	
House improvement	13	0	7	1	1	1	5	0	6	0
Social obligations	4	1	3	3	0	0	2	1	2	1

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

4.3.1 Sources of Credit

In Malawi, providers of financial services are diverse, comprising both, formal and informal financial services. There are two categories of formal financial institutions, namely, commercial banks and other financial institutions.

Commercial banks are responsible for providing of all types of savings services, lending and investment products (Chirwa 2002). Other financial institutions are usually non-bank institutions with a limited scope of services. In addition to the formal financial institutions, there are several semi-formal institutions that provide financial services to the communities. These include Non-governmental Organizations (NGOs), parastatals, and Savings and Credit Cooperatives (SACCOs). As a requirement, semi-formal financial institutions are mainly restricted to providing lending services and are not allowed to mobilize and inter mediate savings. Almost all microfinance institutions belong to the semi-formal sector of financial institutions. The last category of financial services providers is an informal financial sector that caters mainly to the lower income clients. The sector comprises money lenders (Katapila), Rotating Savings and Credit Associations (ROSCAs) and networks of families and friends.

In the study area, informal sources of credit are predominant among smallholder farmers. As indicated in Table 4-4, the majority of farmers that got credit, reported accessing credit from relatives or friends (61 percent) and from money lenders (24 percent). Only 9 percent of the borrowers accessed credit from rural financial institutions. The other minor sources of credit include farmer associations, employers, merry go-round and credit unions. There are marked differences in credit sources across the districts. Borrowing from relatives is more prevalent in Mchinji and Balaka districts, while borrowing from money lenders is prevalent in Chiradzulu and Thyolo.

Participation in the informal financial markets as a lender is common in the developing world. In the study area we attempt to capture information on whether or not a household lent money to any body in the last twelve months. Results in Table 4-4 indicate that about 8 percent of the households lent money to someone. In most cases the lenders appeared to reduce information asymmetry problems associated with micro-lending, by lending to an individual with whom they had pre-existing social ties. Consequently most informal lenders lent to relatives and friends.

Table 4-4. Sources of credit and proportion of households (%) that reported lending money to someone (2006/2007).

Characteristic	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Sources of Credit (%)					
Relative/friend	53.6	46.9	76.9	75.0	61.3
Money lender	39.3	31.3	11.5	5.0	23.6
Rural microfinance institution	3.6	15.6	11.5	5.0	9.4
Farmer club/associations	3.6	3.1			1.9
Employer				10.0	1.9
Merry go-round				5.0	0.9
Savings & credit		3.1			0.9
Households that lent out money (%)	10.5	13.2	5.6	4.5	8.4
Who they lent to among those that lent					
Relationship of borrower (%)	37.5	42.1	37.5	85.7	46.0
Relative	50.0	47.4	50.0	14.3	44.0
Friend	12.5	10.5	12.5		10.0
No relation	37.5	42.1	37.5	85.7	46.0
Households that saved (%)	2.6	36.8	2.	22.1	15.8
Where they saved (% of those that saved)					
In the house	25		84.9	55.9	69.1
Commercial bank		33.3	15.1	23.5	18.1
SACCO	75			2.9	4.3
Rural Microfinance		33.3		2.9	2.1
Friend				5.9	2.1
Merry go-round		33.3			1.1
TAMA				2.9	1.1
Relative				2.9	1.1
Parents				2.9	1.1

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Aside from accessing credit services, households in the study area also have access to savings services. Savings is an important component of the financial products that are demanded by households. Recognizing the increasing importance of savings services for the poor, most microfinance institutions have made savings mobilization as an integral part of their financial products. However, in the study area, most respondents (69 percent) reported saving their money in the house (Table 4-4). Depositing savings in commercial banks, SACCOs and other microfinance institutions was reported by 18 percent, 4 percent and 2 percent of the households, respectively. The finding that most households 'saved in the house', is of interest to financial services experts. It shows that there is a demand for savings services in rural households and it dispels the myth that the poor cannot save.

5 Crop production

5.1 Land tenure, land holding and utilization

In general, land tenure refers to the legal regime in which land is owned by an individual who is said to "hold" the land. Land is the principal form of wealth in rural areas and a source of social status. The legal regime under which it is held has implications on its security and consequently on its utilization. Consistent with this notion, Dorner 1964; Feder and Onchon 1987, argue that the security of land ownership is an important determinant of agricultural performance in developing countries. As a consequence, land tenure policies powerfully affect household income levels, the distribution of wealth and even social political structures. Other than labor, land is the most important factor of agricultural production. Therefore, clearly defined rights of access to land or land tenure, create incentives for long-term investments on land and raises its productivity. Furthermore, in rural economies, property rights that provide access to land together with labor, form the most common form of endowments used to produce food for home consumption as well as cash crops that allow individuals to pay for other needs. Thus land tenure and land distributions are directly linked to the degree and distribution of rural poverty. The importance of property rights in providing incentives to efficient utilization of land has provided justification for land reforms that not only focus on land distribution from estates or large farms to farm families, but also on the security of tenure and liberalization of land markets – sales and rental markets (World Bank 2003). In Malawi, the government is currently in the process of drafting a new Land Act in line with the Malawi National Land Policy, which among other things will provide a new legal framework for land reforms and administration of land matters.

Currently, the land of most smallholder farmers falls under customary tenure - it is estimated that about two-thirds of the country's total land is under customary tenure. The remaining one-third is held under public and private land tenures. Customary land which is under the jurisdiction of the traditional authority administration has come under pressure through subdivision amongst family members and the increase in population. The average household land holding has declined from 1.5 hectares in 1969, to 0.80 hectares in 2000 (Chirwa 2002).

Land markets are underdeveloped mainly because most of the land is held under customary law and under the jurisdiction of traditional chiefs. Consequently, almost all smaller farmers who hold customary land do not have the title deeds of the land that they hold. The land owned can

however be redistributed to other relatives and rented out to other people at a fee for a specified period of time, but it is rarely sold. Since most smallholder land is held under customary tenure, the analysis in this paper focuses more on the landholding patterns and utilization, and less on the land holding/tenure systems and property rights. Table 5-1 presents statistics of the average land owned, the number of plots cultivated, the size of plots cultivated, land rented - in and out, and land - borrowed in and borrowed out, for the sampled households in the study area for the year 2006/2007.

Table 5-1. Land holding and land utilization in the rainy season (2006/2007).

Category of land (acres)	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Number of plots	3	3.6	4.4	2.9	3.5
Average plot size (ha)	0.32	0.27	0.26	0.50	0.34
Total land owned (ha)	0.82	0.86	1.06	1.44	1.05
Land operated/cultivated (ha)	0.87	0.88	1.08	1.42	1.07
Borrowed out (ha)	0.02	0.02	0.00	0.02	0.02
Borrowed in (ha)	0.01	0.01	0.00	0.01	0.01
Rented out (ha)	0.03	0.00	0.00	0.05	0.02
Rented in (ha)	0.07	0.05	0.04	0.06	0.06
Land under fallow	0.30	0.03	0.02	0.10	0.12

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Overall, a farmer in the study area, owns 3.5 plots of land, each averaging 0.34 hectares. Mchinji households have significantly larger plots of land (0.5 ha) than households from the other three districts, apparently due to larger holding in the district. The average land holding per household is 1.05 hectares. Households from Mchinji have significantly larger land holdings (1.44) than households from Chiradzulu (0.82 ha), Thyolo (0.86 ha) and Balaka (1.06 ha). Farmers tend to cultivate slightly more land (1.07 ha) than the amount of land owned (1.05 ha) suggesting that the sampled category of farmers rent in, or borrow extra land to meet their land requirements. Furthermore, farmers in the study area left about 0.1 hectares fallow. The average land holding size in Mchinji is almost twice as much as that from the other districts. The other interesting finding is that in Mchinji, there are some signals of functioning land markets, as evidenced by slightly larger portions of land that are rented in and out. Figure.5-1 depicts results on land utilization by land holding quintile. Consistent with prior expectation, households in the first 2 quintiles cultivate all their land due to smaller land sizes whereas, households in the third and fourth quartile keep some land uncultivated or fallow.

5.2 Cropping patterns

Household Cropping patterns of the 2006/07 cropping season are examined in this section. Table 5-2 presents results of the crop portfolio of the study area, this includes the proportion of households growing each crop and the area of land allocated to each of the crops. Malawi is predominantly a maize country and, therefore, it is not surprising to note that over 90 percent of the households planted maize in 2006/2007. Explaining the predominance of maize in Malawi's

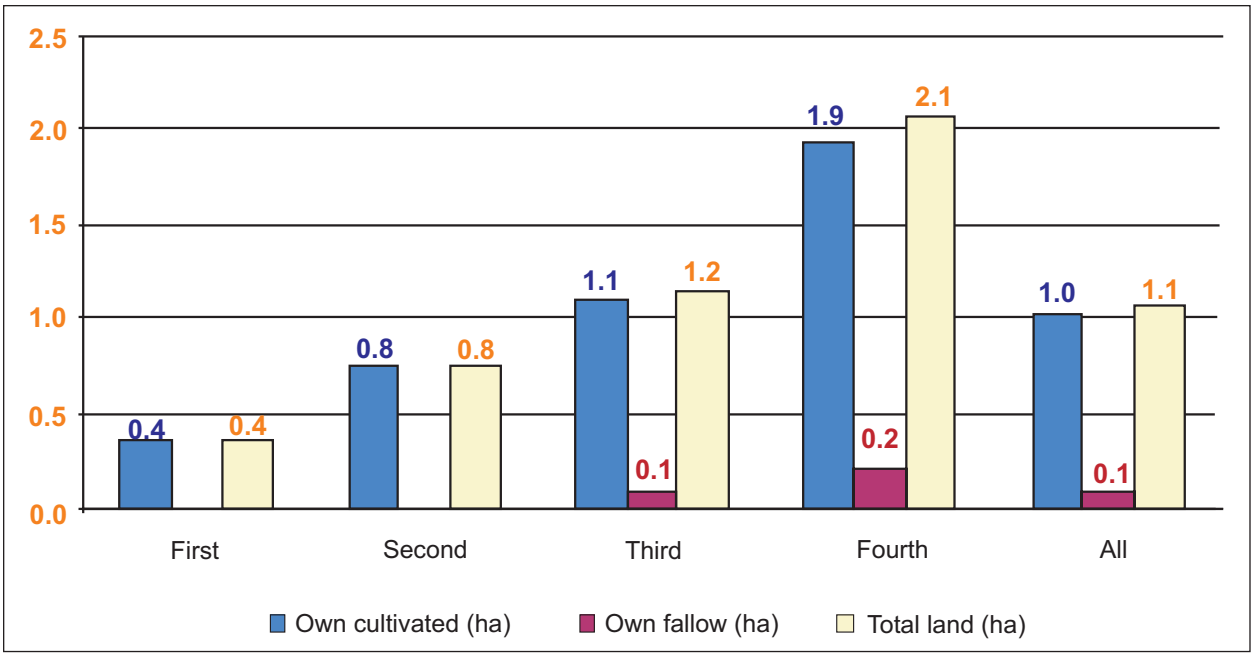

Figure 5-1. Land holding and utilization by quintile.

farming systems, Carr (1997), notes that the continued rise in the land allocated to maize could be attributed to the fact that maize is a C4[4] plant, such that it produces more calories per unit land area than other crops grown in Malawi. With the decline in farm size, smallholders have allocated more of their land to maize. Groundnut is the second most frequently cultivated crop (55%), while pigeonpea comes third and is cultivated by 40 percent of the households in the sample. Tobacco, cotton and cassava, sorghum, sweet potatoes and tomatoes are the other frequently cultivated crops. While maize is consistently grown by more than 90 percent of the sampled households in each of the districts, there are significant variations in the distribution of farmers growing other crops across the districts. Groundnut, for example, is grown mainly in Mchinji and Balaka districts, where 90 percent and 70 percent of the sampled households respectively reported growing the crop. Only 29% of the households in Chiradzulu and Thyolo reported growing groundnuts. Pigeonpea is largely grown in Balaka by 86 percent of the sampled farmers, whereas 44 percent and 34 percent of the households in Chiradzulu and Thyolo districts, respectively, grew the crop.

The variation in crop cultivation across districts is largely due to agro-ecological differences across districts. The average land allocated to each of the crops is also presented in Table 5-2. Consistent with the distribution of households growing each crop, maize is allocated more land (0.70ha) followed by groundnut (0.3ha) and pigeonpea (0.3ha). Tobacco, cotton, cassava and sorghum are each allocated an average land size of 0.05ha, while the other minor crops are allocated negligible sizes of land. More households in Mchinji (47 percent) grew tobacco, while cotton cultivation is predominant in Balaka district (31 percent). Cassava and sorghum are cultivated by about 19 percent and 14 percent of the households, respectively in Thyolo district.

[4] C4 plants are plants found principally in hot climates whose initial fixation of carbon dioxide in photosynthesis is by the hatch slack kortshak (hsk) pathway. The presence of the hsk pathway permits efficient photosynthesis at high light intensities and low carbon dioxide concentrations, which make C4 plants more efficient at fixing carbon dioxide than other plants. Most species of this type have little or no photorespiration.

Table 5-2. Cropping pattern during 2006/07 cropping year.

Crops grown	District								Total (n=594)	
	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)			
	Households growing the crop (%)	Area planted (ha)	Households growing the crop (%)	Area planted (ha)	Households growing the crop (%)	Area planted (ha)	Households growing the crop (%)	Area planted (ha)	Households growing the crop (%)	Area planted (ha)
Maize	88.8	0.58	92.4	0.73	97.9	0.81	94.2	0.74	93.3	0.71
Groundnut	28.9	0.12	29.2	0.19	70.1	0.39	89.6	0.51	54.7	0.30
Pigeonpea	44.1	0.28	34.0	0.25	86.1	0.69	0.0	0.00	40.4	0.30
Tobacco	3.3	0.01	2.8	0.01	2.8	0.01	46.8	0.22	14.3	0.06
Cotton	0.0	0.00	0.00	0.00	31.3	0.19	0.0	0.00	7.6	0.05
Cassava	2.0	0.00	19.4	0.15	4.2	0.04	3.9	0.01	7.2	0.05
Sorghum	11.2	0.05	14.6	0.14	0.00	0.00	0.0	0.00	6.4	0.05
Sweet potato	5.3	0.03	4.9	0.03	5.6	0.02	0.6	0.00	4.0	0.02
Tomato	12.5	0.03	3.5	0.00	0.0	0.00	0.0	0.00	4.0	0.01
Chickpea	5.3	0.03	10.4	0.08	0.0	0.00	0.0	0.00	3.9	0.03
Beans	0.7	0.00	2.1	0.01	0.0	0.00	5.2	0.01	2.0	0.01
Sugar cane	0.7	0.00	7.6	0.01	0.0	0.00	0.0	0.00	2.0	0.00
Rice	2.0	0.00	0.7	0.00	4.9	0.01	0.6	0.00	2.0	0.00
Cowpea	0.7	0.00	0.0	0.00	6.3	0.01	0.6	0.00	1.9	0.00
Soya	0	0.00	0.0	0.00	2.1	0.00	3.9	0.01	1.5	0.00
Banana	0	0.00	3.5	0.00	0.7	0.00	0.0	0.00	1.0	0.00
Finger millet	2.0	0.01	1.4	0.01	0	0.00	0.0	0.00	0.8	0.00
Vegetables	1.3	0.00	0.7	0.00	0.7	0.00	0.0	0.00	0.7	0.00
Others	2.6	0.00	8.3	0.01	0.0	0.00	0.0	0.00	2.7	0.00

Source: ICRISAT Treasure Legumes/TLII Study (April- May 2008)

When expressed in terms of the share of land allocated to each crop as a percentage of the total cultivated land, results in Table 5-3 indicate that 54% of the cultivated land is allocated to maize, while groundnut and pigeonpea are allocated 17% and 15% of the total cultivated land, respectively.

Table 5-3. Share of land allocated to different crops.

Crops	Chiradzulu	Thyolo	Balaka	Mchinji	Total
Maize	57.0	62.9	43.5	51.4	53.7
Groundnut	9.7	7.3	16.7	34.8	17.3
Pigeonpea	20.6	12.4	29.1	0.0	15.4
Tobacco	0.8	0.5	0.3	12.1	3.5
Cassava	0.3	5.7	0.8	0.5	1.8
Cotton	0.0	0.0	6.6	0.0	1.6
Sorghum	2.9	2.9	0.0	0.0	1.4
Chickpea	1.5	3.1	0.0	0.0	1.1
Potato	1.7	1.1	1.2	0.0	1.0
Tomato	2.7	0.3	0.0	0.0	0.8
Rice	0.2	0.4	0.7	0.0	0.3
Beans	0.1	0.4	0.0	0.6	0.3
Sugarcane	0.2	0.7	0.0	0.0	0.2
Vegetables	0.4	0.1	0.2	0.0	0.2
Millet	0.5	0.2	0.0	0.0	0.2
Soyabean	0.0	0.0	0.1	0.5	0.2
Cowpea	0.1	0.0	0.4	0.0	0.1
Banana	0.0	0.3	0.1	0.0	0.1
Bambaranuts	0.0	0.0	0.2	0.0	0.0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

5.3 Crop yields

Crop yield is one of the farm productivity indicators and a measure of farm performance. Figure 5-2 depicts the yield of different crops grown by the sample households. The yield of maize, the main crop, is 1,129 kg/ha which is consistent with the national average. Similarly groundnut yield averaged 622 kg/ha while the average pigeonpea yield is 355 kg/ha[5]. However, as will be discussed later, there are significant yield differences between improved and local varieties across all crops. These yields are also much lower than the potential yield obtained under on-farm research.

The yields for all crops disaggregated by the type of variety (improved and local) across the four districts are presented in Table 5-4. Improved varieties consistently exhibit higher yields than local varieties. However these yield differences between improved and local varieties can not be solely attributed to differences in variety traits, but could also be attributed to other differences in the intensity of input-use and crop management practices.

[5] A detailed assessment of yields disaggregated by improved and local varieties is presented later.

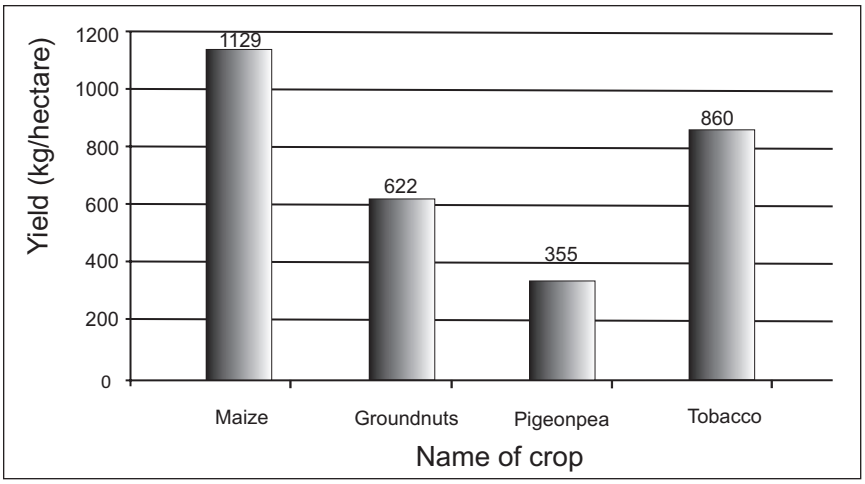

Figure 5-2. Yields for selected crops.

