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Socio-economic Assessment of Legume Production, Farmer Technology Choice, Market Linkages, Institutions and Poverty in Rural Ethiopia

Solomon Asfaw, Bekele Shiferaw, Franklin Simtowe, Geoffrey Muricho, Tsedeke Abate and Setotaw Ferede

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International Crops Research Institute for the Semi-Arid Tropics

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Acknowledgments

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, constraints and opportunities in the farming systems targeted for improving the productivity and market access for legumes in selected countries. In Ethiopia, the main legume of interest is chickpea and much of the effort in this assessment revolves around this crop while also providing the 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 subsectors in Ethiopia in particular and in Eastern and Southern Africa in general. We would particularly like to thank the Debre Zeit Agricultural Research Center (DZARC) of the Ethiopian Institute of Agricultural Research (EIAR) for providing leadership in implementing baseline household surveys. We would particularly like to recognize the contribution of Dr Kebebew Assefa, the project leader at the time of the survey in Ethiopia. We also would like to thank partners from the Ministry of Agriculture and Rural Development, especially those located in the three surveyed districts of Gimbichu, Minjar-Shenkora and Lume-Ejere for their support in the design and implementation of the surveys. The study was financially supported by the Tropical Legumes II and Treasure Legumes projects operating in Ethiopia.

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1. Introduction

Today, about 1.1 billion people continue to live in extreme poverty on less than US$1 a day. Another 1.6 billion live on between US$1–2 per day. Three out of four poor people in developing countries lived in rural areas in 2002 (WDR 2008). Most depend on agriculture for their livelihoods, directly or indirectly. In much of sub-Saharan Africa, agriculture offers a promising opportunity for spurring growth, overcoming poverty, and enhancing food security. Of the total population of sub-Saharan Africa in 2003, 66% lived in rural areas. More than 90% of rural people in these regions depend on agriculture for their livelihoods. Ryan and Spencer (2001) estimated that three-quarters of the 1.3 billion people living below the poverty line in developing countries lived in rural areas. Of these, an estimated 66% relied on marginal lands (TAC 1997). Broad-based agricultural development through improving the productivity, profitability and sustainability of smallholder farming is the main pathway out of poverty for millions of poor farm households. Agricultural productivity growth is also vital for stimulating growth in other sectors of the economy. But accelerated growth requires a sharp productivity increase in smallholder farming combined with more effective support to the millions coping as subsistence farmers, many of them in marginal areas. Gallup and Sachs (2000) estimated that, in comparison to temperate regions, productivity was 27% lower in the humid tropics and 42% lower in the dry tropics.

In Ethiopia agriculture accounts for about half of the country's Gross Domestic Product (GDP) (World Bank 2008). According to CSA (2005) and FAO (2006) data, close to 32 million hectare of the total area is generally considered to be suitable for agriculture. However, only about 12 million hectare is cultivated annually under rainfed agriculture. The country is highly populated and the livelihood of more than 80% of the population depends on agriculture (World Bank 2006). The productivity of agriculture is however low due to low level of use of improved technologies, risks associated with weather conditions, diseases and pests, and underdeveloped seed supply systems and output markets. Moreover, due to increasing population pressure, on the rainfed land area, the land holding per household is declining over time, leading to low level of production to meet the consumption requirement of the households. As a result, intensification of production using improved seeds and best-bet agronomic practices are necessary for increasing productivity on declining farm sizes.

In Ethiopia increasing the productivity of grain legumes presents an opportunity in reversing these trends in productivity, poverty and food insecurity. In part, this is because legumes have the capacity to fix atmospheric nitrogen in soils and thus improve soil fertility and save fertilizer costs in subsequent crops (Serraj 2004). Hence, the rotation of cereal crops with legumes is essential if soil fertility, soil health, and the sustainability of production systems are to be maintained. In this case, legumes production is an integral part of smallholder farming systems where farmers commonly practice crop rotation of cereals with legumes. Second, it enables more intensive and productive use of land, particularly in areas where land is scarce and the crop can be grown as a second crop using residual moisture. Third, it reduces malnutrition and improves human health especially for the poor who cannot afford livestock products. It is an excellent source of protein, fiber, complex carbohydrates, vitamins and minerals. Fourth, the growing demand in both the domestic and export markets provides a source of cash for smallholder producers.

Despite the crucial role of dryland legumes like chickpea for poverty reduction and food security in Ethiopia, lack of technological change and market imperfections have often locked small

producers into subsistence production and contributed to stagnation of the sector (Shiferaw and Teklewold 2007). The local chickpea varieties now dominate the domestic and export markets, but low productivity of the traditional varieties limits the farmers' competitiveness in these markets. The structure and functioning of the marketing system is constrained by small supplies, lack of grading and quality control systems, lack of well-coordinated supply chain, lack of efficient market information delivery mechanisms, underdeveloped infrastructure and high transaction costs (Shiferaw and Teklewold 2007). As a result, the level of integration of smallholder farmers into domestic and export markets in Ethiopia is generally limited. In the last few years several research and development interventions have attempted to facilitate productivity growth for small farmers. Some of these efforts did not however stimulate large scale technology uptake and diffusion mainly because of the limited understanding of farm-level constraints, farmer preferences and the challenges related to better coordination of input supply and delivery of new technologies and market linkages for small producers.

Nevertheless, chickpea breeders have conducted research to genetically improve new and better varieties for the kabuli and desi chickpea types. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in collaboration with the Ethiopian Institute of Agricultural Research, has developed and released several high-yielding and stress tolerant varieties of chickpea with desirable agronomic and market traits[1]. Research centers and bureaus of Agriculture and Rural Development promoted some of the existing technologies; however farmers' adoption of these technologies has been limited.

Research in the region has identified several reasons for this; (i) low productivity of traditional varieties and lack of sufficient surplus for markets; (ii) low market demand for non standardized, mixed, small-seeded and low quality grains produced from local varieties; (iii) underdeveloped seed and input delivery systems and seeds of improved varieties to farmers in affordable quantities and prices; (iv) high transaction costs and lack of reliable market outlets; and (v) vulnerability of most common varieties to insect, disease and pest problems (Shiferaw et al. 2007, Shiferaw and Teklewold 2007). The cumulative effect of these factors is low adoption of improved technologies, low competitiveness and inability to penetrate high-value markets that offer premiums for quality. To address these overlapping constraints and harness the untapped potential of legumes for the poor, ICRISAT initiated two major legume projects: (Tropical Legumes II) supported by the Bill & Melinda Gates Foundation and Treasure Legumes project supported by IFAD.

Thus, the main focus of this study is to provide a broad overview of the existing production and socioeconomic conditions and to establish and share baseline information to the breeders and other technology development and dissemination partners on several issues including resource use patterns, productive assets, farmer and market-preferred traits, priority development and technology uptake constraints, and early impact indicators that help in conducting ex-post impact evaluation in future. However an attempt is also made to address a wider range of issues that affect the livelihoods of smallholder farmers including non-farm opportunities, livestock production activities, poverty profile and food security in the target areas. Specifically, the study tries to provide information on the following key aspects:

(i) Socioeconomic profile of smallholder farmers, including distribution of land and other productive assets and the poverty and income profile of the study area using income and expenditure measures;

[1]Dadi et al. 2005 and Shiferaw et al. 2007 give detailed information about the recently released chickpea varieties.

(ii) Main characteristics of the production system, with emphasis on resource use patterns, land productivity and current situation of chickpea grown in the study area;

(iii) Role of market institutions, infrastructural and household assets in determining access to new technologies and markets for small farmers;

(iv) Profitability of different crop and livestock enterprises in the study regions;

(v) Level of adoption and dis-adoption of new chickpea varieties;

(vi) Constraints and opportunities in seed production and delivery systems;

(vii) Implications for agricultural research and development strategies and investments in order to impact more profoundly on the rural poor.

The report is organized into eleven chapters. Following this introductory section, chapter two describes the methodology on data collection and analysis. Chapter three discusses household demographics and assets ownership. Access to agricultural and business services in terms of proximity to markets, access to market information, extension service and credit is presented in chapter four. Chapter five deals with crop production issues and covers land tenure systems, cropping pattern, crop yields, input use, profitability of different crops and utilization. Chapter six presents the livestock production systems spanning types of livestock, crop-livestock linkages and the relative profitability of the different enterprises. Chapter seven deals with non-farm income diversification while poverty analysis is presented in chapter eight. Chickpea technologies, production and marketing challenges and opportunities are discussed in chapter nine. Chapter ten discusses the gender aspect of chickpea production and marketing, followed by chapter eleven, which presents a summary of the key findings and implications for research.

2. Data and analytical methodology

2.1 Project intervention areas

The primary target countries for the projects were identified based on consultations with local partners and analyses of existing information on legume economies, potential benefits for improving wellbeing and reducing poverty, and anticipated gains for the broader regions. The Treasure Legumes project is undertaken in four countries (Ethiopia, Tanzania, Malawi and Kenya) where significant and underutilized opportunities for income growth and poverty reduction exist through targeting dryland legumes. In Ethiopia, the work is focused in major chickpea producing areas in the east and south-west of Shewa region. These areas were identified by the Ethiopian Institute of Agricultural Research for scaling up suitable kabuli and desi type chickpea varieties and marketing strategies.

The primary countries for the Tropical Legumes II project include Ethiopia, Kenya, Malawi, Tanzania and Mozambique in Eastern and Southern Africa (ESA), and Nigeria, Mali and Niger in West and Central Africa (WCA); and India and Myanmar in South Asia. The primary target areas for piloting the interventions were selected based on consultations and analyses of already existing knowledge with due consideration to the following factors: (a) suitability for one or more target legume crops; (b) suitability for evaluating one or more of the targeted stress factors (drought, disease, pests, etc); (c) the spread and depth of poverty and the potential of legumes to reduce vulnerability of livelihoods; (d) agro-ecological representation and potential for spillovers to other areas; (e) potential for synergy with other ongoing efforts by governments and partner institutions and (f) accessibility, feasibility and likelihood of success. The pilot areas for each legume crop in each of the targeted countries were selected through exploratory field visits, consultations with local partners, and analyses of existing data on poverty and agro-ecological conditions. These primary target areas for piloting available and future technology options mainly focused on one or two districts or divisions within the target country. In Ethiopia three districts were selected for the intervention.

2.2 Study sites

The baseline household surveys were conducted in the three districts of Minjar-Shenkora, Gimbichu and Lume-Ejere where the two legume projects started key interventions for developing suitable technologies and institutional innovations for improving productivity and market opportunities for smallholder chickpea farmers. These districts represent one of the major chickpea growing areas in the country where new kabuli varieties are beginning to be adopted by farmers. The districts are in the Shewa region in the central highlands of the country (Figure 2.1). Compared to other farming systems, the study area is generally considered to have good potential and suitable for agriculture. The area has reliable rainfall and chickpea is grown during the post-rainy season on black soils using the residual moisture. The study sites are not closely connected to the main urban towns, but fall close to the main highway that links the capital Addis Ababa with Nazareth and other cities in the east and south of the country. The Debre Zeit Agricultural Research Centre (DZARC), which leads the chickpea project, is also located in the area and provides information and capacity building to the target districts on issues related to fertilizer use, crop and pest/

disease management, production of quality seed, grain marketing, and storage practices. It is also the main source of improved germplasm of chickpea and plays a key role in introducing new varieties of both cereals (mainly teff and wheat) and legumes (lentil and chickpea). Available estimates from the districts show that chickpea production in Gimbichu and Lume-Ejere districts ranges from 12,500 to 15,000 hectares whereas chickpea production in Minjar-Shenkora ranges from 15,000 to 17,500 hectares. The year to year variability is generally caused by differences in accessing seed, other inputs, farmers' price expectations and in some cases prevalence of disease and pest.

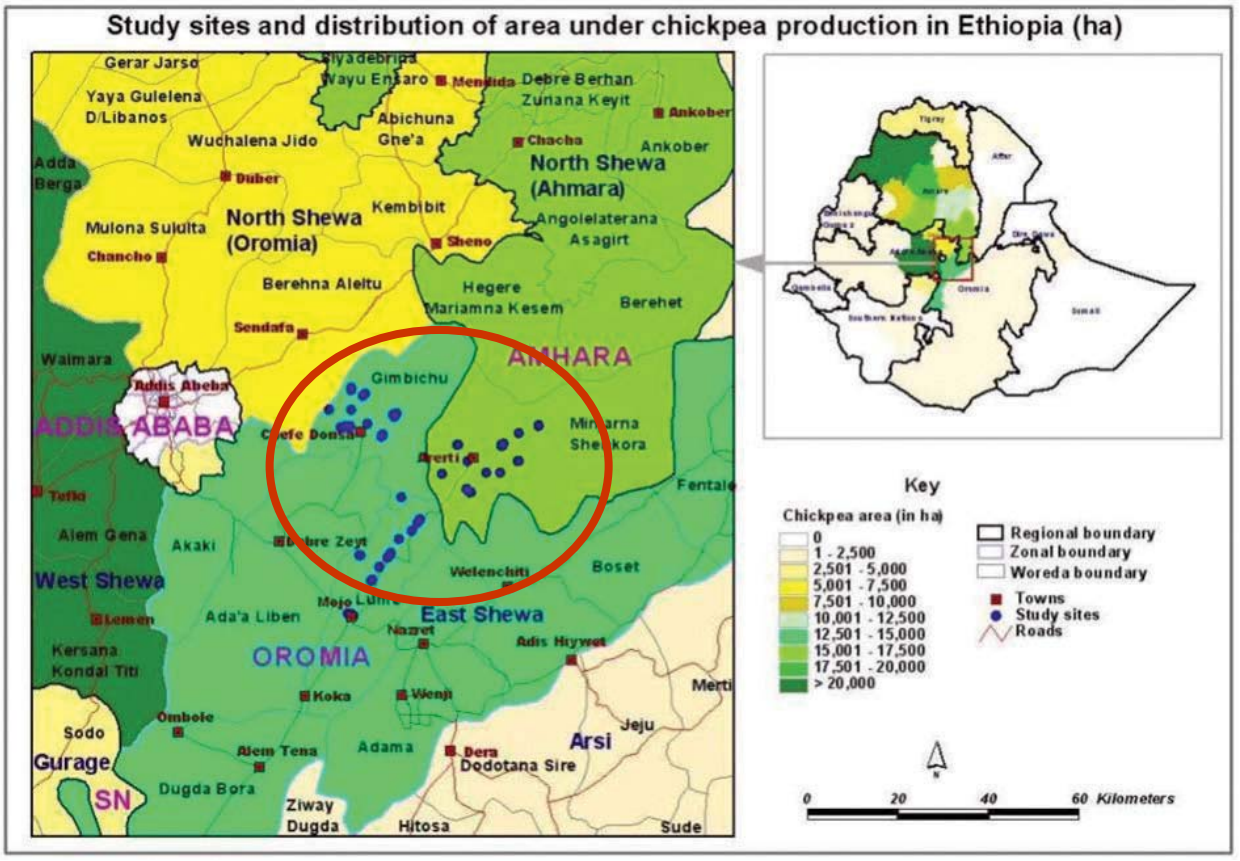

Figure 2.1 Map of the study area.

2.3 Sampling methods

The data used for this report originates from a baseline survey conducted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Ethiopian Institute of Agricultural Research (EIAR) in 2008. 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 the production and marketing conditions in the survey districts. During this exploratory survey, discussions were held with different stakeholders including farmers, traders and extension staff working directly with farmers. The findings from this stage were used to refine the study objectives, sampling methods and the survey instrument.

A formal survey instrument was prepared and trained enumerators collected the information from the households via personal interviews. A combination of stratified and purposive sampling methods was used to select the three districts included in the survey, namely Gimbichu, Minjar-Shenkora (covered under the TLII project), and Lume-Ejere covered under the Treasure Legumes project. Only project districts were selected for the survey and major chickpea producing *kebeles*[2] from these three districts were then randomly selected for the survey. Eight *kebeles* each from Gimbichu and Lume-Ejere districts and ten *kebeles* from the larger Minjar-Shenkora district were then randomly selected. Subsequently, a proportional random sample of 700 households was selected for detailed household survey from these *kebeles*. The three districts, Gimbichu, Lume-Ejere and Minjar-Shenkora constitute 21%, 43% and 36% of the total sampled households, respectively (Table 2.1).

Table 2.1. Sample Communities and Households.

Districts	Total households (Number)	Total kebeles (Number)	Sample kebeles (Number)	Sample households (Number)
Gimbichu	12,316	10	8	149
Lume-Ejere	14,563	13	8	300
Minjar-Shenkora	14,991	18	10	251
All	41,870	41	26	700

Data collected included information on membership of farmers to cooperative(s), household composition and characteristics, land and non-land farm assets, livestock ownership, crop production, resource use patterns, agricultural technologies and awareness about chickpea varieties, chickpea farming experience, sources of information about improved varieties and markets, source of seed and amount of seed of different varieties planted during the 2007/08 crop season, major consumption expenditures and detailed information on the marketing of crops and chickpea.

2.4 Analytical methods

The data collected from primary sources were coded and entered into STATA computer software for the analysis. The data were checked for consistence and completeness and analyzed using different statistical procedures. We employed descriptive statistics such as frequencies, cross-tabulations, means and ratios to analyze, summarize and present the data. Analysis was conducted by disaggregating important relevant information by district so that a snapshot comparison can be made between districts. The paper has not attempted to undertake detailed econometric modeling to test correlations and cause and effect relationships between different variables mainly because the primary purpose of this study is to provide breeders and biophysical scientists with a summary of some basic facts and existing conditions. However in the subsequent report we intend to employ quantitative modeling to establish and test causality on relevant policy variables and estimate the ex-ante impact of proposed chickpea technologies.

[2]It is usually named peasant association and is the lowest administrative unit in the country.

3. Household demographics and assets

3.1 Household characteristics

The average household size is about 6.4 persons of which 3.5 are between 15 and 64 years of age. This figure is relatively higher compared to the national average agricultural household size, which is about 5.2 persons. The dependency ratio, which measures an age-population ratio of those typically not in the labor force (the dependent part) and those typically in the labor force (the productive part), is about 1.11, indicating that for every 100 working persons, there are 111 who are not working in the region. The national ratio is about 0.97. The dependent part usually includes those under the age of 15 and over the age of 64. The productive part makes up the population in between the ages of 15 and 64. As shown in Table 3.1, there are more male members within households compared to female members in all the districts though the national average of male to female ratio is about one. In Ethiopia, the sex ratio (male to female ratio) varies across regions and agro ecological zones. For instance, highest ratios are commonly observed in lowland areas, particularly in the pastoralist regions of the east. Ratios in the highlands vary somewhat, but female-dominated districts are common suggesting emigration of male labor.

Table 3.1. Household Characteristics (N =700).

	Unit	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Family size	Number	6.39	6.73	6.00	6.40
- Age 0-5	Number	0.92	0.76	0.61	0.74
- Age 6-14	Number	2.42	2.61	2.25	2.44
- Age 15-64	Number	3.38	3.60	3.40	3.48
- Age 65 & above	Number	0.11	0.17	0.12	0.14
Female members	Number	2.83	3.11	2.73	2.91
Male members	Number	3.46	3.61	3.24	3.45
Gender of the head (1=male)	Ratio	0.94	0.92	0.94	0.93
Age of household head	Year	46.58	47.53	47.57	46.98
Education of household head					
- No formal education level	%	35.57	43.67	48.61	43.71
- 1 to 4 years of education	%	43.62	41.67	40.64	41.71
- 5 to 8 years of education	%	16.11	10.00	9.96	11.29
- more than 8 years of education	%	4.70	4.67	0.80	3.29
- Average years of education	Year	2.30	1.82	1.30	1.74
Education of spouse	Year	0.54	0.81	0.91	0.78
Dependency ratio	Ratio	1.22	1.14	1.02	1.11
Marital status of the head (1=married)	Ratio	0.96	0.91	0.87	0.91
Main occupation of the head (1=farming)	Ratio	0.95	0.94	0.94	0.94

About 7% of the sample households are female-headed; the corresponding figures are 6.0%, 8% and 6.0% for Gimbichu, Lume-Ejere and Minjar-Shenkora districts, respectively (Table 3.2). The national prevalence of female-headed agricultural households is about 17.6%, which is relatively higher compared to our survey regions. Female-headed households normally face greater challenges compared with male-headed counterparts. In addition to farm management tasks,

the female household head may have considerable childrearing and household management obligations that are not normally the prefecture of Ethiopian men. Such demands can increase the vulnerability of female-headed households to economic and other shocks to their welfare. The average age of household head is about 47 years, which is comparable across districts. Educational attainment tends to be fairly low across the districts. Household heads from Gimbichu district have relatively greater years of education (2.3 years) compared to the household heads in the other two districts. About 35% of the household heads interviewed in Gimbichu, 43% in Lume-Ejere and 47% in Minjar-Shenkora do not have any years of education. Minjar-Shenkora district has also the lowest average years of education, 1.3 years. On the other hand the average education of the spouse is the highest in Minjar-Shenkora district (0.9 years), although the figure is the lowest by any standard. These results also indicate the difference in literacy rate between males and females, which are normally the case in Ethiopia, ie, men are more literate than women. Nearly 90% of the surveyed households are married, with the highest rate in Gimbichu district (96%). There is high likelihood that men often rapidly remarry after the loss of a wife through death or divorce whereas women are much less likely to remarry soon after the loss of a husband. About 94% of the sampled households reported farming as their main occupation, which is similar across districts.

3.2 Natural capital

Natural capital is generally considered to comprise three principal categories: natural resource stocks, land and ecosystems. However, in this report we only focus on the land component since data is not available on the other two categories. Table 3.2 shows the average household land holding disaggregated by quartiles and locations. The results show that the average land holding for the upper 25% of the sampled households is about 4.1 ha of which 3.8 ha is cultivated and 0.5 ha is a fallow. For the lowest 25% of the sampled households, the average land holding is 0.6 ha of which the share of fallow land is nil. If we look across districts for the upper 25% households, farmers in Lume-Ejere seem to have larger land holding with an average of 4.3 ha followed by Gimbichu (3.9 ha) and Minjar-Shenkora (3.8 ha), respectively. The same trend applies for the lowest 25% households except that farmers in Minjar-Shenkora tend to have a relatively higher land holding compared to Gimbichu farmers. An important observation from Table 3.2 is that the lowest 50% of the sampled households did not allocate any land for fallow purposes during the 2006/07 cropping season. This is perhaps attributed to the low land holding size.

3.3 Livestock capital

For farm households in rural Ethiopia, livestock is an important asset that can provide regular income and be disposed of in hard times to provide a safety net. Smaller average herd sizes may indicate lower relative ability to resist shocks to household well-being caused by drought, market failure and family misfortune. Normally in Ethiopia herds tend to be smaller in the highland areas, probably because of the limited land holdings and scarcity of grazing and feed resources. In Gimbichu district, sheep tend to be the dominant livestock animal with an average of 5.7 per household whereas in Lume-Ejere and Minjar-Shenkora, the average holdings of goats and oxen is the highest with an average of 3.7 and 2.4, respectively. If we look at the average livestock holding for the overall sample, sheep and oxen seem to be the highest with mean holding of 2.9

Table 3.2. Natural capital (N=700).

	Gimbichu				Lume-Ejere				Minjar-Shenkora				Total			
	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Own cultivated land (ha)	0.45	1.52	2.37	3.63	0.66	1.58	2.36	3.99	0.62	1.59	2.27	3.69	0.60	1.57	2.33	3.84
Own fallow land (ha)	0.00	0.00	0.12	0.54	0.00	0.00	0.12	0.47	0.00	0.00	0.11	0.41	0.00	0.00	0.11	0.49
Total land (ha)	0.44	1.63	2.46	3.90	0.66	1.70	2.54	4.26	0.62	1.69	2.44	3.77	0.59	1.68	2.49	4.08

Note: Total land size is the summation of cultivated and fallow land.

Table 3.3. Livestock capital (N=700).

