Gender Differentials in Agricultural Production and Decision-Making Among Smallholders in **Ada, Lume, and Gimbichu Woredas of the Central Highlands of Ethiopia**

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Ethiopian Agricultural Research Organization (EARO)

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Abstract: This study provides concrete information about the role of gender in resource ownership and decision-making in the mixed farming systems of Ada, Lume, and Gimbichu woredas in the central highlands of Ethiopia. A multistage purposive sampling method was used to select male-and female-headed households based on population, crops grown, altitude, and distance from the research center. Of a sample of 180 households, 81 (45%) were headed by women. On average, male-headed households (MHHs) were larger than female-headed households (FHHs). Male heads of households were more educated than female heads of household, and they owned more ox-plows and livestock. The average area cultivated by MHHs was larger than that cultivated by FHHs for almost all crops. On the other hand, the average per capita land holding was almost equal between MHHs and FHHs. Both types of households acquired land through government allocation and used credit to purchase seed and fertilizer. Significant factors affecting gross value of output for MHHs were the farmer's age, family labor, farm size, livestock units, and inorganic fertilizer. The significant factors affecting gross value of output for FHHs were family labor, farm size, livestock units, inorganic fertilizer, hired labor, and extension contact. The marginal value product (MVP) of family labor is higher in MHHs compared to its price (wage rate), but it is lower in FHHs, indicating that MHHs were able to increase their productivity by using more family labor. The MVP of farm size was lower than its factor price for MHHs and higher for FHHs, indicating that FHHs could increase their productivity by cultivating more land. The MVP for inorganic fertilizer was higher than its factor cost for both MHHs and FHHs, so both types of households could increase productivity by increasing their use of inorganic fertilizer. The gender difference in gross output was considerable, partly because FHHs used fewer inputs. If MHHs and FHHs had equal access to inputs, it is likely their levels of productivity would be similar. In 1997, about 59% of MHHs and 42% of FHHs grew wheat, and most of these grew local varieties (70% of MHHs and 86% of FHHs). A significantly higher proportion ($t=5.7$; $p<0.05$) of MHHs (30%) grew improved wheat varieties than FHHs (14%). In MHHs, extension services and farm size had a positive effect on the adoption of improved wheats, whereas radio ownership and farm size increased the odds in favor of adopting improved wheats for FHHs.

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ACRONYMS AND ABBREVIATIONS

CSA	Central Statistical Authority
CIMMYT	International Maize and Wheat Improvement Center
DZARC	Debre Zeit Agricultural Research Center
EARO	Ethiopian Agricultural Research Organisation
FAO	Food and Agricultural Organization
FHHs	Female-Headed Households
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
IDR	Institute of Development Research
MHHs	Male-Headed Households
MVP	Marginal Value Product
OLS	Ordinary Least Squares
PA	Peasant Association
TBA	Traditional Birth Attendant
UNDP	United Nations Development Program
WHO	World Health Organization

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EXECUTIVE SUMMARY

Gender analysis has been at the heart of many studies which have sought to outline the complexity, flexibility, and political aspects of access to and control of resources. It is recognized and empirical evidence indicates that women do play an important role in decision-making in agriculture and in the adoption of agricultural technologies. The transfer and adoption of agricultural technologies is therefore affected by who owns productive resources and who decides what to produce, when to produce, and how much to produce. Information provided through research is, therefore, vital for policymakers to be informed of the basis on which decisions are made at the micro-level. This type of information is lacking in Ethiopia, and this study attempts to fill that gap and provide concrete and statistical information about gender's role in agricultural production and decision-making in the household economy. The main focus of the research was to assess the role of gender in terms of resource ownership and decision-making power in the mixed farming systems of Ada, Lume, and Gimbichu woredas in the central highlands of Ethiopia.

A multi-stage purposive sampling method was used to select male- and female-headed households. The households were selected based on the total population, types of crops grown, altitude, and distance from the research center. Out of a sample of 180 households, 81 (45%) were headed by females. Female-headed households (FHHs) were those that were managed by a widowed, divorced, or single woman without the mediation of a husband, father, or male relative in the routine day-to-day activities of that household. Male-headed households (MHHs) were those where a husband was present and was the final decision-maker in important issues pertaining to the household (Starkey et al. 1994). The survey was carried out during the cropping season of 1997.

Survey results indicated a range of similarities and differences among FHHs and MHHs. The average size of MHHs was larger than FHHs, and male heads of household were more educated than female heads of household. In MHHs, the decision to have more children was made jointly by husband and wife. With respect to wealth and resource ownership, both MHHs and FHHs lived in thatched roof houses, but the number of ox plows owned by MHHs was significantly higher than FHHs and they were therefore better able to prepare their land. The mean number of livestock owned by MHHs was higher than FHHs.

The average area cultivated by MHHs was larger than FHHs for almost all crops. The main crop cultivated in Ada and Lume was tef, while in Gimbichu it was wheat. In Ada, both types of households grew only local tef varieties, while 53% and 58% of the MHHs and FHHs in Lume, respectively, grew both local and improved varieties. In Lume, more MHHs (38.7%) grew improved wheat varieties than FHHs (22.2%). In Ada, both types of households learned about improved varieties through extension services provided by the Ministry of Agriculture; in Lume 52.6% of FHHs learned about improved varieties from the market and 47% of MHHs through the extension service. In almost all FHHs it was the head who decided what to plant. In MHHs, it was mostly a joint decision by the head and wife in Ada (48.4%) and Gimbichu (54.4%), while in Lume (83.3%) it was the head who decided. The mean daily energy production per person per day was about 2,278 and 2,291 calories for MHHs and FHHs, respectively.

All MHHs and FHHs used fertilizer. For MHHs, this was a joint decision in Ada (50%), and a household head decision in Lume (97.1%) and Gimbichu (59.4%). In FHHs, the head decided on the use of fertilizer. About 38% and 44% of MHHs and FHHs in Ada, 66% and 50% in Lume, and 21% and 4% in Gimbichu, respectively, used herbicides. Both male and female heads of household decided on the use of herbicides.

The average per capita landholding was almost equal between MHHs and FHHs, and they acquired their land from the government. MHHs indicated that their land was more fertile than FHHs. About 68%, 100%, and 61% of male heads of household were responsible for deciding whether to improve land in Ada, Lume, and Gimbichu, respectively. In FHHs, the majority of heads of household in Ada (96%), Lume (96%) and Gimbichu (100%) decided whether to improve land. The decision to lend land in Lume was the full responsibility of the wife in MHHs, while in Gimbichu it was a joint decision between the husband and wife (75%). In FHHs in Gimbichu, the head and the son decided whether to lend land. The average amount of labor (h/ha) used for crop production was higher for MHHs than FHHs. Also, MHHs hired more labor for crop production than FHHs. Wives and daughters in MHHs and heads and daughters in FHHs were primarily responsible for non-agricultural tasks.

Most farmers obtained credit to purchase seed and fertilizer from the Ministry of Agriculture. Many farmers were also members of a service cooperative that helped them obtain inputs. The decision to use credit was made primarily by the male and female heads of household in Lume and Gimbichu. In Ada, the decision to use credit was made jointly in MHHs, while most female heads of household decided whether to obtain credit. More MHHs had access to extension services than FHHs, and extension contact actually had a negative effect on FHHs' use of recommended technology.

Analysis based on the Cobb-Douglas production function indicated that variation in gross value of output per hectare associated with the factors of production was 72% and 82% in MHHs and FHHs, respectively. The significant factors affecting gross value of output for MHHs were the farmer's age, family labor, farm size, livestock units, and inorganic fertilizer. The significant factors affecting gross value of output for FHHs were family labor, farm size, livestock units, inorganic fertilizer, hired labor, and extension contact.

The marginal value product (MVP) of family labor compared to its price (wage rate) is higher in MHHs and lower in FHHs, which indicates that MHHs could increase their productivity by using more family labor. On the other hand, the MVP for farm size was lower than its factor price in MHHs and higher in FHHs. Thus, FHHs could increase their productivity by cultivating more land. The MVP for inorganic fertilizer was higher than its factor cost for both MHHs and FHHs, which indicates that both types of household could increase their productivity by increasing the use of inorganic fertilizer.

The gender difference in gross output was considerable. MHHs had a gross output of Birr 6,456/ha, while FHHs had a gross output of Birr 4,776/ha. These differences can be explained partly by

the lower quantities of inputs used by FHHs. The use of average values of these inputs from MHHs resulted in a gross output of Birr 6,541/ha for FHHs—1.3% higher than MHHs. This suggests that no productivity differences would have existed between both households if they had equal access to inputs.

In 1997, about 59% and 42% of MHHs and FHHs, respectively, grew wheat. Local wheat varieties were grown by 70% and 86% of MHHs and FHHs, respectively. A significantly higher proportion ($t=5.7$; $p<0.05$) of MHHs (30%) grew improved wheat varieties than FHHs (14%). The logit model explains 84% and 89% of the total variation specified in the model for MHHs and FHHs, respectively. The chi-square indicates that the parameters are significantly different from zero at the 1% level for both households. In MHHs, extension services and farm size had a positive effect on the adoption of improved wheat varieties, while radio ownership and farm size increased the odds in favor of adoption of improved wheat varieties in FHHs.

On the whole, the study found that the MHHs and FHHs in the three woredas had differences in endowments (land rights, education) and differential access to technologies, factors of production, and support services. These differences had implications for the productivity levels and adoption capacities of both types of households.

To address some of these differences, efforts should be made to provide credit and improve the supply of preferred improved seed in time for planting. It is also recommended that technologies should take into account the resource base of female farmers; extension services should be targeted specifically to them; and the decision-making power of female household heads should be harnessed by exposing them to different opportunities.

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1.0 INTRODUCTION

This study is an attempt to address the lack of concrete and statistical information on gender roles in agricultural production and decision-making in the household economy of Ethiopia, focusing primarily on the role of gender in resource ownership and decision-making power in the mixed farming systems of Ada, Lume, and Gimbichu woredas in the central highlands.

Agriculture is a dominant sector in Ethiopia. It contributes 51% to the GDP, employs nearly 80% of the total labor force and generates the bulk of foreign exchange. Smallholder farms are predominant and account for more than 90% of agricultural production and over 95% of the total area under cultivation (Table 1). However, given the poor performance of the agricultural sector vis-à-vis the growing population — estimated at over 55 million and growing at a rate of 3% per annum—the intensification of agriculture is very critical. As a result, there has been an overall effort to increase agricultural productivity to meet the growing food demand.

Much valuable research already exists on the different roles of women and men in various farm activities and non-farm activities like food preparation, household maintenance, and childcare, and there is now growing recognition that they often have very different rights and responsibilities with respect to resource use (Adepoju and Oppong 1994; Bryceson 1995; Dey 1981; McSweeny 1979; Whitehead 1985). The transfer and adoption of agricultural technologies is affected by who owns productive resources and who decides what to produce, when to produce, and how much to produce. Empirical evidence show that women do play a greater role than previously thought in decision-making in agriculture and in the adoption of agricultural technologies. Information provided through research is vital for policymakers to be informed of the basis on which decisions are made at the micro-level.

Table 1. Distribution of household types by production system, land area, and crop production in Ethiopia, 1983

	Households		Cultivated area		Production of major food grains (% of cultivated area)	Production of all crops[a] (% of cultivated area)
	(No.)	(%)	(ha)	(%)		
Smallholders	8,206,000	98.7	5,987,000	94.7	95.1	94.4
Producer cooperatives	94,000	1.1	114,000	1.8	1.9	2.0
State farms	18,000	0.2	222,000	3.8	3.0	3.6

Source: Cohen and Isaksson (1988); cited in Franzel (1993).
[a] Excluding coffee.

Gender also constitutes an important factor in the growing trend of widening disparities in the distribution of income and assets in many low-income countries, which reflects both the erosion of traditional rights of access to resources and increasing population pressures. Female-headed households (FHHs) typically have a much smaller asset base than male-headed households (MHHs), and it is not coincidental that relative poverty in the sense of relative deprivation bears most heavily on women (Dasgupta 1993; UNDP 1990).

While gender is culture neutral, interest in gender relations also derives from gender's explanatory power as a primary organizing principle of society, including agricultural society. For this study, we look at gender not as a means of categorizing household headship, but as a basic key to understanding structures and actions, including production relationships within and across households, goal setting and priorities, mobilization of resources, willingness to take risks, and the decision-making process vis-à-vis the rights to benefits derived from increased farm production.

The specific objectives of the research were to:

- Look into the structure and patterns of production and composition of crops grown, farm sizes and tenure arrangements, types of technology used, and distribution of output across producers and end-users.
- Take stock of the different access of male and female farmers to resources—land, credit, and technology.
- Estimate production functions using both conventional inputs like land, labor, capital, and purchased inputs, and non-conventional inputs like education, extension, and infrastructure.
- Test the heterogeneity of labor—adult male labor, adult female labor, child labor, hired male labor, hired female labor, and hired child labor.
- Compare differences in managerial efficiency and decision-making power between male and female household heads.
- Determine how socioeconomic factors and infrastructure contribute to the adoption of technology.

2.0 THE HOUSEHOLD SURVEY

2.1 The Study Area

Ada, Lume, and Gimbichu woredas were selected as study areas because their accessibility facilitated the organization and monitoring of the field study (Figure 1). Ada woreda, about 40 km southeast of Addis Ababa, covers 1,750 km^2; two-thirds of this area lies above 1,800 m (Gryseels and Anderson 1983).

Map?

Much of the land in Ada is eroded and poorly drained. July and August are the wettest months of the year and April and May are the hottest. The major soil type is vertisol and major crops are tef, wheat, barley, faba beans, chickpeas, and lentils (Workneh Negatu 1989).

Lume woreda lies northeast of Debre Zeit at an altitude ranging from 1,700 to 2,100 m. July and August are the wettest months and April, May, and June are the hottest. The major soil type is vertisol. The major crops grown are tef, wheat, haricot beans, maize, chickpeas, barley, and faba beans.

Gimbichu woreda, at an average altitude of 2,450 m, borders Ada on the northern side of Debre Zeit. July and August are, on average, the wettest months. The major soil type is vertisol and the major crops grown are wheat, tef, chickpeas, and faba beans.

The male-female ratio in all three areas is almost 1:1 (Table 2).

2.2 Methodology

"Household," "gender," or other social constructs influence the way in which field research is structured. Experience has shown that both "household" and "gender" have practical value as conceptual frameworks around which to structure field research. An appropriate balance must, however, be struck between adopting practical research methodologies and accurately describing the complexity of African rural society (Warner, Hassan, and Kydd 1997).

Since the choice of research methodology depends on the goals of each particular research project, the resources available, time constraints, and a host of other factors, it is not appropriate to advocate one research approach over others. It is vital to chose methods that make it possible to elicit as much information as possible about individual members of rural societies, rather than to choose methods based on preconceptions of the significance of any one social construct (Warner, Hassan, and Kydd 1997).

Boserup was one of the first scholars to provide a comparative analysis of women's work based on data from a wide range of societies. In her 1970 book, *Women's Role in Economic Development*, she emphasized that in spite of sex-role stereotyping and cross-cultural regularities in the sexual division of labor, women's work differs from society to society.

In much of the anthropological literature, "household" is the term used to refer to the basic unit of society involved in production, reproduction, consumption, and socialization. The exact nature and

Table 2. Population size, density and area in Ada, Lume, and Gimbichu woredas, Ethiopia

	Population				
Woreda	**Male**	**Female**	**Total**	**Density**	**Area (km^2)**
Lume	56,849	53,518	110,367	155.5	709.85
Gimbichu	36,754	35,236	71,990	101.8	707.49
Ada	141,265	137,837	279,102	170.7	1,635.16

Source: FDRE, CSA. *Statistical Abstract*, Ethiopia (1998).

function of the household clearly varies from culture to culture and in different periods, but the anthropological definition usually rests on what the people themselves regard as the significant unit of their society. It is important to recognize that although recruitment to households is often through kinship and marriage, household units are not necessarily the same as family units. Leaving aside the definitional difficulties, households are important in feminist analysis because they organize a large part of women's domestic/reproductive labor. As a result, both the composition and the organization of households have a direct impact on women's lives, and in particular on their ability to gain access to resources, labor, and income (Moore 1988).

Female-headed and female-centered domestic groups have been identified in a wide range of communities all over the world (Smith 1973; Tanner 1974), and FHHs have emerged in increasing numbers in recent times. It is important to consider under what conditions—social, economic, political, and ideological—FHHs become a significant proportion of the total number of households. The evidence is complex, but it seems that FHHs are more common in situations of urban poverty, in societies with a high level of male labor migration, and in situations where general insecurity and vulnerability prevail (Youssef and Hefler 1983; Merrick and Schmink 1983).

In Africa, preliminary studies from rural areas and national sample survey data suggest that the incidence of FHHs varies inversely with the economic potential of the area. Incidence tends to be high in areas where agricultural productivity is low, either due to population pressure or unfavorable ecological factors. For example, a study conducted by Chipande (1987) in the Lilongwe Land Development Program, Malawi, an area of very high agricultural potential, showed that women headed only 16% of the 160 households sampled. These households were largely composed of older women (45 years and over) who were mostly widowed, divorced, single, or living alone or with their unmarried children. The prevailing view in the literature is that this trend results from male labor migration. It is clear that in some rural economies the strain placed on conjugal relations by the exploitation of rural areas as labor reserves is producing an enormously high proportion of FHHs (Murray 1981; Bush, Cliffe, and Jansen 1986).