Table 5-4. Crop yields (kg/ha) during 2006/07 cropping year disaggregated by type of variety.

Crops grown	District								Total (n=594)	
	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)			
	Local varieties	Improved varieties	Local varieties	Improved varieties	Local varieties	Improved varieties	Local varieties	Improved varieties	Local varieties	Improved varieties
Maize	822	1,122	1,075	1,439	1,089	1,249	1,545	1,335	1,113	1,297
Groundnut	509		156	311	619	823	737	795	618	661
Pigeonpea	258	82	215	381	294	605			323	722
Tobacco		796	403	527		1,087	857	855	555	854
Cotton					829	661			829	661
Cassava		3,616	336	1,235	3,379	727	1,094		539	1,598
Sorghum	132	298	59						84	298
Sweet potato	963	200	801	5,928	3,344	2,476			1,307	1,733
Tomato	519	2,601	14,450	3,557					7,486	6,405
Chickpea	69	685	199						162	623
Beans		222	638				237	2,629	438	2,228
Sugar cane	6,048		9,799	17,290					9,442	17,290
Rice	494	2,149	247		667	976	494		519	1,209
Cowpea		49			308	469	480		308	371
Soya						1,647	494	1,486	247	2,191
Banana			12,041			7,706			12,041	7,706
Finger millet	124	68	247						66	206
Vegetables		2,964		1,544	60				62	2,254

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

5.4 Fertilizer use

Although its intensity of use remains low, fertilizer is the single most expensive and important input in crop production in Africa. In the study area, about 85 percent of the sampled households applied fertilizer to some of the crops they grow (Table 5-5). Farmers' use of fertilizer depends

on the availability of fertilizer, the purchasing ability of the farmer, and the type of crop planted. Fertilizer-use rates for the 2006/07 season are generally higher than normal, partly due to the government 'universal fertilizer subsidy' program that is financed by the government. There are differences across districts in terms of proportions of households using fertilizer. A significantly higher proportion of households in Mchinji and Thyolo (90 percent) (p=0.05) use fertilizer, while fewer households (78 percent) in Balaka apply fertilizer.

Table 5-5. Proportion of households (%) that used different types of inputs during 2006/07 cropping year.

Input type	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
Fertilizer	82.9	90.3	77.8	90.3	85.4
Manure	23.7	32.6	7.6	21.4	21.4
Purchased seed	46.1	37.5	52.8	40.3	44.1
Hired labor	23.0	27.1	25.7	35.7	27.9
Hired oxen			0.7	1.3	0.5
Field chemicals	5.9	4.9	18.8	0.6	7.4

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Results on the intensity of fertilizer and manure-use expressed on a per hectare basis for the crops grown in the 2006/07 season are presented in Table 5-6. Maize and tobacco are the two major crops on which fertilizer is applied. About 80 kg/ha of Urea and 45 kg/ha of 23:21:S+4 (a total of 125 kg/ha of fertilizer) are applied to maize. As for tobacco, farmers apply 114 kg/ha and 88 kg/ha of 23:21:S+4 and Urea, respectively. These findings are consistent with reports by FAO (2002), which states that in Africa, maize and tobacco are the principal crops that are fertilized, followed by other cereals such as teff, barley and wheat in Ethiopia and sorghum and millet in other countries. They further observe that fruit, vegetables and sugarcane absorb about 15% of the fertilizer applied. Rice, cotton, tobacco and traditional tubers such as cassava and yams accounted only for 2-3% each. The relatively large share of fertilizer used on maize and tobacco, probably reflects on the relatively high fertilizer response of maize, and the strong market demand for tobacco as a cash crop and on maize both as a cash crop and a food crop. Previous studies (eg, Integrated Household Survey-2 (IHS-2) conducted by the National Statistical Office) indicate that despite the high poverty levels in Malawi[6], 45 percent and 36 percent of smallholder farmers still purchased an average of 65 kg of fertilizer per household in 2002/3 and 2003/4 respectively, for application on maize and tobacco due to the importance accorded to the two crops by the farmers. Increased fertilizer use in the two crops during the period of study can also be attributed to the universal fertilizer subsidy program that is being implemented by the government. Other crops with significant quantities of fertilizer application include tomato and rice. Interestingly, farmers also apply some fertilizer to legume crops (pigeonpea and groundnuts), however, these quantities are likely to have come from fertilizer applied on maize intercrops. Although small quantities of fertilizer are recommended for application on legumes[7], farmers in Malawi rarely purchase fertilizer for the sole purpose of applying on legumes.

6. It is estimated that about 45 percent of the population in Malawi lives below the poverty line.

7. Beans require some start-up nitrogen and phosphorus for initial plant and root development. Generally, groundnuts do very well following a well fertilized maize crop, so long as phosphorus, calcium, and sulphur-containing fertilizers like CAN, 23-21+4S were applied.

Table 5-6. Fertilizer use (kg/ha) during 2006/07 cropping year.

Crops	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	23:21:0+4s/ DAP	UREA	Manure	23:21:0+4s/ DAP	UREA	Manure	23:21:0+4s/ DAP	UREA	Manure	23:21:0 +4s/DAP	UREA	Manure	23:21:0 +4s/DAP	UREA	Manure
Maize	42.1	74.8	57.8	65.9	88.7	104.5	36.4	65.3	18.1	36.7	89.7	186.4	44.9	79.6	92.6
Groundnut	16.9	31.7	38.6	11.2	18.5	56.2	5.1	7.7	0.0	1.3	11.9	7.6	5.9	14.1	15.7
Pigeonpea	9.9	25.5	48.8	23.0	27.9	117.6	5.5	9.8	0.0	0.0	0.0	0.0	10.3	17.9	37.6
Tobacco	89.6	76.6	312.0	128.0	128.0	0.0	225.0	225.0	0.0	108.5	78.6	569.8	113.8	87.7	501.0
Cotton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0
Cassava	0.0	0.0	0.0	20.8	22.2	29.4	0.0	0.0	0.0	0.0	0.0	0.0	13.5	14.5	19.1
Sorghum	6.7	9.3	120.0	0.0	0.2	0.0							3.1	4.4	55.4
Sweet potato	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0
Tomato	105.5	4.2	89.9	100.8	48.0	1,008.0	0.0	0.0	0.0	0.0	0.0	0.0	104.5	13.3	281.2
Chickpea	37.5	5.0	170.0	16.0	40.0	8.0							23.5	27.8	64.3
Beans	0.0	24.0	0.0	0.0	0.0	0.0				0.0	30.0	216.0	0.0	22.0	144.0
Sugar cane	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rice	0.0	0.0	0.0	120.0	120.0	1,200.0	17.1	0.0	0.0	0.0	96.0	0.0	20.0	18.0	100.0
Cowpea	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
Soya	0.0	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0
Banana				0.0	0.0	48.0	0.0	0.0	0.0				0.0	0.0	40.0
Finger millet	0.0	0.0	0.0	0.0	0.0	0.0							0.0	0.0	0.0
Vegetables	12.0	0.0	0.0	0.0	0.0	1,200.0	0.0	0.0	0.0				6.0	0.0	300.0

Source: ICRISAT Treasure Legumes/TLII Study (September 2007)

5.5 Manure use

The use of manure is advocated by government as a recommended soil fertility management practice. In the study area, manure is applied by only 21 percent of the sample households. Despite the perceived advantages of using manure, there are constraints to its use, which include high labor requirements, and the lack of high quality raw material for making manure. For example households that do not have livestock and are constrained by labor availability are less likely to have access to manure. There are significant variations in the use of manure across the districts. A significantly larger proportion of households from Thyolo (32 percent) use manure than households from Chiradzulu (24 percent), Mchinji (21 percent) and Balaka (7.6 percent). Manure is mainly applied on tobacco, leafy vegetables, tomato, rice and maize. The low nutrient concentration in manure, justifies the application of large quantities of manure per hectare. In tobacco and leafy vegetables, for example, farmers applied about 500kg/ha and 300kg/ha, respectively.

5.6 Seed and chemical use

The use of chemicals and the seed rate are other important factors that determine the productivity and profitability of the crop. In the study area, farmers were asked to provide information on the amount of seed they used for each crop; whether or not they applied any chemicals to the crop and the amount of chemicals applied. The average seed rates for maize is 27 kg/ha (range 22-33 kg/ha) (see Table 5-7), which is slightly higher than the national average maize seed rate, ranging 20-25 kg/ha under mono-cropping (Heisey et al.1998). These rates are still below the recommended seed density. The slightly higher maize seed rate in the study area can be attributed to the ongoing seed subsidy program through which farmers are accessing free seed for maize and selected legumes. Furthermore, a quarter of maize seed was purchased, suggesting that the majority use recycled seed. The average seeding rate for groundnuts is 47 kg/ha (range from 14 kg/ha in Thyolo to 63 kg/ha in Mchinji). The high groundnut seeding rate in Mchinji is consistent with prior expectation, considering that it is the major groundnut growing zone for Malawi. As a matter of fact, groundnut is a major cash crop for farmers in Mchinji, hence they tend to intensify its production. Nonetheless, this seed rate falls below the recommended seed rate for high intensity management of 110 kg/ha for *Chalimbana* variety, which is the most widely grown in the district. About 22% of the seed was purchased from the market suggesting that the majority of farmers use recycled grain as seed. The frequent use of recycled seed by farmers is partly to blame for the underdevelopment of the groundnut seed industry in Malawi and elsewhere. The low seed rate for groundnuts, can also be attributed to the inappropriately wide ridge spacing by farmers. The recommended plant spacing for groundnuts is either 90 x 15 x 1 under high intensity management or 70 x 15 x 1, under low intensity management; farmers however, rarely adhere to either of the two. Results further indicate that farmers plant an average of 13 kg/ha of pigeonpea and the quantities do not vary much across the three districts where the crop is grown. About 19% of the pigeonpea seed is purchased from the market, a proportion lower that that of maize and groundnuts, which suggest that pigeonpea seed is largely recycled. Details for seed rates for the other major crops, such as tobacco, cotton, cassava, sorghum, sweet potatoes, tomatoes, rice and others are also presented in Table 5-7. Perhaps of interest to note is that a substantial share of seed for cotton (63%), tomatoes (51%), and rice (33%) is purchased from the market.

Table 5-7. Seed and chemical use during 2006/07 cropping year.

Crops	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	Seed (kg/ha)	% bought	Chemicals (liters/ha)	Seed (kg/ha)	% bought	Chemicals (liters/ha)	Seed (kg/ha)	% bought	Chemicals (liters/ha)	Seed (kg/ha)	% bought	Chemicals (liters/ha)	Seed (kg/ha)	% bought	Chemicals (liters/ha)
Maize	25.6	28.55	0.07	22.1	19.84	0.00	28.6	24.23	0.03	33.2	28.39	0.01	27.3	25.34	0.03
Groundnut	23.70	23.12	0.00	14.91	27.85	0.00	49.17	31.73	0.30	63.42	13.23	0.00	47.35	22.29	0.09
Pigeonpea	13.41	13.96	0.90	10.15	11.59	0.00	14.59	23.85	0.03				13.35	18.67	0.27
Tobacco	6.82	0.00	0.00	0.30	0.00	0.00	6.14	75.00	0.00	2.97	10.45	0.00	3.22	12.82	0.00
Cotton							17.42	62.22	13.31				17.42	62.22	13.31
Cassava	76.00	33.33	0.00	44.94	2.11	0.00	136.67	20.00	0.00	53.20	20.00	0.00	61.06	9.10	0.00
Sorghum	10.82	12.50	0.00	5.02	0.00	0.00							7.62	5.56	0.00
Sweet potato	24.62	8.33	0.00	113.31	0.00	0.00	127.30	37.50	0.00	420.00	0.00	0.00	101.19	15.28	0.00
Tomato	2.51	48.55	154.74	0.05	100.00	309.12							2.00	51.98	186.90
Chickpea	9.18	12.50	6.01	4.41	7.14	0.00							6.07	9.09	2.09
Beans	1.20	0.00	0.00	46.40	33.33	0.00				98.10	16.67	0.00	77.10	20.00	0.00
Sugar cane	360.00	0.00	0.00	428.73	0.00	0.00							423.00	0.00	0.00
Rice	19.20	66.67	0.00	14.40	0.00	0.00	61.54	28.57	30.86	28.80	0.00	0.00	44.30	33.33	18.00
Cowpea	3.20	0.00	0.00				9.44	0.00	0.00	48.00	0.00	0.00	12.38	0.00	0.00
Soya							60.80	0.00	0.00	102.80	33.33	0.00	88.80	22.22	0.00
Bananas				0.00		0.00	0.00		0.00				0.00		0.00
Finger millet	3.07	33.33	0.00	16.80	0.00	0.00							8.56	20.00	0.00
Vegetables	2.40	100.00	0.00	1.80	100.00	3.60	2.40	100.00	0.00				2.25	100.00	0.90

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

The use of chemicals and pesticides to control pests is advocated for some crops to reduce yield losses resulting from pesticide attacks. In this study, we captured information on the amount of chemicals on each of the crops a farmer grew. We find that chemical use is uncommon for most of the crops, but that they are widely applied on cotton, tomato and on rice.

Since most households cultivate local crop varieties in Malawi, they often do not purchase seed. In the study area, 44 percent of the households purchased seed. There is very high prevalence of the use of recycled seed, which is also consistent with the seed market imperfection facing most crops in the southern Africa region. Seed purchasing is more prevalent in Balaka (53 percent) and Chiradzulu (46 percent) than in Thyolo (40 percent).

5.7 Labor use, frequency of hiring and weeding

The extent of use of hired labor in the study area is minimal. Only 28 percent reported using hired labor. However, the use of hired labor is more prevalent in Mchinji (36 percent) than in the other three districts. The use of chemical was reported by 7 percent of the households while oxen use is negligible. Crop management practices are critical determinants of productivity. In this study, farmers provided information on farming activities, from land preparation to harvesting. Information was collected on the frequency of plowing and weeding as well as the amount of labor used in each activity. As indicated in Table 5-8, plowing was done at least twice for each crop. Apparently, farmers weed their crops more frequently than they plow, which is consistent with prior expectation. Weeding is reported to be one of the most labor demanding activities in the farming calendar due to the frequent sprouting of weeds and due to the fact that most farmers use mechanical methods to remove weeds. There is potential to reduce labor for this activity if chemical weeding can be promoted among farmers. The results on total labor demand indicate that tomato cultivation is the most labor demanding activity followed by rice. Maize, groundnut and pigeonpea are among the least labor intensive crops.

Table 5-8. Frequency of plowing, weeding and person days used in crop production (n= farmers growing each crop).

Crops	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	Frequency of plowing	Frequency of weeding	Total labor used	Frequency of plowing	Frequency of weeding	Total labor used	Frequency of plowing	Frequency of weeding	Total labor used	Frequency of plowing	Frequency of weeding	Total labor used	Frequency of plowing	Frequency of weeding	Total labor used
Groundnut	3	4	186	2	3	206	2	3	124	2	3	126	2	3	144
Pigeonpea	2	3	220	2	3	195	2	2	91				2	3	148
Maize	2	3	202	2	2	185	2	2	92	2	3	97	2	2	142
Beans	2	5	168	3	2	196							4	4	101
Sorghum	2	3	145	1	3	223				5	5	56	2	3	187
Finger millet	3	3	201	2	5	253							3	4	222
Cassava	4		198	2	3	181	3	4	65	5	4	63	2	3	150
Tobacco	3	4	314	3	4	199	5	5	413	3	4	164	3	4	186
Cowpea	2	3	107			264	3	2	228				2	3	210
Cotton	3	4	237	5		329	2	2	148				2	2	148
Vegetables	5		41	2	3	164			34				5		95
Sweet potato							2	2	75				2	3	155
Sugar cane	5		77	5		154							5		308
Rice	5		192			158	4	3	86				4	3	118
Tomato	4	4	311	5		802							4	4	413
Chickpea	3	3	339	2	3	269							2	3	293
Banana				2	2	158	2	2	43				2	2	139

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

5.8 Profitability of different crops

The relative profitability of the crops was conducted by computing the gross income from each of the crops that was planted by farmers. This was done by subtracting the value of variable costs from the value of the total production (gross income). In this study we compute two forms of gross incomes; (i) the returns to land and management, excluding the opportunity cost of family labor, and the (ii) returns to land, where the opportunity cost of family labor is included in the total variable costs. Variable costs for this study included the monetary values of all inputs including seed, fertilizer, manure, purchased chemicals, and labor (hired and family). Details of the gross income and variable costs of selected crops are presented in Table 5-9. Figure 5-3 depicts the gross incomes from selected crops grown in the 2006/07 growing season - in Malawi kwacha per hectare. Of the crops cultivated, tobacco has the highest average gross income of about MWK 120,000/ha. Groundnut and maize have the second (about MWK 30,000/ha) and third highest (MWK 20,000/ha) average gross incomes, respectively. Interestingly, pigeonpea remains one of the least profitable crops being cultivated. It has the ninth highest average gross income. The low profitability of pigeonpea can be attributed to low productivity, resulting from the low use of improved technology. The first step in improving gross incomes from pigeonpea is through increased adoption of improved varieties that offer high yields and have a high market demand. The fact that pigeonpea is less profitable than rice, cotton, cassava and sweet potatoes might partly explain its low adoption rates by farmers. Nonetheless the positive gross margins suggest that there is potential for increasing its wide adoption.

The results for the two categories of variables (gross incomes and variable costs) further disaggregated by district are presented in Table.5-9 and Table 5-10.

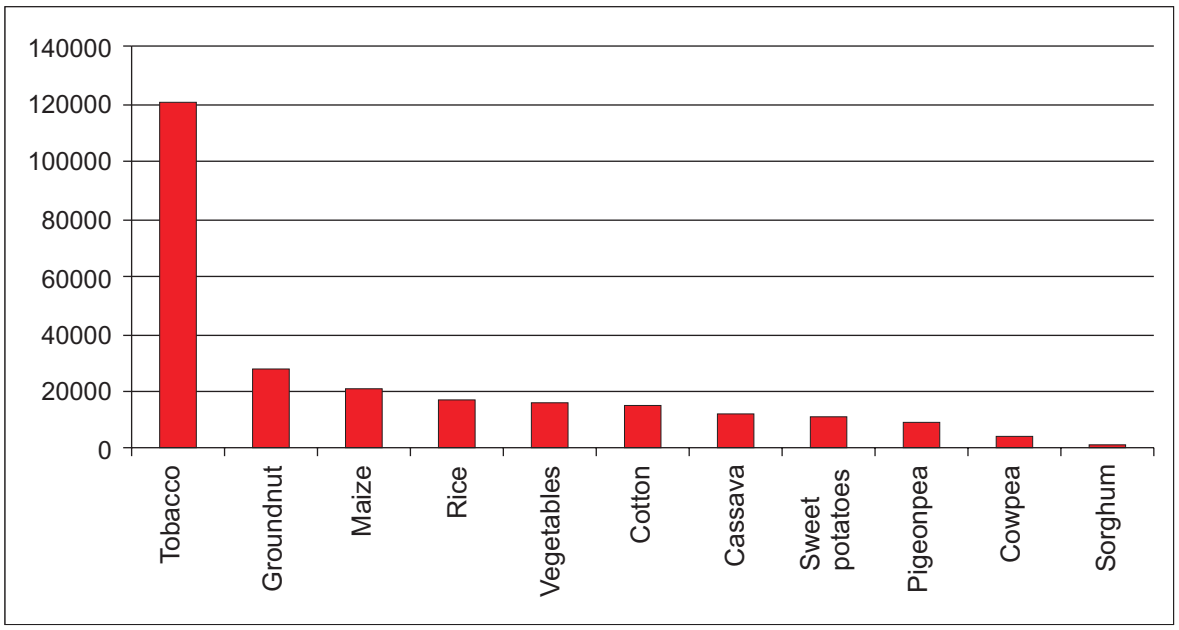

Figure 5-3. Gross income returns (Kwacha/ha) for selected crops.