Districts	Oxen (Number)	Cows (Number)	Other cattle (Number)	Sheep (Number)	Goats (Number)	Donkeys (Number)	Other livestock (Number)	Total (TLU)
Gimbichu	2.92	1.24	2.26	5.67	0.27	1.67	5.80	7.95
Lume-Ejere	3.12	1.31	2.55	2.17	3.67	1.75	5.20	8.26
Minjar-Shenkora	2.41	0.67	1.16	2.00	1.28	1.18	4.99	5.35
Total	2.82	1.06	1.99	2.86	2.08	1.53	1.53	7.15

Note: 1 Ox = 1 Cow = 1TLU, 1 bull=1 heifer=0.75TLU, 1 calf = 0.45TLU, 1 goat=1 sheep=0.15TLU, 1 donkey=0.50TLU, 1 chicken= 0.005TLU, 1 horse=1 mule= 1.15TLU, 1 beehive = 0.001TLU, 1 camel = 1.50TLU.

and 2.8, respectively. We also used tropical livestock unit (TLU)[3] to compare the overall livestock holding across districts and the results suggest that households in Lume-Ejere district own the highest with an average of 8.3 TLU followed by households in Gimbichu with an average holding of 7.9 TLU. Minjar-Shenkora district has the lowest holding of livestock measured in tropical livestock unit, which is about 5.3.

3.4 Physical capital

Table 3.4 presents the physical capital owned by sampled households. Types of housing owned by farm households are often used as a proxy to measure the household wealth and their capacity to use the asset as collateral to access credit. The survey results indicated that about 87% of the sampled farmers own a house with an iron roof whereas only 2.4% own a house with stone walls. Moreover, it was found that about 96% of the sampled households own more than one house. Looking across districts, there seems to be a little difference especially on the ownership of iron roof; households from Gimbichu tend to have the lowest (77%) whereas Lume-Ejere have the highest (91%) houses with iron roof. Only 2% of the surveyed households own a bicycle, which suggests the limited use of the item for transportation purposes. Normally in the survey regions, donkeys and horses are the commonly used animals for transporting humans and goods. The use of radio for entertainment and accessing information is common in urban and rural Ethiopia. Our results show that about 77% of the sampled households own at least one radio whereas the ownership of television is very minimal (1.3%). There seems to be no significant variation in the ownership of radio across the three districts although television ownership is relatively higher in Gimbichu district. When it comes to ownership of mobile phone, the rate is very low for Ethiopia compared to many other African countries. Only 6.1% of sampled households own a mobile phone in the survey regions with Lume-Ejere taking the lead with 9.7%. The implication is that the use of radio remains a vital means of reaching farmers while finding a way to promote the use of mobile phone in rural areas.

Table 3.4. Physical capital (N=700).

				Total	
Districts	Gimbichu (%)	Lume-Ejere (%)	Minjar-Shenkora (%)	(%)	Value (ETB/hh)
Type of house					
- Own iron roof	77.18	91.00	88.45	87.14	-
- Own stone wall	1.33	1.00	4.80	2.43	-
- Own more than one house	95.30	95.00	97.21	95.86	-
Own bicycle	0.67	0.67	3.60	1.71	17.00
Own radio	77.33	78.00	76.40	77.29	117.35
Own mobile phone	6.67	9.67	1.60	6.14	61.91
Own television (TV)	3.33	1.00	0.40	1.29	15.71
Other assets	-	-	-	-	942.13

[3]The conversion factor is presented in the annex

3.5 Human capital

Table 3.5 presents the human capital of the sample households which, in this case, refers to the level of education of household members and the size of active family labor. The average active family labor force measured in adult equivalent (AE) is 4.7 in Gimbichu, 5.0 in Lume-Ejere and 4.6 in Minjar-Shenkora. Average education of the household head is highest in Gimbichu with 2.3 years and lowest in Minjar-Shenkora district with 1.3 years. The overall average education level of the head is 1.7 years, which seems to be the lowest at any given standard. We also tried to compute the average education level of the household members above the age of 6 and the result did not change significantly. The overall average increased to 2.4 years suggesting the need for investment in promoting education in rural Ethiopia. Looking at children less than 12 years of age, the results show that only 34.3% of males and 39.4% of females ever attended school. It is interesting to see that female school enrollment ratio is a bit higher across all the three districts than male counterparts contrary to the national estimate.

Education is a very important determinant of the adoption of new technologies. Often the decision on whether to adopt new agricultural technologies or not is not necessarily made by the head of the household alone but also by other educated adult members of the household. This implies, even if the household head is illiterate, the presence of an adult literate person in the family plays a crucial role in increasing the probability of the household to adopt technologies that can have a positive impact on poverty and undernourishment. This is in line with the hypothesis that an educated member of a household "confers a positive externality on the illiterate family members by sharing the benefits of his or her literacy" (Basu et al. 2000, Asfaw and Admassie 2002). It is not the primary objective of this report to establish this causality but in the subsequent report we intend to test this hypothesis.

Table 3.5. Human capital (N=700).

Districts	Unit	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Education of the head	Year	2.30	1.82	1.30	1.74
Average household education	Year	2.10	2.56	2.46	2.43
Children <12 years ever attended schools					
- Male	%	20.56	38.18	39.39	34.28
- Female	%	27.70	40.80	45.33	39.39
Family labor	AE	4.72	5.04	4.57	4.80

Note: Average household education refers to education for members above age 6. Adult Equivalent (AE) is computed as Age <12 and >=64=0.5, 12<=x<65 male =1, female=0.8.

3.6 Social capital

Social capital here refers to the various forms of farmer or producer organizations that perform diverse functions. Often these farm organizations are grounded on the principle of collective action among potential beneficiaries. As defined by Marshall (1998), collective action occurs when individuals voluntarily cooperate as a group and coordinate their behavior in solving a

common problem. Table 3.6 shows participation in different farmer and community groups and the level of membership by the sampled households. It is apparent from Table 3.6 that almost all sampled households are a member of funeral association ('idir'), which is culturally and traditionally very important in Ethiopia. Subsequent to this comes membership in input supply/ service coops, which is about 88.7%. There is no significant difference across the three districts in the level of membership. A large share of the sampled households (75.7%) is also a member of religious associations, again almost similar across districts. The Farmer association is also another important institution of which about 23.9% of the sampled households are members. About 22.9% of the households are members of the local administration, which corresponds to the involvement of the household head in any kind of government administration in the area. Membership in saving and credit group seems to vary across districts with the highest in Minjar-Shenkora (20.4) and the lowest in Lume-Ejere (8.7%).

Table 3.6. Social capital – membership to farmer and community groups.

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
Type of institutions	%	Duration (Years)	%	Duration (Years)	%	Duration (Years)	%	Duration (Years)
Input supply/service coops/ union	96.67	22.67	88.33	22.52	84.40	20.65	88.71	21.98
Crop/seed producer and marketing group/coops	0.67	0.00	1.33	19.25	1.20	26.00	1.14	20.60
Local administration	21.33	11.40	26.00	13.61	20.00	9.27	22.86	12.20
Farmer association	24.00	0.00	24.00	24.43	23.60	8.00	23.86	24.09
Women's association	7.33	14.70	3.33	15.60	6.80	16.35	5.43	15.70
Youth association	0.00	0.00	2.00	7.00	1.60	16.25	1.43	11.11
Religious association	73.33	22.07	77.00	23.84	75.60	21.62	75.71	22.92
Saving and credit group	17.33	2.25	8.67	3.10	20.40	3.38	14.71	3.05
Funeral association (*idir*)	100.00	20.36	100.00	21.66	100.00	20.86	100.00	21.24
Government team	1.33	6.00	4.00	9.55	0.80	8.00	2.29	8.87
Water user's association	0.00	0.00	1.00	0.00	0.40	23.00	0.57	9.67

Note: Duration refers to the average for farmers who are members. Local administration corresponds to the involvement of household head in any kind of government administration in the area.

3.7 Financial capital

Here, financial capital corresponds to the savings made by the sample households; and Table 3.7 presents share of savings to different sources. In Ethiopia, there are a number of means of saving besides commercial banks, which include rural micro-finance, 'idir', which is a funeral association, 'ekuub', which is a traditional saving association, and so on. Our results show that about 12.4% of the sample households had savings with rural micro-finance in 2006/07 cropping season with an average amount of about 547 ETB whereas only 4.1% of households made savings with commercial banks in the same period with relatively larger amounts (8,635 ETB). About 5.7% had a saving either with 'idir or ekuub' with an average amount of 1,017 ETB. These results suggest

that the relative wealthier households tend to use commercial banks as a way to save their money whereas less wealthy households use rural micro-finance or the traditional means.

Table 3.7. Financial capital – savings.

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
	%	Amount (ETB)	%	Amount (ETB)	%	Amount (ETB)	%	Amount (ETB)
Saving with								
- Commercial bank	2.00	8,600.00	6.00	10,062.22	3.20	5,437	4.14	8,635.17
- Rural micro-finance	16.67	402.72	6.67	744.85	16.80	524.24	12.43	546.93
- Idir/Ekuub	6.00	801.67	7.00	942.19	4.00	1,370.00	5.71	1,017.53
- Money lender	0.00	0.00	0.33	350.00	0.00	0	0.14	350.00
- Merry go-round	0.67	3,000	1.33	18,750.00	0.40	4,800.00	0.86	13,800.00

Note: Amount refers to those who saved.

4. Access to agricultural and business services

The opportunity for smallholders to raise their incomes from agricultural production largely depends on their ability to successfully participate in the marketplace exchanges. However, this participation is complicated by the numerous internal and external challenges that smallholders face. Much of the literature points to the pervasive imperfections that characterize markets in the developing world. Lack of information on prices and technologies, high transaction costs and lack of access to credit make it difficult for smallholder farmers to take advantage of the market.

4.1 Proximity to markets

One of the key constraints in successful market participation by smallholders is the high transaction cost resulting from proximity to markets and different institutions. Those smallholders residing at a far distance from the main or village market tend to experience high transaction cost[4], which in turn reduces the incentives for market participation. A number of proxies are used in our survey to capture proximity to markets. As presented in Table 4.1 average walking distance to nearest

Table 4.1. Access to markets (N=700).

	Unit	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Walking distance to nearest village market	km	3.21	3.43	2.62	3.16
Types of road to village market					
- Non-paved dirt road (yes=1)	Ratio	0.51	0.35	0.13	0.30
- Paved dirt road (yes=1)	Ratio	0.15	0.07	0.13	0.11
- Paved gravel road (yes=1)	Ratio	0.01	0.14	0.13	0.11
Quality of the village road					
- Bad (yes=1)	Ratio	0.45	0.27	0.11	0.25
- Good (medium)(yes=1)	Ratio	0.21	0.23	0.24	0.23
- Very good (yes=1)	Ratio	0.01	0.06	0.04	0.04
Number of months road to village market is passable for trucks in a year	Months	4.40	5.39	6.26	5.46
Transport cost (per person) to the village market using bus/pick-up	ETB	0.67	2.81	0.24	1.23
Walking distance to the main market	km	9.14	11.98	8.42	10.09
Number of months road to main market is passable for trucks in a year	Months	8.06	11.08	9.25	9.77
Transport cost (per person single trip) to the main market using bus/pick-up	ETB	1.96	8.64	2.72	5.03
Distance to cooperative	km	3.47	3.44	2.20	3.00
Distance to extension agent office	km	2.76	2.05	2.06	2.21
Number of years stayed in the village	Years	43.06	43.05	42.12	42.72

[4]A transaction cost is a cost incurred in making an economic exchange, ie, the cost of participating in a market and it includes bargaining costs, search and information costs and policing and enforcement costs.

village market is about 3.2; Lume-Ejere district is the farthest, being 3.4 km away. About 30% of the sampled respondents reported having non-paved dirt road to the village market whereas only 10% have access to paved gravel road. Distance alone cannot provide the full picture unless one captures the quality of the roads and our results depict that only 4% of the respondents reported the quality of the village road as very good whereas about 23% reported it as good. About a quarter of the households reported the quality of the village road as bad. The results also show that the road to the village market is passable for trucks only 5 months in a year suggesting the constraints the farmers face to market their produce all year round. Across the three districts, there seems to be no big variation except that in Gimbichu district there is almost no paved gravel road to the village market and a large share of the sampled households (45%) reported the quality of the village road as bad. On the other hand walking distance to the main market is relatively far compared to the village market and is about 10 km; Lume-Ejere is the farthest at 12 km. The same table also shows that the road to the main market is passable for trucks about 10 months in a year, which is relatively good compared to other regions in the country. Transport cost (per person single trip) to the main market seems to be significantly higher in Lume-Ejere district and is about 8.6 ETB. Distance to cooperative and extension agent officer is about 3 km and 2.2 km, respectively; farmers in Minjar-Shenkora seem to be in a relative short distance to both compared to the other districts.

4.2 Access to market information

In our survey an attempt was made to identify major sources of market information; Table 4.2 presents different sources of input and output market information in the study areas. Government extension agent, neighbors/other farmers, farmer cooperatives or groups and radio are the four major sources of market information in the survey regions. About 55% and 42% of the sampled households received input market information from government extension agents and neighbors, respectively, whereas about 36% and 57% received output market information from the same

Table 4.2. Percentage of households receiving market information (N=700).

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
	Input markets	Output markets	Input markets	Output markets	Input markets	Output markets	Input markets	Output markets
Major sources								
- Government extension agent	98.67	54.67	46.00	34.33	40.40	25.60	55.29	35.57
- Research centre	1.33	0.67	0.67	0.00	0.00	0.00	0.57	0.14
- Newspaper	1.33	0.67	0.33	0.33	0.00	0.00	0.43	0.29
- Seed traders/Agrovets	6.67	11.33	1.00	6.33	0.80	5.60	2.14	7.14
- Other private shops	2.00	26.00	3.00	4.33	0.40	2.00	1.86	8.14
- Radio/TV	33.33	60.67	20.33	28.33	8.40	18.40	18.86	31.71
- Mobile phone	0.00	0.00	0.33	0.00	0.00	0.00	0.14	0.00
- Neighbors/other farmers	84.00	100.00	37.00	47.67	23.20	37.20	42.14	56.86
- NGOs	0.00	0.00	0.33	0.33	0.00	0.00	0.14	0.14
- Farmer coop or groups	86.00	20.67	37.67	18.67	14.40	2.40	39.71	13.29

sources. Perhaps the interesting finding here is the role of neighbors or other farmers as a major means of transmitting information, suggesting the significance of targeting individuals from diverse localities for trainings or information transfer to have a wider impact. About 40% received input markets information from farmer cooperatives or groups whereas about 32% received output market information from the radio. Looking across the three districts, the share of farmers sourcing input and output market information from government extension agents, neighbors, radio and farmer cooperatives is significantly higher in Gimbichu as compared to the other two districts. Research center, newspaper, NGOs and mobile phone are not important sources of market information in the survey areas.

4.3 Access to credit

The ability of rural households to invest for the long term and make calculated decisions for risky and time-patterned income flow is shaped largely by financial services. Broader access to financial services would expand their opportunities for more efficient technology adoption and resource allocation (WDR 2008). However, financial constraints are more pervasive in agriculture and related activities than in many other sectors mainly because financial contract in rural areas involve higher transaction costs and risks than those in urban settings. In Ethiopia farmers normally demand credit for a number of economic reasons including purchase of agricultural inputs, start a small business, household education and health, and also to meet a number of social obligations. A variety of institutions provide short and medium term credit to farmers. Nationally, about 19% of smallholders participate in these programs, although there is wide variation throughout the country (CSA 2006).

As presented in Table 4.3, an attempt was made to explore whether farmers in the survey regions are getting credit for whatever purpose they need. Results show that about 41.3% and 81.9% of the sample households needed the credit for purchasing fertilizer and seed, respectively, and from those who needed the credit about 93.7% and 61.9% have got for the intended purpose. The findings suggest that in the survey regions farmers seem to access credit to purchase fertilizer, and there is no significant variation across the three districts. When it comes to seed there seems to be a credit constraint (ie, about 40% who needed the credit did not get it) and the problem is profound especially in Minjar-Shenkora district. About 16% of sample respondents needed credit to buy other agricultural inputs and about 32.7% of those who needed got credit, suggesting the big gap between supply and demand. The same table also shows that about 12.7% and 11% needed the credit for buying oxen for traction and other livestock, respectively, and only less than 20% of those who needed obtained the credit. For non-farm business activities the demand is relatively low (9%) and only 10% of those who needed got it indicating the low level of participation in off-farm activities in the survey areas. It is interesting to note also that about 15% of the sampled households demanded credit to rent in land and about half of those who needed obtained it.

In Ethiopia, financial services are often delivered to rural populations by both formal and informal institutions such as public and private commercial banks, microfinance banks, cooperatives, informal money lenders and others. Table 4.4 displays different sources of credit. By far the most common source of credit in the survey regions is farmer group or cooperative; 85% of sampled respondents accessed credit from farmer group. Across the three districts, the share is even

larger for Gimbichu and Lume-Ejere districts. The second major source of credit is rural micro-finance (12.7%) followed by money lenders (2.7%). Lume-Ejere district seems to have the lowest access to credit from rural micro-finance whereas farmers in Gimbichu do not access credit from money lenders. Commercial bank is a very minor source of credit in the survey regions.

Table 4.3. Need and access to credit.

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total		
Purpose of borrowing	Needed credit (%)	Get credit (%)	Needed credit (%)	Get credit (%)	Needed credit (%)	Get credit (%)	Needed credit (%)	Get credit (%)	Got amount needed at market rate (%)
Buying seeds	29.33	65.12	55.67	78.57	31.20	24.36	41.29	61.94	81.56
Buying fertilizer	80.67	94.17	94.33	95.42	67.60	90.53	81.86	93.72	84.54
Buy other agricultural inputs	20.67	53.33	16.33	34.00	13.20	12.12	16.14	32.74	75.68
Farm equipment/ implements	8.67	0.00	9.33	3.45	8.80	4.55	9.00	3.17	50.00
Buying oxen for traction	11.33	6.25	12.67	5.13	13.60	38.24	12.71	17.98	75.00
Buy other livestock	12.67	22.22	10.33	3.13	10.80	37.04	11.00	19.48	80.00
Soil and water conservation	4.67	0.00	4.00	0.00	2.00	0.00	3.43	0.00	57.14
Invest in irrigation	4.00	0.00	2.33	0.00	2.80	0.00	2.86	0.00	80.00
Non-farm business or trade	10.67	13.33	9.67	10.00	7.60	10.53	9.14	10.94	80.00
Buying food	3.33	0.00	4.67	7.14	2.40	66.67	3.57	20.00	40.00
Children's education	5.33	0.00	5.67	29.41	0.40	0.00	3.71	19.23	81.13
Family health/medical	4.00	0.00	6.00	27.78	0.40	0.00	3.57	20.00	40.00
Rent in (fixed) land	15.33	45.45	16.67	50.98	12.40	54.84	14.86	50.96	66.67
Improve your house	4.00	0.00	6.67	15.00	2.40	33.33	4.57	15.63	81.56
Social obligations	3.33	0.00	4.33	23.08	0.80	0.00	2.86	15.00	84.54

Note: N for '% needed credit' is based on all sample households in each district; '% get credit' – is from those who 'needed credit' and 'got amount needed' is from those who got credit.

Table 4.4. Sources of credit (2006/2007).

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
Transactions	Accessed credit (%)	Amount (ETB)	Accessed credit (%)	Amount (ETB)	Accessed credit (%)	Amount (ETB)	Accessed credit (%)	Amount (ETB)
Borrowing from								
- Commercial bank	1.33	630.53	0.00	0.00	0.00	0.00	0.29	630.53
- Rural micro-finance	20.00	1,361.60	6.00	1,471.57	16.40	2,426.70	12.71	1,874.51
- Money lender	0.00	0.00	2.33	687.37	4.80	788.48	2.71	751.23
- Farmer group/coop	96.67	1,003.31	100.00	1,386.64	59.60	674.96	84.86	1,140.64
- Other farmers	0.67	400	3.33	1,049.80	1.60	2,100.67	2.14	1,286.71

Note: Amount refers to those farmers who received credit.

5. Crop production

5.1 Land tenure systems

Ethiopia experiences a fierce political debate about the appropriate land tenure policy. After the fall of the socialist derg regime in 1991, land property rights have remained vested in the state and only usufruct rights have been alienated to farmers – to the disappointment of international donor agencies. This has nurtured an antagonistic debate between advocates of the privatization of land property rights to individual plot holders and those supporting the government's position. Farmers do not own title deed on 100% of land that they own, however, they can rent-out, inherit or give out as gift to friends or relatives. Thus, in our analysis, we primarily focus on information related to owned and operated landholdings instead of title deeds. Total owned landholding is composed of own used, rented-out and borrowed-out plots of land. Operated landholding is also composed of own used, rented in and borrowed in plots of land. The average landholdings of surveyed sample households during the main cropping season ('meher') (2006/07 cropping year) are described in Table 5.1. Land used during the short rainy season ('belg') is not analyzed due to the fact that only three farmers have used their land during the season. Average number of plots owned by sampled households' amounts to 7.4, with an average size of 0.38 ha. Farmers in Lume-Ejere district have relatively larger number of plots (8.3) although plot size is the lowest (0.36 ha) compared to the other two districts. The average total owned and operated land size for the whole sample amounts to 2.24 ha and 2.45 ha, respectively. Table 5.1 also shows that the mean owned landholding is smaller than the mean operated landholding for each district. The average owned landholding per individual household member is 0.35 ha in Gimbichu, 0.37 ha in Lume-Ejere and 0.32 ha in Minjar-Shenkora. The corresponding figure for the aggregate sampled households is 0.35 ha. The average total own land that is rainfed amounts to 1.99 ha whereas the average own irrigated land is negligible (0.02 ha) suggesting the need to promote and invest in irrigation technologies.

Table 5.1. Land tenure system during the main cropping 2006/07 season (N=700).

		Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Number of plots	No.	7.30	8.39	6.22	7.38
Average plot size	ha	0.38	0.36	0.39	0.38
Tenure status					
- Total owned	ha	2.33	2.56	1.79	2.24
- Total operated	ha	2.73	2.67	2.03	2.45
- Per capita owned farm size	ha	0.35	0.37	0.32	0.35
- Per capita operated farm size	ha	0.41	0.40	0.37	0.39
- Total irrigated (owned)	ha	0.01	0.04	0.00	0.02
- Total rainfed (owned)	ha	1.93	2.20	1.76	1.99

Note: Land used during the short rainy season is not analyzed. Only three farmers used their land during the short rainy season.

5.2 Cropping pattern

In this sub-section, we examine crop production pattern during 2006/07 cropping year in the survey regions. Table 5.2 shows the percentages of households growing the selected crops, the average area devoted to each crop and share of crop area allocated to improved varieties. For kabuli and desi chickpea, share of crop area allocated to improved varieties is computed based on the total chickpea farmers.

Bread wheat and white teff are the most common crops produced; about 94% and 67% of households produced bread wheat and white teff, respectively, among the sampled households in the survey regions. The average land devoted to bread wheat and white teff are 0.79 and 0.54 ha, respectively. Bread wheat occupies the largest cultivated land among all the crops. This is true across the districts with an exception of Minjar-Shenkora district where white teff occupies the largest cultivated land among all the crops. When it comes to share of crop area allocated to improved varieties, kabuli chickpea takes the lead (42.5%) followed by bread wheat (36%). However, across the districts the results show a different picture where the share of crop area allocated to improved varieties is highest for lentil (40.6%) and bread wheat (20%) in Gimbichu and Minjar-Shenkora districts, respectively. It is important to note that the share of the total crop area planted with improved seed is a good indicator of the extent to which the benefits of agricultural research are passed on to smallholders. Desi chickpea is the third most popular crop produced by 53.6% of sampled households and the average land devoted amounts to 0.22 ha. Red teff and barley are both the fourth most popular crop produced by about 38% of the sampled households although the area allocated to red teff is almost twice the land devoted to barley. The least popular crops in the survey regions include sorghum, durum wheat and mixed teff with an average share of 3.9%, 2.1% and 0.8%, respectively.

5.3 Crop yields

Crop yield is computed based on grain production per unit of land. In this report, yield is expressed as kg per hectare of land. Crop yields for 2006/07 cropping season for different crop portfolio across the three districts are presented in Table 5.3. The average yield for kabuli chickpea is relatively higher in Minjar-Shenkora district compared to the other two districts, whereas for desi chickpea there seems to be no yield difference across the three districts. Results also show that bread wheat, kabuli chickpea and durum wheat are the top three crops with the highest yield while field pea generates the lowest yield. It is important to note that higher yield does not necessarily entail high economic return since cost of production and price of output are not incorporated into the equation. We will be addressing these issues in the subsequent section. The low yield for some crops and the difference across the district may be time specific (seasonal). However, there are also a number of non-seasonal factors that may affect yields, which includes use of agricultural inputs, water and land management techniques, soil quality and other environmental conditions.