In addition to male labor migration, there is evidence that increasing socioeconomic differentiation in rural communities is producing FHHs (Cliffe 1978). Changes in kinship systems and in the organization of agricultural production have meant that many poorer women have lost the security provided by former kinship networks and relationships.

It is true that FHHs are very poor, but as Peters (1994) points out, this is not the case for all of them, and we have to be very careful to avoid any analytical illusion: lack of males = FHHs = marginal = poor. The situation is more complex and requires more research. For example, there is evidence from Africa and other parts of the world that some women are choosing not to marry (Allison 1986; Nelson 1978; Obbo 1980) and that significant numbers of married women are choosing to live separately from their husbands (Bukh 1979). This trend is perhaps more a feature of urban than rural life, but it highlights the dangers of easy generalization and reinforces the importance of historically and socially grounded research.

When households headed by women are taken into account, total female participation in agriculture is greater in all developing regions. It is important to consider the role of headship because available data show that female headship is relatively high and increasing in many places. In sub-Saharan Africa, for example, it is estimated that women head one-fourth of rural households; in some areas they head almost half (Due and Gladwin 1991). In Central America, nearly 20% of rural households are headed by women (Yudelman 1994), and in Bangladesh the proportion of FHHs rose from 5-7% to 16% over 20 years (Mekra 1995).

Women become household heads as a result of death, divorce, separation, and, increasingly, male migration, with the frequent result that more women participate in the labor force. For instance, women's participation in agriculture in Tunisia more than doubled between 1970 and 1985 because male migration from rural areas left women as household heads (United Nations 1989) who were fully responsible for farm production and management. The type and variety of farm tasks performed by women may also increase, as well as their role in decision-making. Staudt (1979) found this to be the case in 40% of farms headed by women in two areas of western Kenya.

A multi-stage sampling method was used for this study to select male- and female-headed households. Formal contacts were made with officials in Peasant Associations (PAs). Informal contacts were made with farmers in different PAs in the three woredas to supplement secondary information gathered prior to the actual survey. After collection of the secondary data and the preliminary survey, the sample PAs were selected. Selection was based on total population, types of crops grown, altitude, and distance from the center of the Ministry of Agriculture.

In each woreda, 60 households were selected from six centers of the Ministry of Agriculture. Out of the three PAs, ten households were selected, among which three were headed by women. The list of *de jure* female household heads was made purposively, but the samples were selected randomly using the prepared list to make sure that the women selected were full-time farmers. In general, the households were more or less homogeneous in types of crops grown, farming operations, and socio-economic characteristics. Enumerators were recruited and trained to administer a formal questionnaire. The survey was conducted after the cropping calendar in the three woredas, with close supervision.

Of a sample of 180 households, 81 (45%) were headed by females. FHHs were defined as households managed by a widowed, divorced, or a single woman without the mediation of a husband, father, or male relative in the routine day-to-day activities of that household. MHHs were those in which a husband was present and was the final decision-maker in the important issues pertaining to the household (Starkey, Mweamyae amd Stares 1994).

Researchers developed the questionnaire in November 1995 and it was pre-tested in February 1996. The questionnaire had four different and related parts designed to fit in the different agricultural activities phase by phase. The information gathered during the pre-testing was used to modify the questionnaire. Part one was pre-tested with assistance from development agents in the three PAs per woreda. After the pre-testing, the questionnaire was modified to its final version.

3.0 SOCIOECONOMIC CHARACTERISTICS

3.1 Household Characteristics

Of the180 households interviewed across the three woredas, 99 (55%) were headed by males and 81 (45%) were headed by females. Table 3 shows the socioeconomic characteristics of households in Ada, Lume, and Gimbichu. On average, MHHs had larger households and more family members (sons, daughters, relatives, and non-relatives[1]) than FHHs in all three woredas. The average number of daughters was significantly higher in MHHs than FHHs.This situation is similar in most developing countries where FHHs have been found to be smaller than MHHs (Buvinic and Gupta 1997). The average age of the head in MHHs was about 43, 47, and 51 years in Ada, Lume, and Gimbichu, respectively; in FHHs it was about 46, 51, and 47 years.

Table 3. Socioeconomic characteristics of households in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Characteristic		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)
Household size (No.)	8.1	–	6.5	–	7.6	–	5.5	–	7.8	–	5.6	–
Sons	3.0	–	2.5	–	2.8	–	2.3	–	2.4	–	2.6	–
Daughters	2.7	–	2.0	–	2.4	–	1.6	–	3.1	–	2.2	–
Relatives	1.2	–	2.1	–	1.8	–	1.1	–	1.9	–	1.8	–
Non-relatives	1.4	–	1.8	–	1.6	–	1.4	–	1.8	–	1.6	–
Age of head (yr)	43.4	–	45.6	–	46.7	–	50.5	–	51.4	–	47.2	–
Education of head (%)												
Illiterate	28.1	9	50.0	14	17.1	6	70.8	17	48.5	16	85.2	23
Literacy class	40.6	13	46.4	13	48.6	17	29.2	7	30.3	10	11.1	3
Primary school	28.1	9	–	–	28.6	10	–	–	12.1	4	3.7	1
Secondary school	3.1	1	3.6	1	5.7	2	–	–	9.1	3	–	–
Education of wife (%)												
Illiterate	37.5	12	–	–	47.1	16	–	–	48.4	15	–	–
Literacy class	50.0	16	–	–	47.1	16	–	–	48.4	15	–	–
Primary school	9.4	3	–	–	5.9	2	–	–	3.2	1	–	–
Secondary school	3.1	1	–	–	–	–	–	–	–	–	–	–
Education of son (%)												
Illiterate	61.8	21	38.2	13	58.3	14	41.7	10	100.0	31	100.0	29
Literacy class	59.1	13	40.9	9	57.1	12	42.9	9	–	–	–	–
Primary school	54.5	6	45.5	5	81.8	9	18.2	2	–	–	–	–
Secondary school	45.5	5	54.5	6	45.5	5	54.5	6	–	–	–	–
Education of daughter (%)												
Illiterate	65.5	19	34.5	10	69.6	16	30.4	7	100.0	31	100.0	29
Literacy class	57.9	11	42.1	8	36.4	4	63.6	7	–	–	–	–
Primary school	40.0	2	60.0	3	80.0	4	20.0	1	–	–	–	–
Secondary class	54.4	3	55.6	5	20.0	1	80.0	4	–	–	–	–
Religion (%)												
Christian	100.0	32	100.0	28	100.0	35	100.0	24	100.0	33	96.3	26
Muslim	–	–	–	–	–	–	–	–	–	–	3.7	1
Ethnic group (%)												
Oromo	71.1	22	64.0	18	74.3	26	87.5	21	90.6	29	96.3	26
Amhara	29.0	9	36.0	10	25.7	9	12.5	3	9.4	3	3.7	1
Marital status of head (%)												
Married	96.9	31	3.6	1	97.1	34	4.2	1	78.8	26	–	–
Single	3.1	1	35.7	10	2.9	1	–	–	18.2	6	3.8	1
Divorced	–	–	7.1	2	–	–	20.8	5	–	–	15.4	4
Widowed	–	–	53.6	15	–	–	75.0	18	–	–	80.8	21

[1] Non-relatives refer to those who live in the household but are not related to the husband or wife.

MHHs and FHHs in all three woredas showed significant difference in access to education and literacy. This scenario is also found in some African countries. In Uganda, for instance, more than half of the female household heads received no schooling compared to less than a quarter of their male counterparts (Appleton 1996, Bisanda and Mwangi 1996). All farmers in MHHs and FHHs in Ada and Lume were Christians; in Gimbichu 3.7% of FHHs were Muslims. The dominant ethnic groups were Oromo and Amhara. The proportion of MHHs whose ethnic group is Oromo is greater than that of Amhara in all the woredas. The marital status of household heads differed widely between MHHs and FHHs.

3.2 Fertility Characteristics

The survey also gathered information on child bearing. About 66% of MHHs and 77% of FHHs in Ada, 54.2% of MHHs and all FHHs in Lume, and 37.1% of MHHs and 81.8% of FHHs in Gimbichu did not want more children. The average number of the children they wanted varied from 4.7 in MHHs and FHHs in Ada to 3.4 for MHHs in Lume, and 6.6 and 6.0 for MHHs and FHHs in Gimbichu, respectively. Women in both types of household delivered at home with no service from a health center because of poor access. In most MHHs and FHHs in all woredas, traditional birth attendants, neighbors, or the women's mothers assisted them during delivery (Table 4).

The main reasons cited for having more children were the lack of male or female children, that women could still reproduce, because husbands wanted more children, or that more children were needed for work (Table 5). In Ada, 33.3% of MHHs said that the number of males in the household was not enough. In Lume, the main reasons for wanting to have more children were shortage of males (20.68%) and the wife could still reproduce (20.68%). In MHHs in Gimbichu, about 36.4% reported that there were not enough males and 22.7% reported there were not enough females. In FHHs in Ada, all women wanted more children because they could still reproduce. In Gimbichu, 60% wanted more children because of a shortage of females, while 40% wanted more children because they could still reproduce. The main reason cited for not having more children in MHHs was that they had enough children (about 76% in Ada, 58% in Lume, and 54% in Gimbichu). About 65%, 46%, and 36% of FHHs in Ada, Lume, and Gimbichu did not have more children because they could not reproduce anymore.

Table 4. Statistics on childbearing and reproductive goals in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Characteristic		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)
Place of delivery (%)												
At home	100.0	32	100.0	26	100.0	34	100.0	24	100.0	30	100.0	26
At health centers	–	–	–	–	–	–	–	–	–	–	–	–
No. of children wanted	4.66	-	4.66	-	3.37	-	-	-	6.57	-	6.0	-
Who assists? (%)												
Mother	25.0	8	42.3	11	17.6	6	2.5	3	25.8	8	25.0	7
Traditional birth			30.8	8	38.2	13	37.5	9	51.6	16	50.0	14
attendant	34.4	11	7.7	2	–	–	–	–	19.4	6	17.9	5
Mother-in-law	3.1	1	19.2	5	44.1	15	50.0	12	3.2	1	7.1	2
Neighbor	37.5	12	–	–	–	–	–	–	3.3	1	–	–
Home worker	–	–										

Table 5. Reasons for having or not having more children in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Reason to have:												
Not enough males	33.3	3	–	–	20.68	6	–	–	36.36	8	–	–
Not enough females	–	–	–	–	51.72	15	–	–	22.72	5	60.0	3
Can still reproduce	22.2	2	100.0	6	20.68	6	–	–	13.63	3	40.0	2
Husband wants more children	22.2	2	–	–	–	–	–	–	9.09	2	–	–
Needed for work	22.2	2	–	–	6.89	2	–	–	18.18	4	–	–
Reason not to have:												
Have enough children	76.2	16	15.0	3	57.9	11	16.7	4	53.8	7	40.9	9
For health reasons	–	–	5.0	1	15.8	3	–	–	15.4	2	13.6	3
Can't reproduce anymore	4.8	1	65.0	13	15.8	3	45.8	11	15.4	2	36.4	8
Expensive	19.0	4	5.0		10.5	2	25.0	6	15.4	2	–	–
Don't like to bear from the other person	–	–	10.0	2	–	–	12.5	3	–	–	9.1	2

Across all woredas, girls born in MHHs had better access to education. In Ada and Lume, over 70% of MHHs and over 60% of FHHs approved of sending girls to school. In Gimbichu, almost 60% and 26% of MHHs and FHHs respectively, approved of sending girls to school. The main reasons for not sending girls to school were that girls were needed for housework; they were not interested in school; the fear of forced marriage; the distance from school; and not having enough children to spare for schooling (Table 6). About 71% of MHHs in Ada did not send girls to school because they were needed for household work, while 80% of MHHs in Lume reported that the school was too far away. About 46% of MHHs in Gimbichu did not have enough girls to spare for schooling.

Table 6. Reasons that household members in MHHs gave for not sending girls to school in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada MHH		Lume MHH		Gimbichu MHH	
Household member	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Head						
Needed for housework	71.4	5	10.0	1	23.1	3
Not interested in school	14.3	1	10.0	1	23.1	3
Fear of forced marriage	14.3	1	–	–	–	–
School is too far away	–	–	80.0	8	23.1	3
Don't have enough	–	–	–	–	46.2	6
Wife						
Needed for housework	71.4	5	10.0	1	23.1	3
Not interested in school	14.3	1	10.0	1	23.1	3
Fear of forced marriage	14.3	1	–	–	23.1	3
School is too far away	–	–	80.0	8	23.1	3
Don't have enough	–	–	–	–	46.2	6

About 3% of MHHs in Ada and Gimbichu and 34% of MHHs in Lume practiced family planning, while none of the FHHs in Ada, 8.3% in Lume, and 3.7% in Gimbichu practiced family planning. Of those farmers practicing family planning in Lume, all FHHs and 75% of MHHs used birth control pills. The most important source of information for contraception was the family planning office (Table 7).

Table 8 shows numbers of boys and girls who were born, adopted, and died; age at first marriage and pregnancy; age at last pregnancy; and the numbers of adopted girls and boys. On average, more girls were born in MHHs than FHHs. About 1.5 boys and girls died in both types of households. The average age at first marriage was higher for MHHs than FHHs. In all woredas, girls married when they were teenagers, perhaps because of the prevailing culture of girls marrying while they are young. The average age of heads at first marriage was 21.9, 22.5, and 22.1 in MHHs and 15.1, 15.3, and 16.8 in FHHs in Ada, Lume, and Gimbichu, respectively. The average age of first marriage of the wife was 15.9, 16.8, and 16.9 in Ada, Lume and Gimbichu, respectively. The average age at first pregnancy was 23.5, 24.2, and 24.1 in MHHs and 17.9, 19.3, and 19.3 in FHHs in Ada, Lume, and Gimbichu, respectively. The average age of the wife at first pregnancy was 17.7, 18.5, and 19 in Ada, Lume, and Gimbichu, respectively. In contrast to the age at first marriage, female household heads were older than wives at first pregnancy. The age at last pregnancy was higher in MHHs and lower in FHHs. The average age of the wife at last pregnancy was 31.1 years in Ada, 34 years in Lume, and 38.6 years in Gimbichu. Wives were younger than female heads of household at last pregnancy. In Ada, Lume, and Gimbichu, 46.2%, 62.5%, and 57.7% of FHHs, respectively, did not have more children due to the death of a husband.

The mean number of adopted boys was 2.0 for Ada, 1.0 for Lume, and 0.25 for Gimbichu in MHHs. In FHHs, it was 1.2, 2.0, and 1.5 for Ada, Lume, and Gimbichu, respectively. The mean number of girls adopted in MHHs was 1.5 for Ada and 1.7 for Gimbichu, and 1.25, 1.2, and 1.5 for FHHs in Ada, Lume, and Gimbichu, respectively.

Table 9 presents information for MHHs and FHHs on who determined the number of children and decided whether to send girls to school.

Table 7. Method and source of information for family planning in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Family planning	3.1	1	–	–	34.3	12	8.3	2	3.0	1	3.7	1
Method:												
Pills	100.0	1	–	–	75.0	9	100.0	2	–	–	–	–
Traditional method	–	–	–	–	25.0	3	–	–	100.0	1	100.0	1
Source of information:												
Family planning	100.0	1	–	–	91.7	11	100.0	2	–	–	–	–
Mass media	–	–	–	–	8.3	1	–	–	–	–	–	–
Friends and relatives	–	–	–	–	–	–	–	–	100.0	1	100.0	1

Table 8. Childbearing and adoption data in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
No. of girls born						
Head	3.00	2.50	2.63	2.25	3.03	74.0
Wife	2.80	0.00	2.83	–	3.37	–
Daughter	1.00	1.00	–	1.00	–	1.0
Relative	–	1.25	–	–	–	–
No. of boys born						
Head	3.15	3.21	3.16	2.95	3.18	2.96
Wife	3.05	–	3.21	3.48	–	–
Daughter	–	–	–	1.00	–	–
Relative	1.00	2.66	–	1.00	–	–
No. of boys died						
Head	1.55	1.27	1.23	2.25	1.47	1.35
Wife	1.44	–	1.28	–	1.35	–
Daughter	–	–	–	–	–	–
Relative	–	1.00	–	–	–	–
No. of girls died						
Head	1.33	1.40	1.41	1.36	1.50	1.18
Wife	1.33	–	1.36	–	1.20	–
Daughter	–	–	–	–	–	–
Relative	–	1.00	–	–	–	–
Age at first marriage						
Head	21.96	15.11	22.45	15.29	22.06	16.81
Wife	15.96	–	16.80	–	16.89	–
Daughter	15.50	–	–	15.00	–	–
Relative	–	13.00	–	28.00	–	–
Age at first pregnancy						
Head	23.5	17.88	24.23	19.29	24.06	19.34
Wife	17.7	–	18.47	–	19.03	–
Daughter	16.5	16.50	–	16.50	–	–
Relative	–	14.66	–	29.00	–	–
Age at last pregnancy						
Head	39.21	34.34	41.32	35.41	43.96	37.92
Wife	31.09	–	33.94	–	38.57	–
Daughter	19.00	–	–	20.0	–	–
Relative	–	39.0	–	29.0	–	–
No. of foster/adopted children						
Boys	2.00	1.16	1.00	2.00	0.25	1.50
Girls	1.50	1.25	–	1.20	1.66	1.50

Table 9. Decision-making on the number of children and sending girls to school in Ada, Lume, Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Who decides on:	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
No. of children												
Husband	21.9	7	3.8	1	5.9	2	–	–	10.3	3	3.8	1
Wife	–	–	15.4	4	2.9	1	29.2	7	3.4	1	–	–
Both	65.6	21	34.6	9	64.7	22	8.3	2	51.7	15	38.5	10
Nature	12.5	4	46.2	12	26.5	9	62.5	15	34.5	10	57.7	15
Sending girls to school												
Head	–	–	65.4	17	–	–	62.5	15	59.4	19	26.9	7
Joint	78.1	25	–	–	71.4	25	–	–	55.2	16	–	–

3.3 Household Amenities

The characteristics of household dwellings in Ada, Lume, and Gimbichu are shown in Table 10. The "simple family home" is a single hut where all family members live together, while "several family homes" are a number of huts in which household members live. Household heads own all dwellings. In Ada, about 66% of MHHs and 44% of FHHs lived in a simple family home. The proportion of MHHs that lived as a single family in several huts and the proportion living in several family homes was roughly similar and lower than the proportion of FHHs that had the same living arrangements. In Lume, 60% of MHHs and 37.5% of FHHs lived in a single-family home; about 34% of MHHs and 50% of FHHs lived as a single family in several huts, and 6% of MHHs and 13% of FHHs lived in several family homes. In Gimbichu, about 70% of MHHs and 81.5% of FHHs lived in a simple family home.