Table 5-9. Gross income, variable costs and gross margins for selected crop portfolio – excluding family labor during 2006/07 cropping year.

Name of crop grown	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	Gross income	Variable cost excluding family labor	Return to land and family labor	Gross income	Variable cost excluding family labor	Return to land and family labor	Gross income	Variable cost excluding family labor	Return to land and family labor	Gross income	Variable cost excluding family labor	Return to land and family labor	Gross income	Variable cost excluding family labor	Return to land and family labor
Groundnut	24,515	2,687	21,828	11,634	2,371	9,263	32,613	5,515	27,097	39,355	3,775	35,580	32,101	4,097	28,004
Pigeonpea	9,171	4,453	4,718	10,106	1,632	8,474	13,008	1,629	11,379				11,630	2,290	9,339
Maize	24,277	6,222	18,055	30,648	7,540	23,108	27,234	9,541	17,693	34,975	10,852	24,585	29,033	8,206	20,916
Beans	11,246	0	11,246	16,790	2,850	13,940				86,122	2,429	83,693	59,029	2,372	56,658
Sorghum	4,989	2,493	2,496	1,791	669	1,122							3,129	1,432	1,697
Finger millet	1,720	13,532	-11,812	4,900	0	4,900							2,992	8,119	-5,127
Cassava	81,209	6,125	75,084	9,030	1,300	7,731	32,900	29,708	3,192	19,898	1,569	18,329	17,831	5,514	12,316
Tobacco	127,269	4,323	122,947	73,827	4,843	68,984	172,480	18,557	153,923	131,868	9,892	121,976	130,737	9,672	121,065
Cowpea	735	0	735				5,121	598	4,523		0	7,350	4,925	489	4,435
Cotton							22,642	8,150	14,492		0		22,642	8,150	14,492
Vegetables	24,990	3,876	21,114	26,031	5,513	20,519	1,041	49	992				19,263	3,328	15,935
Sweet potato	8,200	619	7,581	25,851	0	25,851	43,499	38,763	4,736	7,350		0	26,213	15,099	11,114
Sugar cane	98,784	0	98,784	376,694	11,005	365,689							353,535	10,088	343,447
Rice	41,193	1,470	39,723	6,370	4,655	1,715	22,887	11,218	11,669	12,740	4,900	7,840	25,241	7,707	17,534
Soya							68,600	0	68,600	89,094	437	88,657	82,263	291	81,972
Bambaranut							15,210	0	15,210				15,210	0	15,210
Banana				124,215		124,215	99,372	0	99,372				120,075		120,075

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

Table 5-10. Gross income, variable costs and gross margins for selected crop portfolio – including family labor during 2006/07 cropping year (n= farmers growing the crop).

Name of crop grown	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	Gross income	Variable cost including family labor	Return to land and management	Gross income	Variable cost including family labor	Return to land and management	Gross income	Variable cost including family labor	Return to land and management	Gross income	Variable cost including family labor	Return to land and management	Gross income	Variable cost including family labor	Return to land and management
Groundnut	24,515	20,981	3,534	11,634	19,541	-7,907	32,613	13,868	18,745	39,355	11,080	28,275	32,101	14,167	17,934
Pigeonpea	9,171	33,092	-23,922	10,106	20,747	-10,642	13,008	10,142	2,866		16,884		11,630	17,268	-5,639
Maize	24,277	24,964	-688	30,648	22,743	7,905	27,234	15,685	11,549	34,975		18,614	29,033	20,868	8,259
Beans	11,246	14,749	-3,504	16,790	17,994	-1,204				86,122	6,327	79,795	59,029	10,564	48,465
Sorghum	4,989	13,264	-8,275	1,791	18,936	-17,146							3,129	16,562	-13,432
Finger millet	1,720	24,816	-23,096	4,900	22,228	-17,329							2,992	23,781	-20,789
Cassava	81,209	234,964	57,713	9,030	20,049	-11,019	32,900	33,611	-711	19,898	6,310	13,588	17,831	20,497	-2,666
Tobacco	127,269	29,708	97,561	73,827	22,330	51,496	172,480	54,376	118,104	131,868	21,457	110,412	130,737	23,604	107,132
Cowpea	735	9,411	-8,676				5,121	19,711	-14,590		12,642	-5,292	4,925	18,132	-13,207
Cotton							22,642	18,368	4,274				22,642	18,368	4,274
Vegetables	24,990	8,300	16,689	26,031	28,689	-2,658	1,041	2,999	-1,958				19,263	12,072	7,191
Sweet potato	8,200	21,061	-12,862	25,851	14,438	11,413	43,499	42,696	803	7,350	7,375	-7,375	26,213	27,073	-860
Sugar cane	98,784	6,742	92,042	376,694	29,996	346,697		18,803					353,535	28,059	325,476
Rice	41,193	18,326	22,867	6,370		-11,770	22,887	9,552	4,084	12,740	12,485	255	25,241	18,102	7,139
Soyabean							68,600		59,048	89,094	14,659	74,435	82,263	12,957	69,306
Bambara nut							15,210	7,445	7,766				15,210	7,445	7,766
Banana				124,215	14,749	109,466	99,372	3,793	95,579				120,075	12,923	107,152

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008).

The gross margins for the various crops, vary substantially across the districts. As depicted in Figure 5-4, farmers in Mchinji district obtain the highest margins from groundnut compared to farmers from Balaka and Chiradzulu, while Thyolo farmers get the lowest margins from groundnut. The difference in the profitability is no surprise as it could also be attributed to differences in productivity, as well as differences in input and output prices and plot characteristics. Pigeonpea is slightly more profitable for farmers in Balaka, while farmers in Chiradzulu get the highest margins from cassava cultivation. Compared to other farmers, the highest margins are obtained from the cultivation of tobacco. However, the highest gross margins from amongst all other districts are realized by the farmers from Balaka.

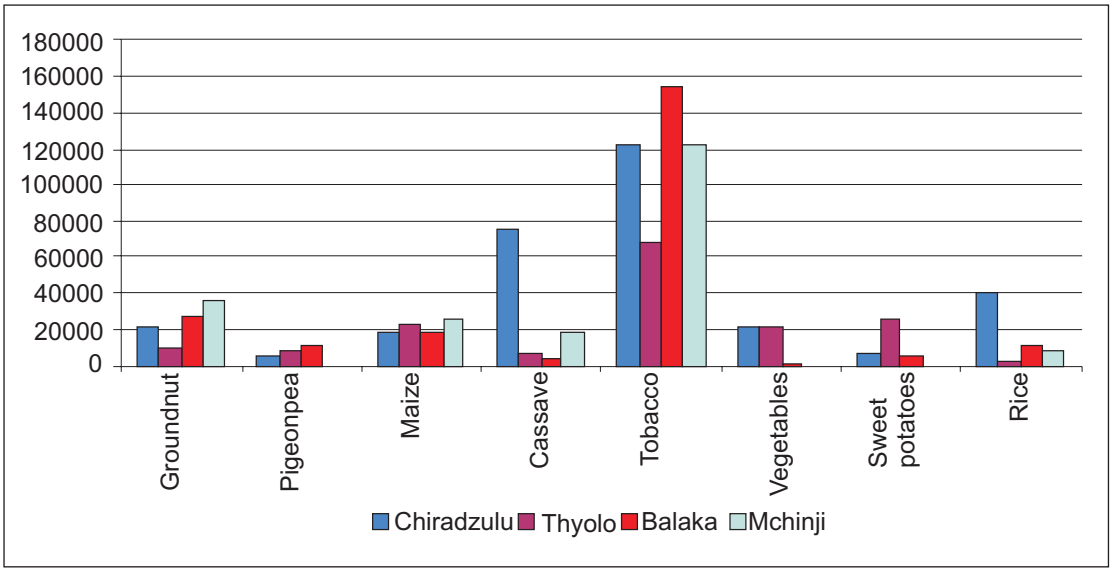

Figure 5-4. Gross margins for selected crops grown in 2006/07 season by districts.

5.9 Crop utilization

In the survey, farmers provided information on how they utilized their harvest for each of the crops they planted. Information was collected on the quantity sold, given out, used as seed, and consumed for each crop. Based on this information, percentage shares of the quantity allocated to each of the 4 purposes for each crop were computed. Table 5-11 and Figure 5-5 depict information on the utilization of all crops. Results reveal a substantial variation in the way different crops are utilized across districts. As depicted in Figure 5-5, groundnut, pigeonpea, maize, beans, sorghum, cassava and rice are grown largely for home consumption. Tobacco, cotton and sugarcane are mainly grown for sale. The low marketed surplus for pigeonpea and groundnuts could be attributed to the low production levels by farmers, which leaves them with little to sell after consumption. There is need for ICRISAT to promote intensive production of the crop through, for example, use of improved varieties to increase productivity. Furthermore, most farmers seem to lack reliable high value markets. It is important that farmers are linked to markets, through, for example, sustainable innovations such as producer marketing groups that reduce transaction costs.

A detailed presentation of utilization patterns for each crop across the four districts (Table 5-11) reveals interesting results as well. Groundnut is mainly grown for home consumption in Chiradzulu (62%), Thyolo (80%) and Balaka (60%), while only 39% of the groundnut produced in Mchinji is consumed on-farm. The utilization of pigeonpea and maize does not vary significantly across districts. There are significant variations in the way cassava is utilized across districts. More of the cassava produced in Chiradzulu (68%) is consumed on the farm, while in Balaka, about 60% of the cassava produced is sold.

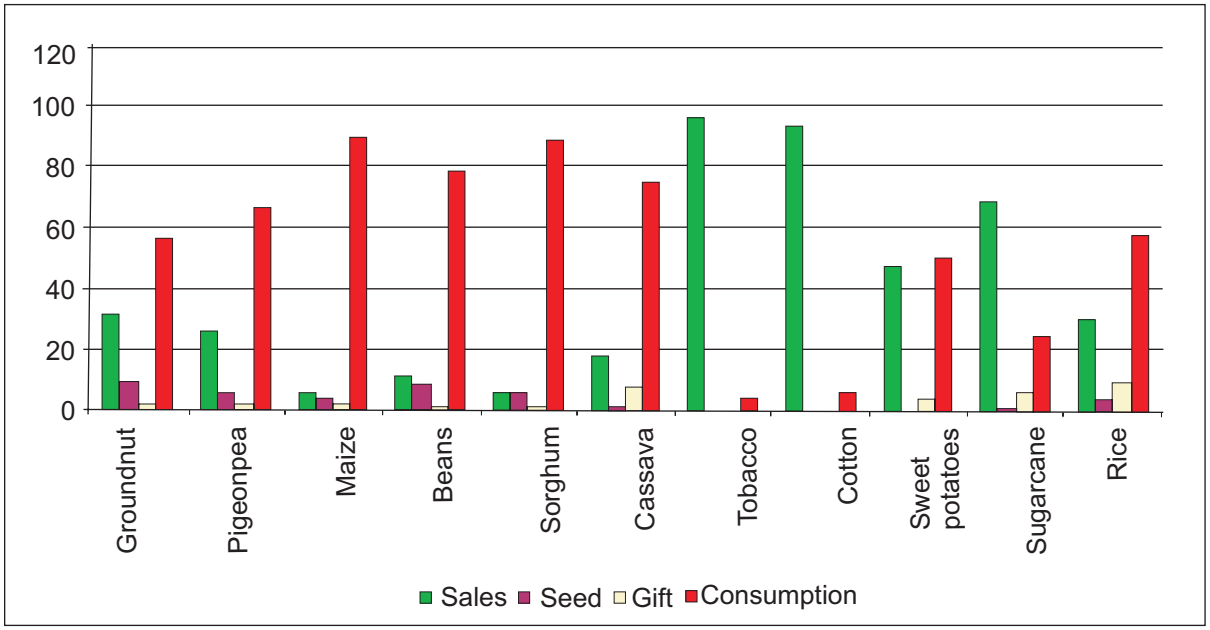

Figure 5-5. Crop utilization for the 2006/2007 season.

Table 5-11. Utilization of crops produced during 2006/07 cropping year.

Crop	Chiradzulu				Thyolo				Balaka				Mchinji				Total			
	Sales	Saved seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption
Groundnut	28	9	1	62	8	8	3	80	29	10	2	60	48	10	3	39	31	9	2	57
Pigeonpea	26	5	2	67	30	6	2	62	23	5	2	71					26	5	2	67
Maize	7	3	2	88	6	2	4	88	4	3	1	92	4	2	2	92	5	3	2	90
Beans	30	5	0	65	0	3	0	97					15	16	4	65	11	8	1	79
Sorghum	8	4	1	87	1	7	1	91									5	6	1	89
Finger millet	3	5	0	92													3	5	0	92
Cassava	15	2	15	68					60	0	8	31	41	5	16	38	17	1	7	75
Tobacco	100	0	0	0	13	0	5	82	88	0	0	13	97	0	0	3	97	0	0	3
Cowpea									94	0	0	6	0	10	25	65	2	4	3	91
Cotton	0	5	3	92	100	0	0	0	3	3	0	94					94	0	0	6
Vegetables	92	0	5	3	88	0	4	8					0	0	0	100	67	0	3	30
Sweet potato	47	1	2	50	38	0	2	61	62	0	4	34	32	6	14	49	48	0	3	50
Sugar cane	81	0	8	11	68	1	6	26									69	1	6	24
Rice	0	1	18	81					48	6	3	44					30	4	9	58
Soya					73	0	0	27	100	0	0	0					76	0	0	24
Bambaranut	84	0	4	12	70	0	0	30									80	0	3	17
Bananas	3	11	2	85	0	11	1	88									1	11	1	87
Tomato									0	4	13	83					0	4	13	83

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

6 Livestock production

6.1 Crop-livestock linkages

Most dryland farming systems in the sub-Saharan Africa integrate crop and livestock production. Consistent with this notion Powell et al. (2004), observed that in some areas, especially those associated with cash crop production, cattle, donkeys, horses and camels provide draft power for tillage, crop planting, weeding, crop harvest, processing and transport. Livestock also provide meat and milk for households, and cash income that is often invested in crop production technologies. In many regions, livestock is also a means of storing capital, of buffering food shortages in years of poor crop production, and of meeting social and religious obligations. In this study, the linkage between crops and livestock was examined by testing some of the hypothesis discussed above. The results confirm that when farmers keep livestock, they tend to integrate crops into the cropping system. About 5 percent of the sampled respondents reported that they used crop residues to feed their livestock (Table 6-1). The interaction appears to be bi-directional: livestock serve as an input (manure, draft animal, threshing, transporting) for crop production, but the role of crop as input (feed) for livestock is less significant, suggesting that farmers have other important feed sources. This may also be explained by the fact that most farmers keep chicken and other livestock that are left on a free range management without supplementary feeding. As expected, crop-livestock linkages are more prevalent in districts with a high proportion of households that keep livestock. A larger proportion of households from Thyolo district depend on crop residues to feed their livestock than the rest of the districts. Livestock waste can also be used as an important source of manure for soil fertility improvement. Information was collected on whether farmers applied manure to their crops and the quantity of manure applied. In this study we did not capture the type of manure used (whether composted from crop residues or whether composted from animal waste), however, results indicated that about 21 percent of the sampled respondents reported that they applied manure to their crop. Also consistent with prior expectation, the proportion of households using manure is significantly higher in districts (Thyolo), with high prevalence of livestock farmers[8].

Table 6-1. Proportion of households using crop residue for livestock feed.

Type of linkages	Chiradzulu (n=109)	Thyolo (n=117)	Balaka (n=99)	Mchinji (n=83)	Total (n=408)
Crop residue used for animal feed	3	10	2	6	5
Green fodder	1	0	0	1	0
Manure use on the farm	23	32	8	21	21

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

6.2 Gross margins from livestock

Gross margin is computed as the value of output (benefits are values of milk and meat produced, manure, oxen, etc) less the variable costs attributed to it. The variable costs include animals bought, the cost of animal feed and other maintenance and marketing costs. The animal stock at the beginning of the period for which gross margins are calculated is treated as a fixed cost.

[8.] More farmers in Thyolo (80 percent) keep livestock than farmers in the other three districts.

We acknowledge the complexity of valuing livestock assets and the shortfall in the methodology used. We used market price to evaluate the return from livestock, with the full knowledge of its disadvantage as it is underestimated. The best should have been to use the social prices, or the opportunity-cost approach, wherein the price of a cow is not its face value (market price), but its opportunity cost. Results of gross margins for livestock keepers is presented in Table 6-2. We asses the profitability of livestock keeping in general, by aggregating costs and benefits from all livestock. The costs aggregated include maintenance costs (eg feeds, medicine, etc) as well as the cost of purchasing new livestock.

Table 6-2. Gross margin analysis for livestock during 2006/07 cropping year.

Category	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=152)	
Benefits					
- Value of animals and animal products sold	4,127	3,495	2,435	3,438	3,461
Costs					
- Value of animals bought	47	144	74	324	123
- Feed/fodder (including cost of crop residue fed to animals)	5,064	11,924	321	140	5,365
Gross margin	-984	-8,573	2,041	2,974	-2,027

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Looking at average gross margins for specific types of livestock in Figure 6-1, we find that negative margins were realized by farmers that kept milking cows and pigs. However, other cows, sheep goats, poultry chicken and rabbits, are found to be profitable for the period of analysis (1 year).