Table 5.2. Cropping pattern during 2006/07 cropping year.

Crops	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
	Households growing crop or variety (%)	Area planted (ha)	Share of crop area allocated to improved varieties (%)	Households growing crop or variety (%)	Area planted (ha)	Share of crop area allocated to improved varieties (%)	Households growing crop or variety (%)	Area planted (ha)	Share of crop area allocated to improved varieties (%)	Households growing crop or variety (%)	Area planted (ha)	Share of crop area allocated to improved varieties (%)
Kabuli chickpea	18.12	0.07	17.38	52.67	0.32	64.21	11.16	0.03	12.26	30.43	0.16	42.55
Desi chickpea	69.13	0.33	5.27	54.33	0.18	1.96	43.43	0.20	3.88	53.57	0.22	3.11
Field pea	4.03	0.01	0.00	22.67	0.06	2.82	19.52	0.03	1.53	17.57	0.04	2.26
Faba bean	23.49	0.05	0.00	47.67	0.09	0.72	23.51	0.04	0.00	33.86	0.06	0.43
Lentil	83.22	0.47	40.66	21.00	0.05	15.43	27.89	0.06	0.41	36.71	0.14	30.83
Grass pea (guaya)	36.91	0.11	3.14	30.67	0.07	3.28	2.79	0.01	0.00	22.00	0.06	3.03
White teff	12.75	0.05	0.00	69.33	0.52	3.14	96.02	0.84	0.00	66.86	0.54	1.31
Mixed teff	0.00	0.00	0.00	1.67	0.01	0.00	0.40	0.00	0.00	0.86	0.00	0.00
Red teff	69.80	0.32	3.71	51.00	0.21	1.37	4.78	0.01	0.00	38.43	0.16	2.30
Bread wheat	97.99	1.03	34.85	95.00	0.84	45.82	90.44	0.58	20.25	94.00	0.79	36.02
Durum wheat	2.01	0.01	25.00	3.67	0.03	22.14	0.40	0.00	0.00	2.14	0.01	21.29
Barley	7.38	0.01	0.00	49.33	0.11	6.26	43.43	0.10	0.00	38.29	0.08	3.43
Maize	0.67	0.00	0.00	28.33	0.03	3.24	36.25	0.04	0.00	25.29	0.03	1.49
Sorghum	0.00	0.00	0.00	1.00	0.00	0.00	9.56	0.05	0.00	3.86	0.02	0.00

Note: Average area planted is computed based on the whole sample (N=700) whereas share of crop area allocated to improved varieties is computed for those who planted the crop. For kabuli and desi chickpea, share of crop area allocated to improved varieties is computed based on total chickpea farmers, ie, improved kabuli area divided by total chickpea area.

Table 5.3. Crop yields during 2006/07 cropping year (kg/ha).

Crops	N	Gimbichu	N	Lume-Ejere	N	Minjar-Shenkora	N	Total
Kabuli chickpea	27	2374.05	158	2389.61	28	3284.77	213	2508.95
Desi chickpea	103	1912.91	163	1988.35	109	1876.62	375	1935.15
Field pea	6	1400.00	68	1243.45	49	1579.52	123	1384.97
Faba bean	35	1318.86	143	1859.81	59	1509.49	237	1693.42
Lentil	124	1520.14	63	1333.70	70	1645.14	257	1508.48
Grass pea (guaya)	55	1675.02	92	1977.82	7	2257.14	154	1881.66
White teff	19	2018.95	208	1638.55	241	1616.96	468	1642.61
Mixed teff	0	-	5	1540.00	1	1700.00	6	1566.67
Red teff	104	1577.38	153	1661.24	12	1425.00	269	1618.28
Bread wheat	146	2438.54	285	2557.92	227	2595.46	658	2544.54
Durum wheat	3	2200.00	11	2397.14	1	4000.00	15	2464.57
Barley	11	2600.00	148	2202.93	109	2283.76	268	2252.22
Maize	1	960.00	85	1580.96	91	2283.97	177	1940.83
Sorghum	0	-	3	933.33	24	2621.94	27	2434.32

Note: Yield per ha is computed for farmers growing each crop.

5.4 Fertilizer application and other inputs use

The proportion by district of households who applied various crop inputs is presented in Table 5.4. Unlike other parts of Ethiopia, a significant proportion of farmers apply chemical fertilizer on crops in the study regions. In all the three districts, 100% of sample households applied some chemical fertilizer on all of their crops although the national average is 32%. This may be related to the proximity of major urban centers and associated fertilizer costs or distribution system. Manure application is also popular especially in Lume-Ejere and Minjar-Shenkora districts. About 40% and 46.6% of sample households reported application of manure in crop production. Manure application is expected to be directly associated with availability of dairy cows (livestock resources); however, at least for Gimbichu that is not the case. Farmers in Gimbichu district tend to have more cattle compared to Minjar-Shenkora (Table 3.3) but in terms of manure use, results from Table 5.4 show the opposite. This result could be related to the fact that manure (cattle dung) is the major energy source for cooking purposes in the highlands of Ethiopia where there is a critical shortage of alternative energy sources and prevalent deforestation problems. Unlike chemical fertilizer, only 48% of sample households use at least some purchased seeds, perhaps due to use of recycled seeds. Looking across the districts, farmers in Lume-Ejere district tend to purchase seeds compared to the other two districts. The proportion of sample households using hired labor is about 64%; Lume-Ejere district taking the highest (77%). Surprisingly hiring oxen or machine is not common in the survey regions. Only about 1.3% of the sampled households hired oxen or machines, perhaps due to the availability of oxen within the household as presented in Table 3.3 (ie, oxen ownership is about 2.8 per household). Application of chemical pesticide is also popular although not like chemical fertilizer. About 70% of sample households applied some chemical in crop production and the figure does not seem to vary across the districts.

Table 5.4. Inputs application during 2006/07 cropping year (N=700).

	Percentages of households using					
District	Fertilizer (%)	Manure (%)	Purchased seeds (%)	Hired labor (%)	Hired oxen or machines (%)	Field chemicals (%)
Gimbichu	100	17.45	42.28	56.38	0.00	62.42
Lume-Ejere	100	40.00	65.33	77.00	2.33	74.67
Minjar-Shenkora	100	46.61	30.68	53.78	0.80	71.71
Total	100	37.57	48.00	64.29	1.29	71.00

Although all sample farmers use fertilizer, the impact on overall yield highly depends on the rate of application. Table 5.5 presents intensity of fertilizer and manure application on different crop enterprises during 2006/07 cropping season. The average input use is computed based on farmers who planted the crop. Generally, the average amount of fertilizer use on legume crops is low. For kabuli chickpea the average amount of DAP and urea fertilizer used per ha amounts to 16 kg and 11 kg, respectively, whereas the amount used for desi chickpea is far less. Farmers also use relatively low amount of DAP and urea fertilizer for other pulse crops such as field pea, faba bean and lentil ranging from 7 to 30 kg per ha. The amount of manure application, however, is relatively high; about 617 kg per ha for field pea and 937 kg per ha for faba bean. On the contrary, the average rate of fertilizer application for teff and wheat is the highest amongst all the crops ranging from 100 kg to 250 kg per ha.

Table 5.5. Fertilizer and manure application during 2006/07 cropping year (kg/ha).

	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
Crops	DAP	Urea	Manure	DAP	Urea	Manure	DAP	Urea	Manure	DAP	Urea	Manure
Kabuli chickpea	3.86	0.00	0.00	13.71	6.61	44.55	38.34	43.64	0.00	15.81	10.79	32.89
Desi chickpea	0.65	0.65	0.00	7.06	5.71	90.80	0.62	2.81	5.50	3.43	3.48	41.07
Field pea	0.00	0.00	666.67	23.26	6.38	47.06	69.22	8.90	1404.08	31.23	7.07	617.89
Faba bean	23.03	0.57	2057.14	24.81	9.33	609.81	37.51	30.64	1071.19	27.41	13.32	937.03
Lentil	8.53	5.79	0.00	36.34	13.38	157.46	48.57	11.62	252.01	26.91	9.24	107.24
Grass pea (guaya)	0.00	8.53	0.00	17.31	19.89	137.63	30.41	28.57	0.00	21.69	16.20	82.05
White teff	249.39	230.44	0.00	257.39	136.04	60.13	129.96	62.38	146.02	191.62	101.97	101.85
Mixed teff	-	-	-	140.00	78.00	0.00	-	-	-	128.33	78.33	0.00
Red teff	212.95	197.43	24.62	285.46	148.86	133.73	128.33	70.33	0.00	250.42	164.13	85.58
Bread wheat	191.01	157.41	20.37	234.33	124.31	67.57	140.56	87.78	387.72	192.21	118.96	168.21
Durum wheat	166.67	293.33	0.00	219.26	155.96	24.24	-	-	-	207.46	179.71	684.44
Barley	58.18	45.45	6109.09	159.97	71.67	627.80	74.07	46.60	605.45	120.69	60.35	842.80
Maize	-	-	-	7.28	5.14	3815.15	2.79	4.43	7421.91	4.92	4.74	6017.44
Sorghum	-	-	-	100.00	73.33	0.00	2.92	8.61	0.00	13.70	15.80	0.00

Note: Input use is computed for those farmers who planted the crop.

Seed and chemical application during 2006/07 cropping season is presented in Table 5.6. The average seed rate for kabuli and desi chickpea amounts to 186 and 150 kg per ha, which is relatively higher than the recommended rate of maximum 140 kg per ha. This is perhaps attributed to the challenge in measuring land size in the survey regions. Normally land size is measured in 'kert' in the surveyed areas, which is about 0.25 ha; however, this estimate varies from farmer to farmer and often it is more than 0.25 ha. The share of seed purchased for kabuli chickpea is about 48.9%, which is significantly higher compared to desi chickpea (3.1%). Results also suggest that the seed rate for both kabuli and desi chickpea in Minjar-Shenkora district is substantially lower compared to the other two districts perhaps due to the low access to seeds and information. Seed rate for wheat and barley is the highest among all other crops, amounting to over 200 kg per ha whereas the rate for teff and maize is the lowest. The application of pesticide is below 1 liter per ha for all crops.

Table 5.6. Seed and chemical use during 2006/07 cropping year.

	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
Crops	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)
Kabuli chickpea	174.47	42.59	0.44	195.97	53.62	0.44	146.01	28.68	1.01	186.49	48.85	0.52
Desi chickpea	169.50	0.97	0.17	172.27	5.91	0.25	97.54	0.92	0.83	149.79	3.10	0.40
Field pea	206.67	0.00	0.00	154.14	2.73	0.77	136.90	6.12	0.24	149.83	3.95	0.52
Faba bean	202.08	0.00	0.00	176.44	4.85	0.05	125.81	8.47	0.14	167.66	5.03	0.06
Lentil	119.60	25.85	1.30	93.08	22.22	0.47	51.78	8.57	0.80	94.62	20.26	0.96
Grass pea (guaya)	140.09	0.00	0.05	121.93	2.15	0.11	135.43	0.00	0.11	129.05	1.28	0.09
White teff	106.77	0.00	0.16	98.57	3.29	0.75	46.94	1.84	0.19	72.38	2.41	0.44
Mixed teff	-	-	-	83.00	0.00	0.15	-	-	-	75.83	16.67	0.15
Red teff	97.20	0.96	0.07	105.74	3.81	0.61	36.83	0.00	0.00	99.37	2.54	0.37
Bread wheat	235.64	8.24	0.19	232.34	26.39	1.23	187.54	6.19	0.49	217.52	15.37	0.74
Durum wheat	246.67	0.00	0.00	244.81	13.64	0.59	-	-	-	248.86	10.00	0.43
Barley	224.00	0.00	0.00	255.74	7.37	0.72	225.46	2.73	0.22	242.06	5.17	0.49
Maize	-	-	-	73.70	9.41	0.18	62.79	0.00	0.00	68.19	4.49	0.09
Sorghum	-	-	-	47.33	33.33	0.27	16.61	8.33	0.00	20.02	11.11	0.03

Note: Input use is computed for those farmers who planted the crop.

We also computed frequency of plowing, weeding and labor used in crop production as presented in Table 5.7. It is important to note that the figures are computed for those farmers growing the crop and labor use includes both family and hired ones. Results suggest that frequency of ploughing is greater than frequency of weeding in almost all crops. The average number of ploughing for kabuli and desi chickpea amounts to 5.4 and 4.5, respectively, whereas the frequency of weeding for the same crops is about 2.4 and 1.6, respectively. Grass pea and bread wheat are the two crops that

require more plowing compared to other crops whereas white teff and bread wheat require more weeding. The average total labor used measured in person days is about 97 per ha for kabuli and 83 per ha for desi chickpea. Farmers in Minjar-Shenkora district use substantially higher amount of labor for kabuli chickpea production while using less labor for desi chickpea compared to the other two districts. It is also apparent from Table 5.7 that maize is a labor intensive crop requiring about 147.5 person days per ha followed by red teff at 110.9 person days per ha.

5.5 Profitability of different crops

Normally farmers engage in production of a certain crop only if the net-returns (ie, gross returns less the costs of variable inputs) are higher compared to other alternative crops. Crops often compete for limited inputs (especially land and labor) and a rational farmer will engage in the production of a certain crop only if it remains relatively competitive. However, it is important to remember that smallholder farmers often opt for maximizing their utility rather than profit unlike big commercial farmers. These entail that farmers prefer to engage in crop enterprise with low risk - low net-return instead of choosing high risk-high return crops. For our analysis, however, the gross margin approach has been adopted for comparing the relative profitability of different crop portfolio. Table 5.8 presents gross income, variable cost and return to land and management for selected crop portfolio during 2006/07 cropping season. Gross income is measured as the total receipts received from the sales of produce plus the value of any retained output. The variable costs include manure and/or fertilizers, seed (own and purchased), chemicals, labor (hired and family) and oxen (hired and own). The gross margins are computed as returns to land and management. As shown, kabuli and desi chickpea have the third and fourth highest gross margin after barley and white teff in terms of returns to land and management among all cultivated crops. When comparing against legumes, chickpea generally stands out to be the crop with the highest gross margin. The average return for barley and white teff is about 8,476 ETB and 7,996 ETB per ha, respectively, whereas kabuli and desi chickpea have a net-return of about 7,532 ETB and 7,088 ETB per ha. When we compare across the three districts, farmers in Minjar-Shenkora tend to have the highest gross margin for kabuli and desi chickpea and white teff whereas farmers in Gimbichu have the highest gross margin for barley. Maize is a crop with the lowest return suggesting the low competitiveness of the enterprise compared to other crop portfolio.

5.6 Crop utilization

Table 5.9 presents utilization of crops produced during 2006/07 cropping season. As shown, over 70% of kabuli chickpea and 55% of desi chickpea produced are sold in the market suggesting the relevance of chickpea as a cash crop in the study area. Kabuli chickpea is the first crop primarily produced for the market compared to all other crops grown in the study regions and it is followed by lentil (67.3%). Desi chickpea takes the third rank in terms of share of produce sold in the market. On the other hand over 85% of maize, 72.5% of barley and 71% of red teff produced by sample households are used for home consumption. The share of crop produced given as a gift, tithe or donations are insignificant and is below 1% for most of the crops, while the proportion saved as seed for next cropping seasons ranges from 4% for sorghum to 19% for field pea.

Table 5.7. Frequency of plowing, weeding and person days used in crop production.

Crops	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
	Frequency of plowing (Number)	Frequency of weeding (Number)	Total labor used (Person-days/ha)	Frequency of plowing (Number)	Frequency of weeding (Number)	Total labor used (Person-days/ha)	Frequency of plowing (Number)	Frequency of weeding (Number)	Total labor used (Person-days/ha)	Frequency of plowing (Number)	Frequency of weeding (Number)	Total labor used (Person-days/ha)
Kabuli chickpea	4.81	2.07	107.99	5.56	2.45	86.74	4.83	2.17	143.50	5.36	2.36	97.12
Desi chickpea	4.15	1.16	81.36	4.20	1.77	86.21	5.14	1.78	80.91	4.46	1.60	83.34
Field pea	3.67	0.83	93.33	2.75	1.16	64.32	2.61	0.96	93.05	2.74	1.07	77.18
Faba bean	2.97	1.26	109.83	2.97	1.81	102.50	2.98	2.05	99.78	2.97	1.79	102.90
Lentil	4.81	2.16	94.39	3.22	2.22	128.92	3.29	1.89	100.47	4.01	2.10	104.51
Grass pea (guaya)	3.39	0.52	66.97	3.43	1.25	84.05	3.43	3.86	79.04	3.42	1.10	77.69
White teff	6.47	2.00	163.35	7.88	3.39	103.36	6.71	3.87	94.00	7.22	3.58	100.95
Mixed teff	-	-	-	4.40	1.20	64.30	-	-	-	4.33	1.50	74.25
Red teff	5.43	2.22	113.65	4.28	2.41	110.16	4.42	1.58	96.17	4.73	2.30	110.88
Bread wheat	8.97	3.17	85.89	6.75	2.73	80.98	6.07	2.63	80.25	7.00	2.79	81.81
Durum wheat	3.33	1.33	92.67	5.36	2.27	74.00	-	-	-	4.87	1.93	76.67
Barley	3.45	1.64	116.36	3.55	1.71	90.19	3.65	1.25	76.49	3.59	1.52	85.66
Maize	-	-	-	3.28	2.41	145.46	3.39	2.41	149.32	3.34	2.41	147.54
Sorghum	-	-	-	2.33	2.33	52.13	3.29	1.96	61.29	3.19	2.00	60.27

Note: N equals farmers who planted the crops.

Table 5.8. Gross income and returns (ETB/ha) for selected crop portfolio during 2006/07 cropping season.

	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
Crops	Gross income	Variable cost	Return to land and management	Gross income	Variable cost	Return to land and management	Gross income	Variable cost	Return to land and management	Gross income	Variable cost	Return to land and management
Kabuli chickpea	10387.01	2697.26	7689.75	10282.71	3178.75	7103.96	13971.53	4253.84	9717.69	10795.75	3263.69	7532.07
Desi chickpea	9917.02	2522.42	7394.60	10238.85	3591.04	6647.81	9818.47	2361.56	7456.92	10028.27	2940.16	7088.11
Field pea	4844.00	2667.80	2176.20	4302.34	4705.97	-403.62	5465.15	2623.40	2841.75	4792.00	3776.90	1015.10
Faba bean	4154.40	2896.92	1257.48	5858.41	2594.74	3263.67	4754.90	2647.71	2107.19	5334.26	2652.31	2681.95
Lentil	7752.73	3319.27	4433.46	6801.86	2606.57	4195.29	8390.19	2238.22	6151.98	7693.27	2850.11	4843.16
Grass pea (guaya)	8609.60	2089.93	6519.67	10165.99	3425.55	6740.44	11601.71	2630.34	8971.37	9671.71	2910.41	6761.30
White teff	14940.21	4832.47	10107.74	12125.27	5092.49	6659.28	11965.48	2971.90	8993.59	12155.32	3992.94	7995.60
Mixed teff	-	-	-	5744.20	2804.01	2940.19	-	-	-	5843.67	3208.21	2635.46
Red teff	5883.61	4102.82	1780.79	6196.41	5051.18	1145.24	5315.25	2784.65	2530.60	6036.17	4583.42	1452.75
Bread wheat	9924.85	3941.26	5983.59	10410.73	5169.27	5241.46	10563.51	3618.29	6945.22	10356.26	4359.48	5996.78
Durum wheat	6380.00	4341.53	2038.47	6951.71	3763.96	3187.76	-	-	-	7147.26	4026.97	3120.28
Barley	15184.00	5791.22	9392.78	12865.12	5444.74	7420.38	13337.14	3532.73	9804.41	13152.97	4677.05	8475.92
Maize	-	-	-	3320.01	3687.75	-367.74	4796.35	4155.13	641.21	4075.73	4009.59	66.14
Sorghum	-	-	-	2240.00	2082.36	157.64	6292.67	1348.06	4944.61	5842.37	1429.65	4412.72

Note: N equals farmers growing the crops and family labor is valued at minimum wage, which is about 10 ETB per man-day. Variable cost includes fertilizer (DAP & Urea), manure, chemicals, seeds (own & purchased), labor (hired and family labor) and oxen (hired & own).

Table 5.9. Utilization of crops produced during 2006/07 cropping year.

Crops	Gimbichu				Lume-Ejere				Minjar-Shenkora				Total			
	Sales (%)	Saved Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Saved Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Saved Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Saved Seed (%)	Gift (%)	Con-sumption (%)
Kabuli chickpea	64.12	11.50	0.00	24.38	74.98	11.45	0.59	12.98	55.88	8.89	6.29	28.94	71.04	11.10	1.31	16.55
Desi chickpea	56.11	14.08	0.38	29.43	55.06	13.29	0.71	30.94	53.75	9.13	0.64	36.48	54.97	12.33	0.60	32.09
Field pea	20.37	12.31	0.00	67.31	28.51	15.12	0.00	52.17	24.62	15.62	0.13	59.63	26.53	15.18	0.05	55.94
Faba bean	13.40	22.46	1.38	62.76	28.67	16.63	0.30	54.40	18.04	12.90	0.53	64.71	23.93	16.60	0.51	58.06
Lentil	77.48	11.14	0.30	11.08	45.01	12.09	0.00	36.03	69.45	6.70	0.14	23.70	67.36	10.12	0.18	20.68
Grass pea (guaya)	50.65	14.15	0.66	34.53	32.75	15.51	0.61	46.65	33.36	15.57	3.57	47.50	39.09	15.04	0.78	42.42
White teff	36.30	8.57	0.00	55.13	53.93	11.04	0.46	34.57	53.45	5.75	1.16	39.64	52.94	8.22	0.80	38.05
Mixed teff	-	-	-	-	28.33	12.83	0.00	58.83	-	-	-	-	28.33	12.83	0.00	58.83
Red teff	21.84	11.94	0.12	66.09	14.23	12.06	0.44	73.28	9.13	6.44	0.00	84.43	16.88	11.75	0.29	71.07
Bread wheat	42.11	12.17	0.27	45.45	41.19	11.91	0.86	46.04	37.22	10.73	0.20	51.84	40.03	11.57	0.50	47.90
Durum wheat	43.75	6.25	0.00	50.00	44.24	12.57	1.09	42.10	-	-	-	-	43.77	10.34	0.71	45.18
Barley	22.87	12.70	1.04	63.39	8.95	17.92	0.52	72.61	13.61	12.70	0.36	73.33	11.41	15.60	0.48	72.51
Maize	-	-	-	-	2.43	10.16	0.60	83.57	5.22	7.68	0.19	86.91	3.88	8.86	0.38	85.36
Sorghum	-	-	-	-	0.00	16.67	0.00	83.33	0.00	2.99	0.23	51.31	41.68	4.13	0.21	53.98

Note: N equals farmers who planted the crops.

6. Livestock production

In Ethiopia, livestock production accounts for nearly 15% of the total GDP and about 40% of the agricultural GDP (Sendros and Tesfaye 1998). This does not include the contribution of livestock to the national economy in terms of draft power, manure and transport services. Export of livestock and livestock by-products have also appreciable contribution to foreign exchange earnings of the country amounting to about 15% and 70% of all export earnings and earnings from agricultural exports excluding coffee, respectively. Although varying from region to region, the role of livestock in the Ethiopian economy was greater than the figures suggest. Almost the entire rural population was involved in some way with animal husbandry, whose role included the provision of draft power, food, cash, transportation, fuel, and, especially in pastoral areas, social prestige. In the highlands, oxen provided draft power in crop production. In pastoral areas, livestock formed the basis of the economy.

Ethiopia has great potential for increased livestock production, both for local use and export. However, expansion was constrained by inadequate nutrition, disease, lack of support services such as extension services, insufficient data with which to plan improved services, and inadequate information on how to improve animal breeding, marketing, and processing. The high concentration of animals in the highlands, together with the fact that cattle are often kept for status, reduces the economic potential of Ethiopian livestock. The highlands of Ethiopia account for not only over 60% of the highlands of eastern and southern Africa, but also about 80% of the livestock mass of the region (de Leeuw and Rey 1995). They have also indicated that this is due to a larger proportion (more than 80%) of cattle in the zone, the majority of which are oxen required for traction purposes.