Aside from gathering information on housing arrangements, the sample survey also gathered information on household wealth indicators. The roof of a dwelling is an indicator of wealth: an aluminum sheet roof indicates more wealth than a grass roof. MHHs and FHHs differed little with respect to this wealth indicator. In Ada and Lume, 65% of both types of households had grass roofs. In Gimbichu, about 71% of MHHs and 77% of FHHs had houses with thatch roofs, while 29.3% of MHHs and about 23% of FHHs had houses roofed with aluminum.

Mud walls (made from mud, straw, and wood) and cement walls are also wealth indicators. In Ada, all MHHs and 87.1% of FHHs had houses with mud walls whereas about 13% of FHHs had houses with cement walls. In Lume, both types of households had mud walls. In Gimbichu, about 94% of MHHs and all FHHs had houses with mud walls and only 6.1% of MHHs had houses with cement walls.

Table 11 presents additional data on household amenities in the three woredas. In Ada, 21.7% of MHHs and 10% of FHHs owned a radio, while 1.7% of both households owned a tape recorder. None of the households owned a TV, gas stove, or refrigerator. In Lume, about 29% of MHHs and 14% of FHHs owned a radio, while only 10.2% and 1.7% of MHHs owned a tape recorder and bicycle, respectively. About 5% of MHHs and 3% of FHHs owned a gas stove. In Gimbichu, 20% of MHHs and 8.3% of FHHs owned a radio, while 10% of MHHs and no FHHs owned a tape recorder. Only one MHH owned a gas stove.

Table 10. Types of dwelling in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Type of dwelling												
Simple family home	65.5	21	44.4	12	60.0	21	37.5	9	69.7	23	81.5	22
Single family in several huts	18.8	6	33.3	9	34.3	12	50.0	12	18.2	6	11.1	3
Several family home	15.6	5	22.2	6	5.7	2	12.5	3	12.1	4	7.4	2
Type of roof												
Grass thatch	65	26	64.5	22	64.5	20	64.5	20	70.7	29	77.4	24
Aluminum sheet	35	20	35.5	19	35.5	11	35.5	11	29.3	12	22.6	7
Type of wall												
Mud	100.0	32	87.1	27	100.0	32	100.0	28	93.9	31	100.0	27
Cement	–	–	12.9	4	–	–	–	–	6.1	2	–	–

Table 11. Household amenities of farmers in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Radio	28.8	17	13.6	8	21.7	13	10.0	6	20.0	12	8.3	5
Radio tape recorder	10.2	6	–	–	1.7	1	1.7	1	10.0	6	–	–
Bicycle	1.7	1	–	–	–	–	–	–	–	–	–	–
Gas stove	5.1	3	3.4	2	–	–	–	–	1.7	1	–	–
Type of toilet												
Pit latrine	5.7	2	–	–	3.1	1	3.7	1	–	–	–	–
Open community	25.7	9	25.0	6	–	–	–	–	–	–	–	–
None	68.6	24	75.0	25	96.9	31	96.3	26	100.0	33	100.0	27
Source of lighting												
Electricity	29.0	1	–	–	6.3	2	–	–	–	–	–	–
Tile lamp	37.1	1.3	20.8	5	–	–	18.5	5	5.9	2	–	–
Oil lamp	60.0	21	79.2	19	93.7	30	81.5	22	94.1	32	100.0	27
Type of fuel												
Firewood	62.8	22	60.0	15	44.6	25	46.9	23	62.9	22	53.5	15
Cow dung	37.2	13	36.0	9	55.4	31	51.0	25	37.1	13	42.9	12
Kerosene stove	–	–	4.0	1	–	–	2.1	1	–	–	3.6	1
Source of firewood												
Collection	72.0	18	87.0	20	50.0	11	71.4	10	27.3	6	13.3	2
Purchase	4.0	1	8.7	2	9.1	2	7.1	10	27.3	6	33.3	5
Own	24.0	6	4.3	1	40.9	9	21.4	3	45.5	10	53.3	8
Source of water												
Collection	90.6	29	96.3	26	39.5	15	55.2	16	94.0	31	96.3	26
Water vendor	9.4	3	3.7	1	28.9	11	34.5	10	3.0	1	3.7	1
Own	–	–	–	–	31.6	12	10.3	3	3.0	1	–	–

Most households did not use any type of toilet. In Ada, 3.1% of MHHs and 3.7% of FHHs had a pit latrine, while in Lume about 6% of MHHs had a pit latrine. About 25% of both types of households in Lume used open community areas. Most households in all woredas used oil lamps for lighting. In Ada and Lume, a very small percentage of MHHs and none of the FHHs had electricity. About 37% and 21% of the MHHs and FHHs in Lume used a tile lamp, respectively, while 18.5% of FHHs in Ada and 6% of MHHs in Gimbichu used a tile lamp.

Most farmers used wood or cow dung for fuel. Very few households in all woredas used a kerosene stove. Most farmers collected water from rivers, ponds, and other natural sources of water, although some purchased it from the water vendor.

3.4 Farm Implements

The number of farm implements owned by both types of households across all the woredas was low (Table 12). All households used ox plows for cultivation and sickles for harvesting. For

Table 12. Number of farm implements owned by MHHs and FHHs in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
Implement	MHH	FHH	MHH	FHH	MHH	FHH
Hoe	1.3	1.0	1.0	1.5	1.4	1.1
Shovel	1.1	1.0	1.0	1.0	2.6	1.8
Spade	1.0	1.0	1.0	1.2	-	1.0
Digging implement	1.1	1.1	1.1	1.0	1.3	1.0
Sickle	2.2	1.9	1.4	1.0	2.3	1.6
Sprayer	1.0	1.0	1.0	-	-	-
Plow	2.6	1.7	1.2	1.1	2.2	1.6
Mensh[a]	2.3	1.6	1.3	1.1	1.5	1.1
Lyda[a]	1.3	1.2	1.1	1.0	1.4	1.3
Axe	1.7	1.4	1.1	1.0	1.2	1.0

[a] Amharic words for implements that farmers use for winnowing their produce while threshing.

winnowing, they used the *mensh* and *lyda*. In Ada, the average number of ox plows owned by MHHs (2.6) was significantly higher than FHHs (1.7) ($t=2.9$; $p<0.01$); in Lume and Gimbichu, FHHs had fewer ox plows but the difference was not significant. Because MHHs generally had more ox plows than FHHs, they were better able to prepare their land on time. In Lume, the average number of sickles owned by MHHs was significantly higher than FHHs ($t=2.5$; $p<0.05$). Similarly, the average number of hoes, spades and digging implements owned by MHHs was higher than FHHs ($t=2.2$, $p<0.05$; $t=2.6$; $p<0.05$; and $t=2.2$, $p<=0.05$, respectively).,

4.0 GENDER DIFFERENTIALS IN FARM MANAGEMENT PRACTICES

4.1 Crop Production

Agriculture in the study area is based on the cultivation of small grain cereals (tef and wheat), with the exception of lowlands in Lume, where farmers grew maize and haricot beans (Table 13). Depending on the type of crops grown, most farmers used seedbed preparation techniques such as flatbeds, ridge and furrow, and broad bed and furrow during land preparation. The majority of households in all woredas used ox plows to form ridges and furrows.

In Ada and Lume, tef is the most important crop, followed by wheat and highland pulses; in Gimbichu, wheat is the most important crop, followed by tef and highland pulses. Wheat and tef seed and highland pulses were broadcasted whereas maize was usually planted in rows. All MHHs and FHHs reported broadcasting small grain cereals. Very few MHHs (2.9%) and FHHs (8.3%) that grew maize in Lume broadcasted.

Households weed the main crops by hand or apply herbicide. In Ada, 9.1% of households used herbicides, while 27.3% of MHHs and 36.4 % of FHHs weeded by hand. The other households did not weed. About 63.3% of the MHHs and 54.6 % of FHHs used both herbicides and hand weeding;

Table 13. Mean crop area cultivated (in kert[a]) in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Crop (in kert)		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)		(Respondents)
Tef	5.43	32	4.74	27	7.64	34	6.47	24	2.79	29	2.35	24
Wheat	1.72	25	1.33	21	2.07	31	1.20	18	5.92	33	4.92	26
Chickpeas	0.88	18	0.94	13	1.32	14	1.50	10	2.00	11	1.85	7
Lentils	1.00	2	-	-	0.60	5	0.60	5	3.19	31	2.86	25
Barley	1.62	12	1.08	12	1.00	31	1.00	21	1.00	1	-	-
Faba beans	1.33	6	1.00	2	0.64	7	0.43	4	0.56	2	1.00	1
Haricot beans	0.50	3	0.50	1	1.14	21	1.00	10	-	-	-	-
Horticultural crops	-	-	-	-	0.30	1	0.81	4	-	-	-	-
Other crops	-	-	-	-	0.75	4	0.37	2	-	-	-	-

[a] A kert is one–fourth of a hectare.

hand weeding, supplemented by herbicides, was used particularly to control broadleaf weeds. In Lume and Gimbichu, most MHHs (98.2%) and all FHHs weeded by hand. Only about 2% of the MHHs used herbicides. MHHs and FHHs in all woredas harvested crops manually. Harvesting was usually done by hired labor because labor was scarce at that time.

The major crops grown in the study area were tef, wheat, chickpeas, lentils, barley, faba beans, field peas, haricot beans, maize, rough peas, and horticultural crops, mainly tomatoes (Table 13). MHHs in Ada had higher average area of tef, wheat, barley, and faba beans than FHHs. In MHHs in Lume, the average area under tef (7.6 kert) and wheat (2.1 kert) was the highest, followed by chickpeas (1.3 kert), haricot beans (1.1 kert), and barley (1.0 kert). The FHHs in Lume grew an average of 6.5 kert of tef, chickpeas (1.5 kert), wheat (1.2 kert), barley (1.0 kert), and haricot beans (1.0 kert). Lume is different from the other woredas because farmers grew horticultural crops probably because they have irrigation. In Gimbichu, wheat covers the largest area (5.9 kert and 4.9 kert for MHHs and FHHs, respectively), followed by lentils and tef.

Households were questioned about their use of local and improved varieties (Table 14). In Lume, about 53% of MHHs and 58% of FHHs plant both local and improved tef varieties. In Ada, all farmers grew local tef varieties, while in Gimbichu all FHHs and 93.1% of MHHs planted local varieties. The use of wheat varieties followed a similar pattern, in which more farmers grew local varieties. FHHs grew fewer improved wheat varieties. All farmers in Ada and Gimbichu grew local chickpea varieties, while 21% of MHHs and 20% of FHHs in Lume grew improved chickpea varieties. Very few farmers planted improved varieties of lentils, barley, faba beans, and rough peas. In Lume, households grew improved varieties of field peas, maize, and haricot beans. Less than one-third of MHHs and FHHs grew improved field pea varieties and only 13% of MHHs and 11% of FHHs grew improved maize varieties. Only 10% of the MHHs grew improved haricot bean varieties.

Farmers' sources of information about improved varieties are shown in Table 15. In Lume, where farmers grew more improved varieties than farmers in the other woredas, extension agents were the main source of information (47% of MHHs and 21% of FHHs). About 53% of FHHs and 24% of MHHs learned about new varieties from the market. Other farmers were another source of information on improved varieties (29% of MHHs and 26% of FHHs). The different responses reflected the bias of extension services in favor of MHHs.

Farmers reported that their choice of crops depends on their profitability and their use as food. Some farmers cited good soil as a reason to grow certain crops (Table 16). Tef, wheat, barley, maize, haricot beans, and horticultural crops were grown for food and also because they were profitable. Chickpeas, lentil, faba beans, rough peas, and field peas were grown for similar reasons, although their compatibility with soils was a third important reason.

Table 14. Use of local and improved varieties in Ada, Lume, and Gimbichu woredas,Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Crop/type of variety	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Tef												
Local	100.0	32	100.0	27	44.1	15	41.7	10	93.1	27	100.0	24
Improved	–	–	–	–	2.9	1	–	–	6.9	2	–	–
Both	–	–	–	–	52.9	18	58.3	14	–	–	–	–
Wheat												
Local	84.0	21	95.2	20	38.7	12	72.2	13	87.9	29	88.5	23
Improved	12.0	3	4.8	1	38.7	12	22.2	4	3.0	1	–	–
Both	4.0	1	–	–	22.6	7	5.6	1	9.1	3	11.5	3
Chickpeas												
Local	100.0	18	100.0	13	78.6	11	80.0	8	100.0	10	100.0	7
Improved	–	–	–	–	21.4	3	20.0	2	–	–	–	–
Lentils												
Local	100.0	2	–	–	100.0	5	80.0	4	100.0	32	100.0	25
Improved	–	–	–	–	–	–	20.0	1	–	–	–	–
Barley												
Local	100.0	12	100.0	13	100.0	31	100.0	21	100.0	1	–	–
Improved	–	–	–	–	–	–	–	–	–	–	–	–
Faba beans												
Local	100.0	14	100.0	1	100.0	6	100.0	4	100.0	2	100.0	2
Improved	–	–	–	–	–	–	–	–	–	–	–	–
Field peas												
Local	100.0	14	100.0	18	62.5	10	68.8	11	100.0	5	100.0	7
Improved	–	–	–	–	25.0	4	31.3	5	–	–	–	–
Both	–	–	–	–	12.5	2	–	–	–	–	–	–
Rough peas												
Local	100.0	12	100.0	7	100.0	3	100.0	1	100.0	7	100.0	5
Improved	–	–	–	–	–	–	–	–	–	–	–	–
Maize												
Local	100.0	1	–	–	87.1	27	89.5	17	–	–	–	–
Improved	–	–	–	–	12.9	4	10.5	2	–	–	–	–
Haricot beans												
Local	100.0	3	100.0	1	85.7	18	100.0	2	–	–	–	–
Improved	–	–	–	–	9.5	2	–	–	–	–	–	–
Both	4.8	1	–	–	–	–	–	–	–	–	–	–

Table 15. Farmers' sources of information about improved varieties in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Source of information	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Extension	100.0	4	100.0	1	47.3	18	21.0	4	-	-	-	-
Other farmers	-	-	-	-	28.9	11	26.3	5	-	-	-	-
Market	-	-	-	-	23.6	9	52.6	10	-	-	-	-

Table 16. Farmers' reasons for growing crops in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Reason	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Tef												
Profitable	36.9	17	42.8	18	43.3	26	42.5	17	28.9	11	30.3	10
Food crop	63.0	29	57.1	24	56.6	34	57.5	23	71.0	27	69.6	23
Wheat												
Profitable	38.4	15	36.3	12	38.0	19	22.7	5	31.1	14	34.2	12
Food crop	61.5	24	63.6	21	62.0	31	77.2	17	68.8	31	65.7	23
Good soil	–	–	3.0	1	–	–	–	–	–	–	–	–
Chickpeas												
Profitable	9.5	2	18.8	3	13.3	2	16.6	2	33.3	4	33.3	3
Food crop	71.4	15	56.2	9	26.6	4	50.0	6	41.6	5	55.5	5
Good soil	19.0	4	25.0	4	60.0	9	33.3	4	25.0	3	11.1	1
Lentils												
Profitable	–	–	–	–	42.8	3	–	–	30.2	13	25.0	4
Food crop	50.0	1	–	–	42.8	3	60.0	3	60.4	26	56.3	9
Good soil	50.0	1	–	–	14.2	1	40.0	2	9.3	4	18.8	3
Barley												
Profitable	45.0	9	45.4	5	36.1	17	20.8	5	–	–	–	–
Food crop	55.0	11	68.8	11	63.8	30	79.1	19	100.0	1	–	–
Faba beans												
Profitable	–	–	–	–	18.1	2	25.0	1	–	–	50.0	1
Food crop	100.0	5	100.0	1	54.5	6	75.0	3	–	–	–	–
Good soil	–	–	–	–	27.2	3	–	–	100.0	2	50.0	–
Rough peas												
Profitable	20.0	3	27.2	3	–	–	–	–	25.0	2	12.5	1
Food crop	60.0	9	54.5	6	100.0	1	100.0	1	50.0	4	50.0	1
Good soil	20.0	3	18.1	2	100.0	1	100.0	1	25.0	2	37.5	3
Maize												
Profitable	–	–	–	–	44.0	22	37.0	10	–	–	–	–
Food crop	–	–	–	–	56.0	28	62.9	17	–	–	–	–
Haricot beans												
Profitable	100.0	3	100.0	1	91.3	21	60.0	6	–	–	–	–
Food crop	–	–	–	–	8.69	2	40.0	4	–	–	–	–
Good soil	–	–	–	–	–	–	–	–	–	–	–	–
Horticultural crops												
Profitable	–	–	–	–	50.0	1	100.0	4	–	–	–	–
Food crop	–	–	–	–	50.0	1	–	–	–	–	–	–
Field peas												
Profitable	32.0	8	28.0	7	25.0	6	15.7	3	–	–	–	–
Food crop	52.0	13	44.0	11	58.3	14	57.8	11	50.0	2	25.0	1
Good soil	16.0	4	28.0	7	16.6	4	26.3	5	50.0	2	75.0	3

Table 17 shows the average quantities of local and improved seed varieties used in the study area. In Ada, the average quantity of improved wheat seed was 56 kg for MHHs and 50 kg for FHHs, while the average quantity of local wheat seed was 80 kg for MHHs and 60 kg for FHHs. In Gimbichu, MHHs (181 kg) and FHHs (88 kg) used less improved wheat seed than local wheat seed (282 kg and 230 kg for MHHs and FHHs, respectively). In Lume, however, MHHs (81 kg) and FHHs (56 kg) used more improved wheat seed on average than local wheat seed (61 kg for MHHs and 42 kg for FHHs). Generally, FHHs used less local and improved seed of any crop (wheat, tef, barley, maize, faba beans, rough peas, field peas, and haricot beans) than MHHs. FHHs used slightly more local chickpea varieties than MHHs in all woredas.