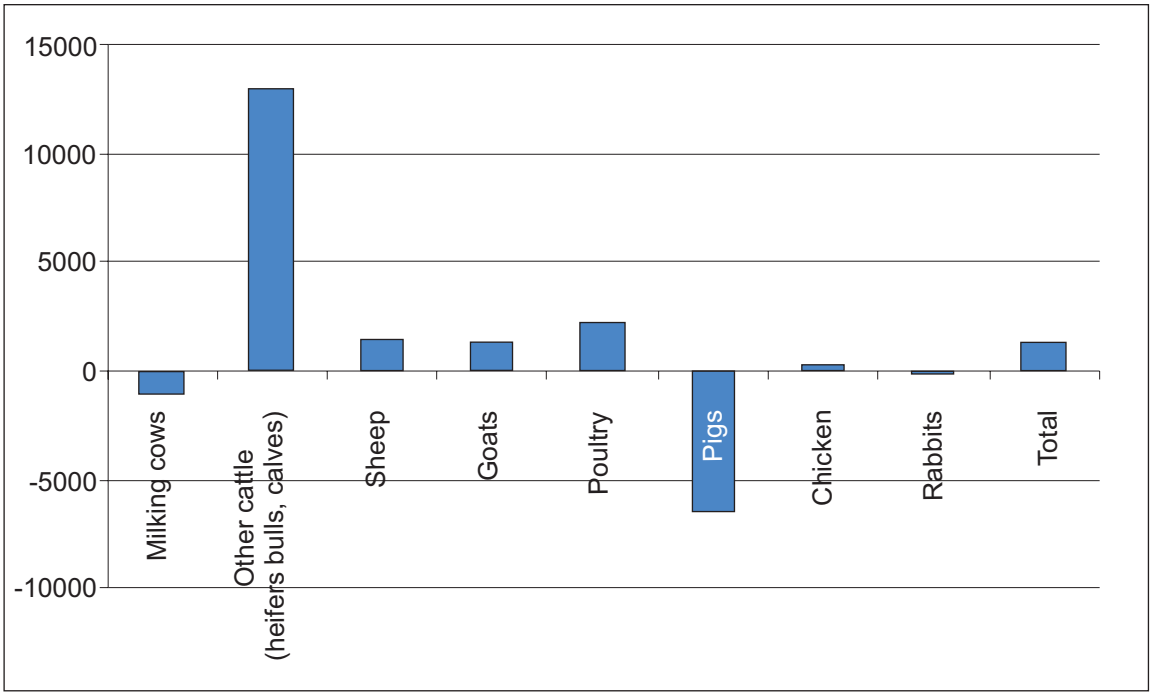

Figure 6-1. Gross margin analysis for livestock during 2006/07 cropping year.

These margins do not necessarily provide a clear picture of the profitability of livestock as the analysis is done for a much shorter period than the full cycle of livestock business. Hence the results presented might under-state or over-state the profitability. Nonetheless, for small livestock such as other poultry and chicken, the positive margins are likely to remain the same even when the margins are computed over a longer period of time.

7 Non-farm income diversification

Households and individuals can diversify their livelihoods portfolios in different ways. Hussein and Nelson (1999) and Ellis (2000), propose a classification of activities in rural livelihood portfolios in which the focus is on different criteria that include for example, (i) on-farm versus off-farm activities; (ii) local versus migratory and, (iii) self employment versus wage labor.

However, Warren (2002) argues, it is the juxtaposition between diversification through wage labor, and diversification through the development of self-employment enterprises, that captures the basic socioeconomic disjunction better.

The rural self employment enterprise refers to activities undertaken by mobilizing labor and other household capital assets. These can be either agricultural, and/or non-agricultural. There are profound differences in the way wage labor and self employment, impact on rural livelihood strategies. As pointed out by Woldehanna and Oskam et al. (2001) cited in Warren (2002), self-employment through rural enterprises is potentially more profitable than wage labor, although rural self employment require that a higher capital risk is taken (see Bryceson 1999: 47 for a further reading on the differences between the wage labor and self-employment diversification pathway). In this study, aside from on-farm diversification, we assess farm diversification patterns - herein referred to as non-farm activities.

7.1 Major non-farm activities

Rural non-farm income refers to earned and unearned income received by rural people from non-agricultural activities. The most common sources of non-farm income include income from remittances and the rural non-farm economy, which includes non-farm activities based in rural areas. In this study, respondents provided information on the types of non-farm activities, including the amount of income derived from such activities. Table 7-1 shows the distribution of respondents, by the type of non-farm income activity in which they engage. Results indicate that casual farm labor is the most prevalent form of non-farm activity undertaken by households in the study area (22 percent), followed by other short term employment activities (21 percent). Participation in other businesses such as trading and tailoring was reported by 20 percent of the respondents. Other prevalent forms of non-farm income generating activities in the study area include permanent employment in a non-farm firm, casual non-farm employment, non-farm agribusiness, and sale of trees/timber/ firewood. There are significant variations regarding participation in non-farm activities across the districts. Participation in the provision of casual-farm labor, also known as ganyu, is more prevalent in Chiradzulu and Thyolo districts than in Mchinji and Balaka. Apparently this trend can be attributed to the presence of well established tea estates in Thyolo and Chiradzulu district that offer opportunities for casual farm employment for households in the two districts. However,

participation in casual farm employment is also associated with extreme poverty in Malawi and, therefore, this could also imply that households in the two districts, with higher participation in casual employment, are poorer than households in Balaka and Mchinji. Earlier studies, for example, the Integrated household survey -2 (IHS2), show that poverty in Malawi is concentrated in the southern part of the country where Thyolo and Chiradzulu are located. Nonetheless, it may possibly be that households have more labor, hence are more likely to sell part of it. Furthermore, participation in non-farm employment may also depend on availability of employment, such that households close to urban centers, for example will most likely participate in some form of casual employment. The prevalence of households reporting that they received remittances sent by non-resident members of the households is mainly high in Thyolo and Chiradzulu districts than in Mchinji and Balaka districts, a finding that can be attributed to the proximity of the Thyolo and Chiradzulu districts to the commercial city of Blantyre where some members of families in the two districts might have migrated to seek employment.

Table 7-1. Proportion of households participating in non-farm income generating activities (%).

Type of off-farm activity	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	Total (n=594)
Casual farm labor	36	35	9	10	22
Other short term employment	3	16	30	34	21
Other business NET income (shops, trade, tailor, etc)	11	39	18	12	20
Remittances (sent from non-resident family and relatives)	28	29	10	5	18
Permanent non-farm labor	5	16	7	1	7
Casual non-farm labor	6	17	2	1	7
Non-farm agribusiness NET income (eg, grain mill)	3	4	10	1	4
Sale of own trees (firewood, etc)	8	3	0	2	3
Sale of CPR (firewood, charcoal, bricks, etc)	1	2	3	1	2
Rented out land	5	1	0	1	2
Selling of crop residue	2	3	0	1	1
Long term farm labor	0	4	1	0	1
Drought relief	3	3	0	0	1
Pension income	0	1	1	1	1
Sale of dung cake for fuel	0	1	0	1	0
Rented out oxen for ploughing	0	0	1	0	0
Marriage gifts (eg, dowry)	0	1	0	0	0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

8 Poverty analysis

Poverty is the main development problem confronting the world. Although it generally refers to the pronounced deprivation in the wellbeing of individuals, poverty has several dimensions which include amongst others: lack of food, housing, clothing, education and healthcare, consumption, and income. The method for poverty measurement depends on the definition of poverty and the choice of the type of poverty one wants to measure. The most commonly used measures of poverty include; insufficient income, insufficient consumption spending, insufficient caloric intake,

food consumption spending above a certain share of total spending, certain health indicators such as stunting, malnutrition, infant mortality rates or life expectancy and certain education indicators such as illiteracy. In this paper we use expenditure to measure the incidence of poverty across districts and across gender. Although trying to understand the determinants of poverty and the causal effect of legume cultivation on poverty reduction is important, in this paper we only assess the incidence of poverty. We briefly discuss household income sources and expenditure levels, before analyzing the incidence of poverty.

8.1 Household income from different sources

Income portfolios are constructed per household and the proportions are summarized as the mean for each district and displayed as tables and pie charts. Figure 8-1 depicts information on income portfolios, which provide a very concise picture of livelihood strategies for the whole study area. Crop income appears to play an important role in the livelihoods of people as it accounts for 71% of the total household income. Non-farm income from self employment activities as well as other enterprises is also important, accounting for about 16% of the household income. Wage income, is the third major non-farm income source for the study area, accounting for 11.3% of the total household income while livestock income is negligible accounting for only 2.6%.

When disaggregated by location, a more detailed understanding of livelihoods is revealed. As indicated in Table 8-1, it is observed that households in Balaka and Mchinji derive a significantly higher proportion of their income from crops (88 percent) than those from Chiradzulu (72 percent) and Thyolo (37 percent). There are more tea estates in Thyolo, households thus acquire farm-wage employment, resulting in a low share of crop income. Furthermore, Thyolo is close to the commercial capital, Blantyre, which provides individuals with more access to markets that facilitate participation in non-farm income generating activities. Almost a third the income of households in Thyolo is generated from non-farm activities (self employment), and a quarter, from wage employment.

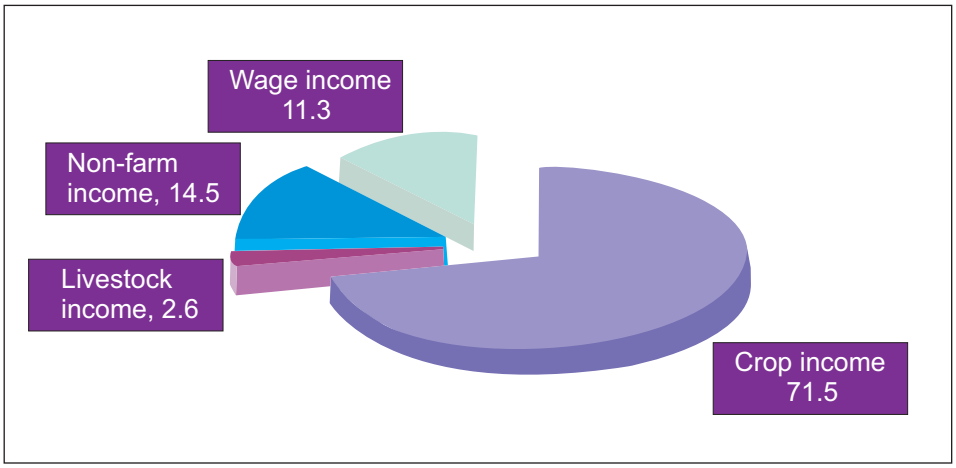

Figure 8-1. Income portfolios, for all sampled households.

Table 8-1. Household income and income share (Jan-Dec 2007).

	Average household income	Income share			
District		Crop income	Livestock income	non-farm income	Wage income
Chiradzulu	21,017.9	72.6	2.1	17.1	8.1
Thyolo	40,996.5	37.2	4.8	31.6	26.4
Balaka	57,013.6	87.6	2.7	1.2	8.5
Mchinji	64,427.8	87.9	0.9	8.4	2.9
Total	65,582.2	71.5	2.6	14.5	11.3

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Table 8-2 shows the variation in the share of income sources by income quartile. The results are interesting, as crop income seems to be more important among low income groups. It accounts for 97% of the total income in the households belonging to the lowest income quartile, but declines to 59% in the highest income group. It is also interesting to note that non-farm income is more important for the high income group, implying that high income households tend to diversify away from agriculture.

Table 8-2. Mean household income portfolios, by income group (Jan-Dec 2007).

	Lowest	Second	Third	Highest	Total
Household income (MWK)	258	18,135	41,379	120,864	45,024
Share of income from different sources (%)					
Crop income (%)	97	68	63	59	72
Livestock income (%)	0	6	4	2	3
Non-farm income (%)	0	15	19	30	14
Wage income (%)	3	11	13	9	11

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

From the discussion above, it can be seen that households in the study area, derive their livelihood mainly from agriculture, which also indicates that they have not diversified much from agriculture.

8.2 Total expenditure

Cash consumption expenditure was collected for six categories of items, which included food grains, livestock products, vegetables, beverages and other drinks, clothing and energy as well as expenditure on social activities. The per capita cash expenditures of the study area are presented in Table 8-3. The average per capita expenditure for the sample is MWK 9,068, ranging from MWK 8,200 for Chiradzulu, to MWK 9,971 for Mchinji. The results indicate that households in Mchinji have the highest per capita expenditure. The results further indicate that a larger proportion of the expenditure is on clothing, bedding and energy (25%). Subsequently, the expenditure on livestock products (22%), vegetables and other food items (21%), are equally important. Interestingly, food grains only account for 18% of the cash expenditure. This can be attributed to the fact that most rural households consume what they produce. Expenditure on social services accounts for 13%

of the total expenditure while expenditure on beverages is negligible. Interestingly, about a third of the income in Mchinji (a district with the highest per capita expenditure) is spent on clothing, bedding and energy.

Table 8-3. Per capita cash expenditure and expenditure share (Jan-Dec 2007).

District	Per capita expenditure	Food grains	Livestock products	Vegetables and other food items	Beverages, drinks and other consumables	Clothing, bedding and energy	Social activities
	MWK	%	%	%	%	%	%
Chiradzulu	8,200	22	23	23	2	18	12
Thyolo	8,958	22	21	22	0	22	13
Balaka	9,130	19	22	21	0	28	10
Mchinji	9,971	11	22	18	0	33	16
Total	9,068	18	22	21	1	25	13

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

In Table 8-4 we assess cash expenditure patterns by expenditure quartile and disaggregated by the gender of the head of household. There are interesting patterns in expenditure across the income quartiles, and between male and female headed households. In both male and female headed households, the share of expenditure on food grains, livestock products and vegetables increases as income increases. These findings suggest that households with higher incomes tend to spend a higher share of their income on food purchases. On the contrary, the share of cash expenditure on clothing and social activities decreases with rising expenditure. It must be pointed out that these expenditure shares do not include consumption of *own* food production, however, the trend was found to be the same after including the value of food consumed from own production.

Table 8-4. Per capita cash expenditure and expenditure share by expenditure quartile and gender (Jan-Dec 2007).

	Male				Female				Total			
	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Per capita expenditure	2,405	5,251	8,216	20,169	2,479	4,972	8,029	21,863	2,426	5,172	8,180	20,500
Food grains	12	19	17	21	18	16	25	30	14	18	19	22
Livestock products	17	22	24	29	14	19	18	20	16	21	22	27
Vegetables and other food items	19	19	22	20	22	23	27	22	20	20	23	21
Beverages, drinks and other consumables	0	1	1	2	0	1	1	1	0	1	0	2
Clothing, bedding and energy	33	26	26	19	29	26	20	18	32	26	24	19
Social activities	19	12	11	10	19	15	10	9	19	13	10	9

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

In order to capture the total household expenditure, we included the value of consumption from *own* production. As indicated in Table 8-5, and consistent with earlier results on cash expenditure, Mchinji has the highest total per capita expenditure, while Chiradzulu has the lowest total per capita expenditure. The per capita value of consumption from *own* production is also the lowest in Chiradzulu (MWK 4,500) compared against a per capita expenditure of MWK 5,567 for households in Mchinji.

Table 8-5. Per capita cash and home consumption expenditure (in MWK) by district.

	Per capita expenditure (MWK)		
District	Total expenditure	Cash expenditure	Home consumption of own production
Chiradzulu	12,660	8,200	4,500
Thyolo	14,225	8,958	5,208
Balaka	14,827	9,130	5,681
Mchinji	16,721	9,971	6,857
Total	14,615	9,068	5,567

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

8.3 Poverty profile

8.3.1 Measuring poverty

In this study, we use total annual per capita expenditure (expressed in Malawi Kwacha) reported by the household as a measure of welfare and poverty analysis. The threshold level of welfare that distinguishes poor households from non-poor households is the poverty line. Using a poverty line, a number of aggregate measures of poverty can be computed. The most widely used measure is the headcount index, which simply measures the proportion of the population that is counted as poor, often denoted by P_0. Formally,

$$P_0 = \frac{N_p}{N} \qquad 1$$

Where N_p is the number of poor and N is the total population (or sample). For clarity this can also be written as ;

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} I(y_i < z) \qquad 2$$

Where, $I(\cdot)$ is an indicator function that takes on a value of 1 if the bracketed expression is true, and 0 otherwise. When expenditure (y_i) is used to measure poverty levels, if (y_i) is less than the poverty line (z) then $I(\cdot)$ equals 1 and the household would be counted as poor. A more general measure of poverty proposed by Foster-Greer-Thorbecke (1984) belongs to a class of poverty measures that is measured over a continuous welfare indicator variable, y_i discrete terms and is given as:

$$p_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^\alpha 1(y_i - z) \qquad 3$$

where n is total number of individuals in the population, q is total number of poor individuals whose income is less than the poverty line z, is the poverty line, and y_i is income of the ith poor household measured in the same unit as $z, 1(.)$ is indicator variable, which takes on a value of one if the income is below the poverty line and 0 otherwise and where α is a poverty aversion parameter, which can take on values of 0, 1, and 2, providing three commonly used indices of poverty: poverty incidence as represented by the Head Count Index, intensity by the Poverty Gap Index and severity by the Squared Poverty Gap Index. In this paper we only compute the incidence of poverty (P_0).

The poverty line is a subsistence minimum expressed in Malawi Kwacha based on the cost-of-basic-needs methodology. The National Statistics Office of Malawi reports that the Malawi poverty line is comprised of two parts: minimum food expenditure based on the food requirements of individual and critical non-food consumption. Food needs are tied to the recommended daily calorie requirement. Non-food needs are estimated based on the expenditure patterns of households whose total expenditure is close to the minimum food expenditure. Using this method, a poverty line is developed for the country. Individuals who reside in households with consumption lower than the poverty line are then labeled “poor”. Using the minimum food expenditure as an additional measure, we can identify the “ultra poor” households whose total consumption per capita on food and non-food items is lower than the minimum food expenditure. In this study we use the two poverty lines constructed by National Statistics Office to estimate the incidence of poverty as well as the incidence of ultra poor households in the study districts. The national poverty line for Malawi is MWK 16,165 while the ultra poor poverty line is MWK 10,025.

8.4 Incidence of poverty

Table 8-6 reports statistics on the incidence of poverty disaggregated by the district. About 70 percent of the households live below the poverty line. These poverty levels are much higher than the national poverty rate of 55 percent reported by the National Statistics Office (2004). The incidence of poverty measured by the headcount index shows that households from Mchinji and Thyolo are less poor (67 percent) than households from Balaka (73 percent) and Chiradzulu (78 percent). Furthermore, the depth of poverty as well as the severity of poverty is highest among households from Chiradzulu than households from the three other districts. About 38 percent of the people among the sample households live in such dire poverty that they cannot even afford to meet the minimum standard of daily-recommended food requirement.

The results on the poverty prevalence by gender are presented in Figure 8-2. Overall, more female-headed households (77 percent) are poor compared to male-headed households (70 percent). The prevalence of poverty among female-headed households is highest in Mchinji (86 percent) than in the rest of the districts.

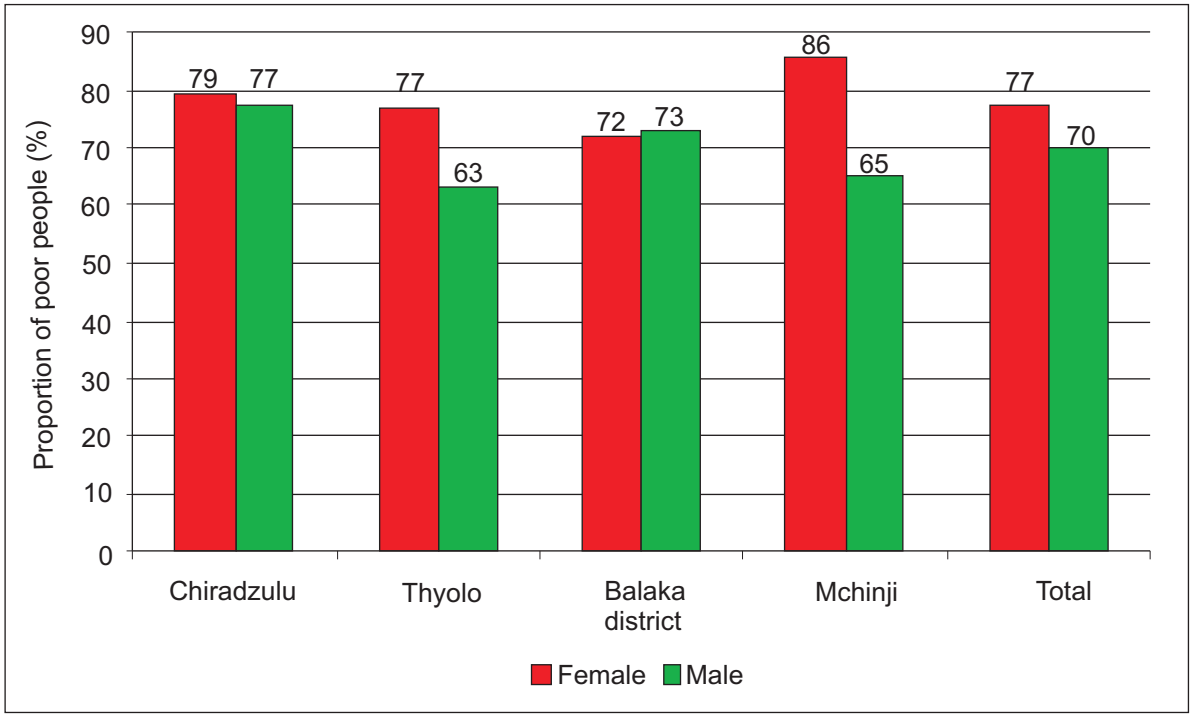

Figure 8-2. The incidence of poverty by gender and district.