6.1 Types of livestock

Like many other parts of Ethiopia, in the study area livestock are used for different purposes. Cattle are used especially for milk and meat, source of income and as draught power. Donkeys, horses and camels are used for transportation, sheep and goats for generating income. Farmers also generate income from the sale of animal products such as eggs, cheese, butter, milk, skin and hides. The non-edible animal products such as hides and skins play a great role in supplementing the farmer's income. Table 6.1 presents livestock ownership during 2006/07 cropping season. According to the survey result, oxen ownership was reported by 94.7% of the sample respondents with an average size of 2.8 suggesting the critical role of oxen especially as a source of draft power for crop production. In examining across the districts, results show that although the proportion of households owning oxen is highest in Gimbichu, the average owned is the highest in Lume-Ejere district. The second most important livestock in the study regions is donkeys, which are owned by about 84.6% of the sampled respondents; 89.9% in Gimbichu, 85.3% in Lume-Ejere and 80.5% in Minjar-Shenkora. The average ownership is about 2.1 although when examining across districts it seems to be a substantial difference. Farmers in Lume-Ejere district have relatively higher number of donkeys (3.7) compared to the other two districts. Donkeys are primarily used for transportation of goods and humans and they are a critical part of the rural economy in the area. Chickens are owned by about 79.8% of the sampled respondents and they are often used as a source of cash. The fourth most important livestock is cattle and owned by 61.9% of the households. The proportion of ownership is the highest in Gimbichu district (76.5%) and lowest in Minjar-Shenkora (61.9%) whereas the average ownership is the highest in Lume-Ejere district (1.3).

Table 6.1. Livestock ownership during 2006/07 cropping year (N=700).

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
	Proportions of households (%)	Average owned (number)	Proportions of households (%)	Average owned (number)	Proportions of households (%)	Average owned (number)	Proportions of households (%)	Average owned (number)
Cows	76.51	1.24	67.00	1.31	47.01	0.67	61.86	1.06
Oxen	97.32	2.92	92.00	3.12	96.41	2.41	94.71	2.82
Other cattle	82.55	2.26	81.00	2.55	56.97	1.16	72.71	1.99
Sheep	79.19	5.67	36.67	2.17	47.81	2.00	49.71	2.86
Goats	8.05	0.27	53.00	3.67	27.09	1.28	34.40	2.09
Mature donkeys	89.93	0.27	85.33	3.67	80.48	1.28	84.57	2.08
Mature horses	46.31	0.37	15.00	0.15	4.78	0.05	18.00	0.16
Camel	0.00	0.00	0.00	0.00	22.71	0.18	8.14	0.07
Chicken	83.22	4.72	80.67	4.12	76.49	4.27	79.71	4.30
Beehives	14.77	0.21	12.00	0.25	7.97	0.18	11.14	0.22

6.2 Crop-livestock interactions

Most smallholder farming systems of Ethiopia are characterized by integrated management of crop and livestock components. In these mixed crop-livestock farming systems, sustainability is maintained through the continuous recycling of resources, energy and nutrients. Livestock are kept to support crop production through provision of draft power and manure, diversify household income sources through sales of meat and milk, and serve as a capital asset. Conversely, crop residues from crop production (cereals and pulses) support the livestock by providing feed sources. Farmers integrate crop and animal production to maximize returns from their limited land and capital, minimize production risk, diversify sources of income, provide food security, and increase productivity.

Percentages of households using various feed stuff during 2006/07 cropping season is presented in Table 6.2. As shown, about 10.5% of the sample respondents use crop residue as source of animal feed whereas about 5.5% use green fodder or grazing land. Grazing of crop fields takes place immediately after harvesting when harvested crops are moved for threshing. The share is relatively low compared to other cereal producing areas, perhaps farmers prefer to use the residue as a source of income by selling at nearby village markets instead of feeding animals. About 10% and 30% of the households use hay and concentrates as animal feed in the survey area, respectively.

Table 6.2. Percentages of households using various feed stuff during 2006/07 cropping year (N=700).

District	Crop residue (%)	Green fodder/ grazing land (%)	Hay (%)	Concentrates (%)
Gimbichu	10.67	11.67	7.60	20.00
Lume-Ejere	15.33	7.00	12.00	36.00
Minjar-Shenkora	4.67	1.00	10.80	28.43
Total	10.52	5.84	10.63	29.89

In Ethiopia, livestock play an important role in the rural economy and soil fertility management. They are the most important source of manure, while the droppings of small animals tend to be used as a fallback when other sources of fertilizer are in short supply. Oxen, donkeys and horses provide draft power for land preparation and means of transporting farm inputs and outputs. Livestock ownership is an indicator of wealth status, particularly in the smallholder farming systems of Ethiopia, with better-off households owning larger herds. Thus, access to livestock is expected to be positively correlated with crop production. Access to draft power gives famers the opportunity to manage large farm size and increase farm production. The survey results clearly showed the integration of crop and livestock production. As indicated in Table 6.3, all sample farmers reported the use of oxen power for crop production. About 37.6% of households use manure in crop production and the figure is the highest in Minjar-Shenkora district. The proportion of households using livestock for threshing and transporting is about 97% and 84.9%, respectively.

Table 6.3. Integration of livestock and crop production during 2006/07 cropping year (N=700).

Districts	Use of oxen in crop production (%)	Manure application on crop production		Use of livestock for threshing (%)	Use of livestock for transporting (%)
		(%)	(kg)		
Gimbichu	100.00	17.45	135.33	100.00	97.92
Lume-Ejere	100.00	40.00	339.46	99.00	78.52
Minjar-Shenkora	100.00	46.61	693.00	93.60	84.20
Total	100.00	37.57	421.98	97.29	84.87

Note:

a) Use of oxen in crop production is synonymous with farmers who ploughed their land at least one time. No data collected separately on share of farmers using oxen in crop production but the assumption is that all who plough land use oxen.

b) Use of livestock for threshing applies for chickpea.

6.3 Gross margins from livestock

Gross margin analysis is a technique used to evaluate and compare the profitability of different enterprises. Although different components of livestock can be seen as distinct enterprises, we treated livestock production as one activity for the sake of simplicity. The summary of gross margin analysis of livestock production is presented in Table 6.3. The gross margin here is defined as the value of output less the variable costs attributed to it. While this is a familiar technique for most farm management, there are a number of important issues when applying gross margin model to livestock enterprise. Livestock outputs should include all animals and produce sold and purchased. It requires the monitoring of animals slaughtered for home consumption and milk used in the house. It will also require the recording of animal gifts to, and from, the households. Finally the usual time period for gross margin analysis is one year, which is shorter than the life cycle of larger animals. Therefore, there is a need to recognize a change in herd value, which is not a cash item but change in capital value. Gross margin analysis assumes that there is a set of fixed assets on the farm and it only considers inputs that vary according to the scale of enterprise. Thus in our analysis the benefits include value of milk produced, value of animals sold, value of meat produced, value of manure produced and value of oxen used in crop production, whereas the variable cost includes value of animals bought, cost of animal feed and husbandry and marketing cost. The value of animals that died and were born during the year is not included

since we assumed that both cancel out each other in the analysis. Our data also did not capture the change in the value of herd (change in capital value), which should be added in the output category. As shown in Table 6.4, the average gross margin of livestock production in the survey area is about 2,639 ETB, which we believe is the lower limit. When we examine across districts, farmers in Gimbichu district tend to have large gross margin from livestock compared to the other two districts.

Table 6.4. Gross margin analysis for livestock during 2006/07 cropping year (N=700).

	Unit	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Benefits					
- Value of milk produced (milk)	ETB	620.20	541.74	206.41	438.20
- Value of animals sold	ETB	1663.15	1180.98	1024.52	1227.51
- Value of meat produced (slaughtered animals)	ETB	248.63	244.88	107.81	196.53
- Value of manure produced	ETB	34.31	85.79	167.57	104.16
- Value of oxen in crop production	ETB	1898.65	1958.54	1641.05	1831.95
Costs					
- Value of animals bought	ETB	536.97	462.08	574.05	518.17
- Feed/fodder (including cost of crop residue fed to animals) and husbandry costs	ETB	632.67	801.36	454.55	641.10
- Marketing cost	ETB	0.30	0.22	0.17	0.22
Gross margin	ETB	3295.01	2748.25	2118.58	2638.85

Note: Value of animals that died and were born during the year is not included. We assumed that both cancel out each other in the analysis and do not affect the margin.

7. Non-farm income diversification

7.1 Major non-farm activities

According to Thomas (1997), non-farm income is defined as income from local non-farm wage employment, local non-farm self-employment, and migration income. Generally there are broadly two categories of non-farm activities being pursued by the households. One is the non-farm proper, which includes the livelihood sources, namely, artisans/service, trade and white-collar jobs. These are either activities that are being pursued by households on a regular or seasonal basis within the village to meet the local demand or government jobs pursued regularly within or outside the village, or manufacturing or service sector jobs undertaken in the village regularly. The second form of non-farm activities is what may be called non-farm migratory. This activity is classified under wage labor in activities like construction, earthwork, factory work and loading (Shylendra and Thomas 1995). According to Woldehanna (2000), non-farm activities in which the farm household participates can be categorized into wage employment and self-employment activities.

It has been well documented that non-farm activities are a critical survival strategy for rural farm households although it varies from region to region. Non-farm activities have an important role in household economy. Under credit constraint and risky environment, non-farm income can increase the household's farm productivity by mitigating risk and promoting farm investment (Evans and Ngau 1991) and finance consumption. Non-farm income provides farm households with insurance against the risk of farming and thereby enables them to adopt new technologies. More importantly, non-farm activities offer cyclical and seasonal employment, to supplement meager farm incomes in many drought-prone areas of Africa.

7.2 Participation in non-farm activities

Rural households in survey regions participate in various non-farm activities and a summary of participation for the three districts is shown in Table 7.1. Most non-farm work is temporary and does not require skilled labor. Results show that over 14% of the sampled respondents are involved in commercial activities such as grain mills, shops, trade and tailoring. Trade in the study area is not only bound within the study locality but buying and selling is also carried out in other places outside the study area. Traded items like cereals and livestock are bought on a market day and are sold on the same or another market day or at another place. In transporting traded items, transportation animals such as horses, mules and donkeys play an important role. Besides this, it can be self-carried, or transported using hired vehicles and hired labor. The proportion of households that participate in wage employment (casual and long-term employment) is about 6.9%. About 5.7% of the households participate in selling of crop residue whereas about 5.4% participate in sale of dung cake for fuel. Generally the results suggest that the role of non-farm activities is limited in the livelihood of households in the study area compared to crop and livestock production.

Table 7.1. Non-farm activities during 2006/07 cropping year (N=700).

Activities	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
	Households receiving income (%)	Income (ETB)	Households receiving income (%)	Income (ETB)	Households receiving income (%)	Income (ETB)	Households receiving income (%)	Income (ETB)
Selling of crop residue	6.67	30.73	7.33	51.78	3.20	30.12	5.71	39.53
Rented out land	2.00	26.00	6.33	135.23	3.20	87.10	4.29	94.63
Rented out oxen for ploughing	0.00	0.00	0.00	0.00	0.80	2.64	0.29	0.94
Labor (casual and long-term employment)	10.67	251.15	5.00	55.58	6.80	124.36	6.86	122.05
Non-farm agribusiness (eg, grain mill)	0.00	0.00	1.67	46.67	1.20	45.12	1.14	36.11
Other business (shops, trade, tailoring, etc)	18.67	415.07	9.33	279.42	14.00	258.34	13.00	300.96
Pension income	1.33	5.07	0.00	0.00	1.20	30.78	0.71	12.08
Remittances	0.00	0.00	0.67	17.33	1.20	6.96	0.71	9.91
Sale of own trees (firewood, etc)	10.67	79.36	4.33	38.63	1.60	8.88	4.71	36.73
Sale of dung cake for fuel	5.33	27.40	9.67	80.22	0.40	3.60	5.43	41.54
Sales from CPRs (firewood, charcoal making, etc)	2.00	22.40	0.67	9.26	1.60	12.24	1.29	13.14
Other (marriage gifts, drought relief, etc)	43.33	161.09	27.33	166.17	30.00	118.04	31.71	147.89

Notes: Income from agribusiness represents the net-income.

8. Poverty analysis

Poverty still poses a major challenge in most of the developing world, especially in sub-Saharan Africa. By many accounts, Ethiopia is one of the poorest countries in sub-Saharan Africa. Rural poverty constitutes the major form of poverty in Ethiopia. The majority of people in Ethiopia (83%) are living in rural areas where poverty is more widespread than in urban areas. In 2005/2006, about 39% of the population lived below the nationally defined poverty line, while it is 45% for rural population and 37% for urban population. On the average, the income of the rural poor is 12.1% below the poverty line, while it is 10.1% for the urban poor (Woldehanna 2004).

8.1 Household income from different sources

The income profile of sample households is summarized in Table 8.1, which shows average household income and income share by different income sources and by district. The average annual farm household income of the total sample is about 16,797 ETB for 2006/07 cropping season. The income sources include farm income (crop and livestock), off-farm activities and wage income. Income from crop production is calculated as production value of farm products minus paid-out costs, which include costs on seeds, fertilizer, chemicals, hired labor and oxen rental, including own oxen. Livestock income is also calculated as production value minus paid-out costs. Production value includes animal sales, animal consumed and value of livestock products, such as milk sale, value of own oxen used in production and value of manure. Paid-out costs for livestock production include purchased feeds including crop residues, expenditure on artificial insemination (AI) service and animal health care service. Non-farm activities include selling of crops residue, renting out land, renting out oxen, net-income from non-farm agribusiness, etc. Wage income only includes wages for permanent and causal non-farm labor activities.

Out of the total income, crop income accounts for 78% on average whereas livestock and non-farm activities occupy 16.4% and 5.5% of the total income, respectively. The share of wage income was insignificant compared to other sources (0.8%). Among the three districts, the average household income for the last 12 months was the highest at 18,702 ETB in Minjar-Shenkora district, while it was the lowest in Lume-Ejere at 15,650 ETB. In Minjar-Shenkora district, the share of crop income occupies 84% of the total income, which was the highest compared to the other two districts. However, the share of livestock, non-farm activities and wage income was the highest in Gimbichu district.

Table 8.1. Household income and income share (Jan–Dec 2007) (N=700).

		Income Share			
District	Household income (ETB)	Crop income (%)	Livestock income (%)	Non-farm activities (%)	Wage income (%)
Gimbichu	15,894.05	70.49	21.81	6.22	1.48
Lume-Ejere	15,650.23	77.34	17.71	4.36	0.59
Minjar-Shenkora	18,702.44	84.17	11.63	3.58	0.62
Total	16,796.57	78.33	16.40	4.48	0.79

Next, sample households were stratified into quartiles based on income level (Table 8.2). Contrary to our expectation, it was found that households in lower income quartiles had lower income shares coming from crop production than households in higher income quartiles and this result was consistent across all the three districts. The proportion of crop income was about 72% among households in the lowest quartile compared to 82% for highest income quartile. In contrast, households in lower income quartiles had larger income shares coming from livestock compared to households in larger income quartile. For instance, households in the lowest income quartile earned 20.6% of income from livestock whereas the corresponding value was 13% for the upper quartile. Although the share was relatively low, households in the lower quartile tended to have more income share from non-farm activities and wage compared to households in the upper quartile. From this table, two important conclusions could be drawn about sources of income in rural Ethiopia. First, crop income is the most important income source for poor households. Thus, increasing crop productivity is a crucial issue to secure and increase farm household income. Second, crop and livestock (farm) income may not be enough to enable households to move up income quartiles (Reardon 1997, Jayne et al. 2003). The non-farm income share is high among the lowest income quartile and it is clear that access to non-farm income plays a critical role in escaping from poverty.

8.2 Total expenditure

Major food expenses among households in Ethiopia are difficult to measure, particularly in rural areas, because of problems related with measurement units, prices and quality. The consumption period could be a week or a month depending on the nature of the food item, the household budget cycle, and consumption habits. Own-consumption is the dominant source of food consumption in rural Ethiopia. Cereal, which makes up the bulk of food consumption, is increasingly obtained from markets as farmers swap high cash-value cereals such as teff for lower-value ones, such as maize and sorghum. Even so, food in rural areas is derived from own sources, which makes valuation difficult. The situation is better in the urban setting, where the bulk of consumption items are obtained from markets and measurement problems are less. Despite the challenges an attempt was made to estimate the per capita cash expenditure of farm households using our survey data.

Per capita cash expenditure profiles for the last twelve months in each district are presented in Table 8.3. In the survey, data were collected on significant consumption expenditures on six major categories including food grains, livestock product (such as meat), vegetables and other food items (such as sugar, salt), beverages (such as coffee, tea leaves), clothing and energy (such as shoes, kerosene) and social activities (contribution to churches or local organizations, education and medical expenditure) over the last twelve months. Information was also gathered on frequencies of purchase, such as once a week or three times in the last twelve months, and average spending per purchase. The average per capita cash expenditure for the entire sample is about 818 ETB. Lume-Ejere district has the highest average per capita cash expenditure at 867 ETB. The share of clothing, bedding and energy is about 31.6% on average and takes the largest share among the six categories. The second and third largest share of expenditure is vegetables and other food items, which occupy about 23.9% and social activities, which account for about 17%. Share of food grains is the lowest among all the categories.

Table 8.2. Household income by quartile (Jan–Dec 2007) (N=700).

	Gimbichu				Lume-Ejere				Minjar-Shenkora				Total			
	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Household income	6204	12004	18180	32248	1714	12324	17985	34379	6843	12350	18255	31594	3898	12251	18142	32895
Income Share (%)																
- Crop income	64.40	69.41	73.49	77.63	72.36	77.37	79.16	82.10	79.96	83.93	84.84	85.83	71.92	77.76	80.95	82.71
- Livestock income	24.58	23.52	21.30	16.20	22.11	18.44	15.22	13.65	11.99	12.24	11.18	11.39	20.65	17.44	14.26	13.25
- Non-farm activities	10.23	5.06	4.34	4.00	4.26	3.73	5.22	4.26	7.45	3.51	3.41	1.81	6.42	3.99	4.23	3.26
- Wage income	0.78	2.01	0.87	2.16	1.26	0.46	0.40	0.00	0.60	0.31	0.57	0.97	1.01	0.80	0.55	0.79

Table 8.3. Per capita cash expenditure and expenditure share (Jan–Dec 2007) (N=700).

		Expenditure Share					
District	Per capita household cash expenditure (ETB)	Food grains (%)	Livestock products (%)	Vegetables & other food items (%)	Beverages, drinks & other consumables (%)	Clothing, bedding & energy (%)	Social activities (%)
Gimbichu	703.07	4.06	13.06	24.42	9.59	31.35	17.53
Lume-Ejere	867.39	4.88	15.30	22.56	8.15	32.30	16.81
Minjar-Shenkora	826.82	6.85	14.77	22.29	8.16	30.91	17.03
Total	817.87	5.41	14.63	22.86	8.46	31.60	17.04

Note: Per capita is defined as total expenditure divided by household size.

Shares of cash expenditure in six categories by the per capita cash expenditure quartile are presented in Table 8.4. Contrary to our expectation, poor households did not spend a high proportion of expenditure on food items compared to the rich ones. For instance, households in the lowest quartile spend about 49.7% of the total cash expenditure on items in food categories (food grains, livestock products, vegetables and beverages), while households in the highest quartile spend about 53.7%. The households in the highest quartile had almost similar cash expenditure on non-food items as households in the lowest quartile.

Next, self-consumption of crops, livestock, and livestock products were evaluated. The results are presented in Table 8.5. The per capita self-consumption value is the highest in Minjar-Shenkora district followed by Lume-Ejere. The average value of per capita self-consumption for the whole sample is about 1,345 ETB. By combining the per capita cash and home product expenditure, we obtain per capita total expenditure (Table 8.5). The average per capita total expenditure during 2006/07 cropping year is about 2,163 ETB. It is important to note that per capita cash expenditure is significantly lower than per capita self-consumption in all the three districts, which is typical of Ethiopian rural households.

Figure 8.1 displays the distribution of per capita total expenditure for twelve months. The peak of the distribution is at about 2,000 ETB, and the distribution has a long tail on the right-hand side, indicating that there are a few households with significantly larger expenditure profiles.

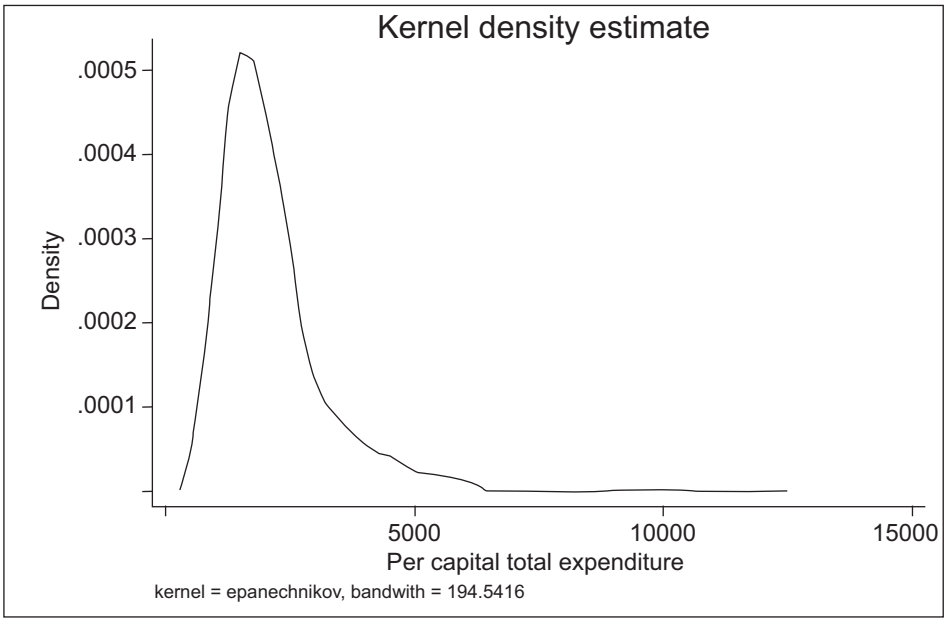

Figure 8.1. Distribution of per capita expenditure for twelve months in ETB.

8.3 Poverty profile

8.3.1 Measuring poverty: concept

Two major approaches could be identified to measure poverty level**.** Ravallion (1994) categorized them as the welfarist and the non-welfarist approaches. The first approach tends to concentrate in practice mainly on comparisons of “economic well-being”, which (for simplicity) is also called “standard of living”. This approach has strong links with traditional economic theory, and it is also widely used by economists in the operations and research work of organizations such as the World

Table 8.4. Per capita cash expenditure share by quartile (Jan–Dec 2007).

	Female-headed households (N=49)				Male-headed households (N=651)				All households (N=700)			
	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Per capita cash expenditure (ETB)	384.62	575.59	797.03	1534.98	410.54	525.80	783.81	1338.17	385.65	573.01	795.83	1516.99
Expenditure share (%)												
- Food grains	8.86	5.61	6.46	9.12	4.04	4.45	5.81	6.86	4.23	4.51	5.87	7.07
- Livestock products	13.83	10.67	16.03	16.75	14.01	14.51	13.58	16.38	14.01	14.31	13.80	16.42
- Vegetables & other food items	25.84	24.26	26.01	22.40	22.96	23.95	22.70	21.32	23.07	23.96	23.00	21.42
- Beverages, drinks & other consumables	9.18	6.20	8.73	6.34	8.32	7.77	9.03	9.03	8.35	7.69	9.01	8.78
- Clothing, bedding & energy	26.95	38.13	27.99	28.69	33.40	32.68	32.32	28.37	33.14	32.96	31.93	28.40
- Social activities	15.35	15.13	14.78	16.70	17.28	16.64	16.56	18.04	17.20	16.56	16.40	17.92

Table 8.5. Per capita home and cash expenditure (in ETB) by district (N=700).