Farmers commonly transport their produce from the field to the home and market using animals they own, hire, or borrow; hired lorries; owned or hired carts; or owned vehicles (Table 18). In Ada, most MHHs (89.3%) and FHHs (69.2%) used their own animals (donkeys and mules) to transport farm

Table 17. Average quantity of improved and local seed varieties used in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(Respondents)		(Respondents)		(Respondents)		(Respondents)		Respondents)		(Respondents)	
Improved variety (kg/ha)												
Barley	–	–	–	–	–	–	–	–	–	–	–	–
Chickpeas	–	–	–	–	37.0	3	34.0	2	–	–	–	–
Faba beans	–	–	–	–	–	–	–	–	–	–	–	–
Field peas	–	–	–	–	46.0	5	31.0	5	–	–	–	–
Haricot beans	–	–	–	–	20.5	4	30.0	1	–	–	–	–
Lentils	–	–	–	–	–	–	8.0	1	–	–	–	–
Maize	–	–	–	–	35.0	5	33.0	2	–	–	–	–
Rough peas	–	–	–	–	–	–	–	–	–	–	–	–
Tef	–	–	–	–	84.1	18	75.9	14	30.0	12	100.0	1
Wheat	56.3	4	50.0	–	80.4	19	56.0	5	181.3	4	87.5	2
Local variety (kg/ha)												
Barley	80.8	12	51.7	12	48.7	31	45.0	21	30.0	1	–	–
Chickpeas	27.6	17	29.6	13	35.3	11	36.6	8	70.5	10	81.4	7
Faba beans	35.0	5	37.5	2	25.8	6	13.8	4	33.0	2	22.5	2
Field peas	94.6	14	39.7	18	46.7	13	36.3	11	66.3	4	56.7	6
Haricot beans	19.0	3	15.0	1	26.9	18	20.5	8	–	–	–	–
Lentils	12.5	2	–	–	6.4	5	5.5	4	104.7	32	100.8	25
Maize	20.0	1	–	–	24.6	25	21.2	17	–	–	–	–
Rough peas	32.7	11	22.4	7	21.7	3	10.0	1	40.0	7	27.5	6
Tef	84.2	31	74.8	27	68.1	33	56.9	24	47.7	27	36.9	24
Wheat	80.2	21	60.3	20	60.8	19	42.6	14	281.7	32	230.0	26

Table 18. Mode of transport of farm products in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Mode of transport	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Owned animal	89.3	25	69.2	18	28.6	10	37.5	9	20.0	1	27.3	6
Hired animal	–	–	3.8	1	2.9	1	–	–	40.0	2	36.4	8
Hired pick-up (lorry)	7.1	2	15.4	4	45.7	16	37.5	9	–	–	–	–
Own cart	–	–	3.8	1	–	–	–	–	–	–	–	–
Hired cart	3.6	1	3.8	1	–	–	4.2	1	–	–	–	–
Own lorry	–	–	3.8	120.0	7.0	16.7	4.0	–	–	–	–	–
Borrowed animal	–	–	–	–	2.9	1	1.7	1	40.0	2	36.4	8

produce. In Lume, most farmers transported produce with a hired lorry (46% of MHHs and 38% of FHHs) or with their own lorry (20% of MHHs and 17% of FHHs). In Gimbichu, most farmers hired or borrowed animals to transport farm produce.

4.1.1 Use of fertilizer and insecticides

Farmers in all the woredas used fertilizer (Table 19). About 38%, 66%, and 21% of MHHs in Ada, Lume, and Gimbichu, respectively, used insecticides compared to about 44%, 50%, and 4% of FHHs in Ada, Lume, and Gimbichu. In Ada and Lume, insecticide was not used because there was no pest problem (50% of MHHs and 47% of FHHs in Ada and 42% of MHHs and 25% of FHHs in Lume). In Gimbichu, the main reason farmers gave for not applying insecticide was lack of knowledge of its application (65% of MHHs and 73% of FHHs). Other reasons included lack of cash, infrequent supply of insecticides, and that insecticides were sometimes not effective to control pests.

4.1.2 Major crop production problems

The main crop production problems mentioned by sample households were the lack of land, shortage of family household labor, high price of inputs, lack of loans from formal and informal sources, poor access to markets, shortage of appropriate storage facilities, and lack of extension services (Table 20).

Shortage of land was the main constraint for 64% of MHHs and 63% of FHHs in Ada, 91% of MHHs and 63% of FHHs in Lume, and 61% of MHHs and 50% of FHHs in Gimbichu. Other constraints included poor quality of soils and erosion. Most farmers in Ada (82% and 90% of MHHs and FHHs, respectively) and Lume (67% of MHHs and FHHs) reported a shortage of family household labor as their main labor constraint. In Gimbichu, the main constraint was the high cost of hired labor (59% of MHHs and 50% of FHHs). Only a few farmers had problems obtaining fertilizer.

The main constraint with agrochemicals in Ada and Lume was their high price; in Gimbichu, it was the shortage of chemicals. In Ada, about 44% of both types of households reported the lack of informal credit as the main credit constraint, while farmers in Lume reported the lack of formal credit as their main credit constraint (72% of MHHs and 44% of FHHs). Few farmers in Gimbichu had

Table 19. Fertilizer and insecticide use and farmers' reasons for not using insecticides in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Input	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Fertilizer	100.0	32	100.0	27	100.0	35	100.0	24	100.0	33	100.0	27
Insecticide	37.5	12	44.4	12	65.7	23	50.0	12	21.2	7	3.7	1
Reasons for not using insecticide												
Cash shortage	15.0	3	6.7	1	16.7	2	25.2	3	7.7	2	7.7	2
No pest problem	50.0	10	46.7	7	41.7	5	25.0	3	26.9	7	19.2	5
No knowledge of use	20.0	4	40.0	6	8.3	1	25.0	3	65.4	17	73.1	19
Infrequent supply	15.0	3	6.7	1	25.0	3	25.0	3	–	–	–	–
Do not avoid pest	–	–	–	–	8.3	1	–	–	–	–	–	–

<<Do not avoid pests – please explain>>

Table 20. Crop production constraints in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Constraint	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Land												
Unavailability	63.6	7	62.5	5	90.9	20	63.2	12	61.1	11	50.0	9
Poor quality of land	–	–	–	–	9.1	2	15.8	3	33.3	6	33.3	6
Serious erosion	36.4	4	37.5	3	–	–	21.0	4	5.6	1	16.7	3
Labor												
Not enough family labor	81.8	9	90.0	9	66.7	6	66.7	8	41.2	7	35.7	5
Hired labor not available	18.2	2	–	–	11.1	1	–	–	–	–	14.3	2
Hired labor expensive	–	–	10.0	1	22.2	2	33.3	4	58.8	10	50.0	7
Fertilizer												
Untimely delivery	33.3	1	100.0	1	100.0	1	–	–	–	–	–	–
Infrequent availability	66.7	2	–	–	–	–	–	–	–	–	–	–
Chemicals												
Chemicals not available	7.1	2	8.3	2	30.0	3	10.0	1	50.0	6	60.0	12
Price too high	89.6	25	91.7	22	40.0	4	60.0	6	8.3	1	35.0	7
Infrequent supply	3.6	1	–	–	30.0	3	30.0	3	14.7	5	15.0	1
Credit												
Don't have required collateral	6.3	1	–	–	–	–	–	–	100.0	3	75.0	3
Bank loans not available	–	–	–	–	72.2	13	44.4	4	–	–	–	–
Informal loans not available	43.8	7	44.4	4	5.6	1	–	–	–	–	–	–
Unfavorable repayment terms	6.3	1	11.1	1	16.7	3	44.4	4	–	–	–	–
High interest rates	31.3	5	22.2	2	5.6	1	11.1	1	–	–	–	–
Not aware about credit	12.5	2	22.2	2	–	–	–	–	–	–	25.0	–
Market												
Market centers are too far	88.9	16	78.3	18	50.0	7	66.7	6	–	–	–	–
High transportation cost	11.1	2	17.4	4	–	–	22.2	2				
Poor farm roads	–	–	4.3	1	7.1	1	–	–	–	–	–	–
Price instability	–	–	–	–	42.9	6	11.1	1	100.0	3	100.0	1
Storage												
No appropriate storage facilities	100.0	1	–	–	100.0	5	100.0	6	20.0	1	–	–
Available storage space not suitable	–	–	–	–	–	–	–	–	80.0	4	–	–
Extension												
None	9.4	3	11.1	3	37.1	13	12.5	3	36.4	12	14.8	4
Extension service unavailable	71.9	23	81.5	22	25.7	9	37.5	9	45.5	15	66.7	18
Extension not appropriate	3.1	1	3.7	1	14.3	5	16.7	4	3.0	1	3.7	1
Extension services not timely	3.1	1	–	–	5.7	2	4.2	1	12.1	4	11.1	3
Infrequent visits	18.75	6	7.4	3	17.1	6	29.2	7	3.0	1	3.7	1

credit problems. The main marketing problem was the distance between the farm and the market. About 89% of MHHs and 78% of FHHs in Ada, and 50% of MHHs and 67% of FHHs in Lume, reported this as their main problem, while all farmers in Gimbichu reported price instability as a marketing constraint. Inappropriate storage structures were primarily a problem for farmers in Lume. More FHHs than MHHs said they suffered from a lack of extension services.

4.1.3 Decision-Making in Crop Production

Table 21 shows the decision-making pattern of households for the sale and consumption of agricultural production by woreda. Both husbands and wives made decisions on consumption in 68%, 80%, and 63% of MHHs in Ada, Lume, and Gimbichu, respectively. Otherwise, the head made the decision. In FHHs the head of the household usually made the decision (88% in Ada, 100% in Lume, and 96% in Gimbichu). Sons participated in decision-making in 11% of FHHs in Ada and 3.7% in Gimbichu.

About 60% of heads in MHHs in Lume made the decision to sell the produce. The head and wife in 69% of MHHs in Ada and 58% of MHHs in Gimbichu made this decision jointly. About 89% of

Table 21. Decision-making of households on sale and consumption of agricultural produce in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Constraint	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Who decides how much to consume?												
Head	31.3	10	88.9	24	20.0	7	100.0	24	36.4	12	96.3	26
Head and son	–	–	11.1	3	–	–	–	–	–	–	3.7	1
Head and wife	68.8	22	–	–	80.0	28	–	–	63.6	21	–	–
Who decides how much to sell?												
Head	31.3	10	88.9	24	60.0	21	100.0	24	42.4	14	92.3	24
Head and son	–	–	–	11.1	3	–	–	–	–	–	7.7	2
Head and wife	68.8	22	–	–	40.0	14	–	–	57.6	19	–	–
Who decides how to use stored produce?												
Head	31.3	10	92.6	25	80.0	28	66.7	16	–	–	–	–
Wife	–	–	–	–	–	–	–	–	80.0	4	–	–
Son	–	–	7.4	2	–	–	–	–	20.0	1	–	–
Head and son	–	–	–	–	2.9	1	33.3	8	–	–	100.0	1
Head and wife	68.8	22	–	–	–	–	–	–	–	–	–	–
Non-relative	–	–	–	–	–	–	–	–	–	–	–	–
Who actually sells?												
Head	93.8	30	55.6	15	97.1	34	75.0	18	72.7	24	42.3	11
Son	–	–	29.6	8	–	–	12.5	3	3.0	1	23.1	6
Head and son	–	–	7.4	2	–	–	12.5	3	6.1	2	11.5	3
Head and wife	6.3	2	–	–	2.9	–	–	–	15.2	5	–	–
Relative	–	–	3.7	1	–	–	–	–	–	–	15.4	4
Non relative	–	–	–	–	–	–	–	–	3.0	1	7.7	2
Place of sale												
Local market	100.0	32	100.0	27	100.0	34	100.0	24	100.0	33	100.0	26
Farm gate & service	2.9	1	–	–	–	–	–	–	–	–	–	–
Who keeps revenues?												
Head	34.4	11	92.6	25	100.0	32	–	–	39.4	13	100.0	26
Son	–	–	–	–	–	–	100.0	1	–		–	–
Wife	–	–	–	–	–	–	–	–	24.2	8	–	–
Husband and wife	65.6	21	–	–	–	–	–	–	36.4	12	–	–
Head and son	–	–	7.4	2	–	–	–	–	–	–	–	–

female heads of households in Ada, 100% in Lume, and 92% in Gimbichu decided how much produce to sell. In MHHs in Ada, the decision to utilize stored produce was made jointly (69%), while in FHHs, heads almost always made the decision (93%). In Lume, it was mostly the head of the household who made this decision (about 80% and 67% of the MHHs and FHHs, respectively).

In MHHs, the head was primarily responsible for selling the produce, while in FHHs, the head and her son played an important role. About 94%, 97%, and 73% of males heads of household in Ada, Lume, and Gimbichu, respectively, were responsible for selling the produce. The head was responsible in around 56%, 75%, and 42% of FHHs in Ada, Lume, and Gimbichu, respectively; in 37%, 25%, and 35% of FHHs, the son alone or the head and the son were responsible. Most produce was sold at the local market. In 65.6% of MHHs in Ada and 36.4% of MHHs in Gimbichu, husbands and wives kept the revenue from the sale of produce. In MHHs in Lume the head kept the revenues. Household heads usually kept the revenue in FHHs (92.6% and 100% of the FHHs in Ada and Gimbichu, respectively).

The decision to use agricultural inputs by gender is shown in Table 22. In MHHs in Ada and Gimbichu, the decision on the type of crops grown was either made jointly by the head and wife or by the head alone, while in Lume it was mainly the head (83.3%) who decided what to plant. In FHHs, the head often decided what to plant (77%, 100%, and 96% in Ada, Lume, and Gimbichu, respectively).

Male heads of household in Lume (97.1%) were often the sole decision-makers in the use of fertilizers, while in Gimbichu they made the decision with their wives (59.4%). In 50% of MHHs in Ada, the decision was made either jointly or by the household head. More than 80% of female heads of households in Ada, Lume, and Gimbichu are responsible for decisions about fertilizer use. The decision to use improved seed was primarily a joint decision in MHHs in Ada (75%) and Gimbichu (75%), while in 50% of the MHHs in Lume it was either a joint decision or a decision by the head. In FHHs in all woredas, the head decided on the use of improved seed. In MHHs in Lume and Gimbichu, heads of households decided on the use of chemicals, while in 80% of MHHs in Ada, the head and wife decided together. Household heads made this decision in all FHHs. In MHHs in Lume, the decision to use manure was made by the head alone (67%) or jointly (23%).

Table 22. Responsibility for input use decisions in Ada, Lume, and Gimbichu woredas, Ethiopia (%)

	MHH						FHH					
	Head			Head and wife			Head			Head and son		
Who decides:	**Ada**	**Lume**	**Gimbichu**	**Ada**	**Lume**	**Gimbichu**	**Ada**	**Lume**	**Gimbichu**	**Ada**	**Lume**	**Gimbichu**
What to plant	51.6	83.3	45.5	48.4	16.7	54.5	76.9	100.0	96.2	19.2	–	3.8
To use fertilizer	50.0	97.1	31.3	50.0	–	59.4	82.1	95.7	88.9	–	–	7.4
To use manure	–	66.7	–	–	22.2	–	100.0	100.0	100.0	–	–	–
To use improved seed	25.0	50.0	25.0	75.0	50.0	75.0	100.0	100.0	100.0	–	–	–
To use chemicals	20.0	100.0	100.0	80.0	–	–	100.0	100.0	–	–	–	–

In Lume, other members of the household (sons, daughters, relatives, and non-relatives) also participated in making decisions on the use of chemicals (2.9%) and manure (11.1%). Female heads of household in all woredas made the decision on the use of manure.