9 Groundnut and pigeonpea technologies, production and marketing

9.1 Available technologies, variety preference and adoption

9.1.1 Available pigeonpea and groundnut technologies

A few improved varieties of long and short duration pigeonpea were released and made available to farmers by ICRISAT in collaboration with the Ministry of Agriculture and Livestock Development. Two long duration varieties (ICP 9145 and ICEAP 0040) and two short duration varieties (ICPL 93027 and ICPL 87105), were released for wider cultivation. Each of the released varieties has economically important traits that make it attractive to smallholder farmers. ICP 9145 (released in 1987) and ICEAP 0040 (released in 2000) are resistant to Fusarium wilt and harbor a high yield potential.

Similarly, a number of improved varieties of groundnuts have been released and are being promoted for commercial production in Malawi. These include CG7, ICGV-SM 90704 (Nsinjiro), JL 24 (Kakoma), and IGC 12991 (Baka). The earlier releases include Chalimbana, Chitembana, Mawanga, Manipintar and RG 1. Adoption of such varieties depends largely on how much the farmers are made aware of their existence and also the farmer's preference for the traits embedded in them. In this section, we discuss the awareness of farmers about the released groundnut and pigeonpea varieties and their preferences. We further discuss the extent of adoption and sources of information for both groundnut and pigeonpea.

9.1.2 Sources of information, knowledge and adoption

9.1.2.1 Farmer knowledge about pigeonpea varieties

Although it is not a sufficient enough condition for adoption to occur, variety knowledge is a pre-requisite to variety adoption. In this study, farmers provided information about the crop varieties that they knew. In the case of pigeonpea there are four varieties that have been released and disseminated to the farmers. Results in Figure 9-1 indicate that about 74 percent of the households are aware of at least one pigeonpea variety. There is universal awareness of pigeonpea in Chiradzulu, Thyolo and Balaka, while very few (only 3 percent) are aware of the crop in Mchinji. Nonetheless, the sample awareness rate of 74% is substantial enough to at least enhance the wide adoption of the technology if farmers perceive it as beneficial to their livelihood, and if other constraints, such as low profitability, seed, land, etc, are addressed as well. The awareness rate of improved pigeonpea varieties [ICP 9145 (released in 1987) and ICEAP 0040] is much lower, estimated to be 25% of the total sample. Knowledge of improved pigeonpea varieties is more prevalent in Thyolo (47%) and Balaka (49%).

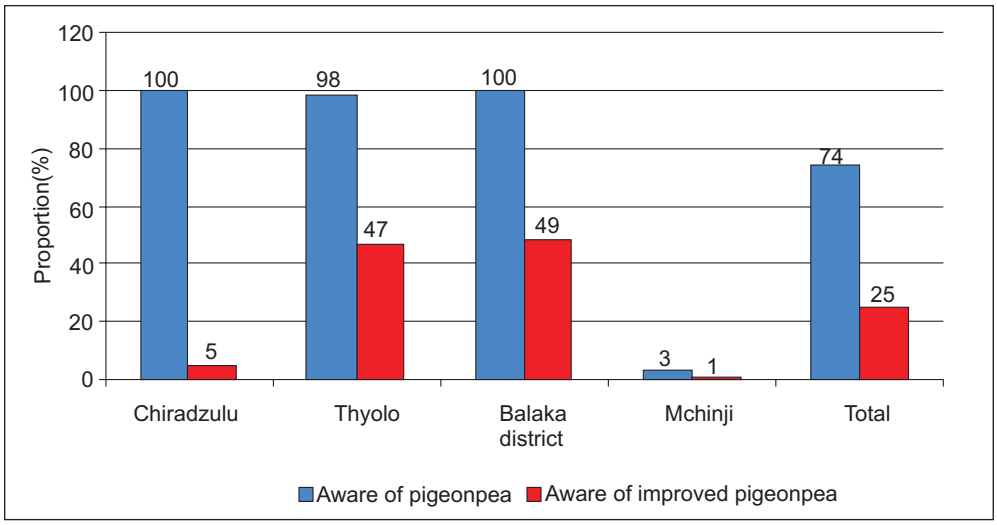

Figure 9-1. Pigeonpea awareness by district.

An examination of the variety awareness in Table 9-1 indicates that local varieties are the most widely known by farmers. Of the two improved varieties, ICEAP 0040 is the most widely known (20 percent), while ICP 9145 is known only by 8 percent of the farmers. These findings indicate that after almost a decade since the two improved varieties were released, there has been little effort to disseminate and create awareness amongst the farmers. There is need for intensified efforts to disseminate and promote technologies. There is an opportunity for ICRISAT to use the existing structures of government extension services, to disseminate information to farmers in potential pigeonpea growing areas.

9.1.2.2 Pigeonpea variety adoption and preference

Results on pigeonpea adoption further indicate that although more farmers expressed awareness of the crop, fewer indicated that they ever grew the crop and much fewer grew the crop in the

Table 9-1. Knowledge and adoption of pigeonpea and groundnut varieties.

Crops	District												Total		
	Chiradzulu			Thyolo			Balaka			Mchinji					
	Know the variety (%)	Ever planted (%)	Planted in 2007/08 season (%)	Know the variety (%)	Ever planted (%)	Planted in 2007/08 season (%)	Know the variety (%)	Ever planted (%)	Planted in 2007/08 season (%)	Know the variety (%)	Ever planted (%)	Planted in 2007/08 season (%)	Know the variety (%)	Ever planted (%)	Planted in 2007/08 season (%)
Pigeonpea															
Local	95	63	7	94	87	73	97	80	49	1	1	0	71	57	31
Mthawajuni	99	99	97	25	17	10	90	76	70	1	0	0	53	48	44
ICEAP 0040	4	3	3	40	31	25	39	38	27	1	1	0	20	18	13
ICP 9145	1	0	0	8	6	4	25	19	13	0	0	0	8	6	4
Groundnuts															
CG 7	14	9	7	57	45	36	73	41	29	68	56	33	53	38	26
JL 24 (Kakoma)	1	0	0	1	1	1	3	1	1	3	3	1	2	1	1
Chalimbana 2005	3	2	3	5	5	5	1	1	1	28	25	21	9	8	8
Chalimbana	81	65	42	81	60	44	95	80	62	79	71	48	84	69	49
ICGV-90704 (Nsinjiro)	3	3	2	1	0	0	6	4	3	3	3	2	3	3	2
ICGV 99568 (Chitala)	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0
ICG 12991 (Baka)	0	0	0	0	0	0	12	6	2	1	0	0	3	2	1
Kalisere	0	0	0	0	0	0	1	1	1	18	18	10	5	5	3
Kasawaya	0	0	0	0	0		0	0	0	1	1		0	0	
Tchailosi	0	0	0	1	1		0	0	0	1	1	0	1	0	
RGI	3	3	0	3	2	2	0	0	0	1	1	0	2	1	1
Manipintar	22	20	11	5	3	2	6	3	0	11	9	7	11	9	6
Chitembana	2	2	0	4	4	1	0	0	2	1	1	1	2	2	1
Mawanga	1	1	0	1	0	0	0	0	0	1	1	0	1	0	

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

2006/07 season. For local pigeonpea, although 71 percent of the farmers know about the crop, only 57 percent have ever grown it and only 31 percent grew the crop in the 2006/07 season. For Mthawajuni variety, 53 percent know the crop, 48 percent indicated that they ever grew the crop, while 44 percent actually grew it in 2007/08. As for the improved varieties, farmers are more aware of ICEAP 0040 (20 percent) and 18 percent have ever grown it, but only 13 percent grew it in 2007/08. In sum, there are a smaller proportion of households growing these varieties in 2006/07 than those that ever grew them, indicating that there is some form of dis-adoption of almost all varieties. Farmers mentioned the lack of seed as the main cause of dis-adoption. This dis-adoption is expected, as some farmers might have been trying or testing the technology before deciding on whether or not to adopt. Consistent with this observation, Rogers (2003), observes that there are five stages in the adoption process, namely, (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. Based on Rogers propositions, we may say that although more farmers have planted these varieties, they were only trying or experimenting on them, they had not yet reached the confirmation stage.

9.1.2.3 Farmer knowledge about groundnut varieties

Farmer's knowledge and adoption of groundnut varieties is presented in Table 9-1. Chalimbana is the most widely known variety (84%), followed by CG7 (53%) and Manipintar (11%). More farmers in Balaka district are aware of Chalimbana (95 percent) and CG7 (73 percent), than farmers from the other districts. The reasons for such disparities across districts are unclear, however, it is most likely that knowledge of these varieties would be more prevalent in agro-ecological areas that favor their cultivation. Furthermore, extension plays an important part in information dissemination. The other less known varieties include Chalimbana 2005, ICGV 90704, ICG 12991 and Kalisere.

9.1.2.4 Groundnut variety adoption and preference

While 84 percent of the sample farmers are aware of Chalimbana, only 69 percent have ever grown the variety. Furthermore, in the 2007/08 season only 49 percent grew the variety. The gap between those that grew the variety in the past and those that grew the crop in 2007/08 is about 20 percent, suggesting that a very significant proportion of the farmers have abandoned the crop. There are many factors that might have contributed to this trend. One of them is because of the high aflatoxin levels in Malawi's groundnut produce in the late 1980s, due to which Malawi's groundnut lost its competitiveness, which led to a substantial loss in profitability and to a reduction in groundnut cultivation. As for CG7, 38 percent of the farmers grew the variety before, but only 26 percent grew it in the 2007/08 season. The trend is the same for the other varieties where fewer farmers reported growing the crop in 2007/08.

9.1.2.5 Reasons for never planting groundnut and pigeonpea varieties

Farmers were asked to provide reasons why they had never planted some of the groundnut and pigeonpea varieties. Results in Figure 9-2 indicate that the lack of seed is a major constraint to legume adoption. About 60 percent of the farmers reported that they knew some of the varieties, but lacked seed so they never planted them. The second major reason for non-adoption of groundnut and pigeonpea varieties, reported by about one-fifth of the farmers, was that the varieties were low yielding. Related to the seed problem is the lack of cash to buy seed, which was reported by

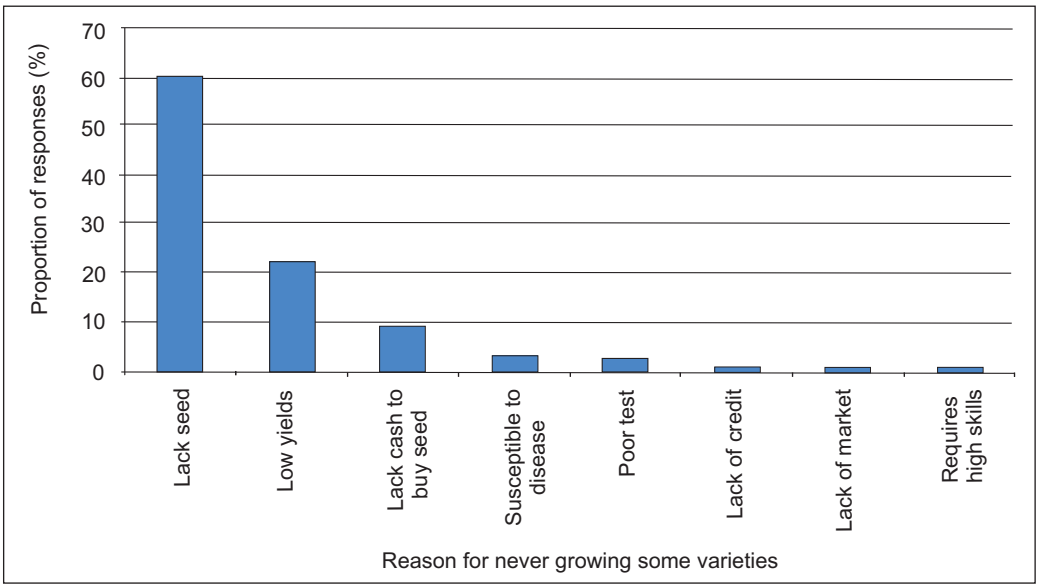

Figure 9-2. Reasons for not growing certain groundnut and pigeonpea varieties.

about 10 percent of the respondents. Other less frequently reported reasons include: susceptibility to diseases, poor test, lack of credit and a lack of market. In sum, these findings highlight the urgency for investing in the development of innovative strategies to improve seed systems for legumes.

Table 9-2 shows a more detailed distribution of reasons for never growing some varieties. Among the groundnut varieties, lack of seed was more frequently mentioned as the constraint to the

Table 9-2. Reasons for not growing certain groundnut and pigeonpea varieties.

Variety	Lack seed	Lack cash to buy seed	Poor test	Lack of credit	Low yields	Lack of market	Requires high skills	Susceptible to disease
Groundnut								
CG 7	19.7	2.2	0.0	0.0	0.9	0.6	0.0	0.0
JL 24 (Kakoma)	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chalimbana 2005	1.3	0.3	0.0	0.0	0.3	0.0	0.0	0.0
Chalimbana	11.3	2.8	0.0	0.3	5.0	0.0	0.6	2.8
ICGV-90704 (Nsinjiro)	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ICG 12991 (Baka)	1.9	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Tchailosi	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RGI	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manipintar	2.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Chitembana	0.3	0.3	0.0	0.0	0.0	0.3	0.0	0.0
Mawanga	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pigeonpea								
ICEAP 0040 (Kachangu)	3.4	0.6	0.0	0.3	0.0	0.0	0.0	0.3
ICPL 9145 (Sauma)	2.8	0.3	0.0	0.0	0.3	0.0	0.3	0.0
Mthawa Juni	6.3	1.3	0.3	0.0	0.0	0.0	0.0	0.0
Local pigeonpea	7.2	0.6	2.5	0.0	15.4	0.0	0.0	0.0
Total	59.9	9.4	2.8	0.9	21.9	0.9	0.9	3.1

cultivation of CG7 and Chalimbana, while local pigeonpea and Mthawajuni featured highly for the pigeonpea varieties. Furthermore low yield is a major constraining factor to the adoption of local pigeonpea varieties.

9.1.3 Source of information on varieties

The main sources of information on the varieties available are presented in Table 9-3. Results indicate that 78 percent of the farmers receive pigeonpea variety information through contact with other farmers. The other frequently mentioned sources of variety information include parents, seed/grain stockists and government. The insignificant role of government in providing extension services is consistent with expectation because, there are very few extension workers working for government currently. The other reason could be that government extension services appear to be concentrated on strategic crops such as maize and tobacco. The lack of government extension services for pigeonpea might explain part of the non-adoption puzzle.

Table 9-3. Sources of variety information.

Households with access to variety information and sources of information	District				Total (n=594)	
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	Preference ranking	
Households that received pigeonpea variety information (%)	100	98	100	3	74	
Major sources of information for those that received						
Another farmer/neighbor	82	74	80		78	1.5
Parents	7	18			8	1.0
Seed/grain stockiest	5	4	14		8	1.3
Government extension	5	1	2	67	3	2.0
NGO		1	3		1	1.3
Radio/newspaper/TV	1	1		33	1	1.7
ADMARC			1		0	1.6

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

9.1.4 Access to groundnut and pigeonpea seed

Farmers were asked to provide the sources of seed of the crops they planted that season. Table 9-4 shows the different sources and the contribution, or share of each seed source to the total seed used for the crops planted in 2007/08 season. Overall results indicate that a larger proportion of seed for all the crops planted, is from own savings (48 percent). A crop specific analysis shows that 58%, 72% and 55% of the seed for groundnut, pigeonpea and maize, respectively, is from the farmer's own savings. These findings suggest that more pigeonpea seed is sourced from the informal seed system than the other crops, which have substantial amounts of seed coming from market based sources. The low share of market based sources for pigeonpea seed suggests a more serious market failure for the pigeonpea seed than the other crops.

Table 9-4. The share of seed as a percentage of total seed from different sources by type of crop.

Crop	Own saved	Bought from a local seed producer	Bought from agro-dealer	Farmer to farmer seed exchange	Inherited from family	Gift	Farmer club	ADMARC
Groundnut	58	16	9	8	7	0	1	0
Pigeonpea	72	13	4	5	3	1	0	0
Maize	55	15	12	6	7	0	1	2
Beans	30	20	33	7	10	0	0	0
Sorghum	75	7	7	4	3	2	0	0
Finger millet	33	0	17	15	31	0	0	0
Cassava	72	10	1	4	5	5	0	0
Tobacco	42	12	6	21	17	0	0	1
Cowpea	75	0	6	6	13	0	0	0
Cotton	7	42	33	2	0	0	9	5
Vegetables	0	33	67	0	0	0	0	0
Sweet potato	56	19	3	13	0	3	3	0
Rice	43	43	14	0	0	0	0	0
Soya	56	14	14	17	0	0	0	0
Sesame	0	100	0	0	0	0	0	0
Bambaranut	100	0	0	0	0	0	0	0
Tomato	21	14	57	7	0	0	0	0
Chickpea	63	13	14	3	4	3	0	0
Average	48	21	17	7	6	1	1	0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

The share of seed for groundnut and pigeonpea varieties from different sources is presented in Table 9-5. Most seed for all groundnut varieties is from farmers own savings. Own saved seed accounts for 59% of seed for CG7, 60% for JL 24, 58% for Chalimbana, 78% for ICG-90704, 60% for Manipintar and 67% for Chitembana. However, a slightly lower share of seed for Chalimbana 2005 (39%) and ICG 12991 (33%) is from farmers own savings. Apart from own saved seed, farmers purchase substantial proportions of groundnut seed from either local seed producers or from agro-dealers. About 33% and 35% of seed for Chitembana and JL24, respectively, is sourced from agro-dealers. Furthermore, our findings indicate that farmer to farmer seed exchange is quite prevalent among groundnut farmers. About a fifth of seed for Chalimbana2005 is sourced through farmer to farmer exchange. Manipintar is another variety where a substantial proportion of seed (16%) is acquired through farmer-to-farmer exchange.

Table 9-5. The share of seed as a percentage of total seed from different sources for groundnuts and pigeonpea varieties.