	Per capita expenditure		
Districts	Total expenditure	Cash expenditure	Home consumption of own products
Gimbichu	1774.48	703.07	1071.41
Lume-Ejere	2209.99	867.39	1342.59
Minjar-Shenkora	2339.49	826.82	1512.67
Total	2163.72	817.87	1345.86

Bank, the International Monetary Fund, and ministries of finance and planning of both developed and developing countries. The second approach has historically been advocated mainly by social scientists other than economists and partly as a reaction to the first approach. Nevertheless, the second approach has also been recently and increasingly suggested by economists and non-economists alike as a multidimensional complement to the classical standard of living approach. The measurement of poverty is usually conducted at household level and then aggregated for a regional or national level. Poverty assessment can, however, be carried out for every individual, in order to make intra household comparisons possible, eg, to show inequalities in the distribution of consumption between household members.

The welfarist approach is strongly anchored in classical microeconomics, where, in the language of economists, “welfare” or “utility” are generally key in accounting for the behavior and the well-being of individuals. Classical microeconomics usually postulates that individuals are rational and that they can be presumed to be the best judges of the sort of life and activities that maximize their utility and happiness. Given their initial endowments (including time, talent, land and capital), individuals make production and consumption choices using their set of preferences over bundles of consumption and production activities, and taking into account the available production technology and the consumer and producer prices that prevail in the economy. Under these assumptions and constraints, a process of individual free choice will maximize the individuals’ utility. Welfarist comparisons of poverty almost invariably use imperfect but observable proxies for utilities, such as income or consumption. These money-metric indicators are often adjusted for differences in needs, prices, and household sizes and compositions, but they clearly do remain imperfect indicators of utility and well-being. Indeed, economic theory tells us little about how to use consumption or income to make interpersonal comparisons of well-being. Besides, the consumption and income proxies are also rarely able to take full account of the role of public goods and non-market commodities, such as safety, liberty, peace and health, in determining well-being. In principle, such commodities can be valued using reference or “shadow” prices. In practice, it is difficult to do so.

Among different sets of poverty measures much quantitative poverty analysis uses a set of poverty measures known as the FGT (Foster-Greer-Thorbecke) poverty indicators. In order to measure poverty, a poverty line has first to be defined, which can be absolute or relative. An absolute poverty line is the threshold below which families or individuals are considered to be lacking the resources to meet the basic needs. It can either be defined at national level, estimating what it means to be poor in each country‘s situation, or at international level. In order to make international comparison possible, the World Bank has also defined US$1 PPP (purchasing power parity) per day as a rough indicator of extreme poverty. Living for under $1 a day should be understood as having a daily total consumption of goods and services comparable to the amount of goods and services that can be bought in the US for $1. Poverty lines can, however, also be determined relative to a population’s mean income or consumption. By this definition, poverty is having significantly less income and wealth than other members of society. A relative poverty line is typically set as an arbitrary proportion (often around 50 percent) of the median or the mean of the living standards in a country. The FGT poverty indicators give an estimation of poverty incidence (headcount ratio), poverty depth (poverty gap) or poverty severity (squared poverty gap), depending on α, and are formally defined as:

$$P_\alpha(z) = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{z - y_i^*}{z}\right)^\alpha$$

where N is the size of the population, z is the poverty line, and y* is the income (consumption expenditure) of those households below the poverty line. When α = 0 the index measures poverty incidence (headcount ratio), when α = 1 the index measures average shortfall of living standards from the poverty line (poverty gap) and when α = 2 the index measures weighted sum of poverty gaps.

8.3.2 Incidence, depth and severity of poverty

Poverty reduction is the ultimate goal of development policy. To reduce poverty, policy makers first need to know the incidence, depth, and severity of poverty. Figure 8.2 presents the poverty profile of sample farm households. Using international poverty line, which is US$1 per day and per capital consumption levels, an attempt was made to establish poverty profile. Purchasing power parity (PPP) concept is often used to convert US dollars to the local currency; however, for our data the official exchange rate (OER) was applied for the sake of simplicity. The OER during the survey was about 7 ETB and thus the annual equivalent amounts to 2,555 ETB. The measure of welfare used in the poverty analysis is the total annual per capita consumption reported by a household. The poverty line – the level of welfare that distinguishes poor households from non-poor households – is also expressed in the same unit of consumption and based on the cost of basic needs for an individual. These costs are often determined by considering the food requirements of an individual and his or her critical non-food consumption. Food needs are tied to a person's recommended daily requirements for calories. It is important to note that different poverty lines that reflect different prices, different household demographic composition, and different consumption preferences could have been established for the study area, however, the international poverty line was used for the purpose of simplicity. The poverty headcount ratio shows that about 77% of the sample households live below the poverty line during 2006/07 cropping season, which is by far higher than the national average, which is about 45% for rural population. It is also apparent from table 8.6 that the incidence of poverty is higher in Gimbichu district, and is about 89%, compared to the other two districts.

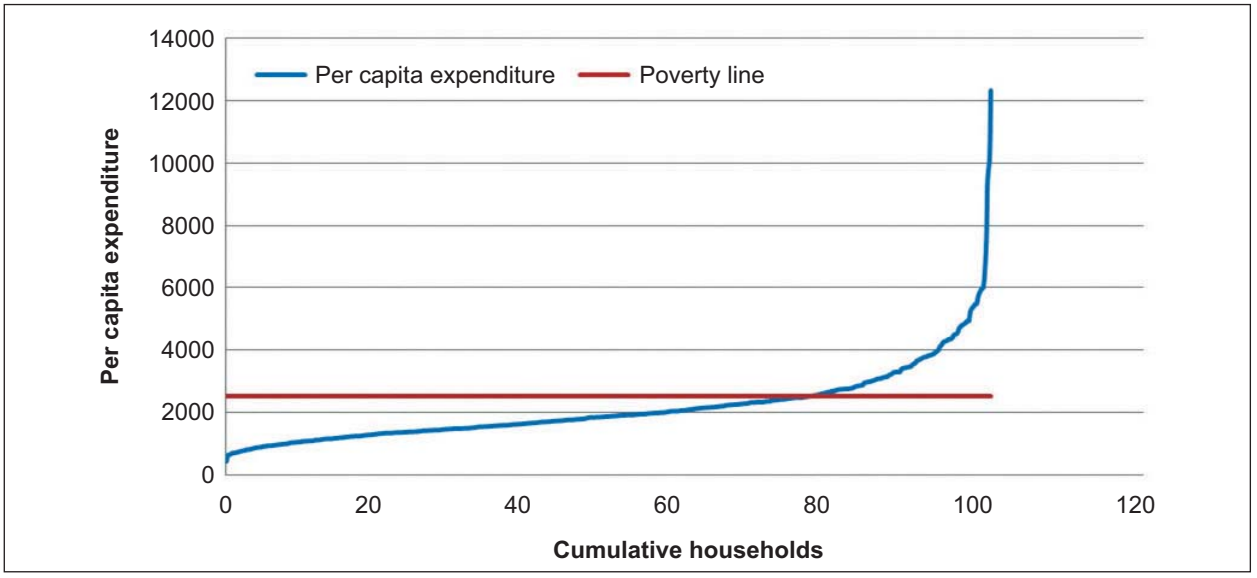

Figure 8.2. Poverty profile of sample farmers.

The poverty gap index is the ratio of the average extra consumption that would be required to bring all poor people up to the poverty lines. The poverty gap is interpreted as measuring the depth of poverty. The squared poverty gap index takes into account not only the consumption shortfall of the poor from the poverty line, but also inequality among the poor. This measure decreases if, for example, income is transferred from a poor individual to a poorer individual. The squared poverty gap index is often interpreted as measuring the severity of poverty. For both indices, the higher the index, the greater is the degree of poverty in an area. These indices are important for the planning of poverty reduction programs. All things being equal, areas with the higher indices should receive priority. The results are shown in Table 8.6. These two poverty indices suggest that poverty is deeper and more severe in Gimbichu compared to the other two districts. The poverty gap and poverty severity for the entire sample is about 0.27 and 0.12, respectively.

Table 8.6. Incidence, depth and severity of poverty (N=700).

Districts	Head count (%)	Poverty gap (index)	Poverty severity (index)
Gimbichu	89.3	0.35	0.17
Lume-Ejere	72.1	0.21	0.09
Minjar-Shenkora	76.4	0.27	0.12
All	77.0	0.27	0.12

8.4 Gender issues

Table 8.7 presents the household income during January to December 2007 disaggregated by income quartile and gender. Although the number of sample female headed households is very small compared to male headed ones, the results can give us a snapshot on the income disparity across gender. Surprisingly the result shows no significant income disparity between male and female headed households in the study area. Among all the quartiles, the income of female headed households is a bit higher than the male headed households. A glimpse of the share of income from different sources shows that there is a variation between male and female headed households. Results show that female headed households in the lower quartile earn 92% of their income from crop production whereas male headed households in the same quartile earn only 69%. The contribution of livestock to the overall household income increases as we move to the upper quartile in the case of female-headed households whereas the opposite was the case for male headed ones. The share coming from non-farm activities was about 9% for the lowest quartile female headed households whereas it was about 6% for male-headed households. Female headed households in the lowest and third quartile tend to earn more income from non-farm activities compared to the second and the highest quartile. However, for male-headed households the contribution of non-farm activities to the total income decline as we move to the upper quartile. The share of wage income is insignificant for both male and female headed households.

Table 8.7. Household income by quartile (Jan–Dec 2007) (N=700).

	Female-headed households (N=49)				Male-headed households (N=651)				All households (N=700)			
	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Household income	5203	12364	18196	38114	3711	12237	18140	32545	3898	12244	18142	32895
Income Share (%)												
- Crop income	92.22	87.38	71.29	82.79	69.01	77.21	81.29	82.70	71.92	77.74	80.95	82.71
- Livestock income	-1.21	10.63	11.50	12.55	23.79	17.81	14.36	13.30	20.65	17.44	14.26	13.25
- Non-farm activities	8.98	1.98	17.20	0.49	6.05	4.13	3.77	3.44	6.42	4.01	4.23	3.26
- Wage income	0.00	0.00	0.00	4.17	1.15	0.85	0.57	0.56	1.01	0.81	0.55	0.79

9. Chickpea technologies, production and marketing

9.1 Chickpea variety preferences and adoption

Research has produced improved varieties that have the potential to increase productivity. At present, the use of improved chickpea production technology packages is negligible. Over the last three decades (1974-2005), 11 improved chickpea varieties (six kabuli and five desi) were released in Ethiopia. However, the adoption rate of these varieties is very low. Official estimates from the Central Statistics Authority (CSA) show that, of the total chickpea cultivated area (194,981 ha) only 0.69% was covered by improved chickpea seeds in 2001/02 cropping season (CSA 2002).

9.1.1 Sources of information, knowledge and adoption

Adoption of newly introduced varieties is influenced not only by the inherent characteristics of the varieties themselves but also by lack of awareness of the end users of the technologies. Farmers' awareness on available improved varieties is an important factor influencing technology adoption. Normally, farmers receive information about new technologies through different channels and Table 9.1 presents the sources of chickpea variety information during 2006/07 cropping season. Survey results showed that the first major source of information for kabuli chickpea varieties is neighbors followed by government extension. The proportion of households receiving information about kabuli varieties from neighbors and government extension amount to 46.6% and 45.3%, respectively. The third most important source of information is farmers' cooperatives (26.1%). Across the three districts, results suggest that the role of government extension as source of information for kabuli varieties is by far the highest in Lume-Ejere district (75%). Neighbors remain the first major source of information (72.4%) for desi varieties followed by family members. The provision of agricultural extension service is aimed at the dissemination of improved agricultural technologies to smallholder farmers to increase agricultural production and productivity. Previous studies have revealed that strong extension services have a positive impact on technology adoption (Zegeye et al. 2001). However, low performance of extension services has resulted in low rate of adoption of technologies (Beyene et al. 1998, Hailye et al. 1998). Local research centers play a very minor role in disseminating information; also the proportion of households receiving varietal information from the media is very minimal.

Results showed that 43.9% and 48% of the sample farmers were aware of the improved kabuli varieties *arerti* and *shasho*, respectively. In Gimbichu district, 50.3% of the sample farmers knew about *arerti*, whereas 49.8% in Lume-Ejere and 49.8% in Minjar-Shenkora knew about it. However, for *shasho* variety there is a substantial variation across the districts in terms of awareness; 80.3% of the farmers knew *shasho* in Lume-Ejere whereas only 6.7% knew in Minjar-Shenkora. Among the sampled respondents only 6.4% were familiar with *chefe* variety whereas about 25% knew *ejere*. Again, there is a significant variation across the three districts in terms of awareness of *ejere* variety; about 25% were aware of *ejere* in Lume-Ejere while only 1.3% and 6.8% knew in Gimbichu and Minjar-Shenkora districts, respectively. On the other hand, results show a different picture for improved desi varieties. It is also found that less than 5% of the sample farmers were aware of the improved desi varieties such as *marye, worku, akaki* and *dubie.* Sample farmers in Minjar-Shenkora district were not aware of any of the improved desi chickpea varieties.

Table 9.1. Sources of variety information during 2006/07 cropping year (N=700).

	Gimbichu		Lume-Ejere		Minjar-Shenkora		Total	
Source of information	Kabuli varieties (%)	Desi varieties (%)	Kabuli varieties (%)	Desi varieties (%)	Kabuli varieties (%)	Desi varieties (%)	Kabuli varieties (%)	Desi varieties (%)
Government extension	38.93	12.08	75.00	4.33	13.55	1.99	45.29	5.14
Farmer cooperative	24.83	1.34	43.67	2.33	5.98	0.40	26.14	1.43
NGO	0.00	0.67	1.33	0.00	0.00	0.00	0.71	0.00
Research centre	2.68	0.00	3.33	1.67	2.39	8.37	2.86	3.71
Seed/grain stockist	0.00	1.34	2.00	3.33	0.40	1.20	1.00	2.14
Another farmer/ neighbor	43.62	77.85	47.67	76.00	47.01	64.94	46.57	72.43
Radio/newspaper/TV	0.67	0.00	0.67	0.33	0.00	0.00	0.29	0.29
Producer marketing groups (PMG)	0.00	0.00	1.67	0.67	0.00	0.00	0.71	0.29
Family	2.01	21.48	1.00	14.67	0.00	19.52	0.86	17.86
Relatives	0.67	2.68	0.00	2.67	0.00	1.99	0.14	2.43

The proportion of farmers who planted the variety is by far lower than those who knew about the variety for both desi and kabuli types. About 16.7%, 27.6%, 2.3% and 14.3% of the surveyed households have ever planted *arerti, shasho, chefe* and *ejere* varieties, respectively. The share of farmers who ever planted improved desi is very minimal (less than 4%) while about 92% ever planted the local desi.

Survey results showed that about 21% and 28% chickpea farmers[5] have planted *arerti* and *shasho* varieties in 2007/08 cropping season, respectively, whereas about 2.3% and 15% planted *chefe* and *ejere* types, respectively (Table 9.2). On the other hand, the proportion of chickpea farmers who planted improved desi in the same period is less than 3% while about 76% planted the local desi. The level of adoption for *arerti* and *chefe* varieties is the highest in Minjar-Shenkora district while *shasho* and *ejere* types are highly adopted in Lume-Ejere district. The level of adoption of improved desi in the survey period is nil in Minjar-Shenkora district although the local desi is planted by about 87% of farmers in the same period. The proportion of chickpea farmers who plan to plant these varieties in the future is bigger than those who planted in the survey year. About 33%, 31%, 6% and 17% of the sampled chickpea farmers plan to plant *arerti, shasho, chefe* and *ejere* varieties in the future, respectively, while the share of chickpea farmers who plan to plant improved desi is again very low. Interestingly, most chickpea farmers (46%) do not intend to plant local desi in the future.

Results on farmers' reasons for not planting some of the chickpea varieties are reported in Table 9.3. The first major reason why some farmers never adopted the improved varieties was lack of access to seed. For instance, the share of farmers who mentioned seed constraints as a reason ranges from about 37% for improved desi (*worku*) to over 20% for all of the kabuli varieties. The amount of improved seeds produced by research and Ethiopian Seed Enterprise is quite small

[5]The percentage of farmers who planted the varieties in Aug/Sep 07 and plan to plant in the future are computed based on the total chickpea farmers (desi plus kabuli).

Table 9.2. Adoption of chickpea varieties, % of growing households (N=700).

	Gimbichu				Lume-Ejere				Minjar-Shenkora				Total			
Chickpea varieties	Know the variety	Ever planted	Planted in Aug/Sep 07	Plant in the future	Know the variety	Ever planted	Planted in Aug/Sep 07	Plant in the future	Know the variety	Ever planted	Planted in Aug/Sep 07	Plant in the future	Know the variety	Ever planted	Planted in Aug/Sep 07	Plant in the future
Kabuli																
- Arerti	50.34	26.17	27.42	30.65	35.67	13.67	12.98	26.34	49.80	14.74	30.20	46.98	43.86	16.71	21.16	33.15
- Shasho	52.35	24.16	18.55	29.03	80.33	51.67	48.47	44.66	6.77	0.80	0.67	9.40	48.00	27.57	28.28	31.27
- Chefe	8.72	3.36	0.81	9.68	5.67	1.33	0.76	4.96	5.98	2.79	5.37	4.70	6.43	2.29	2.06	5.99
- Ejere	1.34	0.67	0.81	0.81	52.00	31.67	27.48	32.44	6.77	1.59	4.70	4.70	25.00	14.29	14.98	17.42
Desi																
- Marye	12.08	3.36	3.23	4.03	1.00	0.67	0.38	0.76	0.00	0.00	0.00	0.00	3.00	1.00	0.94	1.31
- Worku	2.01	0.67	1.61	0.81	5.33	3.33	1.91	3.82	0.00	0.00	0.00	0.00	2.71	1.57	1.31	2.06
- Akaki	0.67	0.67	1.61	0.81	1.33	0.67	0.00	0.38	0.00	0.00	0.00	0.00	0.71	0.43	0.37	0.37
- Dubie	3.36	2.68	0.81	3.23	2.00	0.67	0.38	1.53	0.80	0.00	0.00	1.34	1.86	0.86	0.37	1.87
- Local	99.33	98.66	87.90	41.13	97.00	95.33	63.74	48.47	98.01	84.06	87.25	74.50	97.86	92.00	76.03	54.12

Note: Know the variety and ever planted are computed based on the total N but planted in Aug/Sep 07 and plant in the future are computed only for chickpea farmers.

and because of this, farmers often depend on informal seed supply. The very limited numbers of private seed enterprises and the low attention accorded to the informal seed sector aggravated the seed supply crises and narrowed the options available to farmers for having access to good quality planting materials at affordable prices, at the right place and time. The second major reason is theft during the green stage. Large seeded varieties are preferred for their green pod consumption (Dadi et al. 2004). If the chickpea field is not regularly guarded during the green pod stage, it is more likely that people passing by may pick chickpea for consumption. Since attending chickpea fields day and night requires additional labor, farmers are often reluctant to plant large seeded chickpea varieties due to fear of theft. The third and fourth major reasons why some farmers never planted chickpea varieties is shortage of land, and lack of cash to buy seed and/or lack of credit, respectively. Credit availability plays a crucial role in technology adoption. Cash shortage is prevalent among smallholder farmers particularly during the main cropping season when the previous year's harvest is near exhaustion; this is the time when cash is required to purchase inputs. Other less important reasons were high price of improved seeds, low yielding variety and requirement of high skills.

Table 9.3. Major reasons for not planting some chickpea varieties.

Chickpea varieties	N (sample size) (Number)	Lack of access to seeds (%)	Lack of cash to buy seed or lack of credit (%)	Seeds are expensive (%)	Theft during green stage (%)	Low yielding varieties (%)	Susceptible to diseases/ pests (%)	Low prices (%)	Shortage of land (%)	Requires high skills (%)
Kabuli										
- Arerti	191	30.89	9.95	0.52	19.37	2.09	1.57	0.00	15.18	1.57
- Shasho	145	20.69	8.97	4.14	23.45	2.07	1.38	0.69	17.93	2.07
- Chefe	29	20.71	20.71	3.45	27.61	3.45	0.00	0.00	17.26	0.00
- Ejere	79	24.06	11.40	3.80	13.93	0.00	2.53	0.00	18.99	0.00
Desi										
- Marye	14	28.57	0.00	0.00	57.14	0.00	0.00	0.00	0.00	21.43
- Worku	8	37.45	24.97	0.00	12.48	0.00	0.00	0.00	0.00	0.00
- Akaki	2	0.00	0.00	0.00	50.25	0.00	0.00	0.00	0.00	0.00
- Dubie	7	23.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Local	43	11.63	9.30	2.33	16.28	2.33	2.33	2.33	34.88	2.33

Note: N equals farmers who never planted the variety although they have knowledge about the cultivar.

9.1.2 Chickpea seed access

In Ethiopia, both the informal and formal seed systems are operational. The informal seed systems (self-saved seed or farmer-to-farmer seed exchange) accounts for 90% of the seed supply to smallholder farmers (Belay 2004). The formal seed system was and still is used as a major source for disseminating new varieties (technology transfer channel) obtained from the Ethiopian Institute of Agricultural Research, International Agricultural Research Centers and regional research centers and higher learning institutes in the form of basic (foundation) seed or breeding lines. At present, the private sector is a limited force in Ethiopia's seed market. Locally

Table 9.4. Contribution of different sources of chickpea seed (%) for 2007 planting season.

Chickpea varieties	Sample size (N)	Own saved seed	Research and PVS	Extension demo plots	PMGs/ Coops	Bought from local seed producers	Bought from local trader or agro-dealers	Farmer to farmer seed exchange	Provided free by NGOs	Provided free by other govt agency	Inherited from family
Kabuli											
- Arerti	53	47.19	1.12	2.25	32.58	8.99	4.49	1.12	2.25	0.00	0.00
- Shasho	110	49.66	3.45	2.76	25.52	8.28	4.14	2.07	0.00	1.38	2.76
- Chefe	7	76.79	0.00	0.00	3.57	7.14	8.93	1.79	0.00	0.00	1.79
- Ejere	97	16.67	0.00	16.67	33.33	16.67	16.67	0.00	0.00	0.00	0.00
Desi											
- Marye	1	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
- Worku	7	71.43	0.00	0.00	14.29	0.00	0.00	0.00	0.00	14.29	0.00
- Dubie	2	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
- Local	367	84.31	0.00	0.00	3.43	3.68	3.68	3.68	0.00	0.74	0.49

Table 9.5. Quantity of chickpea seed by source (kg), 2007 planting season.

Chickpea varieties	Sample size (N)	Own saved seed	Research and PVS	Extension demo plots	Coops/ Union	Bought from local seed producers	Bought from local trader or agro-dealers	Farmer to farmer seed exchange	Provided free by NGOs	Provided free by other govt. agency	Inherited from family
Kabuli											
- Arerti	53	19.21	1.32	3.07	17.97	2.83	2.61	0.18	4.20	0.00	0.00
- Shasho	110	48.08	2.54	1.72	21.57	4.81	2.65	0.89	0.00	1.14	0.08
- Chefe	7	11.82	0.00	0.00	30.91	7.27	13.64	0.32	0.00	0.00	1.25
- Ejere	97	45.76	0.00	2.85	12.08	2.91	4.57	0.00	0.00	0.00	0.00
Desi											
- Marye	1	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
- Worku	7	39.29	0.00	0.00	3.57	0.00	0.00	0.00	0.00	2.40	0.00
- Dubie	2	0.00	0.00	0.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00
- Local	367	45.10	0.00	0.00	0.59	2.61	1.80	1.75	0.00	0.62	0.51

Note: N equals farmers who planted chickpea crop in 2006/2007.

operating international NGOs such as World Vision, CARE, and Catholic Relief Service are also involved in the production, marketing and distribution of seed through a variety of community-based projects such as local seed banks and on-farm seed multiplication projects. The state-controlled seed system is characterized by limited production of crops and varieties, unreliable seed quality, and late delivery (Byrelee et al. 2007). For instance, during the 2004/05 season, the supply of improved varieties channeled through the formal system fell short of the estimated demand from the regional bureaus of agriculture by 73% (Ibid). The major problems in the Ethiopian formal chickpea seed system is that 1) the existing parastatal seed system focused more on the production and marketing of cereals; 2) the seed rate for crops like chickpea is high compared to cereals, and may not be affordable by resource-poor farmers to buy from the formal seed system; and 3) it cannot be easily available to farmers on time unlike the informal seed system.