The decision to use farm inputs and the decision on who pays for these inputs are two different issues within households. Table 23 shows who pays for the farm inputs by gender of household head. In MHHs in Lume, heads (94.3%) usually paid for fertilizer, while about 56% and 54% of the heads in Ada and Gimbichu respectively, did so. In about 44% of MHHs in Ada and in Gimbichu, the head and wife paid for fertilizer. In Lume and Gimbichu the male household head always paid for improved seeds and chemicals. In Ada, the male household head (66.7%) or the head and wife (33.3%) paid for improved seed. Both head and wife (80%) usually purchased the chemicals. Female household heads in all woredas usually purchased inputs.

4.2 Livestock Production

The average number of livestock owned and bought is shown in Table 24. The average number of cattle owned by MHHs was higher than FHHs in all woredas. In Lume and Gimbichu, MHHs had slightly more sheep and goats than FHHs, while in Ada, FHHs had more. On average, more MHHs owned poultry, donkeys, and mules than FHHs.

Farmers purchased cattle, donkeys, goats, mules, poultry, and sheep. In Ada, farmers purchased cattle (9 in MHHs and and 4 in FHHs) at an average cost of Birr 990 for MHHs and Birr 973 for FHHs. In Lume, MHHs purchased more livestock (17 animals) than FHHs (8 animals) at a lower cost (Birr 824 for MHHs and Birr 1,061 Birr for FHHs). In Gimbichu, MHHs purchased 9 animals compared to 6 for FHHs at an average cost of Birr 736 and Birr 449, respectively.

Livestock sales and consumption are shown in Table 25. In all woredas, MHHs consumed more livestock than FHHs. In Ada, however, the value of the livestock consumed in FHHs (Birr 120) was higher than the value in MHHs (Birr 66); the opposite was true in Lume and Gimbichu.

The total number of livestock sold in MHHs was 28, 13, and 8 animals for Ada, Lume, and Gimbichu, respectively, while FHHs sold 18, 14, and 8 animals, respectively. In Ada, the mean value of the livestock sold was higher in FHHs (Birr 818) than MHHs (Birr 529). The average value of the livestock sold was higher for MHHs (Birr 1,329 and Birr 1,036 in Lume and Gimbichu, respectively) than for FHHs (Birr 950 in Lume and Birr 448) in Gimbichu.

Table 23. Payment for farm inputs by gender of household heads in Ada, Lume, and Gimbichu woredas, Ethiopia (%)

	MHH								FHH				
	Ada			Lume		Gimbichu			Ada	Lume		Gimbichu	
Who pays for:	Head	Wife	Head and Wife	Head	Wife	Head	Wife	Head and wife	Head	Head	Head and son	Head	Head and son
Fertilizer	56.3	-	43.8	94.3	2.9	54.3	3.3	43.8	96.2	95.7	4.3	96.3	3.7
Improved seed	66.7	33.3	-	100.0	-	100.0	-	-	100.0	100.0	-	100.0	-
Chemical	20.0	-	80.0	100.0	-	100.0	-	-	100.0	100.0	-	-	-

Table 24. Mean number of livestock owned and bought and cost of purchase (Birr) in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
	Mean no.	Mean no.	Mean no.	Mean no.	Mean no.	Mean no.
Livestock owned						
Cattle	5.6	4.9	7.9	5.9	5.7	4.8
Sheep	2.4	3.3	7.3	6.0	4.3	2.7
Goats	3.1	4.0	6.1	5.3	4.7	3.3
Poultry	4.2	3.9	6.5	5.3	4.5	4.3
Donkeys	2.0	1.2	1.9	1.3	1.2	1.4
Mules	–	–	–	–	1.1	1.0

Livestock bought	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents
Cattle	1.1	8	1.0	4	2.0	8	1.2	6	1.0	2	2.0	1
Donkeys	–	–	–	–	1.0	3	1.0	1	1.0	3	1.0	1
Goats	–	–	–	–	1.0	1	–	–	1.0	1	–	–
Mules	–	–	–	–	–	–	–	–	–	–	–	–
Poultry	–	–	–	–	1.3	4	1.0	1	–	–	2.0	2
Sheep	–	–	–	–	2.0	1	–	–	4.0	3	3.0	2

Mean cost of purchased stock

Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents
990	8	973	4	824	17	1,051	8	736	9	449	6

Table 25. Livestock consumed and sold and their value (Birr) in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents
Livestock consumed												
Cattle	1.0	1	1.0	1	-	-	2.0	1	1.0	2	-	-
Goats	1.0	3	1.5	2	1.5	6	1.0	3	2.4	5	1.0	1
Poultry	1.8	14	1.8	8	3.3	13	2.7	12	-	-	1.0	1
Sheep	2.5	2	1.0	4	1.5	8	1.3	6	-	-	-	1
Livestock sold												
Cattle	1.6	12	1.3	10	1.1	9	1.5	2	1.1	6	1.2	5
Donkeys	-	-	1.0	1	1.0	1	-	-	-	-	-	-
Goat	1.5	4	1.0	1	1.0	1	3.5	2	1.0	2	1.0	1
Mule	-	-	-	-	-	-	-	-	-	-	-	-
Poultry	11.1	7	3.6	3	2.0	1	1.0	10	-	-	3.0	2
Sheep	2.4	5	2.3	3	1.0	1	-	-	-	-	-	-

Mean value of stock sold during the year

Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents
529	28	818	18	1,329	13	950	14	1,036	8	448	8

Mean value of stock consumed at home

Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents	Cost (Birr)	Respondents
66	20	120	15	115	27	89	22	193	7	148	2

The main costs of keeping livestock were hiring labor and feeding (Table 26). The cost of livestock feed is almost the same for MHHs and FHHs in Ada, but in Lume it was much higher for MHHs than FHHs, and in Gimbichu FHHs paid more than MHHs. Other costs included veterinary services, drugs and vaccines, and building costs.

Table 27 shows the division of responsibilities of household members for animal husbandry activities. In MHHs in Ada and Lume, the head or son were mainly responsible for animal feeding, while in

Table 26. Costs of keeping livestock (Birr) in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents	Mean no.	Respondents
Feeding	110.1	17	119.5	11	301.7	17	95.7	9	188.7	26	217.3	10
Veterinary attention	_	_	1.0	3	14.5	10	9.8	6	95.0	3	17.5	2
Drugs and vaccine	13.3	6	9.0	6	20.2	5	17.0	5	_	_	_	_
Hired labor	390.0	10	353.3	15	256.2	17	127.1	6	315.8	6	280.0	5
Building	60.0	1	33.8	5	35.0	3	15.0	1	_	_	_	_

Table 27. Responsibility for animal husbandry in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Activity/ household member	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Animal feeding												
Wife	34.4	11	–	–	–	–	–	–	–	–	–	–
Son	71.9	23	64.3	18	57.1	20	73.9	17	45.5	15	44.0	11
Daughter	15.6	5	–	–	17.1	6	13.0	3	21.2	7	16.0	4
Head	78.1	25	60.7	17	80.0	28	30.4	7	9.1	3	20.0	5
Relative/non-relative	37.5	12	64.3	18	28.6	10	47.8	11	39.4	13	48.0	12
Animal treatment												
Wife	–	–	–	–	–	–	–	–	19.4	6	–	–
Son	6.3	2	17.9	5	–	–	26.1	6	6.1	2	12.0	3
Daughter	–	–	–	–	–	–	–	–	–	–	4.0	1
Head	34.4	11	17.9	5	48.6	17	26.1	6	51.5	17	40.0	10
Relative/non-relative	–	–	3.6	1	–	–	4.3	1	6.1	2	32.0	8
Animal transport												
Wife	3.1	1	–	–	–	–	–	–	3.2	1	–	–
Son	9.4	3	25.0	7	14.3	5	26.1	6	6.1	2	20.0	5
Daughter	–	–	–	–	–	–	–	–	–	–	–	–
Head	56.3	18	28.6	8	51.4	18	34.8	8	39.4	13	8.0	2
Relative/non-relative	9.4	3	10.7	3	–	–	13.0	3	15.2	5	32.0	8
Animal slaughter												
Wife	–	–	–	–	–	–	–	–	–	–	–	–
Son	3.1	1	28.6	8	2.9	1	43.5	10	3.2	1	20.0	5
Daughter	–	–	7.1	2	–	–	–	–	–	–	–	–
Head	43.8	14	3.0		51.4	18	2.0		60.6	20	9.0	
Relative/non-relative	–	–	–	–	–	–	–	–	6.1	2	–	–
Animal production												
Wife	62.5	20	–	–	79.4	27	–	–	45.2	14	–	–
Son	6.3	2	7.1	2	–	–	–	–	–	–	–	–
Daughter	6.3	2	7.1	2	25.7	9	39.1	9	–	–	–	–
Head	3.1	1	50.0	14	–	–	87.0	20	9.1	3	48.0	12
Relative/non-relative	–	–	7.1	2	2.9	1	–	–	12.1	4	20.0	5

Gimbichu it was mainly the son, non-relatives, and relatives. In FHHs in Ada, the female head and her son were mainly responsible for animal feeding, while in Lume and Gimbichu it was mainly the son or relatives. The head of the household was mainly responsible for the treatment of sick animals and the transport of animals. In MHHs in all woredas, the household head slaughtered the animals, and in FHHs, the son or head were primarily responsible. In MHHs, the wife was mainly responsible for animal production, while in FHHs it was the household head.

Table 28 gives respondents' reasons for keeping different types of livestock. Households mainly kept livestock for draft power and dairy products. MHHs also kept cattle for dowries, but none of the FHHs did so. Donkeys were mainly used for transport although a few households sold them. Mules and horses were reported only in Gimbichu and were used for transport. Goats were both consumed and sold.

Table 28. Reasons for keeping different types of livestock in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Cattle												
Gift	12.5	4	14.3	4		–	–	–	3.1	1	–	–
Consumption main products	31.3	10	42.9	12	61.1	22	43.5	10	18.8	6	12.0	3
Draft power	100.0	32	100.0	28	97.2	35	91.3	21	100.0	32	100.0	25
Dowry	100.0	32	–	–	100.0	32	–	–	100.0	32	–	–
Consumption of by-products	84.4	27	100.0	28	50.0	18	100.0	23	81.3	26	100.0	25
Transportation	100.0	32	71.4	20		–	43.5	10	–	–	80	20
Donkeys												
Gift	11.1	3	–	–	–	–	–	–	–	–	–	–
Sale	18.5	5	9.5	2	35.5	11	15.8	3	–	–	–	–
Transportation	100.0	27	100.0	21	100.0	31	100.0	19	100.0	27	100.0	19
Mules and horses												
Transportation	–	–	–	–	–	–	–	–	100	15	100	2
Goat												
Consume by-products	28.6	2	20.0	1	–	–	–	–	36.4	4	42.9	3
Gift	14.3	1	20.0	1	–	–	–	–	–	–	–	–
Consume main products	100.0	7	100.0	5	100.0	8	100.0	4	90.9	10	85.7	6
Sale	57.1	4	60.0	3	100.0	8	100.0	4	72.7	8	85.7	6
Poultry												
Consume main products	100.0	19	100.0	16	96.0	24	100.0	13	57.1	12	72.2	13
Sale	63.2	12	75.0	10	96.0	24	92.3	12	57.1	12	38.9	7
Sheep												
Consume by-products	11.1	1	–	–	–	–	–	–	–	–	–	–
Dowry	–	–	12.5	1	–	–	–	–	–	–	–	–
Gift	33.3	3	25.0	2	–	–	–	–	–	–	–	–
Consume main products	100.0	9	100.0	8	90.9	10	84.6	11	94.1	16	69.2	9
Sale	77.8	7	87.5	7	100	11	100.0	13	41.2	7	69.2	9

Almost all of the MHHs and FHHs in Ada and Lume kept poultry for consumption; fewer households in Gimbichu kept poultry for this purpose. More FHHs than MHHs kept poultry for sale. Sheep were kept for consumption and sale.

4.3 Tree Crop Production

Table 29 shows tree crops on farmers' fields in the study area. More households in Ada and Lume had trees in their fields than Gimbichu. Acacia was the most common species, although eucalyptus was also important.

5.0 GENDER DIFFERENTIALS IN ACCESS TO LAND

Studies of African concepts of land tenure during the colonial period report that land was conceived of primarily as an inalienable community property which was indispensable for the cohesion of social relations. Land, the most important means of production, was the basis of the family, the source of life, and formed the link between social organization and ideology. For these reasons, access to land was subjected to strictly patriarchal control, and land was inalienable to anyone (Berg van den 1997). The total amount of land available per household and its use are crucial, given the population growth and the need for increased agricultural productivity.

In all three woredas, MHHs had relatively larger farm sizes than FHHs, but there was no significant difference between the two groups of households. The difference in farm size could have resulted from the nature of land ownership in the study area. Traditionally, in Oromo culture, women had access to land only through marriage, and a widow's land was still the property of the husband, but a PA policy allowed them to allocate land to FHHs. In general, the law in Ethiopia does not discrimate overtly against women in terms of land inheritance, ownership, and management, but women's rights have not been fully asserted in major legislation (Daniel Haile 1980). In Africa in general, women's access to land is not a problem where social institutions allocate land to both men and women or where women can borrow or claim unused land (Bryson 1981).

Table 29. Most important tree crop in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
Tree crop	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Most important tree crop												
Eucalyptus	10.0	20	5.3	1	3.6	1	6.7	10	–	–	–	–
Acacia	85.0	17	94.7	18	53.6	15	46.7	7	–	–	50.0	1
Wacho	5.0	1	–	–	–	–	6.7	1	100.0	1	50.0	1
True man tree	–	–	–	–	3.6	1	13.3	2	–	–	–	–
Other	–	–	–	–	39.3	11	26.7	4	–	–	–	–
Second most important tree crop												
Acacia	50.0	1	50.0	1	20.0	2	28.6	2	–	–	–	–
Wacho	–	–	50.0	1	–	–	14.3	1	–	–	–	–
Others	50.0	1	–	–	60.0	6	57.1	40	–	–	–	–
Eucalyptus	–	–	–	–	10.0	1	–	–	–	–	–	–
True man tree	–	–	–	–	10.0	1	–	–	–	–	–	–

Per capita landholdings of both MHHs and FHHs did not vary significantly. In Lume, MHHs held more land per capita than FHHs, while in Gimbichu FHHs had larger land holdings per capita than MHHs (Table 30). This difference can be explained by the fact that, in Ethiopia, there is no individual ownership of land/plots within the farm household. Instead, all productive resources owned by the family are used collectively, with the exception of small plots in the backyard that women use to grow vegetables.

5.1 Land Rights

An increasing number of African farmers are finding themselves with insufficient land to feed their families, or worse still, no land at all. An abundant and available resource prior to colonial occupation, land was rarely owned in the western sense of exclusive, inalienable rights vested in one individual in exchange for cash. There is confusion over terms related to land rights, such as tenure, usufruct, freehold, and ownership when they are applied in the African context. "Tenure" refers to landholding rights, including land that is passed on through inheritance, through a loan or rent for an established exchange value, or through an outright sale. "Usufruct" refers to a collective group or individual right to use land. "Freehold" refers to an individual's or a corporate body's exclusive right to hold a piece of land that can be transferred. "Ownership" refers to land that has cash or commodity value and is registered through a process of entitlement to an individual or corporate group (Davis 1988).

A critical issue for smallholder agriculture throughout Africa is the shortage of good quality farming land. Increasing population pressures and fragmentation of holdings have sharply reduced cultivated area per person. Within this context of rapid population growth and the need for increased productivity of land, there is a growing debate about whether women farmers' access to land and their decision-making power are constraints to agricultural transformation (Saito, Mekonnen, and Spurling 1994). Historically, men gained access to land as lineage members, but in the majority of cases, women gained access as wives; in a few cases, women inherited land as lineage daughters (Davis 1988). Both men and women farmers are generally better off when they have the right to land.

5.2 Land Acquisition

Unlike other African countries, in Ethiopia MHHs and FHHs acquired land primarily through allocation by the government or the village head. In Kenya, for instance, a higher percentage of MHHs and FHHs obtained land through inheritance and purchase, and in Nigeria, most MHHs and FHHs acquired land through inheritance. In Burkina Faso, government interventions in land tenure have ignored the rights of women (Saito, Mekonnen, and Spurling 1994).

Table 30. Landholdings by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
Farm size (ha)	2.35	1.90	3.15	2.82	3.16	2.64
Household size (no. persons)	8.10	6.50	7.60	5.50	7.80	5.60
Per capita holding (ha/person)	0.29	0.29	0.46	0.51	0.41	0.47

The process of land acquisition in the study area was analyzed to determine whether MHHs and FHHs had differential access to land. Land was allocated to MHHs in Ada (42%) and Lume (74%) by the village head. In Gimbichu, 64% of MHHs acquired land from the government. Land was also acquired through rent or lease. A very small proportion of MHHs in Ada. (3.2%) purchased land (Table 31).