Crop varieties planted last season (Nov/Dec 2007)	Own saved	Bought from a local seed producer	Bought from agro-dealer	Farmer to farmer seed exchange	Inherited from family	Farmer club
Groundnuts						
CG 7	59	21	9	3	3	2
JL 24 (Kakoma)	60	0	35	0	0	0
Chalimbana 2005	39	16	9	19	7	0
Chalimbana	58	14	8	9	9	1
ICGV-90704 (Nsinjiro)	78	11	0	11	0	0
ICG 12991 (Baka)	33	33	0	0	0	33
Kalisere	43	14	21	7	7	0
Manipintar	60	16	4	16	4	0
Chitembana	67	0	33	0	0	0
Pigeonpea						
ICEAP 0040 (Kachangu)	77	8	3	1	5	0
ICPL 9145 (Sauma)	71	20	0	0	4	4
Mthawajuni	65	15	7	7	2	0
Local pigeon pea	81	8	2	4	4	0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

As for pigeonpea, an even larger proportion of seed is from own savings. The share of seed from own savings ranges between 65% for Mthawajuni and 81% for local pigeonpea. Some farmers also purchase pigeonpea seed from local seed producers. About 20% of the seed for ICPL 9145 and 15% for Mthawajuni, is purchased from the local seed producers. The findings on legumes seed sources, indicate the important role being played by the informal seed system in supplying seed, and the sheer non-existence of the formal sector. This is apparently due to the low participation of the private sector in Malawi's legume seed sector. In fact, there are very few private companies in Malawi that produce and market quality legume seeds in general and pigeonpea and groundnut seeds in particular. The problems of exclusion for both pigeonpea and groundnut seed implies low returns to private investments in the seed sector, hence the private sector is likely to continue maintaining a low profile in the legume seed sector. One viable solution is the strengthening of the existing informal community based institutions such as the farmer seed multiplication groups that will produce commercial groundnut and pigeonpea seed. There is also need to strengthen the linkages between informal and formal sector to allow regulatory inspection in seed production so as to improve seed quality. As reported by Simtowe et al. (2009) the adoption of simpler standards such as quality declared seed (QDS) for local diffusion of good quality seed through truthful labeling would enhance seed availability and adoption. Previous arrangements such as the establishment of the seed revolving fund scheme managed by ICRISAT in the period 1999-2008, were viable and should be expanded to cover different regions of the country. Financial support in the form of seed money to start revolving schemes will be required to promote the establishment of more viable programs. Furthermore, existing community level and private seed producers and marketing institutions must be encouraged and empowered in a manner that enhances the creation of a stable and commercially viable seed sector that meets the seed needs of a diverse group of farmers. For the sustainability of the legume seed industry, government- and NGO-supported input subsidy programs will have to be implemented in a manner that does not

displace commercial sales. The development of a commercial seed sector should go in parallel with the development of a commercial grain market, which is poorly developed in most parts of the country. In the absence of a commercial grain market, it is unreasonable to expect a commercial seed market to emerge.

9.1.5 Preferred traits for groundnut and pigeonpea

Farmers were asked to provide information on 'variety preference' and 'preferred traits' of groundnuts and pigeonpea. The ranking was done by using the local variety as a reference point. The ranking was done using a scale of 1-5. The codes for the rankings were as follows: 1 = very poor; 2 = poor; 3 = Fair/average; 4 = Good; 5 = Very good /excellent. The resultant ranking on preferred traits, are presented in Table 9-6. Among groundnut varieties, Chalimbana 2005 is the most preferred variety with the highest overall ranking of 4.2. CG7 is the next preferred variety with an overall ranking of 4.1. The other preferred varieties include Chalimbana, ICGV-90704, and Manipintar. For the highly ranked varieties (Chalimbana 2005 and CG7), they are mainly preferred for their high yielding and early maturing traits.

Table 9-6. Variety preferred traits for groundnuts and pigeonpea.

Crop varieties planted in the past	Yield score	Drought tolerance score	Disease tolerance score	Pest tolerance score	Early maturity score	Cost of production score	Uniform maturity score	Grain color score	Grain size score	Price (MK/kg) score	Cooking time score	Taste score	Overall variety score
Groundnuts													
Chalimbana 2005	4.1	3.6	3.5	3.5	4.0	3.9	3.9	3.9	4.0	3.8	4.0	4.1	4.2
CG 7	4.4	3.9	3.6	3.6	4.4	4.0	4.1	4.0	3.8	3.7	4.1	3.9	4.1
Chalimbana	3.9	3.2	3.1	3.1	3.4	3.7	3.7	4.1	4.2	3.9	3.8	4.2	3.9
ICGV-90704 (Nsinjiro)	4.5	3.5	3.6	3.6	4.0	3.9	4.2	3.8	3.6	3.5	3.8	3.5	3.9
Manipintar	4.2	3.5	3.4	3.3	4.0	3.6	3.6	3.7	5.1	3.7	4.0	4.2	3.9
ICG 12991 (Baka)	3.8	3.8	3.7	3.7	4.0	3.6	3.7	3.8	3.8	3.7	3.9	3.6	3.8
RGI	5.0	3.0	3.8	2.8	4.3	4.0	4.3	4.0	3.8	3.8	5.0	3.5	3.8
Kalisere	4.0	3.4	3.1	3.3	3.6	3.5	3.7	3.8	3.5	3.8	3.7	3.9	3.7
JL 24 (Kakoma)	3.7	3.1	2.6	3.3	3.9	3.3	3.7	3.9	3.0	3.6	3.7	3.3	3.6
Chitembana	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	2.5	3.5	4.5	3.0
Mawanga	4.0	5.0	3.0	3.0	2.0	3.0	4.0	5.0	3.0	3.0	5.0	3.0	2.0
Pigeonpea													
Mthawajuni	4.5	3.7	3.6	3.5	4.4	4.0	4.1	4.2	4.1	3.8	4.4	4.1	4.3
ICEAP 0040 (Kachangu)	4.2	3.8	3.7	3.8	4.3	3.8	4.0	4.0	3.8	3.6	4.1	3.7	4.1
ICPL 9145 (Sauma)	3.9	3.9	3.6	3.8	4.1	3.7	3.8	3.9	3.4	3.5	3.9	3.4	3.8
Local pigeon pea	3.8	3.3	3.0	3.0	3.3	3.8	3.6	4.0	3.8	3.9	3.5	4.3	3.8
Total	4.2	3.6	3.4	3.4	4.0	3.8	3.9	4.0	4.0	3.8	4.0	4.0	4.0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Among pigeonpea varieties, Mthawajuni and ICEAP 0040 are the most preferred varieties with overall rankings of 4.3 and 4.1, respectively. ICPL 9145 and local pigeonpea are ranked last with an overall ranking of 3.8 each. The findings further indicate that most highly preferred varieties are liked because they exhibit three key traits; high yielding, early maturity and short time of cooking. Interestingly, Mthawajuni, considered as a local variety, is highly preferred for its high yield, as well as its early maturity and its shorter cooking time. Consistent with this notion, Jones et al. (2002) reports that Malawian exporters are faced with supply constraints, in that there is an insufficient production of large and white seeded pigeonpea, preferred by the export market (Jones et al. 2002), due to the low adoption of white seeded varieties such as ICEAP 0040 by farmers. ICEAP 0040 is the second most preferred by farmers, largely for its high yielding traits, which suggests that there is wide scope for promoting its adoption by farmers.

9.2 Groundnut and pigeonpea production practices and productivity

9.2.1 Production pattern and productivity

Cropping patterns for groundnuts and pigeonpea varieties are presented in Table 9-7. About 40 percent of the households planted groundnuts in the 2007/08 season. Among the groundnut varieties, Chalimbana (a local variety) is the most widely grown (40%) while CG7 is the second most widely cultivated variety (24%). The other less frequently reported, but equally important groundnut varieties include Kalisere, JL24 and ICGV-90704. There are significant differences in the distribution of farmers cultivating different varieties across districts. More farmers in Balaka (65 percent) and Mchinji (49 percent) grow Chalimbana than farmers from Chiradzulu (32 percent) and Thyolo (23 percent). It is also interesting to notice that CG7 is more widely grown in Thyolo (56%), than in the other three districts, even though Thyolo is not a traditional groundnut growing region.

We also computed the share of groundnut land (%) allocated to different varieties. We find that about half (53%) of the groundnut land is allocated to Chalimbana, followed by CG7 (27%). The distribution of the share of land allocated to different varieties is generally consistent with the proportion of farmers that grow the variety.

As for pigeonpea, Mthawajuni is the most widely grown variety. About a third of the households in the sample grow Mthawajuni which is a local variety. Furthermore, about 27 percent of the farmers grow the local pigeonpea varieties. Improved varieties, ICEAP 0040 and ICPL 9145, are grown by only 12 percent and 4 percent of the sample farmers, respectively. Farmers did not grow pigeonpea in Mchinji district. Furthermore, significant differences in the cultivation of the pigeonpea varieties were found across districts. A much larger proportion of farmers in Balaka (72 percent) than in Chiradzulu (43 percent) and Thyolo (6 percent), grow Mthawajuni. Other local pigeonpea varieties are also more widely cultivated in Thyolo (62%) and Balaka (49%). The cultivation of improved pigeonpea ICEAP 0040 is more prevalent in Balaka (28%). Consistent with the proportion of farmers growing each variety, a larger proportion of pigeonpea land (52%) is allocated to Mthawajuni.

Table 9-7. Proportion (%) of households growing different groundnut and pigeonpea varieties and the share (%) of land allocated to each variety.

	Chiradzulu (n=152)		Thyolo (n=144)		Balaka (n=144)		Mchinji (n=154)		Total (n=594)	
	% of household	Share of groundnut land (%)	% of household	Share of groundnut land (%)	% of household	Share of groundnut land (%)	% of household	Share of groundnut land (%)	% of household	Share of groundnut land (%)
Groundnuts	39		39		71		90		55	
Chalimbana	32	70	23	34	65	67	49	44	40	53
CG 7	5	11	24	56	30	23	35	27	24	27
Chalimbana 2005	0	0	1	3	1	1	21	15	6	7
Kalisere	0	0	0	0	1	1	8	8	3	3
JL 24 (Kakoma)	0	0	2	3	3	3	2	3	2	3
ICGV-90704 (Nsinjiro)	1	2	0		1	1	2	3	1	1
ICG 12991 (Baka)	0		0		2	2	0		1	1
Tchailosi	0		1	2	0		0		0	0
RGI	1	2	1	2	0		0		0	0
Manipintar	5	15	0		2	2	8		4	5
	% of household	Share of pigeonpea land (%)	% of household	Share of pigeonpea land (%)	% of household	Share of pigeonpea land (%)	% of household	Share of pigeonpea land (%)	% of household	Share of pigeonpea land (%)
Pigeonpea	44		34		76		0	0	40	
Mthawajuni	43	95	6	4	72	48	0	0	33	52
Local pigeonpea	1	1	62	82	49	31	0	0	27	33
ICEAP 0040 (Kachangu)	3	4	19	11	28	12	0	0	12	9
ICPL 9145 (Sauma)	0	0	3	3	15	9	0	0	4	6

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

The productivity of different varieties of groundnut as well as pigeonpea was assessed by computing the average yield (quantity of each variety produced per hectare) for the farmers that grew the crop in 2007/2008 season. Therefore yields of the different varieties are presented in Table 9-8. For groundnut, we restrict our discussion to the three most widely cultivated varieties: Chalimbana, Chalimbana 2005 and CG7. Results indicate that the average yield for CG7 and Chalimbana 2005 are almost the same (685 kg/ha for CG7 and 697 kg/ha for Chalimbana 2005). These yields are however significantly higher than the yield of Chalimbana of 617 kg/ha. The results are consistent with expectation, as Chalimbana is a local variety, while the other two (CG 7 and Chalimbana 2005) are improved varieties. These findings further suggest improved varieties have superior on-farm yields than local varieties but they also indicate that farmers are unable to realize superior yields from the varieties. Indeed these yields are less than half the potential yield under proper management. This yield gap can be attributed to poor management practices such as low seeding densities, poor plant spacing as well as the poor performance of other recommended practices, which might lead to technical inefficiency and low yield.

For pigeonpea, improved varieties also perform better on-farm, than local varieties. The yields for ICEAP 0040 and ICPL 9145 are 599 kg/ha and 472 kg/ha, respectively. These yields are substantially lower than the potential yields of 2 tons/ha but much higher than the on-farm yield of the local varieties. The average yields for local varieties amongst the sample farmers are 377 kg/ha for Mthawajuni and 383 kg/ha for other local pigeonpea varieties. The yield gap between improved and local varieties is substantially high, suggesting that there is scope for improving pigeonpea productivity if the improved varieties can be widely disseminated and adopted by farmers.

Table 9-8. Yield of different varieties of groundnut and pigeonpea.

Name of variety	Chiradzulu	Thyolo	Balaka	Mchinji	Total
Groundnut					
CG 7	36	296	810	856	685
JL 24 (Kakoma)		472	989		817
Chalimbana 2005		216	706	741	697
Chalimbana	484	123	631	767	617
ICGV-90704 (Nsinjiro)	21		539	1,323	751
Kalisere				707	707
Manipintar	412		83	750	582
Pigeonpea					
ICEAP 0040 (Kachangu)	82	967	591		599
ICPL 9145 (Sauma)	275	735	458		472
Mthawajuni		283	465		377
Local pigeonpea	735	214	503		383

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

NB: Averages based on the number of farmers that grew the variety

9.3 Constraints and prospects of groundnut and pigeonpea production in Malawi

9.3.1 Groundnut constraints and prospects

The main constraint to the development of the groundnut sector is farmers low adoption rate of improved groundnut varieties, which is attributed to the lack of access to sufficient quantities of improved seed. Presently, there is an absence of a stable and commercially viable groundnut seed market; hence farmers recycle grain, which is used as seed. Furthermore, the participation of private traders in the marketing of groundnuts and other grain products following the market liberalization in the 1980s, led to the closure of a number of ADMARC selling points that were previously major sources of groundnut seed, further aggravating the problem of seed constraints among the farming communities. Furthermore, following the liberalization of Malawi's agricultural markets, ADMARC stopped stocking improved groundnut seed. Consequently, farmers were forced to recycle their seeds, which led to the deterioration of groundnut quality. Nakagawa et al. (1999) reports that even though international prices remained relatively attractive, the export market collapsed between 1990 and 1999 due to quality concerns and changes in demand.

The sharp drop in Malawi groundnut exports is partly attributed to the high levels of aflatoxin in Malawi's groundnuts. Consistent with this observation, Nakagawa et al. (1999), reports that the management of aflatoxin, is a crucial factor for exporting groundnuts. They report that due to the aflatoxin levels exceeding 20 parts per billion in Malawi groundnuts, the European Union ceased importing groundnuts from Malawi during the 1990s. A high Performance Liquid Chromatography (HPLC), considered as the only internationally accepted method of aflatoxin inspection, costs around US$230 per sample assessed, which is prohibitively expensive for the smallholder farmers. Malawi is currently testing its crops through other forms, including enzyme-linked immunosorbent assay (ELISA) kits, which can be purchased by individual farmers at about US$1, but that too reduces the competitiveness of groundnut exports. NASFAM and ICRISAT have been testing some groundnuts for aflatoxin using the ELISA technology, but in most cases groundnut samples are still sent to accredited laboratories in the Republic of South Africa.

Inadequate supply of seed for market-preferred varieties

The groundnut seed system is grossly under-developed due to the low participation by the private sector in seed production. Consequently, there is a low supply of improved and market preferred varieties to the producers. Survey results further indicated that in the 2006/07 season, only 40% of the groundnut land was allocated to improved varieties, which had a negative impact on the productivity and competitiveness of groundnut. Moreover, some of the local varieties are not preferred in the international markets, reducing production for the market preferred varieties. About 60 percent of the farmers that did not grow groundnut, reported that seed was the major constraint to their adoption of groundnut.

Inadequate attention to the development of the sub-sector

The groundnut sector and the private sector have not received enough attention from the government with regard to financing research and development initiatives aimed at enhancing the transformation of the groundnut sector in Malawi. Unlike the maize and tobacco sectors, which have benefited significantly from public investments in research, there has been marginal investment in groundnut research. Also, while there has been significant credit support for the production of tobacco and maize, such support is missing for groundnut production.

9.3.2 Pigeonpea constraints and prospects

Pigeonpea constraints are almost similar to those of groundnut. Although improved pigeonpea varieties were released as early as 1987, their dissemination and adoption by smallholder farmers remain low. Furthermore, Simtowe et al. (2009), reported that only 10 percent of the sampled farmers grew improved pigeonpea varieties in 2007, although 40 percent of them could potentially adopt improved varieties of pigeonpea if they were exposed to the varieties and had access to seed. The main constraint to the adoption of improved pigeonpea varieties has been the lack of access by farmers to sufficient quantities of good quality seed. Aside from the seed constraint, Snapp et al. (2002), report the destruction of pigeonpea by goats and cattle as a primary constraint to the adoption of the crop in central Malawi. Protecting pigeonpea fields from these animals would require additional family labor and time. Several traditional pigeonpea varieties are also available to farmers, but Mthawajuni is the most popular, reportedly grown by most pigeonpea farmers in central and southern Malawi.

9.4 Post-harvest handling and consumption

Post-harvest activities include all operations performed on the commodity after harvest and before it reaches the final consumer. Such activities may include cleaning, grading, separation, drying, storage, milling, processing, packaging, transportation and marketing before it reaches the consumers. Proper post-harvest handling helps to conserve the produce and add value, making the material economically more remunerative. Improper post-harvest handling could lead to post-harvest losses. For example, improper post-harvest handling of groundnut can introduce aflatoxin, and make the product unfit for human and animal consumption. The focus in this study is on the maintenance of variety purity, transportation, marketing and utilization in general.

9.4.1 Maintenance of varietal purity for groundnuts and pigeonpea

In this study, pigeonpea and groundnut farmers were asked whether they maintained variety-purity for the pigeonpea and groundnut they grew. Results in Table 9-9 indicate that farmers make significant efforts to maintain the variety-purity of groundnut and pigeonpea. About 99 percent of the farmers do not mix different varieties of groundnut during harvesting and storage. Furthermore, the fact that almost 99 percent of the groundnut is shelled by hand, suggests that the losses that result from post-harvest handling are minimized.

Table 9-9. Maintenance of groundnut varietal purity.

Issues	District				Total (n=594)
	Chiradzulu (n=152)	Thyolo (n=144)	Balaka (n=144)	Mchinji (n=154)	
How groundnuts are shelled					
Oxen on cemented surface	`0	0	0	0.7	0.2
Human labor on dirty surface	0.7	0.7		0	0.3
Human labor on cemented surface	0	0	0.7	0.2	
By hand on to a container	99.3	99.3	100	97.4	99.0
Pounding	0	0	0	1.3	0.3
Mixing different varieties of groundnut during harvesting (%)	0	1.4	0	1.3	0.7
Mixing different varieties of groundnut during storage or marketing (%)	0	2.8	0	1.4	1.0
How pigeonpea is threshed					
Oxen on dirty surface	0	0.7	0.2		0.2
Human labor on dirty surface	91.4	96.5	69.9		86.0
Human labor on cemented surface	0.7	1.4	1.4		1.1
By hand on to a container	2.6	0.7	28.0		10.3
Pounding	5.3	1.4			2.3
Mixing different varieties of pigeonpea during harvesting (%)	0	2.7	4.2		2.8
Mixing different varieties of pigeonpea during storage or marketing (%)	0	2.7	3.5		2.4

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Similarly, for pigeonpea, about 97 percent of the farmers do not mix different varieties during harvesting and storage, which suggests that they strongly adhere to the maintenance of variety-purity. The most popular method for threshing pigeonpea is by using human labor on a dirty surface (86%). The other widely used threshing methods include hand-threshing (10%) and pounding (2.3%). The extensive use of manual post-harvest handling, reflects the subsistence nature of the production systems of the two crops. The farmers usually produce small quantities of groundnut and pigeonpea and hence do not require extensive machinery for processing.