Table 9.4 presents the major sources of chickpea seed in 2006/07 cropping season. The first major source of seed for *arerti* and *shasho* varieties is own saved seed followed by producers groups. About 47% of those who planted *arerti* and 50% of those who planted *shasho* used their own saved seed for 2006/07 cropping season whereas about 33% and 26% of those who planted the same variety sourced seed from producer marketing groups or cooperatives. Own saved seed was again a vital source of seed for *chefe* (77%), *worku* (71%) and local desi (84%) varieties while producer marketing groups also contribute for *ejere* type (33%). The third and fourth important source of seed for most kabuli and desi varieties during the 2006/07 planting season is local seed producer and local trader and/or agro dealer, respectively. A relatively small share of sampled farmers also sourced seed through farmer to farmer exchange and extension demonstration plots. Again the role of research institution is very minimal.

The quantity of seed sourced from previous harvest is the highest for most chickpea varieties (Table 9.5). On average, farmers obtained about 48 kg of *shasho*, 46 kg of *ejere*, 39 kg of *worku* and 45 kg of local desi from own saved seeds during the 2006/07 planting season. Producer marketing groups and/or cooperatives are the second major sources of seed especially for kabuli varieties.

The primary message from the above results is that farmers use the informal seed system (ie, saving their own seeds or sourcing from producer marketing organization) rather than the formal sector, which is often characterized by late delivery and market failure. The informal sector is more flexible and adaptable to changing local conditions and less dependent on or less influenced by other external factors. The informal system comprises a multitude of individual private farmers who select and save their own seed or exchange seed with others through traditional as well as a diversity of local level seed production initiatives organized by farmers' groups and/or NGOs working under no legal norms and certification schemes of the organized seed sector (Ibid).

Generally, a more flexible seed system, which is sustainable (both financially and institutionally), that meets the seed needs of a diverse group of farmers, and reduces the current seed supply crises is crucial in Ethiopia to accelerate agricultural growth and commercialization to reduce poverty and enhance food security. This requires lifting the entry barriers for participation of the private seed industry and encouraging the growth of the informal sector by providing adequate access to basic or foundation seed and extension advice on seed production, processing, treatment and storage. Community based seed production and marketing systems like quality declared seed (QDS), which is tested in Tanzania for dissemination of truthfully labeled seed of high quality could be one strategy for easing the seed shortage problem, especially for open-

pollinated cereals or self-pollinated legumes like chickpea. The private sector lacks the incentive to participate in the enhanced delivery of seeds of these crops as the size of the market is small and farmers are able to use recycled seed for 3-5 years.

Strengthening the on-going farmer based seed production program and revolving seed scheme by improving farmers' skills in seed multiplication can assist in increasing the supply of seed for improved varieties both within communities and to the formal seed system. The revolving seed scheme where target farmers often organized into groups or cooperatives access a certain amount of seed of improved varieties from a supplier (eg, NGO or Ministry of Agriculture) and return at least the same amount of seed in-kind, is an important mechanism in the absence of adequate supply of improved seeds to reach all farmers. Currently, the scheme is run for disseminating improved varieties by the district agricultural offices although there is a possibility to involve cooperatives. This scheme was initially proposed for forage seeds distribution but recently grain seeds are also being distributed through this system. This system unlike the formal seed system does not involve many transactions. The great advantage of this system it that it benefits resource-poor farmers who may otherwise have poor access to or lack adequate cash to buy seed from the formal seed system.

9.1.3 Preferred traits for chickpea

Besides socio-economic characteristics, inherent characteristics of the improved chickpea varieties and farmers perception about the improved varieties do have an important effect on adoption and/or rejection of the varieties. Sample chickpea farmers were asked to rank their preferred traits for chickpea varieties using local varieties as a reference group. The scores are coded from very poor (coded as 1) to very good/excellent (coded as 5), which suggest the direct relationship between the rank and the importance of the variety in terms of specific traits. Table 9.6 reports the preferred traits of chickpea varieties by gender. The overall score for *chefe* variety is the highest for both male and female chickpea farmers followed by *ejere* types. When we examine based on specific traits, female chickpea farmers prefer *arerti* variety for their taste and high price in the market whereas male farmers prefer the same variety for high price and grain yield. *Shasho* variety is highly preferred for its high price in the market, grain size and grain color both by male and female farmers. Male and female chickpea farmers tend to have different preferences for *chefe* variety. Male farmers prefer *chefe* for their grain color and size while female farmers prefer them for their high price in the market, grain size and low cost of production. The preferred traits for *ejere* variety by both male and female farmers are high price in the market, grain size and grain color. Generally kabuli varieties are highly preferred for their high economic return in addition to their grain color and size. Characteristics of *worku* variety favored by male farmers include good taste and uniformity in maturity while female farmers prefer them for good taste, grain color and high price in the market.

Table 9.6. Preferred traits for chickpea varieties (using local varieties as a reference group) – total separated by gender.

	Arerti		Shasho		Chefe		Ejere		Mariye		Worku		Local	
Chickpea varieties	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Total														
Grain yield	3.7	4.1	3.6	4.0	4.0	3.9	3.8	4.1	0.0	3.6	3.0	4.0	3.2	3.2
Drought tolerance	3.3	3.7	3.1	3.4	3.5	3.9	3.8	3.5	0.0	3.2	4.0	3.8	3.4	3.4
Disease tolerance	2.7	3.5	2.7	3.2	3.0	3.7	3.2	3.2	0.0	3.2	3.0	3.8	3.2	3.3
Pest tolerance	2.3	3.2	2.8	3.0	3.0	3.5	3.0	3.0	0.0	3.1	4.0	3.5	3.3	3.3
Early maturity	2.7	3.2	3.1	3.2	3.0	3.6	0.0	3.4	5.0	3.6	0.0	0.0	3.3	3.2
Cost of production	3.7	3.8	3.8	3.8	4.5	4.1	4.0	3.8	0.0	3.4	4.0	3.4	2.8	3.1
Uniformity in maturity	2.7	3.6	3.4	3.6	4.0	4.0	3.3	3.6	0.0	3.4	4.0	3.8	3.5	3.5
Grain color	4.0	4.2	3.9	4.2	4.0	4.7	4.5	4.3	0.0	3.6	3.0	4.3	3.1	3.3
Grain size	4.0	4.2	4.0	4.3	4.5	4.6	4.5	4.3	0.0	3.4	3.0	3.8	2.6	2.9
Price (ETB/quintal)	4.3	4.3	3.9	4.4	4.5	4.4	4.3	4.4	0.0	3.4	3.0	4.2	3.0	3.2
Cooking time	3.0	3.5	3.1	3.4	3.2	3.4	4.0	3.7	0.0	3.0	5.0	4.0	3.3	3.5
Taste	4.3	3.7	3.3	3.8	3.5	3.9	3.7	3.8	0.0	3.2	4.0	4.3	3.9	3.8
Overall variety score	4.0	4.1	3.9	4.2	4.5	4.3	4.3	4.2	0.0	3.6	3.0	4.3	3.2	3.3

Note:
a) N equals farmers who planted chickpea crop in 2006/2007.
b) The scores are coded as 1 = very poor, 2 = poor, 3 = fair/average, 4 = good and 5 = very good/excellent.

9.2 Chickpea production practices and productivity

9.2.1 Production pattern and productivity

Table 9.7 reports the cropping pattern of chickpea varieties during the 2006/07 cropping season. The chickpea varieties are disaggregated by kabuli and desi types. Improved desi captures *marye*, *worku* and *dubie* variety. Among the kabuli types, *shasho* is the most widely grown variety followed by *ejere* and *arerti*, respectively. However, across the districts there is a substantial variation whereby most of the *shasho* growers are based in Lume-Ejere district (about 33.3%) compared to 2% in Gimbichu district. The traditional local desi is grown by about half of the sampled farmers whereas only 3.3% grow improved desi. When examining the share of chickpea farmers growing the variety, we observed the same trend. As shown, the most widely grown variety among chickpea farmers remains *shasho* (20.6%) followed by *ejere* (11.7%) and *arerti* (10%), respectively. In Gimbichu, only 2.4% of chickpea farmers grow *shasho* whereas the same variety is grown by about 38% in Lume-Ejere and 20.6% in Minjar-Shenkora district. In all the districts, very small numbers of chickpea farmers grow *chefe* variety whereas *ejere* variety is grown mostly in Lume-Ejere district (26%). Local desi remains the most widely grown variety among chickpea farmers while only 4.3% grow improved desi. The share of chickpea farmers growing local desi is the highest in Gimbichu district (87%) followed by Minjar-Shenkora district (67%). Of the total chickpea area in the survey regions, about 54.5% is allocated to local desi followed by *shasho* (21%) and *ejere* (11.9%). The share of area allocated to local desi is the highest in all the three districts. The variety with the second highest share is *ejere* in Gimbichu whereas *shasho* and *arerti* in Lume-Ejere and Minjar-Shenkora districts, respectively.

Table 9.7. Cropping pattern of chickpea varieties during 2006/07 cropping year.

Chickpea varieties	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
	Growers (% of total sample from district) (%)	Chickpea farmers growing the variety (%)	Area allocated (% total chickpea area) (%)	Growers (% of total sample from district) (%)	Chickpea farmers growing the variety (%)	Area allocated (% total chickpea area) (%)	Growers (% of total sample from district) (%)	Chickpea farmers growing the variety (%)	Area allocated (% total chickpea area) (%)	Growers (% of total sample from district) (%)	Chickpea farmers growing the variety (%)	Area allocated (% total chickpea area) (%)
Kabuli												
- Arerti	10.07	12.10	5.53	6.67	7.63	8.21	7.57	12.75	13.38	7.71	10.09	8.77
- Shasho	2.01	2.42	1.50	33.33	38.17	36.04	2.79	4.70	2.85	15.71	20.56	21.15
- Chefe	1.34	1.61	1.18	1.00	1.15	1.00	0.80	1.34	0.84	1.00	1.31	1.00
- Ejere	7.38	8.87	5.67	22.67	25.95	18.96	1.20	2.01	0.31	11.71	15.33	11.93
Desi												
- Improved	2.01	2.42	2.14	4.33	4.96	1.96	2.79	4.70	5.27	3.29	4.30	2.73
- Local	72.48	87.10	83.99	50.67	58.02	33.83	39.44	66.44	77.35	51.29	67.10	54.42

Note: Improved desi includes Marye, Worku and Dubie variety.

On-farm chickpea crop yields by variety during 2006/07 cropping season is presented in Table 9.8. The average yield is computed only for those who planted the crop during the season. Results show that *arerti* and *shasho* variety show superior performance in Lume-Ejere district whereas *chefe* and *ejere* have the highest productivity in Gimbichu and Minjar-Shenkora district, respectively. Surprisingly yield of local desi is higher than the improved desi; perhaps this may be attributed to the low number of farmers who planted improved desi. Results generally suggest that kabuli varieties perform superior in terms of yield compared to the desi types. The national average yield of chickpea, under farmers' production system, is not more than 0.88 tons per ha (CSA 2004). On the other hand, our results show that the productivity in the study areas is 2 to 3 times higher than the national average. It is important to note, however, that higher yield does not necessarily translate into higher net-return.

Table 9.8. Chickpea crop yields (kg/ha) by variety during 2006/07 cropping year

Chickpea varieties	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
Kabuli				
- Arerti	2710.00	3538.04	3055.45	3112.64
- Shasho	2390.48	2943.32	1666.67	2873.33
- Chefe	3175.00	1266.67	2880.00	2272.86
- Ejere	1688.89	2702.65	4824.24	2950.17
Desi				
- Improved	1814.29	2169.23	1400.00	1960.87
- Local	2236.70	2137.14	2064.99	2142.89

Note: N equals those farmers who planted chickpea crop in 2006/2007. Improved desi varieties include Marye, Worku and Dubie.

9.2.2 Net-return of chickpea

Net-return for different chickpea varieties are computed as the difference between gross income and total variable costs for a farm activity. Gross income is measured as total receipts received from the sales of produce plus the value of any retained output. The variable costs include manure and/or fertilizers, seed (own and purchased), field chemicals, labor (hired and family) and oxen (hired and own). Table 9.9 presents gross income, variable cost and return to land and management for different chickpea varieties during 2006/07 cropping season. As shown, *arerti* and *shasho* varieties have the first and second highest gross margin in terms of returns to land and management among all chickpea varieties. Surprisingly the local desi has about four times higher margin than the improved desi, which is in fact attributed to lower yield as reported earlier. The average return for *arerti* and *shasho* is about 10,283 ETB and 9,496 ETB per ha, respectively, whereas improved desi has a net-return of about 2,481 ETB per ha. In Gimbichu, the return to land and management is highest for *chefe* variety whereas *arerti* and *ejere* perform superior in Lume-Ejere and Minjar-Shenkora districts, respectively. It is important to note that *ejere* variety performs very poorly in Gimbichu district (66 ETB per ha).

Table 9.9. Gross income, costs and returns (ETB/ha) by variety during 2006/07 cropping year.

Chickpea varieties	Gimbichu			Lume-Ejere			Minjar-Shenkora			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
Kabuli												
- Arerti	11951.10	3211.50	8739.601	15602.76	3623.54	11979.22	13474.54	3497.77	9976.767	13726.74	3443.63	10283.12
- Shasho	10589.81	2480.85	8108.96	13038.92	3310.26	9728.668	7383.33	2406.19	4977.146	12728.83	3232.82	9496.009
- Chefe	17935.00	1761.80	16173.2	5345.33	2229.51	3115.823	12153.60	3789.60	8364	10887.60	2541.62	8345.981
- Ejere	6856.89	6790.44	66.44	10972.77	3507.84	7464.931	19586.42	6949.49	12636.94	11977.68	4089.62	7888.06
Desi												
- Improved	7220.86	2039.60	5181.254	8633.54	7951.25	682.2906	5572.00	1597.43	3974.567	7804.26	5323.29	2480.968
- Local Desi	11742.65	3036.56	8706.09	11219.96	3492.43	7727.532	10841.17	2622.60	8218.57	11250.15	3105.04	8145.107

Note:
a) Improved desi includes Marye, Worku and Dubie variety and N equals those farmers who planted chickpea crop in 2006/2007.
b) Variable cost includes fertilizer (DAP & Urea), manure, chemicals, seeds (own & purchased), labor (hired and family labor) and oxen (hired & own).

9.2.3 Constraints and prospect of chickpea production in Ethiopia

Developing and adopting pro-poor and environment-friendly technologies like chickpea varieties has the potential to increase agricultural productivity and help transform subsistence agriculture towards market-oriented and income-generating pathways. In Ethiopia, chickpea is an important food and cash crop with high acceptability and wider use. It accounts for about 16% of the total pulse production of the country. In addition to being a key source of protein, chickpea fixes atmospheric nitrogen in soils and thus improves soil fertility and saves fertilizer costs in subsequent crops – a key advantage in times of high fertilizer prices in the land-locked country. Despite these and other benefits, the adoption of improved chickpea varieties is constrained by a number of factors.

First, the available high-yielding varieties with market-preferred traits have not reached farmers on a large scale and hence, the productivity of the crop has remained one of the lowest in the world. The improved varieties have high yield potential up to four to five folds of the local cultivar. These varieties do not only excel the local varieties by their yield potential but also have better seed size. They possess desirable color, which makes them more marketable than local cultivar grains. In addition, the varieties have better stress tolerance, wider environmental adaptability, and better food quality than the local cultivar (Dadi et al. 2004).

Second, the local landraces grown by farmers do not meet the quality and quantity requirements preferred to some extent by domestic but especially international markets. This means that chickpea produced by small-scale farmers is limited in volume and quality, making it less tradable in international and regional markets.

Third, poor and inadequate seed systems, shortage of quality seed and lack of timely delivery is another major limiting factor for adopting new varieties, especially the kabuli types, and insufficient access to production credit to farmers. The formal seed system was and still is used as a major source for disseminating new varieties (technology transfer channel) obtained from the national and international research centers in the form of basic (foundation) seed or breeding lines. The Ethiopian Seed Enterprise (ESE) is the only public seed enterprise responsible for production of seed for all crops (cereals, pulses, fruits, vegetables and forage), although its seed production is dominated by cereals, especially maize and wheat. At present, the private sector is a limited force in Ethiopia's seed market. In 2004, although there were 26 firms licensed to produce seed, 33 to retail, and four to export seed, only eight firms were active in seed production. This lack of private involvement could be seen even in the hybrid maize seed sector, which has been largely privatized in many other low-income countries (Alemu et al. 2008).

These constraints seriously affect resource poor farmers who do not have alternative means to access improved technologies but are forced to overuse or misuse the natural resource bases to meet basic needs. As described above, the government completely controls the seed industry, even though parastatal seed production and distribution has usually proven to be an ineffective system of seed supply. Solving these institutional, infrastructural and social constraints can speed up adoption of improved chickpea varieties.

9.3 Post-harvest handling and consumption

The inherent quality of produce cannot be improved after harvest, only maintained for the expected window of time (shelf life) depending on the characteristic of the commodity. Part of what makes for successful post-harvest handling is an accurate knowledge of what this window of opportunity is under your specific conditions of production, season, method of handling and distance to market. Export markets are increasingly becoming more discerning and product specifications are progressively dictating terms of trade. Chickpea destined for food markets need to be of high quality and visually appealing. Color has a strong influence on how acceptable the seed is to people as a food. Seed size and uniformity are of greater importance where seed is processed into dhal (splits). The presence of split or broken seed and impurities are also important parameters that affect visual quality.

Under small scale chickpea production, maintaining the purity of the variety is a challenge. We asked chickpea farmers if they maintain chickpea varietal purity during post-harvest and the results are presented in Table 9.10. Results show that about 86.4% of farmers who ever planted chickpea thresh their produce with animals on dung cemented surface and/or grass whereas about 13% thresh with animals on dirt surface. The share of farmers who use animals on dirt surface is the highest in Gimbichu district while a majority of farmers (92%) in Minjar-Shenkora district use animals for threshing on dung cemented surface. Human labor plays a very minimal role in threshing chickpea. Surprisingly the share of farmers who mix different varieties of kabuli and/or desi during harvesting is almost zero. Besides, farmers in the study area do not mix chickpea varieties during storage or marketing, perhaps suggesting the low level of chickpea purity problem in the study area.

Table 9.10. Maintenance of chickpea varietal purity (%).

Issues	Gimbichu	Lume-Ejere	Minjar-Shenkora	Total
How is chickpea threshed				
- Animals on dirt surface	26.35	12.08	6.30	13.16
- Animal on dung cemented surface/grass	73.65	87.92	92.44	86.40
- Human labor on dirt surface	0.00	0.00	0.42	0.15
- Human labor on dung cemented surface/grass	0.00	0.00	0.84	0.29
Mix different varieties of kabuli during harvesting	0.00	0.69	0.00	0.31
Mix different varieties of desi during harvesting	0.00	0.00	0.00	0.00
Mix kabuli and desi during harvesting	0.00	0.00	0.00	0.00
Mix different varieties of kabuli during storage or marketing	0.00	0.69	0.00	0.31
Mix different varieties of desi during storage or marketing	0.00	0.00	0.00	0.00
Mix kabuli and desi during storage or marketing	0.00	0.00	0.00	0.00

Note: N equals only those farmers who ever planted chickpea, thus it is different from 700.

Table 9.11 presents utilization of chickpea varieties produced during 2006/07 cropping year. As shown, about 74% of *shasho* and *ejere* varieties produced are sold in the market ranking first among chickpea varieties in terms of market share. *Arerti* and local desi take the second and third rank in terms of share of produce sold in the market. The proportion of improved and local desi sold in the market is about 20% and 55%, respectively. About 10% of all kabuli varieties produced are saved as seed for next cropping seasons while the share is a bit higher of desi

Table 9.11. Utilization of chickpea varieties produced during 2006/07 cropping year.

Chickpea varieties	Gimbichu				Lume-Ejere				Minjar-Shenkora				Total			
	Sales (%)	Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Seed (%)	Gift (%)	Con-sumption (%)	Sales (%)	Seed (%)	Gift (%)	Con-sumption (%)
Kabuli																
- Arerti	68.79	11.52	0.00	19.69	69.53	10.96	0.30	19.22	45.04	7.84	10.48	36.64	61.27	10.12	3.53	25.07
- Shasho	59.60	12.68	0.00	27.72	76.57	11.73	0.28	11.41	40.31	8.47	0.00	51.21	74.02	11.70	0.25	14.03
- Chefe	62.09	4.76	0.00	33.15	0.00	0.00	0.00	0.00	46.37	11.47	0.00	42.16	51.61	9.23	0.00	39.15
- Ejere	-	-	-	-	74.05	11.75	1.19	13.01	72.50	8.54	0.00	18.96	73.88	11.40	1.06	13.65
Desi																
- Improved	20.00	9.33	0.00	70.67	60.65	12.76	0.96	25.63	0.00	10.56	0.00	89.44	20.00	12.32	0.77	67.94
- Local	56.11	14.08	0.38	29.43	54.78	13.32	0.70	31.20	53.91	9.10	0.65	36.35	54.89	12.32	0.60	32.19

Note: Improved desi includes Marye, Worku and Dubie variety and N equals those farmers who planted chickpea crop in 2006/2007.

types. Among the kabuli varieties, the share of produce used for home consumption is highest for *chefe* (39%) followed by *arerti* (25%). On the other hand, about 68% of improved desi and 32% of local desi produced by sampled households are used for home consumption. The share of chickpea varieties produced given as gift, tithe or donations are insignificant, and range from a maximum of 3.5% for *arerti* to zero for *chefe* cultivar.

9.4 Chickpea marketing and quality management

9.4.1 Chickpea marketing system in Ethiopia

Marketing system for chickpea in Ethiopia is very complex, linking a number of actors as the grain moves from the producer to the consumer or end-user. The number of links in the market chain reflects the services that are required to deliver the produce to the different consumers and end-users. Despite the length of the marketing chain, the structure of the markets for chickpea shows limited transformation or value addition that takes place as the grain moves within a given marketing chain. The bulk of the chickpea grain is transacted in unprocessed form. This suggests that, beyond transport and limited storage, relatively few market services are provided by intermediaries, indicating a relatively unsophisticated market structure. While the overall structure of the marketing system is quite complex, a few major marketing channels (value chains) linking producers with different end-users have been identified by Shiferaw and Teklewold (2007). These include: (i) rural retailers channel; (ii) assembler to district retailer channel; (iii) assembler to urban retailer channel; (iv) assembler to processor channel; (v) assembler to supermarkets channel; (vi) assembler to exporter channel; (vii) district wholesaler to exporter channel; (viii) farmers union to exporter channel and (ix) farmers union to processor channel.

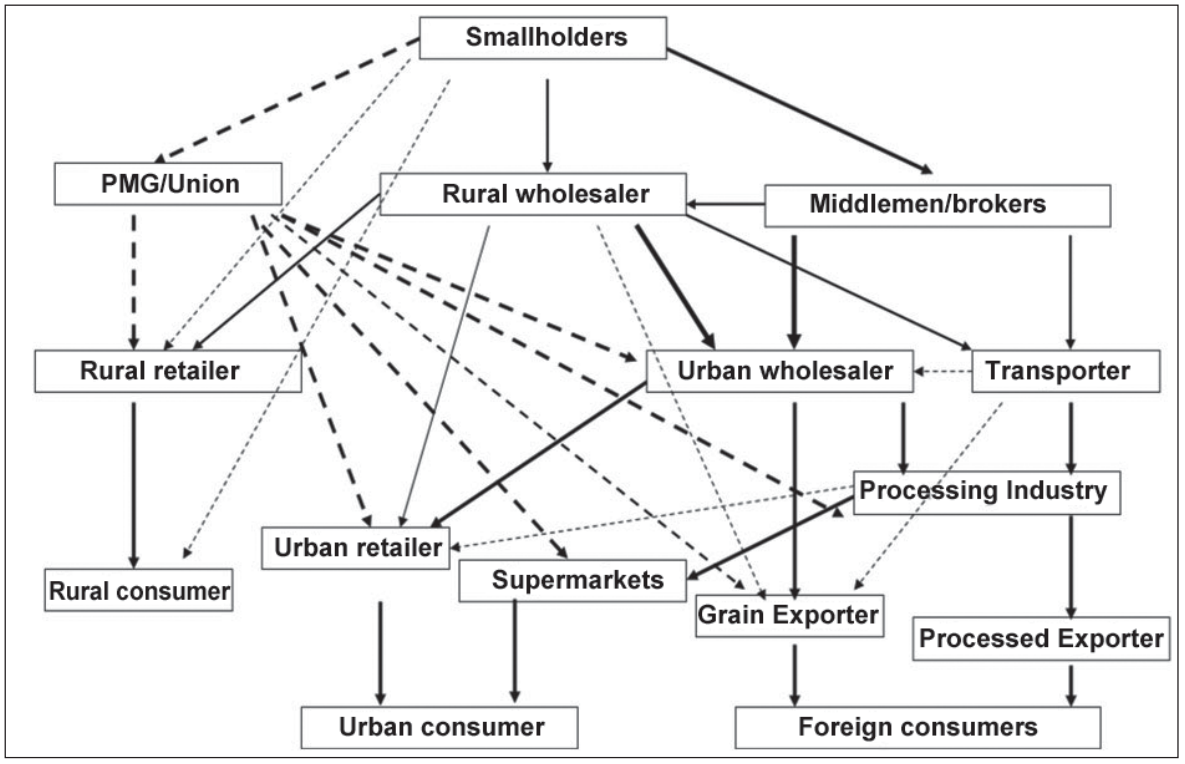

Figure 9.1. Marketing channels and value chain of chickpea in Ethiopia.