About 68% of FHHs in Lume and 89% in Gimbichu acquired land through government allocation, while about 13% of FHHs in Lume acquired land through inheritance. In Ada, 48% of FHHs were allocated land by the village head and around 36% from the government. Other forms of land acquision for FHHs in Ada (16%) included renting or leasing.

5.3 Land Quality

Concomitant with decreasing per capita landholdings, the deterioration in the quality of land is a concern among farmers in many developing countries. Continuous monocropping, lack of soil-ameliorating practices, and increasing populations of humans and livestock are among the prominent factors exacerbating the situation. The shift in farming practices from the traditional land-extensive, low-input cultivation systems that maintained ecological balance to modern, labor-intensive systems is also considered as one of the factors leading to the deteriorating quality of land (Saito, Mekonnen, and Spurling 1994).

The quality of land is good in Ada and Lume because soils in these woredas are mainly fertile vertisols. Gimbichu has a degraded topograph; hence a large proportion of its total area is not suitable for agricultural production.

Table 32 shows farmers' opinions of the fertility of their soils and the proportion of irrigated land in the study area. Most farmers in Ada and Lume said that their soils ranged from fertile to very fertile, while farmers in Gimbichu reported that their soils were poor to very poor. In general, the study shows that more MHHs than FHHs thought they had fertile soils.

Irrigation is one of the factors that improves the quality of land. Even though most farmland is rainfed, efforts have been made to introduce irrigation, particularly during the off-season for the production of horticultural crops, which play an important role in providing cash. Few farmers in Ada

Table 31. Methods of land acquisition by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

Methods of land acquisition	MHH						FHH					
	Ada		Lume		Gimbichu		Ada		Lume		Gimbichu	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Purchase	3.2	1	–	–	–	–	–	–	–	–	–	–
Inheritance	3.2	1	–	–	3.0	1	–	–	20.8	6	–	–
Allocated by government	94.6	29	100.0	25	97.0	30	100.0	25	79.2	24	100.0	25
Others[a]	32.2	10	25.7	9	33.3	11	16.0	4	8.3	2	7.4	2

[a] Rented/leased, joint allocation by village head and government.

Table 32. Soil fertility status and irrigation of farmland in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Very fertile	32.3	20	18.8	9	22.4	13	26.0	13	3.3	3	1.3	1
Fertile	38.7	24	41.7	20	56.9	33	42.0	21	31.9	29	29.9	23
Poor	24.2	15	31.3	15	19.0	11	26.0	13	28.6	26	33.8	26
Very poor	4.8	3	8.3	4	1.7	1	6.0	3	36.3	33	35.1	27
Irrigated	18.4	7	4.0	1	16.7	5	21.4	6	9.7	3	11.1	3
Not irrigated	81.6	31	96.0	24	83.3	25	78.6	22	90.3	28	88.9	24

and Gimbichu practiced irrigation. In Lume more FHHs (21%) practiced irrigation than MHHs (17%), possibly because in Lume, women were responsible for horticultural crop production on small plots of land using irrigation.

5.4 Decision-Making for Land Improvement, Acquisition, and Rental

Some researchers regard the indigenous tenure system as a static constraint to agricultural development, providing insufficient tenure security to induce farmers to make necessary land-improving investments (Dorner 1972; World Bank 1974; Harrison 1987). Others counter that indigenous tenure arrangements are dynamic and evolve in response to changes in factor prices (Cohen 1980; Boserup 1981; Nornha 1985; Bruce 1988). In Kenya, for instance, women traditionally did not inherit land, but their rights to use land belonging to a male relative were assured. Today, unless the land is registered in her own name, a women's right to use land is threatened by land commercialization. In fact, it could be argued that there is a spontaneous individualization of land rights over time, whereby farm households acquire a broader and more powerful set of transfer and exclusionary rights over land as population pressure and agricultural commercialization proceed. This trend in turn raises the question of whether or not there is a need for expensive land registration and titling programs at this stage of economic development in sub-Saharan Africa. On the other hand, if indigenous tenure systems are dynamic, then it is relevant to ask if governments can take more useful measures to facilitate the process of technology adoption.

Table 33 shows the decision-making responsibilities to improve, lend, or rent land in the three woredas. About 68%, 100%, and 61% of male heads of household are responsible for decisions to improve land in Ada, Lume, and Gimbichu, respectively. Almost all female heads of household are responsible for this decision in all woredas. The decision to lend land in Lume was the full responsibility of the wife in MHHs, while in Gimbichu it was mostly a joint decision between the husband and wife (75%). In Gimbichu, female household heads and their sons were the ones who decided to lend land.

Table 33. Responsibility for decisions on land improvement, acquisition, and renting by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	MHH								FHH					
	Ada		Lume			Gimbichu			Ada		Lume		Gimbichu	
Who decides to:	Head	Wife	Head	Wife	Head and wife	Head	Wife	Head and wife	Head	Son	Head	Head and son	Head	Head and son
Improve land	67.7	32.3	100	–	–	60.6	39.4	–	96.3	3.7	95.7	4.3	100	–
Lend land	–	–	–	100	–	25.0	–	75.0	–	–	–	–	–	100
Rent land	–	–	–	33.3	66.7	–	–	100	–	–	–	100	–	100

In Ada, there is no lending or renting of land. The decision to rent land in Lume was made by husband and wife (67%), while in FHHs the decision was the joint responsibility of the female head and son. In MHHs in Gimbichu, the decision to rent land was made by the husband and wife (100%) and in FHHs, by the female head and son (100%).

6.0 GENDER PATTERNS OF LABOR UTILIZATION

People often refer to the "triple roles" of gender: production, reproduction, and community management. The productive role involves the production of goods and services for consumption and trade. Work related to crop and livestock production (agricultural production) and other income-generating activities is regarded as productive. Reproductive work involves the care and maintenance of the household and its members. Collecting fuelwood and water, caring for children, cooking, and cleaning are all considered reproductive work. These activities do not directly bring cash into the household and are often not even recognized as work. If it is clear that a woman or groups of women are collecting fuelwood for sale, however, then this activity is considered productive. Community management work involves the collective organization of social events and services. Thus group work such as cleaning irrigation channels and terracing is viewed as community management.

6.1 Use of Family Labor in Crop Production

6.1.1 Land preparation

Unlike some African countries where the gender division of family labor in agricultural production is becoming less distinct (Saito, Mekonnen, and Spurling 1994), in Ethiopia in the study area, no female farmers engaged in land preparation. Across all three woredas, land preparation was the responsibility of the male household head, son, male relatives, and male non-relatives in MHHs; in FHHs, the son, male relatives, and male non-relatives were responsible (Table 34).

In Ada and Gimbichu, male household heads prepared most of the land. The average number of days male heads spent preparing land was 34, 21.5, and 30 in Ada, Lume, and Gimbichu, respectively. The difference between Ada and Lume and between Ada and Gimbichu was significant at $p<0.01$. The average number of days allotted for land preparation in Ada is probably higher because tef is

Table 34. Division of household labor by gender and crop operation in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
Crop operation	**MHH**	**FHH**	**MHH**	**FHH**	**MHH**	**FHH**
Land preparation						
Average number of days						
Head	34.0	–	21.5	–	30.0	–
Son	29.3	29.8	26.6	28.2	20.3	19.6
Relatives	–	28.7	40.0	32.0	14.3	19.0
Non-relatives	27.8	31.4	16.4	28.2	29.0	20.8
Average h/day						
Head	7.4	–	6.6	–	6.9	–
Son	7.1	7.5	6.6	6.5	7.8	7.6
Relatives	–	6.7	6.2	6.8	6.4	6.2
Non-relatives	6.5	8.0	7.4	6.4	6.9	7.1
Planting						
Average number of days						
Head	17.0	–	11.4	–	15.5	–
Son	14.1	13.1	9.2	13.6	14.7	13.0
Relatives	–	15.7	–	8.0	18.7	15.2
Non-relatives	16.5	15.0	9.2	12.0	14.0	14.1
Average h/day						
Head	8.6	–	7.9	–	8.6	–
Son	8.5	8.8	7.6	7.7	7.4	8.5
Relatives	–	11.3	–	4.0	7.3	7.5
Non-relatives	9.0	9.2	8.0	7.1	8.4	9.0
First weeding						
Average number of days						
Head						
Wife	14.3	13.7	21.3	18.6	14.5	15.9
Son	13.7	–	18.0	–	16.9	–
Daughter	22.6	20.9	26.3	26.0	19.3	20.2
Relatives	18.3	20.7	20.2	19.0	16.0	21.3
Non-relatives	3.3	12.7	93.0	8.0	18.3	21.3
Average h/day						
Head	8.7	8.8	7.8	7.2	7.6	7.3
Wife	8.9	–	7.7	–	7.0	–
Son	9.1	8.5	7.7	7.8	7.3	7.8
Daughter	8.9	8.3	7.8	7.6	7.8	7.3
Relatives	9.5	8.5	8.0	9.0	6.3	8.0
Non-relatives	8.4	9.2	7.9	7.3	7.7	7.2
Second weeding						
Average number of days						
Head	6.7	8.6	7.8	9.6	4.7	3.0
Wife	7.1	–	7.9	–	4.5	–
Son	10.6	9.3	13.9	13.0	10.5	–
Daughter	12.4	9.0	9.2	8.3	8.0	10.0
Relatives	11.0	7.7	–	4.0	–	–
Non-relatives	13.0	10.3	10.3	10.7	2.0	–
Average h/day						
Head	7.7	9.0	6.8	7.8	9.0	7.0
Wife	8.0	–	7.2	–	9.0	–
Son	8.4	8.5	6.6	8.8	8.9	–
Daughter	7.2	8.3	6.1	7.8	8.5	9.0
Relatives	7.5	5.5	–	9.5	–	–
Non-relatives	7.7	8.3	7.5	9.3	8.0	–

(Continued) →

Table 34. (Cont'd.)

Crop operation	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
Harvesting						
Average number of days						
Head	12.2	3.2	11.2	6.4	18.9	7.2
Wife	4.1	–	6.1	–	5.3	–
Son	16.5	16.0	12.1	11.0	21.5	23.4
Daughter	6.3	6.0	5.2	8.2	9.9	10.7
Relatives	20.3	16.5	9.1	9.8	17.1	20.7
Non-relatives	10.2	15.4	12.0	8.3	25.0	27.0
Average h/day						
Head	7.7	7.4	7.2	6.5	8.8	7.1
Wife	7.2	–	6.8	–	7.8	–
Son	7.5	8.2	7.1	7.0	8.7	8.6
Daughter	7.3	5.3	7.5	8.1	8.1	8.1
Relatives	8.0	8.2	7.8	7.8	8.5	8.1
Non-relatives	7.9	7.9	7.3	7.4	8.4	7.5
Transporting						
Average number of days						
Head	9.6	–	9.4	5.7	10.6	6.9
Wife	8.5	–	8.9	–	8.3	
Son	16.9	11.0	12.1	9.2	13.8	12.5
Daughter	10.1	–	7.7	9.3	7.3	7.8
Relatives	17.1	9.2	21.7	19.2	10.4	20.1
Non-relatives	9.7	11.8	11.3	5.2	15.3	17.6
Average h/day						
Head	6.9	–	7.0	6.6	6.2	5.8
Wife	6.4	–	7.2	–	6.5	–
Son	6.7	7.0	7.1	6.8	6.2	5.7
Daughter	6.5	–	7.3	7.2	6.8	5.8
Relatives	7.4	6.8	7.8	8.5	6.3	6.1
Non-relatives	7.2	6.7	6.5	7.5	5.9	5.9
Threshing/storage						
Average number of days						
Head	13.0	4.7	16.4	9.5	11.9	7.2
Wife	7.1	–	10.8	–	8.3	–
Son	17.8	14.1	19.5	19.1	14.5	12.6
Daughter	12.9	3.3	8.5	16.4	9.3	7.9
Relatives	22.5	10.4	9.6	14.0	6.2	11.1
Non-relatives	18.3	13.3	19.1	12.0	18.3	9.9
Average h/day						
Head	8.6	6.5	8.5	7.9	8.7	6.5
Wife	6.9	–	7.7	–	7.9	–
Son	8.8	8.8	8.6	8.5	8.8	8.6
Daughter	7.0	9.0	8.1	7.3	7.6	7.6
Relatives	7.7	7.8	8.4	8.4	7.3	8.2
Non-relatives	10.0	8.4	8.2	8.9	8.6	8.2

the dominant crop and the land requires several plowings before it is planted. Even though farmers in Lume and Gimbichu also grow tef, tef performs so well in Ada that farmers give it top priority in the allocation of labor. The average number of days spent on land preparation was relatively higher in Gimbichu than in Lume because of waterlogging, which is the dominant crop production problem there.

In Ada and Lume, FHHs spent 30 days on land preparation while in Gimbichu they spent 20 days. MHHs in Lume and Gimbichu spent more time on land preparation than FHHs, while in Ada both types of household spent roughly the same amount of time on land preparation.

There was little difference in the number of hours spent on land preparation between MHHs and FHHs across the three woredas. In Ada, male household heads spent more hours per day preparing land than other members of the household, while in Lume and Gimbichu the male head spent fewer hours per day than other members of the household, although the difference was not significant. In FHHs, sons, relatives, and non-relatives spent more than six hours per day on land preparation.

6.1.2 Planting

There was little difference between MHHs and FHHs in the average number of hours spent on planting per day. The male household head, sons, and non-relatives in MHHs in Ada and Lume did the planting, while relatives also participated in Gimbichu. Female heads of household did not engage in planting. In all three woredas, the son, relatives, and non-relatives were engaged in planting. In Ada and Lume, male heads spent more days on planting than other members of the household. In Gimbichu, relatives spent more days planting than male heads. In FHHs in all woredas, sons spent on average 13 days on planting. With the exception of Lume, relatives in FHHs spent more days planting than relatives in MHHs.

6.1.3 Weeding

All members of farm households were involved in weeding (Table 34). In MHHs, the son worked the highest number of days (more than 20 days) on the first weeding, followed by non-relatives (close to 20 days) and daughters (more than 16 days). The number of days spent on weeding ranged from about 3 in Ada to 18 in Gimbichu. In all woredas, there was little difference in the number of days husbands and wives spent on weeding. In FHHs, the average number of days spent on weeding was greatest for sons (more than 20 days). In Ada and Lume, daughters and relatives spent on average 21 days on weeding. Female heads spent the fewest hours on weeding. The average number of days for the first weeding in FHHs ranged from 8 days by relatives to 26 days by sons in Lume. Female heads on average spent about 14, 19, and 16 days on weeding in Ada, Lume, and Gimbichu, respectively**.** There was no marked difference in the number of days spent by male and female heads on first weeding.

In MHHs, the average hours spent by relatives per day on the first weeding ranged from around 6 hours in Gimbichu to around 10 hours in Ada. There was no significant difference in the average number of hours per day among members of the household. However, household members spent on average more hours per day on weeding in Ada, followed by Lume and Gimbichu. There was no significant difference between the average number of hours that male heads and wives spent per day spent on weeding in the

three woredas. In FHHs, the average hours spent on weeding ranged from about 7 by the female head in Lume and non-relatives in Gimbichu to 9 by non-relatives in Ada per day. Female heads spent fewer hours per day on weeding than male heads in all the three woredas, although the difference was not significant.

The average number of days spent on the second weeding was less than the average number of days spent on first weeding in all woredas. In MHHs, it ranged from 2 days by non-relatives in Gimbichu to 14 days by sons in Lume. Heads spent on average 6.7, 7.8, and 4.7 days on the second weeding in Ada, Lume, and Gimbichu, respectively. In Ada and Lume, wives spent more days on the second weeding than the heads, but again, the difference was not significant. The average number of days spent on the second weeding was the lowest in Gimbichu. Relatives did not participate in the second weeding in Lume and Gimbichu.

In FHHs, the average number of days spent on the second weeding ranged from 3 days by the head in Gimbichu to about 11 days by non-relatives in Lume. Female heads spent an average of 8.6 days in Ada, 9.6 days in Lume, and 3 days in Gimbichu on the second weeding. In FHHs in Gimbichu, the second weeding was limited to the head (3 days) and daughters (10 days). MHHs spent more days on the second weeding than FHHs, although the difference was not significant.

The average hours per day spent on the second weeding in MHHs ranged from about 6 hours by daughters in Lume to 9 hours by the head and wife in Gimbichu. Heads spent on average 7.7, 6.8, and 9 hours per day on the second weeding in Ada, Lume, and Gimbichu, respectively. The average number of hours per day that wives spent on the second weeding was higher than the time spent by household heads in Ada and Lume, while wives and heads spent the same number of hours per day (9) in Gimbichu. The average number of hours that household members spent each day on the second weeding was higher in Gimbichu, followed by Ada and Lume.

In FHHs, the average number of hours per day spent on second weeding ranged from about 6 hours by relatives to 9 hours by the head in Ada and daughters in Gimbichu. Heads spent on average 9, 7.8, and 7 hours per day in Ada, Lume, and Gimbichu, respectively, on the second weeding. FHHs spent more time on second weeding than MHHs, although the difference was not significant.