9.4.2 The utilization of pigeonpea and groundnut

Farmers were also asked to explain how they utilized the pigeonpea and groundnut that they had harvested. Presented in Table 9-10 - Overall, about 61% of the groundnut produced, is consumed on-farm. However, there are significant differences across districts. For example, groundnuts produced in Chiradzulu (83%), Thyolo (81%) and Balaka (66%) are largely consumed on-farm, while almost half of the groundnut produced in Mchinji is sold. Furthermore, only 10%, 6% and 26% of the groundnut produced in Chiradzulu, Thyolo and Mchinji, respectively, is sold. The findings suggest that groundnut is a commercial crop in Mchinji, while it is a subsistent in the other three districts. There are interesting observations in terms of utilization across varieties as well. A much larger proportion of the production for Chalimbana 2005 (39%) - an improved variety - is marketed. We also note that about half of the production for Kalisere is marketed although it is only grown by 3 percent of the farmers.

Table 9-10. Utilization of groundnut and pigeonpea varieties produced during the 2006/07 cropping year.

Varieties grown	Chiradzulu				Thyolo				Balaka				Mchinji				Total			
	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption	Sales	Seed	Gift	Consumption
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Groundnuts	11	5	1	83	6	4	9	81	26	8	1	66	48	9	5	38	29	8	3	61
CG 7	0	7	0	93	8	7	5	80	26	8	2	64	51	9	2	38	28	8	3	61
JL 24 (Kakoma)	0	2	2	97	0	1	0	99	0	5	0	95	29	10	0	60	12	6	0	82
Chalimbana 2005	29	2	5	64	13	1	13	73	63	7	0	31	43	10	7	40	39	8	7	45
Chalimbana	35	9	1	55	7	12	2	80	29	11	2	58	47	10	3	40	31	11	2	57
ICGV-90704 (Nsinjiro)	0	13	0	87					24	19	0	57	65	7	13	15	30	12	5	53
RGI	0	0	0	100	0	0	25	75	12	0	0	88					12	0	0	88
Kalisere									25	6	0	69	54	8	3	35	51	8	3	38
ICG 12991 (Baka)									11	0	0	89					11	0	0	89
Manipintar	14	6	0	79	0	0	0	100	33	0	8	58	45	11	2	41	0	0	17	83
Chitembana			0	98	43	3	0	54									27	7	2	64
Pigeonpea	13	3	1	83	28	5	1	66	22	5	3	71					28	5	2	65
ICEAP 0040 (Kachangu)	0	2	0	98	22	7	0	71	17	4	2	77					43	3	0	54
ICPL 9145 (Sauma)				32	3	0	65	29	5	3	62					18	5	1	75	
Mthawajuni	26	5	2	67	29	4	2	65	27	3	2	68					29	5	3	63
Local pigeonpea					31	6	2	60	16	6	3	75					25	6	3	67

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

With regard to pigeonpea, 65% of the pigeonpea produced is consumed on farm, while 25% of it is marketed. The results further indicate wide differences in the way pigeonpea is utilized across districts. A much larger proportion of pigeonpea produced in Chiradzulu (83%) is consumed, compared to 71% in Balaka and 66% in Thyolo. With regard to variety differences, we find that a much larger proportion of ICPL9145 (75%) is consumed on-farm than ICEAP 0040 (54%), Mthawajuni (63%) and local pigeonpea (67%). About 43% of the ICEAP 0040 produced is marketed, a proportion significantly higher than any other variety. This could be attributed to the fact that ICEAP 0040 has large and white seed grains that are preferred by the export market.

9.4.3 Groundnuts and pigeonpea marketing and quality management

9.4.3.1 The marketing system of groundnuts and pigeonpea

The actors in Malawi's pigeonpea and groundnut markets include small and large scale producers, intermediate buyers, farmer associations, processors and consumers.

Figure 9-3 depicts the structure of pigeonpea markets in Malawi, showing the flow of pigeonpea from the producers to the consumers. The most prevalent grain legume marketing system involves individual farmers selling small quantities of grain legume products to intermediate buyers. Other prevalent marketing systems involve (i) individual farmers selling pigeonpea to local markets, (ii) farmers organizing themselves into groups that pool together their products, identify buyers (often a company) and sell at negotiated prices, and (iii) farmers selling their grain legumes to NGOs. There are several categories of buyers, which include, intermediate buyers, processing and packaging companies, and other consumers of grain legumes.

Intermediate buyers are categorized into small-scale and large-scale assemblers. The small-scale intermediate buyers are often village based. Some have small shops in the village and buy the products directly from farmers through village shops. Others go around the villages on bicycles or on foot, looking for products, or colonize the local markets with weighing scales (Msukwa 2005).

The large-scale intermediate buyers tend to cover a wider catchment area, which could be several districts or an entire region, or all legume growing areas.They often buy large quantities of products. They employ agents and place them in areas of high pigeonpea production. They may also purchase pigeonpea from small-scale intermediate buyers. Most of them deal in both seed and commercial grains and also supply export market channels. The large scale buyers may sometimes sell directly to processors or sell to the subsidiary of NASFAM, the National Smallholder Commodity Marketing and Exchange (NASCOMEX), or export directly.

Producer associations are also involved in the marketing of legumes. For example, NASFAM through its subsidiary, NASCOMEX, purchases grain legume from its members as well as non-members in a number of areas in the country. NASCOMEX then sells the grain to processors and exporters or exports it directly. Although, in some cases, NASCOMEX offers lower prices than the prices offered by private traders, the absence of NASFAM leads to farmers obtaining less favorable prices, as private traders are left without competitors.

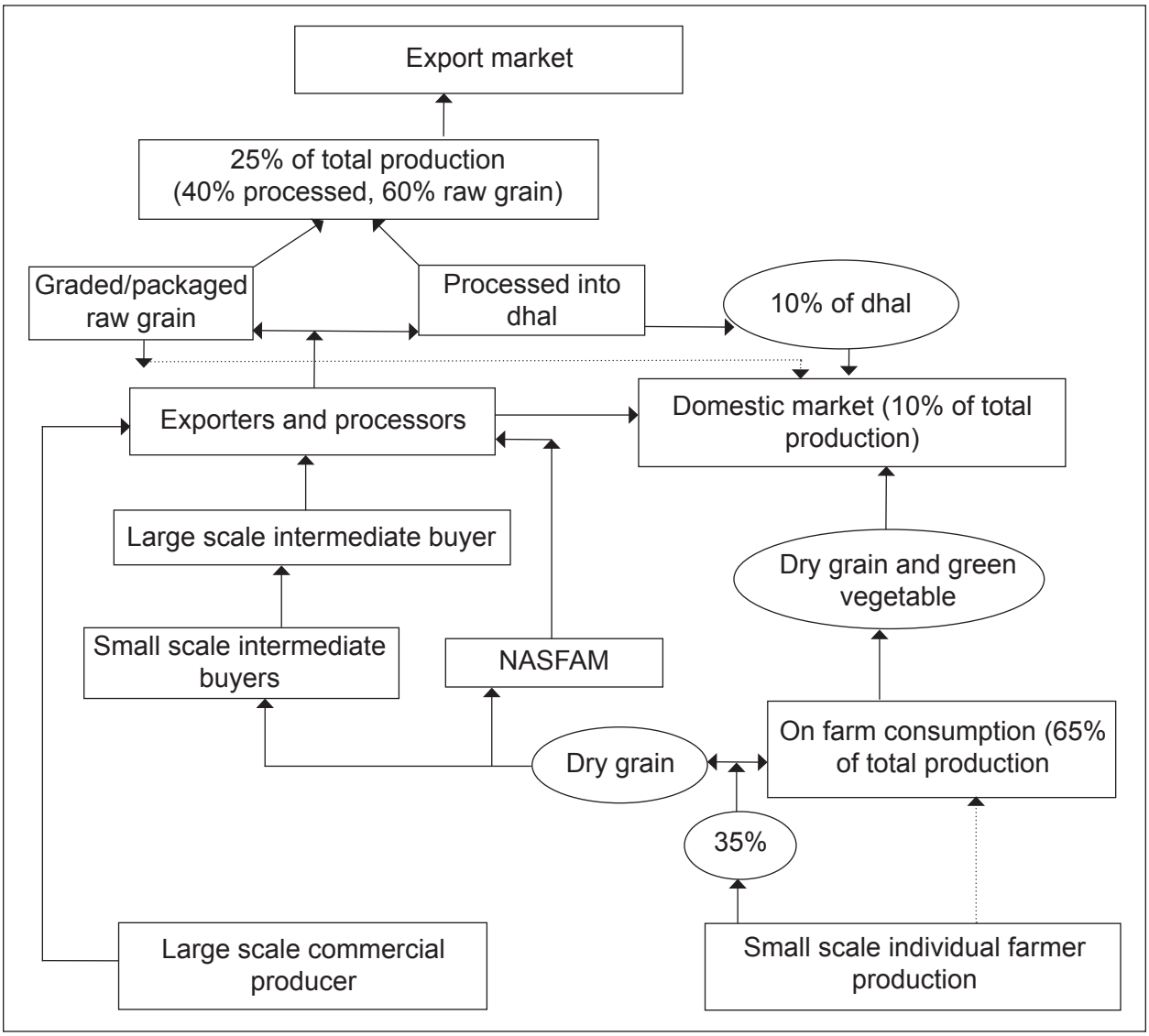

Figure 9-3. Pigeonpea marketing structure in Malawi.

Aside from intermediate buyers, there are more than fourteen companies in Malawi that buy grain legumes and have the capacity to process, package, distribute locally and export different types of grain legume products (Msukwa 2005). For example, Muli Brothers Ltd, a Malawian local company is one of the companies involved in the marketing of legumes.

9.4.3.2. Farmer market participation and market surplus for groundnuts and pigeonpea

Agricultural commercialization is a key counterpart to the rural development and poverty reduction policy in Malawi. Consequently, government has pursued a number of policy changes aimed at increasing farmer participation in the marketing of produce. Following the liberalization of produce marketing in the early 1990s, a number of traders were encouraged to participate in the buying of produce from farmers. It is assumed that commercialization increases household incomes in most cases resulting in increased labor and land productivity on farms as well as increased employment opportunities for hired labor (von Braun 1994).

In this study we collected information on the farmers who sold part of their harvest. Other information collected included prices, period of payment, buyers, distance to markets and modes of transport, amongst others. In this section we assess marketed surplus assessing the amount of grain marketed for each variety. The extent of market participation is measured by computing the share of produce marketed as a proportion of the total produce.

As indicated in Table 9-11, about 73 percent of the groundnut farmers participated in groundnut marketing. Each of the farmers sold an average amount of 137 kg of groundnut. The extent of market participation varies with the type of variety grown. In general, more than three-quarters of the farmers that planted Chalimbana2005, sold some of the produce, while the marketing of produce by farmers that grew other varieties, was slightly lower. Furthermore, the marketed surplus of groundnut accounts for 29% of the total groundnut production. When compared across districts, we find that a much larger proportion (93 percent) of households in Mchinji, marketed groundnut. The marketed surplus as a proportion of the total production that is marketed, is highest in Mchinji district. These findings confirm the earlier hypothesis that groundnut is mainly grown as a commercial crop in Mchinji district. There are a number of factors that might influence the propensity and the intensity of market participation, and the quantity of marketed surplus. The quantity produced is a major underlying factor that determines whether a household could keep some surplus for sale. The other factor is the market price of the produce. It is apparent that the farmers that produce products with good market prices have the incentive to sell part of their produce, than those with lower prices.

Results on pigeonpea indicate that although 91 percent of the pigeonpea farmers sold some pigeonpea, only 29% of the pigeonpea produced is marketed. On average, about 71 kg of pigeonpea were sold per person. Although a much higher proportion of the farmers growing Mthawajuni participate in the marketing of the crop, the marketed surplus as a share of the total production is much lower (29%) than that of ICEAP 0040 (43%).

In aggregate terms, results in Table 9-12 show that prices for both groundnuts and pigeonpea vary widely across districts. We find that the average price of groundnut in Mchinji is higher (MWK 60/kg) than at Thyolo (MWK 41/kg), Chiradzulu (MWK 48/kg), and Balaka (MWK 38/kg). This finding may partly explain why the marketed surplus for groundnut (as a share of total production) is higher in Mchinji than in the other districts.

Table 9-11. Farmer market participation and marketed surplus for all crops.

Crops	District												Total		
	Chiradzulu			Thyolo			Balaka			Mchinji					
	Households that sold (%)	Quantity sold (kg)	Price (MK/kg)	Households that sold (%)	Quantity sold (kg)	Price (MK/kg)	Households that sold (%)	Quantity sold (kg)	Price (MK/kg)	Households that sold (%)	Quantity sold (kg)	Price (MK/kg)	Households that sold (%)	Quantity sold (kg)	Price (MK/kg)
Groundnut	73	87	48	31	38	41	64	103	38	93	177	60	73	137	51
Pigeonpea	100	79	34	100	72	29	54	65	23				97	71	29
Maize	31	210	26	20	459	21	16	852	22	19	268	28	21	395	24
Beans	100	80	20							50	17	59	42	29	51
Sorghum	59	36		10	33	25							32	35	28
Finger millet	100	41											80	41	20
Cassava	100	124	11	61	215	19	67	1,143	39	67	158	31	70	316	22
Tobacco	100	129	74	100	163	140	100	204	53	100	300	174	100	277	160
Cowpea							100	10	15				25	10	15
Cotton							100	299	35				100	299	35
Vegetables				100	110	17							25	110	17
Sweet potato	75	263	24	100	236	15	100	684	13	100	30	30	92	397	17
Sugar cane	100	800	54	91	1,801	10							100	1,668	16
Rice							86	154	26				50	154	26
Soya							67	125	28	50	64	52	56	88	42
Banana				60	1,220	9	100	3,120	50				68	1,410	13
Tomato	89.5	832	25	60	103	7							83	650	21

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Table 9-12. Farmer market participation and market surplus for groundnut and pigeonpea.

Varieties grown	Chiradzulu			Thyolo			Balaka			Mchinji			Total		
	Household that sold (%)	Amount sold (kg)	Share sold (%)	Household that sold (%)	Amount sold (kg)	Share sold (%)	Household that sold (%)	Amount sold (kg)	Share sold (%)	Household that sold (%)	Amount sold (kg)	Share sold (%)	Household that sold (%)	Amount sold (kg)	Share sold (%)
Groundnut	73		11	32		6	64		26	93		48	73	137	29
CG 7		0	0		6	8	68	42	26	96	178	51	59	76	28
JL 24 (Kakoma)		0	0		0	0		0	0	50	25	29	20	10	12
Chalimbana 2005	70	100	29	50	10	13	58	90	63	87	142	43	78	121	39
Chalimbana	55	44	35	14	5	7	50	71	29	100	144	47	57	72	31
ICGV-90704 (Nsinjiro)		0	0				50	34	24		302	65	50	122	30
ICG 12991 (Baka)								125	11				50	125	11
Kalisere							100	45	25	82	182	54	83	171	51
RGI		0			0		100	12	12	82			0	0	0
Manipintar		22	14		0	100		45	33		132	45	54	66	56
Chitembana		0			25	54	50			82			100	25	27
Pigeonpea	100		13	100		66	54		22				97		28
ICEAP 0040 (Kachangu)	0	0	0	43	29	71	39	16	17				40	21	43
ICPL 9145 (Sauma)	0	0	0	75	57	50	53	39	29				57	42	18
Mthawajuni	52	37	26	67	48	65	53	33	27				53	36	29
Local pigeon pea	0	0	0	64	45	60	35	22	16				48	33	25

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

9.4.3.3 Transportation

Households that marketed some of their produce in the main market were asked to provide information regarding their main mode of transport for the commodity to the market. As depicted in Figure 9-4, carrying the produce on the head or head-load and walking, is the major (38%) mode of transportation to the market where groundnut and pigeonpea are sold. However, the use of head-load is more prevalent among pigeonpea farmers (50 percent), than among the groundnut producers (27 percent). About 32 percent of those that sold some pigeonpea and groundnut sold it on-farm and, therefore, they did not need any transport to move their product. Bicycles remain an important mode of transport in rural Malawi. About a quarter of farmers that marketed their crop used the bicycle to transport their produce. Other reported modes of transport include Donkeys/ oxcart (2.7%), hired truck (1%) public transport (0.4%) and the use of a wheel barrow (0.4%).

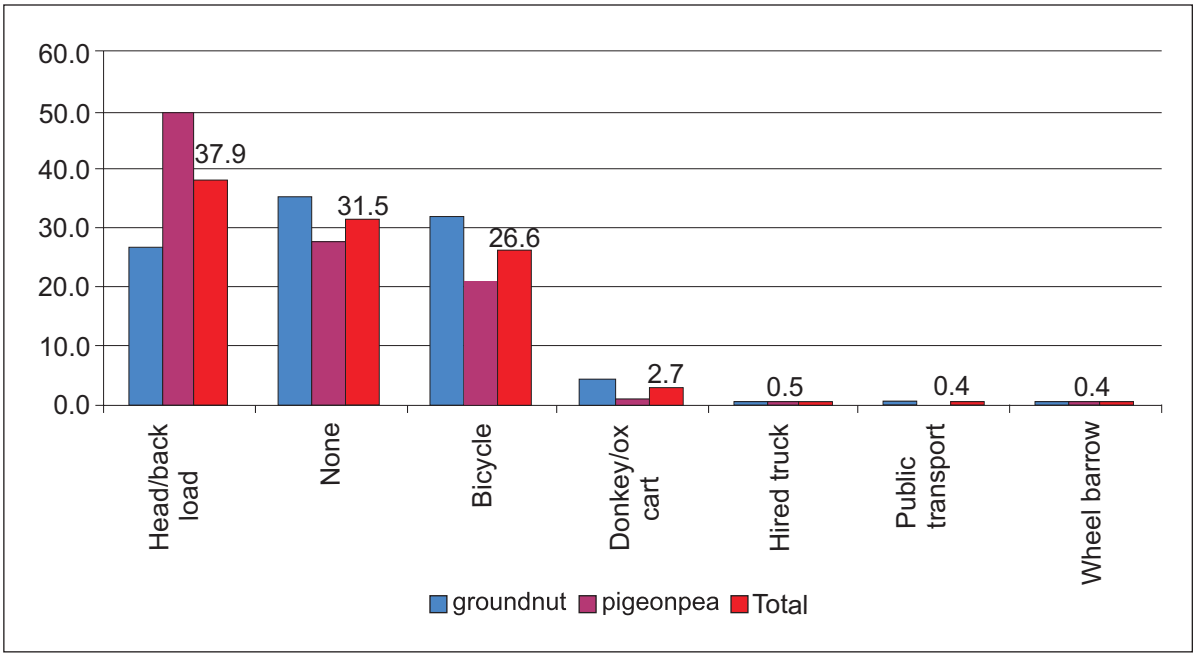

Figure 9-4. Modes of transportation to the market for pigeonpea and groundnuts.