These nine marketing channels represent the full range of available outlets through which the grain moves from the primary and secondary markets in rural areas to domestic consumers and grain exporters to meet end-user needs in foreign markets. The rural retailers handle only a small volume of the total marketed surplus of mainly desi types. They collect directly from farmers and retail it to rural consumers in village shops, making this channel the shortest chain in the marketing system. The rural consumers include those engaged in non-agricultural activities and farmer net buyers of chickpea (mainly those who do not grow the crop). The rural assemblers, who collect the largest proportion of both desi and kabuli produce from farmers, are critical players in feeding alternative marketing channels. Most of the processed and packed chickpea sold in the supermarkets so far has been prepared from desi types. There seem to be some changes in this trend now as some supermarkets have started selling unprocessed and processed kabuli chickpea to domestic consumers. The district wholesalers are also important as they procure some of the produce from farmers and channel this to processors and exporters. The farmers' union is another player in the market with its own marketing chain extending from the primary cooperatives to processors and exporters. The length of the chain and the number of links in the value chain depend on the distance between the assemblers and the final outlet to the consumers or the exporters.

Marketing of chickpea generally starts with the collection of grains from the farm-gate and village markets (primary markets) moving on to the district towns (secondary markets) and then on to terminal markets in the cities. In the marketing chain the product passes successively through a number of market actors (representing the links in the value chain) before it reaches the end user. Broadly, there are two types of wholesalers in chickpea marketing in Ethiopia. These are wholesalers at district level towns and wholesalers operating at the tertiary markets including the parastatal, the Ethiopian Grain Trade Enterprise. Previously, wholesale chickpea trade was largely controlled by the public enterprises, mainly by the Ethiopian Oilseeds and Pulses Exporting Corporation. However, following the liberalization of the grain market system in 1990, the role of public enterprises significantly diminished and the role of private wholesalers increased. Market survey results indicated that wholesale markets both at the secondary and terminal levels are the main assembly centers for chickpea grains in their respective surrounding areas (Shiferaw and Teklewold 2007). Almost every trader has a warehouse in the market either self owned or on a rental basis. There is also an easy access to transport, which makes it well-located both for producers and other traders to move chickpea grain from one market to the others. Almost all wholesalers have at least one cellular phone, highly beneficial in conducting their buying and selling activities through a range of contacts they have in different markets.

Usually, speculative storage to benefit from inter-seasonal price movements is rarely practiced because of poor liquidity and high storage risks. Chickpea transaction from the district level wholesalers to urban wholesalers, processors and exporters is usually facilitated by arbitrage of brokers so as to coordinate inter-market chickpea flow usually based on trust. Similar to other grain marketing practices in Ethiopia, brokers identify chickpea buyers, sell chickpea on behalf of district level wholesalers and collect and send back money from the sale of chickpea. The market intermediaries communicate market information back to their clients on a regular basis.

Today Ethiopia also has several Farmers Unions and Primary Cooperatives involved in chickpea and other grain trading activities. The farmers unions facilitate access to improved seed, other inputs and credit to farmers. Recently, some of the Farmers Unions have started selling grain to wholesalers and exporters. There are also a few large scale and medium level mills that process chickpea mainly in the tertiary market.

On the other hand, almost all of the medium and small scale processors (locally known as *baltina*) are found in the tertiary markets and their number is higher than that of large scale processors. They require both desi and kabuli chickpea, although their demand for desi is relatively higher. Almost all of them have more than one selling point in and outside Addis Ababa. In addition, most of their products are available in most supermarkets and directly sold to consumers through small outlets in urban areas. There are also some grain exporting private and government owned companies. None of the exporters specialize in chickpea trade. Some of the exporters also engage in multiple businesses including wholesaling and retailing of grains in the domestic market. Because of the limited availability of kabuli chickpea in the markets very few exporters handle kabuli types. Recent market studies show that desi type chickpea comprised about 82% whereas kabuli type chickpea comprise the remaining 18%. The increased availability of small-seeded kabuli chickpea is not however going to make Ethiopian exporters competitive as domestic prices are high while prices for small-seeded kabuli in international markets are very different from desi chickpea. This is especially the case in south Asian markets, which are very sensitive to prices than quality at this time.

9.4.2 Farmer market participation and marketed surplus

Table 9.12 presents market participation and marketed surplus of different crops produced during 2006/07 cropping season. It is worth noting that the share of market participation and marketed surplus for chickpea varieties are computed based on the total chickpea producers. For instance, market surplus of a specific chickpea variety refers to the average amount sold for the total chickpea producer. The same concept applies to share of market participation and percentage sold in the main market. As shown, about 37% and 64% of chickpea farmers have participated in the marketing of kabuli and desi type, respectively. Within the kabuli category, the proportion of chickpea farmers involved in marketing of *shasho* variety is the highest followed by *ejere* type. When we examine across the districts, the share of chickpea farmers involved in marketing of kabuli types is highest in Lume-Ejere district (56%) compared to 21% in Gimbichu and 16.8% in Minjar-Shenkora districts. On the other hand, results show that more chickpea farmers participate in marketing of desi type in Gimbichu district (74%) compared to the other two districts. Generally the proportion of chickpea farmers who participate in marketing is relatively high (about 82%), indicating the role of this crop as a source of cash in the study area. Aside from chickpea, there are a number of other crops that are produced for the market. Almost all sampled farmers producing durum wheat also participate in the market. Results also show that market participation for white teff is about 93% and for lentil, mixed teff and bread wheat about 83%.

Market participation does not necessarily entail better income and livelihood, rather, the level of participation does matter to fully harness the benefit of market participation. Mainly due to high transaction costs and problems of asymmetric information and/or imperfect information, smallholder farmers face imperfect markets that include thin markets (imperfect competition), markets with price bands (where the price at which farmers sell their produce is far below their

Table 9.12. Market participation and marketed surplus during 2006/07 cropping season.

Crops/varieties	Gimbichu			Lume-Ejere			Minjar-Shenkora			Total		
	Market participation (%)	Marketed surplus (kg)	% sold in the main market	Market participation (%)	Marketed surplus (kg)	% sold in the main market	Market participation (%)	Marketed surplus (kg)	% sold in the main market	Market participation (%)	Marketed surplus (kg)	% sold in the main market
Arerti chickpea	14.52	94.76	18.99	6.11	65.23	5.08	3.98	18.13	5.96	6.29	47.7	7.49
Shasho chickpea	7.26	24.76	5.29	39.31	455.53	31.24	1.99	6.77	2.65	16.71	177.31	21.92
Chefe chickpea	1.61	11.69	0.77	0.38	1.53	0.17	1.59	3.55	1.39	1	3.91	0.49
Ejere chickpea	0	0	0	18.32	150.39	11.71	2.39	23.71	7.57	7.71	64.79	9.07
All kabuli	20.97	131.21	25.05	56.11	672.68	48.2	16.78	52.16	17.57	37.08	293.71	38.97
Improved desi	0	0	0	3.44	8.78	0.95	0	0	0	1.29	3.29	0.63
Local desi	74.19	337.06	59.88	55.73	218.26	19.08	37.45	203.24	72.13	47.43	214.28	35.18
All desi	74.19	337.06	59.88	59.16	227.04	20.03	63.09	203.24	72.13	63.86	217.57	35.81
All chickpea	83.87	468.27	84.93	85.5	899.72	68.23	73.15	255.4	89.7	81.84	511.28	74.78
Field pea	33.31	116.58	100.00	49.45	142.38	83.66	39.43	74.49	76.88	44.72	114.48	82.74
Faba bean	28.57	44.14	61.17	55.04	112.63	74.95	34.35	64.91	69.44	45.99	90.67	72.99
Lentil	91.94	635.37	77.53	64.28	223.42	59.09	85.17	240.07	86.32	83.28	426.77	76.46
Grass pea (guaya)	85.46	248.20	55.53	62.57	170.43	77.34	66.40	401.73	79.34	70.78	206.94	68.15
White teff	63.17	226.35	79.07	91.21	717.25	71.44	96.30	827.23	83.40	92.75	754.54	78.29
Mixed teff	0.00	0.00	0.00	50.25	201.01	100.00	0.00	0.00	9.09	83.06	290.70	71.43
Red teff	53.85	159.21	81.16	33.23	175.59	57.70	18.11	52.06	100.00	40.52	163.87	67.06
Bread wheat	89.04	1203.42	74.28	85.95	1161.90	56.80	77.66	889.29	67.60	83.77	1076.80	64.21
Durum wheat	100.00	400.68	37.50	100.00	802.01	85.94	33.48	552.41	0.00	100.00	831.11	69.88
Barley	36.38	86.85	100.00	26.94	105.86	86.48	38.38	101.73	76.65	31.97	103.37	83.01

Note: Market participation, market surplus and % sold in the main market are computed based on the total chickpea farmers, thus, market surplus, for example, refers to average amount sold by all the chickpea growing farmers.

buying price), partly missing markets (rationing out, seasonality), and missing markets where the market for a particular commodity is totally non-existent. Because of the underlying factors, farmers have low incentive to produce quality and high yield varieties with desirable market traits. In a market where there are significant transaction costs, whether a smallholder farmer participates in a market or not (and to what extent when he/she decides to participate) depends on how the subjective equilibrium prices within the household varies from the observed buying and selling prices (De Janvry et al. 1991). This determines whether the household is a net seller, self-sufficient or a net buyer of the agricultural produce. As shown in Table 9.12, the marketed surplus for most crops is less than one ton for the 2006/07 cropping year. The marketed surplus for kabuli chickpea is a bit higher than desi types and overall chickpea is the fourth in terms of quantity sold in the market. Durum wheat, bread wheat and white teff are the first three crops with the highest market surplus during the 2006/07 cropping year. About 74% of the chickpea is sold in the main market. Over two third of the other crops are also sold in the main market.

As shown in Table 9.13, farmers in the study regions primarily use donkeys for transporting produced crops to the market. About 89% of chickpea producers used donkeys while about 15% used public means to ship chickpea to the market. For wheat producers, the proportion of farmers using donkeys is 100%.

Table 9.14 presents the major buyers of chickpea and other pulses during 2006/07 cropping season disaggregated by districts. Results show that urban grain traders are the first major buyers of chickpea in all the three districts followed by rural traders and rural assemblers. Field pea is mostly sold to the cooperatives or farmer unions in Gimbichu district while to the urban grain traders in Lume-Ejere and to rural traders in Minjar-Shenkora district. The proportion of faba bean farmers selling their produce to rural traders is the highest in Gimbichu and Minjar-Shenkora districts while in Lume-Ejere most farmers sell to urban grain traders.

Table 9.13. Mode of transport to market crops during 2006/07 cropping season (all districts).

Crops/varieties	Hired truck (%)	Public transport (%)	Donkey (%)	Oxen/ horse cart (%)	Back load (%)	Public transport & donkey (%)	Camel (%)
Kabuli chickpea	2.73	15.00	89.54	2.27	0.45	1.82	0.45
Desi chickpea	0.80	6.68	88.50	0.00	0.27	2.67	2.67
Field pea	0.00	3.25	40.65	0.00	0.81	0.81	2.44
Faba bean	0.00	0.84	6.33	0.00	0.42	0.00	0.00
Lentil	0.00	1.56	89.89	0.78	0.39	3.11	1.95
Grass pea (guaya)	0.00	3.25	71.43	0.00	0.00	0.00	0.00
White teff	0.64	12.58	93.82	0.21	0.00	3.84	6.40
Mixed teff	0.00	16.61	66.45	0.00	0.00	0.00	0.00
Red teff	0.00	2.60	42.38	0.00	3.35	0.00	0.00
Bread wheat	0.91	8.95	100.00	1.37	0.00	1.06	1.52
Durum wheat	6.68	100.00	100.00	6.68	13.35	0.00	13.35
Barley	0.37	3.35	26.02	0.37	0.37	1.49	0.37
Maize	0.00	0.56	9.55	0.00	0.00	0.56	0.00
Sorghum	0.00	0.00	77.72	0.00	0.00	3.70	3.70

Note: N equals farmers who planted each crop or variety in the three districts.

Table 9.14. Major buyers of chickpea and other pulses during 2006/07 cropping season.

Crops/varieties	Amount sold (kg)	Cooperative or farmer union	Consumer or other farmer	Rural assemblers	Urban grain traders	Rural trader
Gimbichu						
Kabuli chickpea	650.74	24.89	0.92	4.27	62.08	7.84
Desi chickpea	405.76	1.08	6.10	17.65	48.80	26.38
Field pea	116.58	71.43	0.00	28.57	0.00	0.00
Faba bean	44.14	0.00	0.00	32.36	0.00	67.64
Lentil	635.37	19.45	0.44	18.21	37.90	24.00
Guaya	248.20	4.76	6.63	26.59	23.92	38.10
Lume-Ejere						
Kabuli chickpea	1071.64	22.55	3.34	22.35	28.81	22.94
Desi chickpea	366.17	0.92	4.29	18.12	45.91	30.75
Field pea	142.38	0.00	3.58	24.00	56.08	16.34
Faba bean	112.63	1.55	2.78	16.55	57.69	21.44
Lentil	223.42	0.00	1.05	22.32	31.16	45.47
Guaya	170.43	0.32	1.27	32.12	20.10	46.21
Minjar-Shenkora						
Kabuli chickpea	434.59	16.20	0.00	31.63	32.31	19.86
Desi chickpea	470.47	0.00	1.96	22.60	51.01	24.43
Field pea	74.49	0.00	12.81	23.68	22.28	41.23
Faba bean	64.91	0.00	10.71	31.75	6.61	50.93
Lentil	240.07	0.00	1.44	19.21	54.42	24.92
Guaya	401.73	0.00	20.66	0.00	70.25	9.09

We also asked the farmers to rank the buyers of chickpea in terms of some attributes whereby one represents most important and four represents least important. The results are reported in Table 9.15. Cooperatives and/or farmer unions rank the highest for their reliable weights and strict regulation on grain quality requirements compared to other buyers. The sampled chickpea farmers rank rural assemblers the highest for their proximity to their residences. Urban wholesalers are

Table 9.15. Comparison of buyers of chickpea (rank 1=most important, 4=least important).

	Cooperative or farmer union	Rural wholesaler	Consumer or other farmer	Rural assemblers	Broker/ middlemen	Urban wholesalers	Exporter
Pays a better price	2.55	1.84	1.66	2.41	3.81	1.35	1.47
Has reliable weights	1.21	1.97	2.15	2.45	3.49	1.56	1.70
Pays on time	2.88	1.50	1.91	2.38	3.35	1.34	1.36
Located near your residence	1.71	2.31	2.28	1.61	3.98	1.98	1.64
Stricter on grain quality requirements	1.29	2.48	2.09	2.53	4.06	1.67	1.58
Most preferred market outlet	1.78	1.66	2.36	2.48	3.98	1.53	1.39

Note: N equals those farmers who have experience in production and marketing of chickpea.

ranked the highest for three attributes, namely better price, making the payment on time and most preferred market outlet. Brokers or middlemen are ranked the lowest for all the attributes compared to other buyers.

Farmers who ever planted chickpea were also asked the choice of their selling time. We provided the farmers with some hypothetical kabuli chickpea prices for specific months and asked them their preferred time of selling and share of total to be sold in that specific time period. The hypothetical prices provided to farmers include 300 ETB/100 kg between January and March; 350 ETB/100 kg between April and June; 400 ETB/100 kg between July and September and finally 450 ETB/100 kg between October and December. Results show different time preference of selling their chickpea produce across districts. The preferred time of selling for over 60% of farmers in Gimbichu district is between July and September whereas for a majority of the farmers in Lume-Ejere and Minjar-Shenkora districts the preferred time is between January and March. The share of kabuli chickpea sold as a percentage of total sold over the year is the highest between October and December in Gimbichu district while between January and March in Lume-Ejere and Minjar-Shenkora districts. These results generally suggest that price is not the sole reason driving the time of selling and share to be sold.

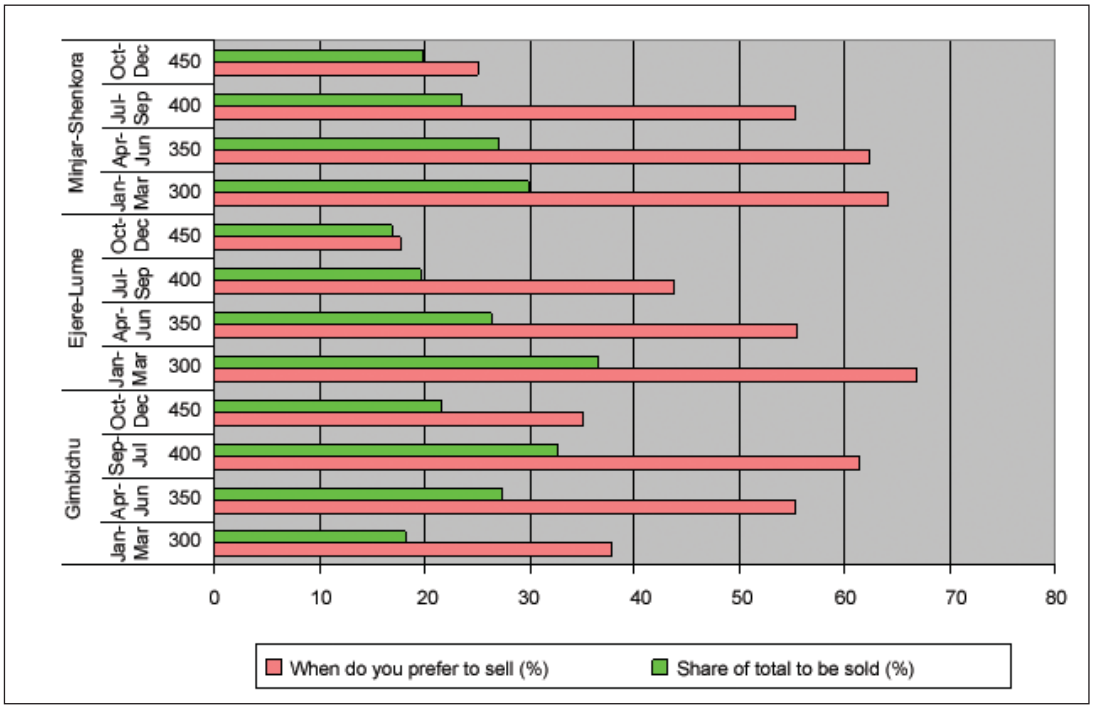

Figure 9.2. Choice of selling time for chickpea.

9.4.3 Grades and standards

A recent market study found that traders at all market levels classify chickpea into three informal grades, although the third chickpea grade was recognized by fewer respondents especially in the primary and secondary markets (Shiferaw and Teklewold 2007). About 75% of traders recognized kabuli chickpea as having two grades (Grade 1 and 2). There is uncertainty about the number of valid quality grades for desi types. For desi chickpea, the majority of the sample traders in the primary markets (70%) recognized only one quality grade for the commodity.

The study also looked at the market traits that are important in determining quality grades for chickpea. The major quality traits used in markets to classify chickpea grades include grain color, grain size, presence of foreign matter and broken and shriveled seeds. For kabuli chickpea, the highest quality grade requires about 98% white color grain, 96% large seeded grain, and less than 4% foreign matter and 4% shriveled and broken grain. On the other hand, the second quality grade prescribes about 96% white colored grain, 91% large seeded grain, and less than 5% foreign matter and 5% shriveled and broken grains. This indicates that kabuli grades drop when the proportion of white large seeded grain decreases and the proportion of foreign matter and shriveled and broken grain increase.

For desi chickpea, the requirements for the first quality grade are about 94% red color grain, 96% large seeded grain, and not more than 6% foreign matter and less than 6% shriveled grain. The second grade on the other hand requires about 80% red color grain, 90% large seeded grain, and not more than 8% foreign matter and shriveled and broken grains. There seems to be overall awareness about what matters for quality, but much less is known on how such grades relate to prices. This is unlike the case of major staple crops like teff where the consumers and traders alike generally know about the different grades and the associated prices.

This quality classification of chickpea is actually based on visual observation and it does not include any of the hedonic characteristics of the product. In many cases, visual inspection of the product is needed to determine the quality standards, which often requires the presence of the trader or his/her agent at the point of transactions. The traders usually take random samples from a given consignment using a special sampling device that can be inserted into sacks, and check for the major market preferred traits before they set their offer prices. While the Quality and Standards Authority of Ethiopia has established three quality grades for chickpea, much less is known on how the informal classification of chickpea grades based on grain size and color conforms to these standards. Even though the quality characteristics of traded chickpea do not always conform to the formal standards and requirements, the market still considers and gives weight for some of the quality parameters than the others.

Compared to primary markets, secondary and tertiary markets had the highest proportion (about 80%) of kabuli chickpea rated to be grade one while primary markets had most of the chickpea in grade two categories (Shiferaw and Teklewold 2007). This may indicate some divergence on how the same grain is rated into different quality grades in the different markets, where primary markets generally undervalue quality. Quality grades will not have any relevance if market prices do not reflect such differentiation. The survey results indicate that at all market levels (except for desi in primary markets) quality seems to attract a price premium. On average, there was a margin of about 27 ETB/100 kg for kabuli chickpea and 15 ETB/100 kg for desi chickpea. Interestingly, the level of significance of quality increases substantially in the tertiary market than the other markets. The price differential between grades in this market for kabuli chickpea reaches up to 72 ETB/100 kg. The effect of quality on prices is much lower in the primary markets than in the secondary and tertiary markets.

9.4.4 Constraints and prospect for chickpea marketing in Ethiopia

Since the 1980s and 1990s, many sub-Saharan African countries have embarked on an economic reform program initiated in the form of Structural Adjustment Programs (SAP), which is geared towards opening new market-led opportunities for economic growth and poverty reduction. After the fall of the socialist regime in 1991, Ethiopia has also set forth reform programs that transform the command economy system to a liberalized market oriented economy system. Liberalization of the country's economy has given opportunities for smallholder farmers to diversify their products and take their surplus to nearby markets. The removal of trade barriers and discouraging local monopoly helped the smallholder farmers choose buyers of their surplus produce and sellers of their farm inputs. The structure and performance of rural markets, however, is still a concern for the well developed commercialization of agriculture (Shiferaw and Teklewold 2007).

Technologically, agricultural production is characterized by spatial dispersion, high transportation and travel costs, seasonality, synchronic timing, heterogeneity of factors of production and various types of risks. As a result, seasonality, price fluctuation, risk, high transaction cost and asymmetric information are some of the features of the agricultural market (Holden and Binswanger 1998, Holden et al. 2001, Sadoulet and de Janvry 1995). Mainly due to high transaction costs and problems of asymmetric information and/or imperfect information, smallholder farmers face imperfect markets that include thin markets (imperfect competition), markets with price bands (where the price for which farmers sell their produce is far below their buying price), partly missing markets (rationing out, seasonality), and missing markets where the market for a particular commodity is totally non-existent. Because of the underlying factors, the farmers have low incentive to produce quality and high yield varieties with desirable market traits. In a market where there are significant transaction costs, whether a smallholder farmer participates in a market or not (and to what extent when he/she decides to participate) depends on how the subjective equilibrium prices within the household varies from the observed buying and selling prices (de Janvry et al. 1991).