6.1.4 Harvesting

All household members in the study area took part in harvesting (Table 34). Non-relatives were more involved in harvesting than other members of the household. On average, MHHs spent much more time on harvesting than FHHs in all woredas ($p<0.01$). There was little difference between MHHs and FHHs in the average number of days that household members (sons, daughters, relatives, and non-relatives) spent on harvesting. In MHHs, the average number of days spent on harvesting ranged from 4 days by the wife in Ada to 25 days by non-relatives in Gimbichu, while in FHHs it ranged from 3 days by the head in Ada to 27 days by non-relatives in Gimbichu.

The average hours spent per day on harvesting in MHHs ranged from about 7 hours by the wife in Lume to about 9 hours by the head in Gimbichu. On average, all household members in MHHs in Ada and Lume spent more time on harvesting than FHHs. In Ada, this was because daughters in MHHs spent more hours (7) harvesting. This difference was significant ($p<0.01$). In Lume, there was little difference in the average number of hours household members spent each day on harvesting between MHHs and FHHs. In Gimbichu, there was a significant difference in the average number of hours that male and female heads of households spent on harvesting ($p<0.01$).

6.1.5 Transporting produce

This activity entails the transportation of agricultural produce from the field to the threshing area and to the nearest market. There was no significant difference between MHHs and FHHs in the number of days spent transporting produce (Table 34). The average number of days household members spent transporting produce ranged from 5.2 days by non-relatives in FHHs to 21.7 days by relatives in MHHs in Lume. In MHHs in Ada, household heads spent an average of 9.6 days transporting produce, while wives spent 8.5 days. Relatives, followed by sons in MHHs, undertook most of the transporting. In FHHs, non-relatives and sons did most of the transporting. Heads and daughters in FHHs in Ada were not involved in transporting at all.

In Lume, heads and non-relatives in MHHs spent significantly more time transporting produce than heads and non-relatives in FHHs ($p<0.01$). In FHHs in Lume and Gimbichu, all household members were involved in transporting produce. More household members in MHHs transported produce than in FHHs. In Gimbichu, there was a significant difference in the average number of days that male and female heads of households ($p< 0.05$) and relatives ($p<=0.05$) spent transporting produce. On average, household members in FHHs in Gimbichu spent more days transporting produce than household members in MHHs.

The average hours spent per day transporting produce ranged from about 6 hours by sons in FHHs in Gimbichu to about 9 hours by relatives in FHHs in Lume. Except for relatives and non-relatives in MHHs in Ada, Lume, and Gimbichu, the average number of hours that farm household members spent transporting produce per day was higher in MHHs than in FHHs.

6.1.6 Threshing/storage

In the study area,threshing of small grain cereals involves both animal power and human labor. Animals are rotated over the thinly spread crop on a specially prepared threshing ground, and household members winnow the grain from the straw. In Ada, the average number of days spent threshing and storing grain ranged from about 5 days by the head in FHHs to about 23 days by relatives in MHHs (Table 34). With the exception of daughters and relatives in Lume and relatives in Gimbichu, the average number of days that household members spent on threshing and storing grain was higher in MHHs than FHHs in all woredas.

In Ada, relatives followed by non-relatives in MHHs recorded the highest average number of days spent on threshing/storage, while in FHHs the son followed by non-relatives and relatives recorded the highest average number of days. Time spent on this operation differed significantly only between

the heads ($p<0.01$) and daughters ($p<0.07$) of MHHs and FHHs. Female heads (4.7 days) and daughters (3.3 days) spent the least number of days on threshing/storage.

In MHHs in Lume, the head, son, and non-relatives spent more than 15 days on threshing/storage, while in FHHs, only sons and daughters spent more than 15 days on threshing/storage. There was a significant difference between MHHs and FHHs in the case of the heads ($p<0.01$), daughters ($p<0.00$), and relatives ($p<0.00$). Female heads spent the least number of days on threshing/storage.

The average hours per day of threshing/storage ranged from about 7 hours by the female head in Ada and Gimbichu to 10 hours by non-relatives in MHHs in Ada. Sons spent more hours per day on threshing/storage than other members of the household with the exception of non-relatives in MHHs in Ada and Lume. Household members in MHHs spent on average more hours per day on threshing/storage than household members in FHHs. On average, daughters in MHHs and FHHs in Ada spent significantly fewer hours per day on threshing/storage than daughters in Lume and Gimbichu.

6.2 Use of Family Labor in Livestock Production

All household members in MHHs and FHHs were involved in livestock activities though different household members were responsible for different activities (Table 35).

In most MHHs in Ada, the head (78%) and the son (72%) were responsible for animal feeding, while the wife (34%) and relatives/non-relatives (36%) were less active. In about 80% of the MHHs in Lume, the head was responsible for livestock feeding, while in Gimbichu, only 9% of heads in MHHs were responsible. In Gimbichu, the son (46%) was mainly responbile for livestock feeding, followed by relatives/non-relatives (39%), the daughter (21%), and the wife (7%). In FHHs, the responsibility for animal feeding rested mainly with the son and relatives/non-relatives across all woredas.

Heads of households were primarily responsible for treating sick animals in all woredas. In MHHs, heads were responsible for slaughtering and selling animals. In Ada, Lume, and Gimbichu, the head was responsible for slaughtering and selling animals in about 44%, 51%, and 61% of the MHHs, respectively; in FHHs, sons and relatives/non-relatives were responsible. Heads of household were responsible for transporting animals to the market in about 56%, 51%, and 39% of MHHs in Ada, Lume, and Gimbichu, respectively, while sons were responsible in 9% of MHHs in Ada, 14% in Lume, and 6% in Gimbichu. In FHHs, 29% of heads in Ada, 35% in Lume, and 8% in Gimbichu transported animals to the market, while sons did this in 25% of FHHs in Ada, 26% in Lume, and 20% in Gimbichu. Relatives/non-relatives transported animals to the market in 11%, 13%, and 32% of FHHs in Ada, Lume, and Gimbichu, respectively.

Wives in MHHs were mainly responsible for processing animal products. Heads of households were responsible in 50% of FHHs in Ada, 87% in Lume, and 48% in Gimbichu. In Lume, daughters also participated considerably in processing animal products.

In general, the head was mainly responsible for feeding, treating, slaughtering, and transporting animals in MHHs, while the wife processed animal products. Other family members assisted only in treating, slaughtering, and transporting animals. On the other hand, other family members were responsible for all livestock activities in FHHs. It is important to note, however, that in Ethiopia the sexual division of labor and gender roles varies from one cultural setting to another depending on whether the plow or the hoe are used for cultivation. For instance, in some parts of Ethiopia, women do not sell or buy bulls, oxen, heifers, or cows (Rahamato 1991).

Table 35. Division of family labor by gender and livestock production task in Ada, Lume, and Gimbichu woredas, Ethiopia (%)

	Ada		Lume		Gimbichu	
Task	**MHH**	**FHH**	**MHH**	**FHH**	**MHH**	**FHH**
Feeding						
Head	78.1	60.7	80.0	30.4	9.1	20.0
Wife	34.4	–	22.9	–	6.5	–
Son	71.9	64.3	57.1	73.9	45.5	44.0
Daughter	15.6	–	17.1	13.0	21.2	16.0
Relative/non-relative	37.5	64.3	28.6	47.8	39.4	48.0
Treating sick animals						
Head	34.4	17.9	48.6	26.1	51.5	40.0
Wife	–	–	–	–	19.4	–
Son	6.3	17.9	–	26.1	6.1	12.0
Daughter	–	–	–	–	–	4.0
Relative/non-relative	–	3.6	–	4.3	6.1	32.0
Slaughter and sale						
Head	43.8	7.1	51.4	–	60.6	–
Wife	–	–	–	–	–	–
Son	3.1	26.6	2.9	43.5	3.2	40.0
Daughter	–	–	–	–	–	–
Relative/non-relative	–	10.7	–	8.7	6.1	36.0
Transport to market						
Head	56.3	28.6	51.4	34.8	39.4	8.0
Wife	3.1	–	–	–	3.2	–
Son	9.4	25.0	14.3	26.1	6.1	20.0
Daughter	–	–	–	–	–	–
Relative/non-relative	9.4	10.7	–	13.0	15.2	32.0
Product processing						
Head	3.1	50.0	–	87.0	9.1	48.0
Wife	62.5	–	79.4	–	45.2	–
Son	6.3	7.1	–	–	–	–
Daughter	6.3	7.1	25.7	39.1	–	–
Relative/non-relative	–	7.1	2.9	–	12.1	20.0

6.3 Use of Hired Labor in Crop Production

The use of hired labor in crop production is shown in Table 36. Hired labor in agricultural operations is limited to weeding, harvesting, threshing and transporting. Both male and female workers were hired for these operations. Children were also hired for weeding. In Ada, Lume, and Gimbichu, about 88%, 97%, and 82% of MHHs, respectively, hired labor for crop production compared to about 78%, 96%, and 74% of FHHs. The main reason given by both types of households for not hiring labor was that the labor supply was sufficient. Other reasons were that cash was short or that hiring labor was not profitable.

The division of hired labor by gender and agricultural production tasks in Ada, Lume, and Gimbichu is shown in Table 37. In MHHs in Ada, male and female labor was hired for weeding for 19 and 15 days, respectively, and for 11 and 10 days in FHHs. In Lume, only male labor was used (17 days in MHHs and 25 days in FHHs). In Gimbichu, households hired male labor (33 days in MHHs and 19 days, in FHHs) and child labor (2 days in MHH and 8 days in FHHs). Laborers were paid Birr 4-5 per day for weeding.

In Ada, both types of households hired mainly male labor for harvesting. Only MHHs in Ada (6 days) and Lume (8 days) hired female labor. Male laborers were paid Birr 5-9 for harvesting per day, while female laborers were paid Birr 5- 6 per day.

In MHHs in Ada, Lume, and Gimbichu, male labor was hired for about 10, 19, and 7 days for transportation, while FHHs in Gimbichu hired male labor for an average of 28 days. Hired laborers were paid Birr 5-7 per day.

Most households hired only male labor for threshing, with the exception of FHHs in Lume, which hired men as well as women. In Lume, the cash payment and cash equivalent per day for male laborers were Birr 5.7 and 3.8, respectively, in both MHHs and FHHs, while that of female labor was Birr 7. In Gimbichu, MHHs and FHHs hired male labor for an average of 8 and 9 days, respectively. The cash payment per day was Birr 8.8 in MHHs and Birr 4.3 in FHHs. The cash equivalent was Birr 6.8 in MHHs and Birr 5 in FHHs.

Table 36. Hired labor and reasons for not hiring labor in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Households using hired labor	87.5	28	77.8	21	97.1	34	95.8	23	81.8	27	74.1	20
Reasons for not hiring labor												
Have enough labor	100.0	4	83.3	5	100.0	1	–		50.0	3	71.4	5
Cash shortage	–		16.7	1	–		100.0	1	33.3	2	26.6	2
Not profitable	–		–		–		–		16.7	1	–	–

Table 37. Division of hired labor by gender and agricultural production tasks in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
Production task	**MHH**	**FHH**	**MHH**	**FHH**	**MHH**	**FHH**
Weeding						
Number of days						
Male labor	19.0	11.0	16.9	25.0	33.3	19.0
Female labor	14.7	10.4	–	–	–	–
Child labor	–	2.0	–	–	2.0	8.0
Cash payment (Birr)						
Male labor	4.5	4.0	4.2	5.0	4.6	4.5
Female labor	4.7	3.9	–	–	–	–
Child labor	–	1.0	–	–	3.0	4.0
Harvesting						
Number of days						
Male labor	28.1	23.2	38.4	22.8	30.6	28.2
Female labor	5.5	–	8.0	–	–	–
Cash payment (Birr)						
Male labor	8.9	8.6	8.9	8.4	5.3	6.0
Female labor	6.0	–	5.0	–	–	–
Cash equivalent (Birr)						
Male labor	5.2	5.2	4.2	4.4	4.4	4.8
Female labor	6.0	–	5.3	–	–	–
Transporting						
Number of days						
Male labor	9.7	–	19.0	1.0	7.0	28.0
Female labor	–	–	–	–	–	–
Cash payment (Birr)						
Male labor	5.5	–	5	7.0	5.0	5.0
Female labor	–	–	–	–	–	–
Cash equivalent (Birr)						
Male labor	6.5	–	4	6.8	3.0	3.0
Female labor	–	–	–	–	–	–
Threshing						
Number of days						
Male labor	9.7	–	28.4	22.3	8.0	9.0
Female labor	–	–	–	8.0	–	–
Cash payment (Birr)						
Male labor	6.8	–	5.7	5.7	8.8	4.3
Female labor	–	–	–	7.0	–	–
Cash equivalent (Birr)						
Male labor	5.4	–	3.8	3.8	6.8	5.0
Female labor	–	–	–	–	–	–

6.4 Use of Family Labor in Non-Agricultural Production Tasks

6.4.1 Food preparation

Household members' involvement in various non-agricultural tasks is shown in Table 38. Food preparation is generally the responsibility of women in Ethiopia and no male heads of household were involved. In all woredas, wives, daughters, and relatives participated in food prepartion. Non-relatives also participated in MHHs in Gimbichu and in FHHs in Ada and Lume. Relatives were more involved in food preparation than wives across all three woredas, perhaps because of a cultural

Table 38. Division of household labor by gender and non-agricultural tasks in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada		Lume		Gimbichu	
Task	**MHH**	**FHH**	**MHH**	**FHH**	**MHH**	**FHH**
Food preparation						
Average number of days/week						
Head	–	7.0	–	6.1	–	5.6
Wife	6.7	–	6.5	–	5.2	–
Son	–	–	–	–	–	–
Daughter	6.4	6.3	6.2	5.3	3.6	4.1
Relatives	7.0	7.0	7.0	–	6.0	5.5
Non-relatives	–	7.0	–	7.0	4.8	–
Average hours per day						
Head	–	3.5	–	4.2	–	2.6
Wife	3.02	–	5.3	–	–	–
Son	–	–	–	–	–	–
Daughter	3.6	3.85	6.5	3.4	2.9	2.6
Relatives	3.0	–	5.8	–	4.7	2.8
Non-relatives	–	2.8	–	6.5	4.2	–
Fetching water						
Average number of days/week						
Head	7.0	6.2	4.3	6.0	4.3	4.7
Wife	7.0	–	6.2	–	5.6	–
Son	–	4.5	4.6	5.0	5.0	4.5
Daughter	6.8	5.6	6.0	6.0	5.6	5.5
Relatives	7.0	7.0	2.0	5.0	5.5	5.8
Non-relatives	7.0	6.6	5.3	3.5	5.5	–
Average hours per day						
Head	1.0	1.1	0.7	1.1	0.4	1.0
Wife	1.2	–	0.9	–	0.8	–
Son	–	2.0	1.6	1.2	1.4	1.2
Daughter	2.01	1.7	1.1	1.2	0.8	1.4
Relatives	1.0	2.0	1.5	1.3	0.6	0.9
Non-relatives	1.0	0.8	2.6	1.0	1.0	–
Childcare						
Average number of days/week						
Head	6.7	7.0	–	7.0	3.0	5.8
Wife	6.4	–	6.8	–	5.5	–
Son	–	–	–	–	–	–
Daughter	6.1	7.0	6.8	7.0	3.5	–
Relatives	–	1.0	–	7.0	–	–
Non-relatives	–	–	7.0	7.0	1.0	–
Average hours per day						
Head	3.0	6.1	–	5.3	3.5	7.1
Wife	6.0	–	5.1	–	5.8	–
Son	–	–	–	–	–	–
Daughter	7.5	7.5	5.5	5.7	1.1	–
Relatives	–	6.0	–	8.0	–	–
Non-relatives	–	–	4.0	6.0	4.0	–

(Continued) →

Table 38. (Cont'd.)

Task	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
Social activities						
Average number of days/week						
Head	2.3	2.3	2.0	4.4	2.7	2.0
Wife	2.1	–	4.7	–	2.0	0.7
Son	1.5	1.8	2.0	2.1	4.5	–
Daughter	2.0	1.0	4.8	5.2	3.6	4.0
Relatives	–	–	1.0	–	3.5	4.0
Non-relatives	–	–	2.8	1.3	3.3	2.0
Average hours per day						2.7
Head	4.5	4.8	4.2	3.6	5.6	4.5
Wife	4.7	–	3.6	–	3.9	–
Son	2.5	3.0	5.0	4.0	6.5	5.1
Daughter	6.5	3.0	3.4	2.7	6.0	3.4
Relatives	–	–	5.0	–	6.5	5.0
Non-relatives	–	–	2.1	3.3	5.3	3.8
Making handicrafts						
Average number of days/week						
Head	–	–	–	3.3	–	3.0
Wife	–	–	2.9	–	2.3	–
Son	–	–	–	–	–	–
Daughter	4.3	–	2.6	3.8	4.0	4.0
Relatives	–	–	–	–	–	4.0
Non-relatives	–	–	2.0	–	1.0	–
Average hours per day						
Head	–	–	–	3.0	–	5.3
Wife	–	–	3.0	–	3.5	
Son	–	–	–	–	–	–
Daughter	3.3	–	3.0	2.5	5.0	6.0
Relatives	–	–	–	–	–	3.0
Non-relatives	–	–	2.0	–	1.0	–

tradition that considers it disrespectful for wives to cook in the presence of relatives. The average number of days spent per week on food preparation in MHHs varied from 3.6 days by daughters in Gimbichu to 7 days by relatives in both Ada and Lume.