Table 9-13 shows detailed information on major modes of transport for all crops disaggregated by type of crop. The bicycle is the most popular means of transport for crops not sold on-farm. Consistent with expectation, tobacco is transported mainly by hired truck (37%), to the market. Apparently, tobacco is bulky, but more lucrative, which justified the use of a relatively more expensive means for its transportation (hired truck) to the market. The use of Donkeys and Oxcart is also quite prevalent among tobacco and cotton growers. The use of head and back load is common across all crops but even more so amongst crops that are produced on a smaller scale such as millet and pigeonpea.

Table 9-13. Mode of transport of crops to market during the 2006/2007 season.

Crop grown	None(%)	Bicycle (%)	Hired truck (%)	Public transport (%)	Donkey/ox cart (%)	Head/back load (%)	Wheel barrow (%)
Groundnut	35.3	31.8	0.7	0.7	4.2	26.9	0.4
Pigeonpea	27.4	21.1	0.4	0.0	1.1	49.6	0.4
Maize	20.8	34.2	1.7	0.0	3.3	35.8	4.2
Beans	40.0	40.0	0.0	0.0	0.0	20.0	0.0
Sorghum	33.3	25.0	0.0	0.0	0.0	41.7	0.0
Finger millet	25.0	0.0	0.0	0.0	75.0	0.0	
Cassava	36.7	13.3	0.0	0.0	0.0	50.0	0.0
Tobacco	16.3	7.0	37.2	4.7	26.7	8.1	0.0
Cowpea		100.0	0.0	0.0	0.0	0.0	0.0
Cotton	17.0	23.4	0.0	0.0	25.5	31.9	2.1
Vegetables	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Sweet potato	0.0	27.3	0.0	0.0	0.0	27.3	0.0
Sugar cane	20.0	13.3	0.0	0.0	0.0	53.3	13.3
Rice	83.3	16.7	0.0	0.0	0.0	0.0	0.0
Soya	20.0	0.0	0.0	0.0	0.0	80.0	0.0
Bambaranut	0.0	50.0	0.0	0.0	0.0	50.0	0.0
Banana	10.0	0.0	0.0	0.0	0.0	90.0	0.0
Tomato	3.6	32.1	0.0	0.0	0.0	64.3	0.0
Chickpea		50.0	0.0	0.0	0.0	50.0	0.0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

9.4.3.4 Major buyers of crops and farmers' preferences

Information was collected on the major buyers of the different crops that farmers were marketing. Results indicate that most crop produce is sold to vendors and rural assemblers (Table 9-14). About two-thirds of the groundnut and three-quarters of the pigeonpea growers, sold their groundnut and pigeonpea to the rural assemblers/vendors. Some crops such as beans, finger millet, soybeans, bambaranuts and sorghum are usually sold to fellow farmers on the farm. Almost all vegetables are sold to fellow farmers while tobacco is largely (58%) sold directly to the auction floors. Interestingly, despite the widely acknowledged urgency of the state supported marketing board (ADMARC), to resume its trading activities in most locations where the private sector has failed to penetrate, its role in the purchase of agricultural produce in general, remains low. Results indicate that of the respondents, only 3 percent sold maize and 2 percent sold groundnut to ADMARC. These findings highlight the declining role of the state in agricultural marketing.

Table 9-14. Major buyers of crops during 2006/07 cropping season.

Crops	Buyers										
	Total Amount sold (kg)	Farmer club	Farmer union or cooperative	Consumer or other farmer	Rural assembler (vendor)	Broker/ middlemen	Urban grain trader	Exporter	Auction	NASFAM	ADMARC
		%	%	%	%	%	%	%	%	%	%
Groundnut	137	0.7	0.7	10.6	68.6	3.9	12.0	0.0	0.7	0.7	2.1
Pigeonpea	71	0.0	0.8	10.9	77.8	0.8	7.9	1.1	0.8	0.0	0.0
Maize	395	0.0	0.0	23.3	54.2	4.2	8.3	1.7	5.0	0.0	3.3
Beans	29	0.0	0.0	40.0	20.0	0.0	0.0	0.0	20.0	20.0	0.0
Sorghum	35	0.0	0.0	41.7	50.0	0.0	0.0	8.3	0.0	0.0	0.0
Finger millet	41	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Cassava	316	0.0	0.0	36.7	40.0	0.0	20.0	0.0	3.3	0.0	0.0
Tobacco	277	0.0	0.0	1.2	23.3	0.0	8.1	9.3	58.1	0.0	0.0
Cowpea	10	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Cotton	299	0.0	0.0	2.1	48.9	8.5	25.5	0.0	2.1	0.0	0.0
Vegetables	110	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweet potato	397	0.0	4.5	31.8	54.5	0.0	4.5	0.0	4.5	0.0	0.0
Sugar cane	1,668	0.0	0.0	13.3	46.7	0.0	33.3	6.7	0.0	0.0	0.0
Rice	154	0.0	0.0	0.0	83.3	0.0	16.7	0.0	0.0	0.0	0.0
Soya	88	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Bambaranut	125	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Banana	1,410	0.0	0.0	30.0	20.0	0.0	50.0	0.0	0.0	0.0	0.0
Tomato	650	0.0	0.0	67.9	21.4	0.0	10.7	0.0	0.0	0.0	0.0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Farmers were asked to provide their preference rankings (importance) of buyers of groundnuts and pigeonpea in terms of the prices they offered and the quality of services they provided. The ranks were on a scale of 1 to 4, with 1 representing the most important, and 4, the least important. The results for groundnut are reported in Table 9-15 and those for pigeonpea are reported in Table 9-16. Middlemen or brokers rank the highest as groundnut buyers compared to other buyers, mainly due to their strictness about grain quality, on-time payments and for their use of reliable weights. Some groundnut buyers were also ranked highly for specific attributes; although only one percent of the groundnut farmers reported selling their produce to farmer associations, they reported that they preferred this route, due to their strictness on grain quality requirements for which they are rewarded with a premium price. Rural assemblers (to whom about 69 percent of the farmers sold their groundnut), are mainly preferred, due to payments being made on time, but they are also ranked high for their proximity to the farmer's residence, which substantially reduces transport costs. Fellow farmers/consumers are ranked highly for their proximity to the homestead. ADMARC, though no longer a major groundnut buyer, is also ranked highly for three attributes (i) use of reliable weights, (ii) offer of better prices, and (iii) strictness on grain quality, for which a premium price is rewarded. Although farmer groups are the least preferred, they are liked for the better price they are said to offer.

Table 9-15. Ranking of the importance of groundnut buyers based on prices offered and quality of services provided.

	Buyers of groundnut								
	Farmer group	Farmer association	Rural wholesalers	Rural assembler	Broker/ middlemen	Consumers	ADMARC	Exporter	Urban trader
All	2.0	1.7	1.7	1.7	1.4	1.8	1.8	1.7	2.0
Pays a better price	1.7	1.8	1.7	1.8	1.3	1.8	1.5	1.0	1.0
Has reliable weights	1.7	1.3	1.4	2.1	1.3	1.6	1.2	2.0	2.0
Pays on time	2.5	1.8	1.6	1.3	1.7	1.9	2.2	2.0	2.0
Located near your residence	2.2	2.3	2.2	1.5	1.5	1.4	2.3	2.0	3.0
Stricter on grain quality requirements	1.7	1.1	1.4	1.9	1.3	2.0	1.2	2.0	3.0
Market outlet preferred	2.2	2.0	2.0	1.4	1.3	1.8	2.1	1.0	1.0

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

Results for pigeonpea buyers are interesting as well (Table 9-16), they are consistent with those of groundnut buyers. Farmers associations are the most highly preferred among all pigeonpea buyers. They are preferred because they make their payments on time. Rural assemblers are the second most preferred, also for making their payments on time, but also because they offer a better price.

Middlemen or brokers are highly preferred for the better prices they offer to pigeonpea farmers. Rural assemblers (to whom about 77 percent of the farmers sold their pigeonpea) are mainly preferred for making their payments on time, but they are also ranked high for their proximity to the farmer's residence. Fellow farmers/consumers (about 11 percent of the farmers sold pigeonpea to fellow farmers) are ranked highly for their proximity to the homestead and for their use of reliable weights or measurements. Urban traders are also preferred for the better prices they offer and their use of reliable weights.

Table 9-16. Ranking of the importance of pigeonpea buyers based on prices offered and quality of services provided.

	Buyers of groundnut								
	Farmer group	Farmer association	Rural wholesalers	Rural assembler	Broker/ middlemen	Consumers	ADMARC	Exporter	Urban trader
All	2.2	1.5	1.6	1.7	1.8	1.8	1.8	1.9	1.8
Pays a better price	1.9	1.5	1.5	1.7	1.0	1.9	1.5	1.5	1.7
Has reliable weights	2.0	1.1	1.4	2.0	2.0	1.6	1.3	1.5	1.7
Pays on time	2.7	1.5	1.4	1.4	2.0	2.0	2.2	2.5	2.0
Located near your residence	2.3	1.7	2.4	1.5	2.0	1.6	2.5	2.5	2.0
Stricter on grain quality requirements	1.9	1.5	1.3	1.8	2.0	2.0	1.2	2.5	2.0
Market outlet preferred	2.5	1.6	1.9	1.4	2.0	1.8	2.1	1.0	1.3

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

9.4.3.5 Choice of selling time

Agricultural production is prone to various forms of risks; however farmers are widely believed to focus more on production risks, rather than on market risks. Market risks mainly affect prices of the produce that farmers expect or anticipate to receive upon harvest. Most farmers would like to sell their produce at a time when the prices are good enough. However, since such decisions are made under uncertainty, there are always regrets when farmers sell their produce at a period when prices are lower than they expect. Such regrettable decisions are used to perfect their future decisions. In this study, groundnut growers were asked to express the preferred time for the sale of groundnut and the price they would prefer to receive for their product. Farmers were provided with hypothetical prices for the specified months. The hypothetical prices provided were MWK 50/kg, for the period January to March, MWK 80/kg, for the period April to June, MWK 150/kg, for the period July to September and MWK 160/kg, for the period October to December. Results in Table 9-17 show the proportion of farmers willing to sell groundnut at different prices and months disaggregated by district. About 55 percent of the farmers preferred selling their groundnut between January and March when prices are the highest at MWK 160/kg, while about 40 percent preferred selling between October and December when prices are at MWK 150/kg. These findings are consistent with prior expectations suggesting that prices are the major driver in the farmers' selling decisions. Interestingly, there are some variations across the districts, with more farmers in Mchinji (53 percent) preferring to sell groundnuts between July and September when prices are slightly lower at MWK 80/kg. Apparently this happens soon after harvest. These findings further suggest that in some cases there are other factors, other than prices, that influence selling decisions.

Table 9-17. Choice of groundnut selling time.

Assume that groundnut prices (MWK/kg) are as given (%)	Chiradzulu (n=152)				Thyolo (n=144)				Balaka (n=144)				Mchinji (n=154)				Total (n=594)			
	Jan-Mar 160	Apr-Jun 50	Jul-Sep 80	Oct-Dec 150	Jan-Mar 160	Apr-Jun 50	Jul-Sep 80	Oct-Dec 150	Jan-Mar 160	Apr-Jun 50	Jul-Sep 80	Oct-Dec 150	Jan-Mar 160	Apr-Jun 50	Jul-Sep 80	Oct-Dec 150	Jan-Mar 50	Apr-Jun 80	Jul-Sep 150	Oct-Dec 160
When do you prefer to sell (%)	72	18	16	42	74	7	18	35	31	8	33	34	34	24	53	45	53	14	30	39
Proportion (%) groundnuts willing to sell	75	21	37	63	78	36	48	54	95	90	95	92	56	41	65	69	76	41	67	69

Source: ICRISAT Treasure Legumes/TLII Study (April-May 2008)

10 Summary and Conclusions

In Malawi, dryland legumes such as groundnuts and pigeonpea are grown in diverse agro-ecologies where the depth and spread of poverty is high and though farming households can avail of multiple benefits, they remain a small component of Malawi's agricultural sector.

This study was conducted to assess and understand farming systems in the study area with emphasis on groundnut and pigeonpea. Also to assess the current marketing systems and transactional costs incurred by smallholder farmers. The study also aimed at assessing and identifying the current market-preferred, low-risk legume varieties and the complimentary management practices. Plus, it provides an understanding of the seed supply systems, the extent of utilization of quality seed of improved varieties, and complementary inputs.

Results on household asset-ownership indicate that farmers in the study area have an average land holding size of 1.1 ha, and have an average of 0.37 Tropical Livestock Units (TLU) per household. Malawi is generally said to have a very low level of livestock ownership by the Southern African regional standards. It is said to be the third most densely populated country in mainland sub-Saharan after Rwanda and Burundi. Such small land holding causes a serious challenge to the transformation of Malawi's agriculture. Policy initiatives aimed at increasing access to land by smallholders, such as the World Bank funded, Community based land redistribution program, should be encouraged and scaled up by the government. On the other hand, market assisted land reforms may also help in encouraging large scale land holders to relinquish part of their land to smallholders.

The age of households with membership in some social groupings or associations is quite low. Only 20 percent of the households reported membership in some organization or a social grouping. About 69 percent of the respondents reported saving part of their income in the house. Savings deposited in commercial banks, SACCOs and other microfinance institutions, was reported by about 20 percent of the respondents. Financial capital from borrowing was reported by 16 percent, although most of them borrowed from informal sources such as relatives and friends, which suggest the urgent need for formal microfinance institutions to expand their outreach to the population.

Over 90 percent of the households planted maize in 2006/2007. Groundnut is the second most frequently cultivated crop (55%), while pigeonpea, which comes third is cultivated by 40 percent of the households in the sample. Tobacco, cotton, cassava, sorghum, sweet potato and tomato are the other frequently cultivated crops. Consistent with the distribution of households growing each crop, maize is allocated more land (0.70 ha) followed by groundnut (0.3 ha) and pigeonpea (0.3 ha). When it comes to the share of crop area: 54% of the cultivated land is allocated to maize, while groundnut and pigeonpea are allocated 17% and 15% of the total cultivated land, respectively.

Yield results indicate that improved varieties consistently exhibit higher yields than local varieties. The yield of maize, the main crop, is 1,129 kg/ha, while the yield of groundnut and pigeonpea averaged 622 kg/ha and 355 kg/ha, respectively. In general, the yields are much lower than the

potential, suggesting an urgent need for farmers to adopt recommended farming practices, to enable them achieve potential yields.

The results on gross margin analysis, indicate that tobacco is the most profitable with the highest average return of about MWK 120,000/ha. Groundnut has the second highest return (about MWK 30,000/ha) and maize has the third highest average return (MWK 20,000/ha). Pigeonpea remains one of the least profitable cultivated crops. The finding on low profitability suggests the need to intensify efforts that link farmers to improved technologies and markets that offer premium for good quality.

The average per capita expenditure for the sample is MWK 9,068, ranging from MWK 8,200 for Chiradzulu to MWK 9,971 for Mchinji. A large proportion of the cash expenditure is on clothing, bedding and energy (25%). Subsequently, the expenditure on livestock products (22%), vegetables and other food items (21%) are equally important. Interestingly, expenditure on food grains only accounts for 18% of the cash expenditure. This can be attributed to the fact that most rural households consume what they produce. The average income for the sample households is MWK 65,582. Crop income accounts for 71% of the total household income while non-farm income accounts for 16% of the household income. Wage income is the third major non-farm income source for the study area, accounting for 11.3% of the total household income, while livestock income is negligible, accounting for only 2.6%. Crop income accounts for 97% of the total income in the households belonging to the lowest income quartile, but declines to 59% in the highest income group. Using a national poverty line, results on poverty incidence indicate that about 70 percent of the sampled households live below the poverty line. These poverty levels are much higher than the national poverty rate of 55% reported by the National Statistics Office. Overall, more female-headed households (77 percent) are poor compared to male-headed households (70 percent). The high incidence of poverty suggests the need for raising farm income through increased productivity and improved access to markets, which would reduce poverty. With regard to market access, there is need to promote institutional innovations that encourage market participation by farmers through a reduction in the transaction costs.

The analysis on groundnut and pigeonpea awareness, indicates that most farmers are aware of the crops; however, the awareness rate for improved pigeonpea varieties (ICPL 9145 (released in 1987) and ICEAP 0040) is much lower. Of the two improved varieties, ICEAP 0040 is the most widely known by 20 percent of the farmers, while ICPL 9145 is only known by 8 percent of the farmers. Furthermore, the adoption rate of improved varieties of pigeonpea is only 14%. As for groundnut, 60 percent of the respondents indicated awareness of at least one improved variety of groundnut, though only 26 percent of the sampled farmers grew at least one of the improved groundnut varieties. The low awareness and adoption rates of improved varieties suggest the urgency for intensified efforts to create awareness about their existence using methods that have already proven to be effective, such as through on-farm trials; demonstration plots that are controlled by agricultural extension agents; field days for farmers; and agricultural shows to which farmers are invited. It is also important to increase seed availability to farmers.

Among pigeonpea varieties, Mthawajuni and ICEAP 0040 are the most preferred varieties with overall rankings of 4.3 and 4.1, respectively. ICPL 9145 and local pigeonpea are ranked last with

an overall ranking of 3.8 each. The findings further indicate that most highly preferred varieties are liked for the three key traits they exhibit: high yield, early maturity and short time to cook. Interestingly, Mthawajuni, considered as a local variety, is highly preferred for its high yield, as well as its early maturity and its shorter cooking time.

Results from the analysis on market participation and marketed surplus indicate that about 73 percent of the groundnut farmers participated in groundnut marketing. Each of the farmers sold an average of 137 kg of groundnut. The degree of market participation appears to vary with the type of variety grown. In general, more than three-quarters of the farmers that planted Chalimbana2005 (improved variety), sold some of the produce, while the marketing of produce amongst farmers that grew other varieties is slightly lower.

Results on pigeonpea marketing indicate that 91 percent of the pigeonpea farmers sold some pigeonpea, and that only 29% of the pigeonpea produced is marketed. On average, about 71 kg of pigeonpea were sold per person. Although a much higher proportion of farmers growing Mthawajuni participate in the marketing of the crop, the marketed surplus as a share of the total production is much lower (29%), than that of ICEAP 0040 (43%). There is need to promote market participation through increased productivity and by linking farmers to markets that offer a premium price for quality. To facilitate their increased participation into product and input markets, farmers must be encouraged to participate in Institutional innovations that reduce transaction cost.

In general, the findings suggest that there is great scope for improving the production and productivity of dryland legumes, once key constraints, such as the lack of awareness, lack of seed and low productivity due to the over-reliance on local varieties, are addressed. Furthermore, the fact that a substantial proportion of farmers are able to sell part of their produce is indicative of the large and potential market for dryland legumes. For improved productivity, there is an urgent need to address the issue of seed constraint. Existing seed delivery systems will require to be strengthened to reach farmers who continue to rely on low-yielding and disease-susceptible local varieties. Also, existing value chains, and alternative pigeonpea export markets must be developed.

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ICRISAT
Science with a human face

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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