The transaction costs that bedevil smallholder farmers include distance from market and under-developed infrastructure that make transportation costs high; wide marketing margins because of traders with local monopoly power; high search and recruitment costs due to information asymmetry; and incentive and supervision costs on hired labor (Sadoulet and de Janvery 1995). Studying the factors that affect the decision of smallholder farmers whether to sell at farm-gate prices or to transport to the market where they can get higher prices, Fafchamps and Hill (2005) found that quantity supply, proximity of the market and poverty level of the farmers are some of the significant factors. Their findings showed that the larger the quantity supply, and the closer the market, the more likely the farmer takes his produce to the market. Assuming away public transportation, the article showed that poorer farmers are willing to walk to markets as the shadow price of time for the wealthy is higher.

Generally, limited number of traders, inadequate transportation network, high handling cost, limited market outlets, weak bargaining power of producers and poor information systems are some of the features of the country's agricultural market (Demeke 2000). These marketing features also contribute to the low market orientation of producers of our study crop. Though chickpea has a great potential in the local market and as a source of foreign exchange, its production system is not adequately market-oriented. The traditional chickpea variety dominates the local and export markets; however, low productivity of the variety limits the farmers' competitiveness in

these markets. According to Shiferaw et al. (2007), the structure and functioning of the chickpea marketing system in Ethiopia is constrained by several factors. First, the supply originates in small quantities from several highly dispersed small producers that supply non-homogenous desi types to local markets. The marketed surplus by individual farmers and the overall traded volume are low, and hence per unit transaction cost of marketing for individual farmers and rural traders are high. Second, there is lack of a well-coordinated supply chain that links producers and buyers. This increases the transaction costs and lowers the share of the consumer price that is received by small producers. Third, there is no efficient mechanism for delivering market information to the producers and traders at local markets on issues related to seasonal prices, demand, and quality requirements in different markets across the country. Fourth, there is lack of a well-established system of grades and standards in the chickpea marketing system. Fifth, the desi chickpea varieties currently grown by farmers in the country are not able to satisfy the quality attributes required by diverse markets.

9.4.5 Chickpea price trend in Ethiopia

From 1995 through 2001, the producer price trend was downward, however there is an upward movement of prices since 2002 (Figure 9.3). In general, it has a positive annual average growth rate of 0.12% and coefficient of variation of 18%.

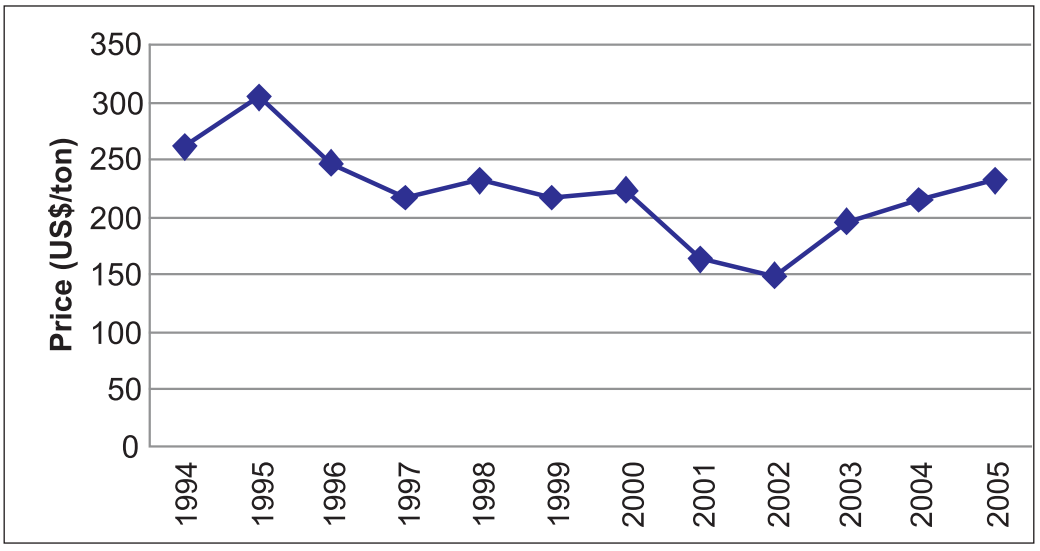

Figure 9.3. Chickpea producer price trends.

The FAOSTAT database does not differentiate prices by chickpea types. Using market information from one of the spot chickpea growing areas (Debre Zeit) in Ethiopia, kabuli and desi chickpea producer and retail price trends are explored. Figure 9.4 and 9.5 show that both producer and retail price are higher for kabuli chickpea than for desi types. The retail price movement is much steeper than the producer price. Retail price is more variable than producer price. The coefficients of variation are 21% and 37% for kabuli and desi retail price, respectively. On the other hand, the coefficients of variation for kabuli and desi producer price are 12% and 20%, respectively. The

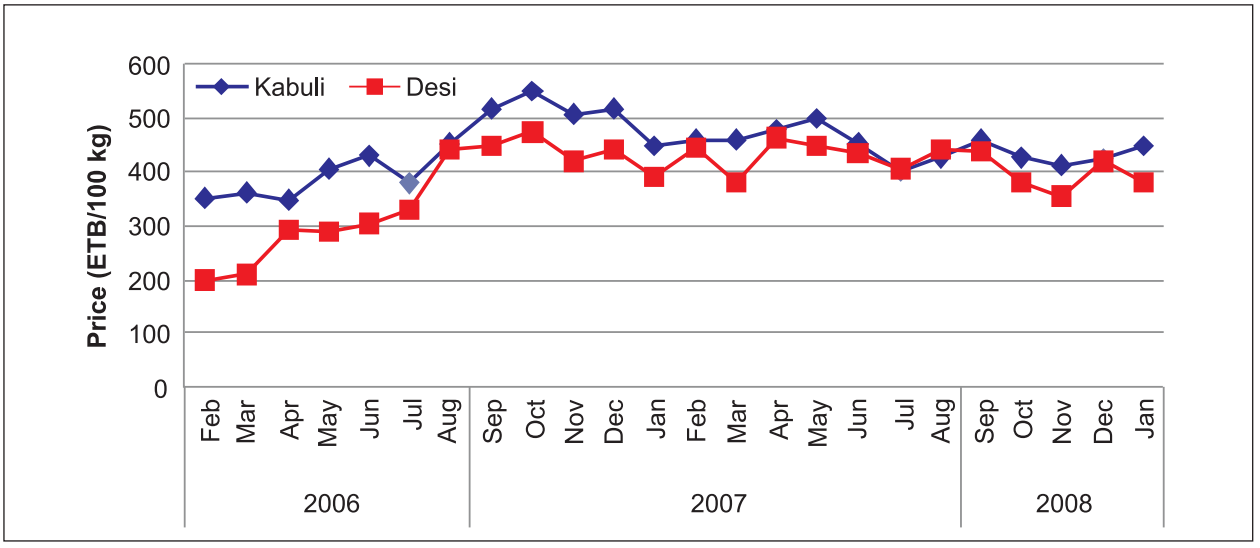

Figure 9.4. Monthly average kabuli and desi producer price trends in Debre Zeit.

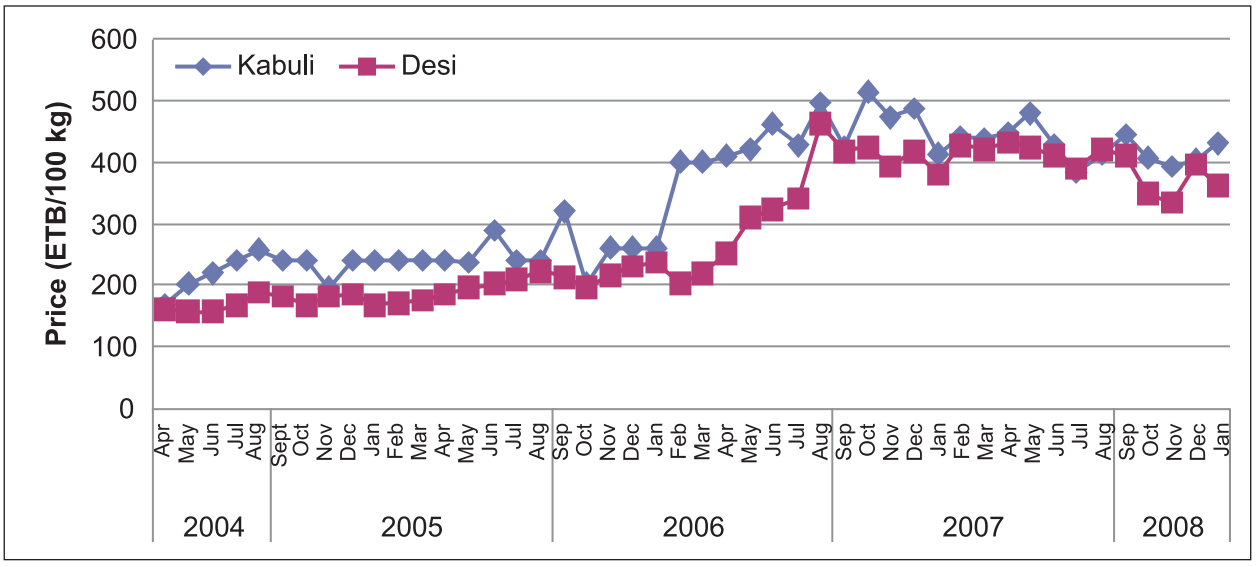

Figure 9.5. Monthly average kabuli and desi retail price trends in Debre Zeit.

annual average growth rate (AAGR) of kabuli retail price (4.5%) is more than double the desi retail price (2.3%). On the contrary, the AAGR of desi producer price (3.68%) is much higher than kabuli producer price (0.37%).

10. Gender aspect of chickpea production and marketing

Gender is an important element in labor share in crop and livestock production systems in Ethiopia. Both men and women do a large number of tasks related to animal and crop production, with some degree of variation in involvement from region to region. Culture and tradition often define most of women's roles in the agricultural sector in Ethiopia. In most cases, their role as primary caregivers may limit the time women have to spend on non-reproductive activities including crop and livestock production. Women in the agricultural sector are heavily involved in home production activities, which involve childcare, food preparation and carrying of water and fuel.

In the study area, production of chickpea is the responsibility of the household in general but it is important to make distinctions among the types of responsibility that women have over chickpea production: ownership, control over decision-making, use rights and provision of labor. In most systems, women provide labor for the various tasks related to production but may or may not control the process of decision-making, particularly over the disposal of produce. Similarly, women may be involved in production, but may or may not own the means of production. Both husbands (men) and wives (women) usually have a say over the use of resources, although there may be unequal, often conflicting claims on resources for the satisfaction of basic needs. Men's ownership rights are guaranteed by a near universal set of inheritance rules that are gender biased and rooted in religion and patriarchal kinship systems. Women in general have less access to the means of production in comparison with the extent of their labor contribution.

In the study areas, land preparation, planting, fertilizer application and irrigation are often done by men whereas women play a great role in weeding, harvesting, transporting and threshing. The decision to sell valuable agricultural products and control the income generated from the sales of the products is a question of entitlement. In the study areas, men and women appear to make decisions regarding the sale of chickpea. However women's involvement in rural markets is little understood and inadequately researched, particularly in terms of the facilities that women use, their price responsiveness and their dependence on barter or cash. Women are less familiar with modern markets and feel powerless to influence them. They are hampered by cultural norms, and the lack of access to information on new technology, prices, demand, etc. Unlike their husbands, they are rarely given training in modern small-business management. Also, they are hampered by factors common to all: lack of adequate transport and communications services, inadequate equipment and facilities in marketplaces and the presence of exploitative middlemen.

Compared to women, men have easier access to technology and training, mainly due to their strong position as head of the household and greater access to off-farm mobility. Men have easier access to credit than women. Women are rarely considered creditworthy because they have no collateral. In addition, they often cannot read and write, and are not used to frequenting governmental or official institutions without their husbands' consent and being accompanied. Since training could balance between the development of technical and methodological skills, and creating a social awareness for putting gender strategies into action, to increase productivity in chickpea production, training should be oriented towards those persons directly involved in these activities. Efforts to introduce new technologies that do not take into account existing knowledge of men and women are unlikely to meet with success. Failure to direct information to the person responsible for a given activity may result in no increase in productivity or even in stock losses. Credit lines have to respond to client's needs and their social and cultural values. Social behavior and traditional rules of men and women have to be well considered and credit lines adapted to their special needs.

11. Conclusions and synthesis

This report summarizes findings from the 2006/07 baseline survey in Ethiopia. This survey is a part of the ICRISAT research projects called Tropical Legumes II and Treasure Legumes with the overall goal of enhancing productivity and production of grain legumes, and the incomes of poor farmers in drought-prone areas of sub-Saharan Africa. The research findings will be used to inform policy makers, development practitioners and other stakeholders in formulating and implementing policies and strategies in Ethiopia. It also supports research developments in breeding through a feedback process, policy dialogue, and by identifying lessons learnt for technology dissemination. The survey is based on data collected from a random cross-section of 700 households in 26 *kebeles* from three districts in central highlands of Ethiopia.

The report identifies eleven major findings:

The first findings are related to household asset categorized into natural, livestock, physical, human, social and financial capital. Natural capital refers to land ownership ignoring natural resources and ecosystem. The average total land holding for the upper 25% of the sampled households is about 4.1 ha of which 3.8 ha is cultivated land and 0.5 ha is fallow land. For the lowest 25% of the sampled households, the average land holding is 0.6 ha of which the share of fallow land is nil. Looking at the average livestock holding, sheep and oxen seem to be the highest with mean holding of 2.9 and 2.8, respectively. Using tropical livestock unit (TLU) as unit of measurement, households in Lume-Ejere district own the highest with an average of 8.3 followed by Gimbichu households with an average holding of 7.9. About 87% of the sampled respondents own house with iron roof whereas only 2.4% own house with stone wall. Results also show that about 96% of the sampled households own more than one house. Only 2% own bicycles, which suggest the inferior use of the item for transporting purposes. About 77% of the sampled households own at least one radio whereas the ownership of television is very minimal (1.3%). There seems to be no significant variation in the ownership of radio across the three districts although television ownership is relatively higher in Gimbichu district. Only 6.1% of sampled households own mobile phone in the survey regions with Lume-Ejere taking the lead with 9.7%.

The average active family labor force measured in adult equivalent (AE) is 4.7 in Gimbichu, 5.0 in Lume-Ejere and 4.6 in Minjar-Shenkora. The overall average education level of the head is 1.7 years, which seems to be the lowest at any given standard compared to many African countries. Average education of the household head is highest in Gimbichu with 2.3 years and lowest in Minjar-Shenkora district with 1.3 years. Almost all sampled households are members of funeral association (‘idir’) while about 89% are members of input supply/service cooperatives. About 76% are also members of a religious association. The percentage of sampled farmers participating in farmer associations and local administration amounts to about 23% each. About 12.4% of the sampled households had savings with rural micro-finance whereas only 4.1% of households made savings with a commercial bank in the 2006/07 cropping season. About 5.7% had a saving either with ‘idir’ or ‘ekuub’.

The second findings are related to access to agricultural and business services. Average walking distance to nearest village market is about 3.2 km. About 30% of the sampled respondents reported having non-paved dirt road to the village market whereas only 10% have access to paved gravel road. The road to the village market is passable for trucks only 5 months in a year suggesting the constraints the farmers face for marketing their produce all year round. On the

other hand walking distance to the main market is relatively far compared to the village market and is about 10 km. Distance to cooperative and extension agent officer is about 3 km and 2.2 km, respectively. Results also show that government extension agent, neighbors/other farmers, farmer cooperatives or groups and radio are the four major sources of market information in the survey regions. About 79.3% and 26% of the sampled households have got credit for purchasing fertilizer and seed, respectively, although those who needed the credit were about 81.9% and 41.3%.

Third, the report finds that bread wheat and white teff are the first and second most common crops produced among the sampled households in survey regions. The average land devoted to bread wheat and white teff are 0.8 and 0.5 ha, respectively. Bread wheat occupies the largest cultivated land among all the crops. When it comes to share of crop area allocated to improved varieties, kabuli chickpea takes the lead (42.5%) followed by bread wheat (36%). Desi chickpea is the third most popular crop produced by 53.6% of sampled households and the average land devoted amounts to 0.2 ha. Bread wheat, kabuli chickpea and durum wheat are the top three crops with the highest yield while field pea generates the lowest yield.

Fourth, the report finds that in all the three districts, 100% of sampled households applied at least some chemical fertilizer on all of their crops although national average is 32%. Generally, the average amount of fertilizer use on legume crops is low. For kabuli chickpea the average amount of DAP and urea fertilizer used per ha amounts to 16 kg and 11 kg, respectively, whereas the amount used for desi chickpea is by far less. On the contrary, the average rate of application for teff and wheat is the highest amongst all the crops ranging from 100 to 250 kg per ha. Manure application is also popular especially in Lume-Ejere and Minjar-Shenkora districts. Unlike chemical fertilizer, only 48% of sampled households use at least some purchased seeds, perhaps due to use of recycled seeds. The share of seed purchased for kabuli chickpea is about 48.9%, which is significantly higher compared to desi chickpea (3.1%). The average seed application rate for kabuli and desi chickpea amounts to 186.5 and 149.8 kg per ha, which is relatively higher than the recommended rate of a maximum of 140 kg per ha. Surprisingly hiring oxen or machine is not common in the survey regions. About 70% of households use at least some chemical in crop production and the figure does not seem to vary across the districts. The application of chemical pesticide is below one liter per ha for all crops. Compared against other legumes, chickpea generally stands out as the the crop with the highest gross margin. The average return for barley and white teff is about 8,476 ETB and 7,996 ETB per ha, respectively, whereas kabuli and desi chickpea have a net-return of about 7,532 ETB and 7,088 ETB per ha.

Fifth, the report finds that oxen is owned by 94.7% of the sampled respondents with an average size of 2.8 suggesting the critical role of oxen especially as draft power in crop production The second most important livestock is donkeys, which are owned by about 84.6% of the sampled respondents with an average ownership of about 2.1. Chickens and cows are owned by about 79.8% and 62% of the sampled respondents, respectively. About 10.5% of the sampled respondents use crop residue as source of animal feed whereas about 5.5% use green fodder or grazing land. About 10% and 30% of the households use hay and concentrates as animal feed in the survey area, respectively. Almost 100% of sampled respondents use oxen as draft power in crop production. About 37.6% of households use manure in crop production and the figure is the highest in Minjar-Shenkora district. The proportion of households using livestock for threshing and transporting is about 97% and 84.9%, respectively. The average gross margin of livestock production in the survey area is about 2,639 ETB.

Sixth, the report finds that about 14% are involved in commercial activities such as grain mills, shops, trade and tailoring whereas the proportion of households participating in wage employment (casual and long-term employment) is about 6.9%. About 5.7% of the households participate in selling of crop residue whereas about 5.4% participate in sale of dung cake for fuel. Generally, it is fair to suggest that off-farm business activities play a minor role in the daily livelihood of smallholders in the survey regions.

Seventh, the report finds that the average per capita household expenditure among the sampled households is 2,164 ETB for 2006/07 cropping year. To obtain the annual per capita expenditure, we added annual expense on food grains, livestock produce, vegetables, beverages, clothing and social activities for twelve months. Out of the per capita expenditure, cash expenditure is 819 ETB, while the rest, 1,346 ETB, is consumption of commodities produced on the farm. The implication is that most food in rural areas of Ethiopia is derived from own sources.

Eighth, the report also finds that the average household income is about 16,797 ETB for twelve months. Income sources include crop income, livestock income, non-farm activities and wage income. Out of the annual household income, crop income (including amount consumed at home) takes the largest share of 78%, followed by livestock incomes of 15% and non-farm business activities of 6%. The share of wage income is insignificant compared to other sources (0.8%). Although shares from different sources differ across districts, crop income provides the largest income share in all districts surveyed. When stratified by income quartiles, we find that households in lower income quartiles have lower income shares coming from crop production than households in higher income quartiles and this result is consistent across all the three districts. Surprisingly, the result shows no significant income disparity between male and female headed households in the study area. Among all the quartiles, the income of female headed households is a bit higher than the male headed households. The major lesson that can be drawn from these results is that crop income is the most important income source for poor households. Thus, increasing crop productivity is a crucial issue to secure and increase income for them. Using the international poverty line, (earning US$1 per day), results also show that about 77% of the sampled households live below the poverty line, a percentage far higher than the national average, which is about 45% for rural population. The poverty gap and poverty severity for the entire sample is about 0.27 and 0.12, respectively.

The ninth findings are related to sources of information, chickpea variety preference and adoption. The proportion of households receiving information about kabuli varieties from neighbors and government extension amount to 46.6% and 45.3%, respectively. The third most important source of information is farmer cooperative (26.1%). Neighbors remain the first major source of information (72.4%) for desi varieties followed by family members. The improved kabuli variety *arerti* and *shasho* are known to 43.9% and 48% of the sampled respondents, respectively. Among the sampled respondents only 6.4% knew *chefe* variety whereas about 25% were aware of *ejere*. While a majority of the sampled respondents (98%) knew the local desi variety, less than 5% were acquainted with the improved ones such as *marye, worku, akaki* and *dubie.* The proportion of farmers who ever planted the variety is by far lower than those who knew the variety for both desi and kabuli types. Among chickpea farmers, about 21% and 28% have planted *arerti* and *shasho* varieties in August/September 2007, respectively, whereas about 2.3% and 15% planted *chefe* and *ejere* types, respectively. On the other hand, the proportion of chickpea farmers who planted improved desi in the same period is less than 3% while about 76% planted the local desi.

The proportion of chickpea farmers who plan to plant these varieties in the future is bigger than those who planted in the survey year except for the local desi variety. Generally, kabuli varieties are highly preferred by chickpea farmers for their high economic return in addition to their grain color and size. The first and second major reason why some farmers never adopted the improved varieties was lack of access to seed and fear of theft during the green stage, respectively. The third and fourth major reasons are related to shortage of land and lack of cash to buy seed and/or lack of credit. The first major source of seed for *arerti* and *shasho* varieties is own saved seed followed by producers' groups. Own saved seed again was a vital source of seed for *chefe* (77%), *worku* (71%) and local desi (84%) varieties while producer marketing groups also contribute for *ejere* type (33%). The third and fourth important sources of seed for most kabuli and desi varieties during the 2006/07 planting season are local seed producers and local traders and/or agro dealers, respectively.

Tenth, the report finds that the most widely grown variety among chickpea farmers remains *shasho* (20.6%) followed by *ejere* (11.7%) and *arerti* (10%), respectively. Local desi remains the most widely grown variety among chickpea farmers while only 4.3% grow improved desi. Of the total chickpea area in the survey regions, about 54.5% is allocated to local desi followed by *shasho* (21%) and *ejere* (11.9%). Generally kabuli varieties perform superior in terms of yield compared to the desi types. Among all chickpea varieties *arerti* and *shasho* varieties have the highest gross margin in terms of returns to land and management. The average return for *arerti* and *shasho* is about 10,283 ETB and 9,496 ETB per ha, respectively, whereas improved desi has a net-return of about 2,481 ETB per ha.

Eleventh, the report finds that about 37% and 64% of chickpea farmers have participated in the marketing of kabuli and desi chickpea, respectively. Within the kabuli category, the proportion of chickpea farmers involved in marketing of *shasho* variety is the highest followed by *ejere* type. Generally, the proportion of chickpea farmers involved in marketing is relatively high (about 82%) indicating the role of this crop as a source of cash in the study area. The marketed surplus for kabuli chickpea is a bit higher than desi types and overall chickpea is the fourth in terms of quantity sold in the market. Durum wheat, bread wheat and white teff are the first three crops with the highest market surplus during the 2006/07 cropping year. About 74% of the chickpea are sold in the main market. About 89% of chickpea producers used donkeys for transporting while about 15% used public means to ship chickpea to the market. Urban grain traders are the first major buyers of chickpea in all the three districts followed by rural traders and rural assemblers.

In sum, the findings in this report provide some insights on important information that could help in conducting ex-post impact assessments. It is obvious that most of the findings are based on descriptive analysis. However, over the next few months we will make an attempt to establish some causality and evaluate how the adoption and use of some technologies affect productivity, commercialization and poverty.

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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 and a degraded environment through better 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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