In FHHs, the average number of days spent on food preparation per week ranged from 4.1 days by daughters in Gimbichu to 7 days by heads, relatives, and non-relatives in Ada and non-relatives in Lume. With the exception of Gimbichu, female heads of households, like wives in MHHs, spent fewer days per week on food preparation than other household members. Again, relatives and non-relatives spent more days per week on food preparation than other family members. In general, household members spent on average relatively fewer days on food preparation in FHHs than in MHHs, although the difference was not significant.

The average hours spent per day on food preparation in MHHs ranged from 2.9 hours by daughters in Gimbichu to 6.5 hours by daughters in Lume. The average number of hours spent by all household members on food preparation per day was highest in Lume followed by Gimbichu and Ada. Among members of the farm household, wives spent fewer hours per day on food preparation than daughters, relatives, and non-relatives. With the exception of Lume, daughters in Ada and Gimbichu spent more hours per day on food preparation than any other family member.

In FHHs, the average hours spent per day on food preparation ranged from 2.6 hours by heads and daughters in Gimbichu to 6.5 hours by non-relatives in Lume. Female heads of household spent on average 3.5, 4.2, and 2.6 hours on food prepartion in Ada, Lume, and Gimbichu, respectively. However, daughters in Ada, non-relatives in Lume, and relatives in Gimbichu spent on average more hours per day on food preparation than female heads of household. With the exception of Ada, household members in MHHs spent on average more hours per day on food preparation than household members in FHHs, although the difference was not significant.

6.4.2 Fetching water

In both MHHs and FHHs in all woredas, the average time spent per day on fetching water was around 2 hours, an indication that water points were relatively close to homesteads. All household members in MHHs spent more than 4 days each week fetching water, with the exception of relatives in Lume and sons in Ada. The average number of days spent fetching water per week varied from 2 by relatives in Lume to 7 by the head, wife, relatives, and non-relatives in Ada. Heads of households spent an average of 7 days per week in Ada and 4.3 days in Lume and Gimbichu fetching water, while wives spent 7 days in Ada, 6.2 days in Lume, and 5.6 days in Gimbichu. With the exception of Ada, wives spent more days per week fetching water than male heads. Daughters spent an average of 6.8 days, 6 days, and 5.6 days per week fetching water in MHHs in Ada, Lume, and Gimbichu, respectively.

In general, household members in FHHs spent more days per week fetching water than household members in MHHs. In FHHs, the average number of days spent fetching water ranged from 3.5 by non-relatives in Lume to 7 by relatives in Ada. Female heads spent on average 6.2, 6, and 4.7 days fetching water in Ada, Lume, and Gimbichu, respectively, while relatives spent 7, 5, and 5.8 days per week fetching water in Ada, Lume, and Gimbichu. Daughters and relatives spent 5.6 and 7 days in Ada, 6 and 5 days in Lume, and 5.5 and 5.8 days in Gimbichu, respectively.

6.4.3 Childcare

Childcare is one of the reproductive roles of gender. In both MHHs and FHHs in Ada and Lume, daughters were usually responsible for childcare, while in Gimbichu it was the wife in MHHs and the head in FHHs.

In MHHs, household heads spent on average 6.7 days per week in Ada and 3 days per week in Gimbichu taking care of children. Male heads in Lume did not spend time caring for children. Wives spent 6.4, 6.8 and 5.5 days per week in Ada, Lume, and Gimbichu, respectively, looking after children. Daughters spent 6.1, 6.8 and 3.5 days per week in Ada, Lume and Gimbichu, respectively, while non-relatives spent 7 and 1 days per week in Lume and Gimbichu, respectively.

In FHHs, the responsibility for children rested with the head, daughters, and relatives. Heads of household and daughters spent on average 7 days per week caring for children in both Ada and Lume while the head spent 5.8 days per week in Gimbichu. In Gimbichu only the household head cared for the children. Relatives spent 1 day in Ada and 7 days per week in Lume caring for children. In Lume, non-relatives spent on average 7 days per week caring for children.

In MHHs, household heads spent on average 3 and 3.5 hours per day on childcare in Ada and Gimbichu, respectively, while in Lume, the head did not spend any time on childcare. Wives, on the other hand, spent 6, 5.1, and 5.8 hours per day in Ada, Lume, and Gimbichu, respectively. Daughters spent 7.5, 5.5, and 1.1 hours per day in Ada, Lume, and Gimbichu, respectively. Non-relatives spent 4 hours per day in Lume and Gimbichu while they did not spend any time on childcare in Ada.

Female household heads spent on average 6.1 hours per day in Ada, 5.3 hours per day in Lume and 7.1 hours per day in Gimbichu on childcare while daughters spent 7.5 and 5.7 hours per day in Ada and Lume, respectively. Relatives spent 6 and 8 hours per day in Ada and Lume, respectively, while non-relatives spent 6 hours per day in Lume.

6.4.4 Firewood collection

Almost all household members collected firewood. In MHHs, the head spent 5 and 1 days per week collecting firewood in Ada and Lume, respectively, while in Gimbichu the head did not collect firewood. Wives spent 3.6, 3.8, and 2.6 days per week collecting firewood in Ada, Lume, and Gimbichu, respectively, while daughters spent 4.1, 2, and 2.5 days per week. Relatives and non-relatives also gathered firewood.

In FHHs, the head and daughters were mainly responsible for collecting firewood. Household heads spent 3.6, 3.3, and 3.8 days per week collecting firewood in Ada, Lume, and Gimbichu, respectively, while daughters spend 5.2 and 3.3 days per week in Ada and Lume.

6.4.5 Social activities and handicraft making

Household members also spent time attending local festivals, funerals, wedding ceremonies, and other social gatherings. In general, MHHs and FHHs spent the same amount of time on social activities.

Household members in all three woredas spent little time making handicrafts. Across woredas, more daughters participated in this activity than any other household member.

7.0 GENDER DIFFERENTIALS IN AGRICULTURAL PRODUCTION, UTILIZATION, AND FOOD AVAILABILITY

In sub-Saharan Africa, agriculture is the livelihood of 69% of the economically active population. The productive capacities of natural resources on the continent depend on the productive capacities of its people. In rural communities, producers and consumers live in the same household and are often the same people. The way rural households function and make decisions and their visions of the future have long been recognized as essential information for planners and policymakers in the agricultural sector. What is less frequently recognized is the significance of the consequences of different levels and patterns of consumption and the effects of agricultural decisions on household food security and nutritional status of both the producers and consumers in rural and urban areas (FAO 1997).

Food security may have different meanings for different people. The International Conference on Nutrition, held in Rome in 1992, defined food security as "access by all people at all times to the food needed for a healthy life" (FAO/WHO 1992). Essentially, to achieve food security a country must achieve three basic aims: ensure adequate quantity, quality, and variety of food; optimize stability in the flow of food supplies; and secure sustainable access to available food supplies by all who need them. Adequate food availability at the national, regional, and household levels, obtained through markets and other channels, is the cornerstone of nutritional well being. At the household level, food security implies physical and economic access to foods that are adequate in terms of quantity, nutritional quality, safety, and cultural acceptability to meet each person's needs. Household food security depends on adequate income and assets, including land and other productive resources. It is ultimately associated with access to nutritionally adequate food at the household level, i.e., the ability of households or individuals to acquire a nutritionally adequate diet at all times.

Agricultural decisions may result in a direct change in diet or in the quantity, quality, variety, and safety of food available in a particular community. Frequently, the effect is a change in access to food for a particular sector of society or community because of fluctuations in food prices or in household income. All of these changes affect consumers' consumption of food, health, and productivity. The poor, who do not have the resources or adequate stocks to withstand a crisis and to maintain household food security on a sustainable basis, are especially affected by these changes (FAO 1997).

7.1 Methodology

Food balance data simply provide information on the quantity of food available to the consumer. Actual food consumption data, on the other hand, help to identify the types of food consumed and nutritional problems experienced by a certain population group. Food consumption data may come from two types of surveys: by actually weighing the food consumed in the household and/or by collecting data on household food expenditure (the quantity and monetary value of food items acquired and/or consumed by households). Surveys of actual consumption rather than expenditure yield more representative and complete estimates of "habitual" food intake, as information such as food wastage and food produced at home is accounted for (FAO 1997).

Table 39 shows the production and consumption patterns of each household in Ada, Lume, and Gimbichu for main food crops. From these quantities of grains and pulses the calorie equivalent was calculated (using the conversion factors of FAO's Country Nutrition Profile of Ethiopia 1997). It should be noted from the outset that these data by no means represent the food security status of the household. Rather, they give a rough estimate of whether there were gender differentials in daily energy production and consumption from the major food crops produced in the study area.

7.2 Results and Discussion

The Ethiopian diet is based mainly on cereals, which provide about 70% of calorie intake. Ada, Lume, and Gimbichu are known for their cereal and pulse production, and thus the calorie intake is based on cereal and pulse production (Mulat et al. 1995).

The mean daily energy (in calories) of production per person per day was about 2,278 for MHHs and 2,291 for FHHs. These amounts are higher than the average national energy supply from cereals (1,713 calories per person per day) (FAO 1996). MHHs and FHHs did not differ significantly in total calorie production per person per day. This finding is different from other findings reported in the literature, in which FHHs are usually categorized as being at the chronic stage in terms of access to food (Debebe and Maxwell 1992).

The total cereal calorie consumption of both MHHs and FHHs was lower than the daily requirement recommended by FAO/WHO/UNU (1,540 calories per person per day for cereals only). The amount of calories consumed per person per day was about 894 and 877 for MHHs and FHHs, respectively. The main explanation for the low calorie consumption per person per day

Table 39. Mean quantities of agricultural production and consumption (quintal) by type of crop in Ada, Lume, and Gimbichu woredas, Ethiopia

Crop production and utilization	Ada		Lume		Gimbichu	
	MHH	FHH	MHH	FHH	MHH	FHH
Barley						
Grain produced	7.66	4.92	4.67	3.81	3.00	–
Grain consumed	3.08	2.13	2.73	2.01	1.00	–
Chickpea						
Grain produced	3.66	3.73	5.78	5.30	4.22	4.16
Grain consumed	2.03	2.06	1.51	1.43	1.01	0.95
Faba beans						
Grain produced	3.83	4.00	2.16	1.33	1.25	2.31
Grain consumed	1.96	2.00	0.99	0.70	0.87	0.50
Field peas						
Grain produced	3.13	1.56	2.48	1.49	2.16	1.70
Grain consumed	1.35	0.82	0.95	0.74	0.41	0.65
Haricot beans						
Grain produced	1.36	1.50	3.85	3.95	–	–
Grain consumed	0.98	–	1.12	1.38	–	–
Lentils						
Grain produced	2.75	–	0.65	1.08	8.00	6.40
Grain consumed	1.60	–	0.50	0.70	0.68	0.61
Maize						
Grain produced	4.00	–	7.62	5.73	–	–
Grain consumed	2.40	–	3.29	2.28	–	–
Rough peas						
Grain produced	2.52	3.28	2.86	0.50	2.25	1.41
Grain consumed	1.93	1.50	0.90	0.35	0.90	0.79
Tef						
Grain produced	14.82	12.19	16.70	13.65	6.44	5.05
Grain consumed	7.02	5.55	6.13	4.69	2.62	1.81
Wheat						
Grain produced	7.54	5.65	8.56	4.79	20.16	15.05
Grain consumed	3.47	2.57	3.68	2.65	6.80	5.65

is that the households consumed small portions of the cereals and pulses they produce. Figures 2 and 3 show the wheat and teff utilization by gender of the household head. About 38% of MHHs and 42% of FHHs consumed the wheat they produced, while 40% of MHHs and 39% of FHHs consumed their tef produce. The amount of food that farmers purchased after they sold their produce was not included in the calculation of calories consumed, and therefore the daily calorie intake is underestimated.

The three woredas differed significantly with respect to the calorie production per person per day. The mean calorie production per person per day was 1,707, 2,668, and 2,478 in Ada, Lume, and Gimbichu, respectively. The daily calorie production per person was below the joint recommendation of FAO/WHO/UNU only in Ada. The daily cereal calorie consumption per person was about 810 in Ada, 775 in Gimbichu, and 1,083 in Lume. The calorie consumption per person per day was significantly higher in Lume than in Ada and Gimbichu ($p<0.05$). In Ada, environmental degradation has significantly reduced land availability, and hence contributed to food insecurity (Debebe and Maxwell 1992).

8.0 GENDER DIFFERENTIALS IN AGRICULTURAL PRODUCTIVITY

Overcoming stagnating agricultural productivity and food insecurity hinges on increasing agricultural productivity. In many parts of sub-Saharan Africa, where subsistence agriculture predominates, it is paramount to place strong emphasis on increasing the productivity of labor, land, capital, and other resources. Agricultural productivity may vary by gender if men and women use different technologies or different quantities of production factors, or if there are differences in the quality of these factors (Saito, Mekonnen, and Spurling 1994). In this section, we use a Cobb-Douglas production function to assess whether agricultural productivity varies in MHHs and FHHs.

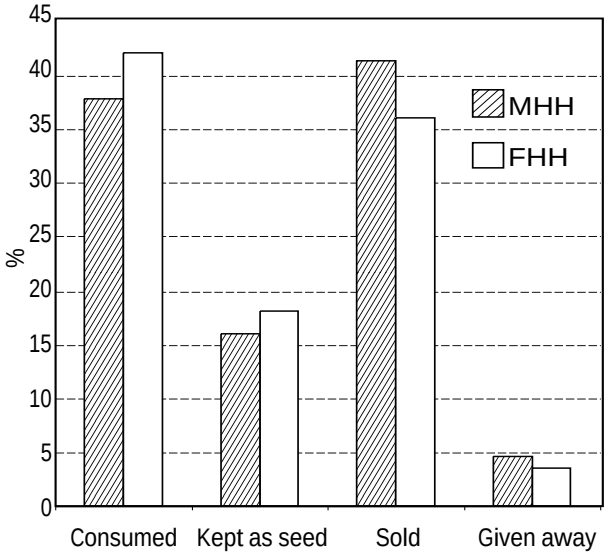

Figure 2. Utilization of wheat by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia.

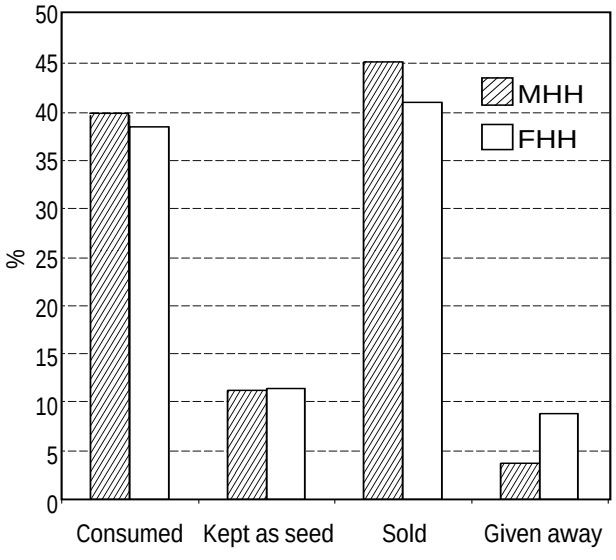

Figure 3. Utilization of tef by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia.

8.1 The Production Function

A Cobb-Douglas production function, in which coefficients of input variables were estimated from survey data, was used to used to assess the extent to which productivity was affected by various inputs. The variables were hypothesized to influence the adoption of improved wheat varieties either positively (+), negatively (-), or positively and/or negatively (+/-). The production function can be expressed as:

[1] $$Y = \beta_{0,i} * X_{1,i}^{\beta 1,i} * X_{2,i}^{\beta 2,i} \ldots X_{n,i}^{\beta n,i}$$

i =1,2 (1= MHH; 2= FHH),

where:

- Y = gross value of farm output in Birr[2];
- X_1 = age of the household head (yr) (+/-);
- X_2 = total family labor used for agricultural production (weighted by 1 h/yr for men and women and 0.5 h/yr for children) (+);
- X_3 = farm size (ha) (+);
- X_4 = number of tropical livestock units (weighted by 1 for cattle, 0.14 for goats and sheep, 0.43 for donkeys, and 0.02 for poultry) (+);
- X_5 = amount of inorganic fertilizer used (kg N/ha) (+);
- X_6 = quantity of herbicide (ha) (+);
- X_7 = quantity of insecticide (ha) (+);
- X_8 = hired labor for agricultural production (h/yr) (+);
- X_9 = extension contact (dummy variable = 0 if no contact, 1 if contact) (+);
- X_{10} = education of household head (dummy variable = 0 if illiterate, 1 if literate) (+);
- b_0 = constant;
- b_i's = estimated parameters.

The Cobb-Douglas production function is used widely because of a number of desirable properties. One of these desirable properties is that β_i's are the elasticities of output with respect to the relevant input. A critical assumption is that β_i's are positive and each is less than one. The sum of the β_i's also provides the returns to scale parameter. Another attractive property of the production function is that, econometrically, it is easy to estimate, because in its log form, the parameters are linear and can be estimated easily using the Ordinary Least Squares method. However, since it treats input choices as exogenous, it is susceptible to management bias. Ideally, input choices should be modeled simultaneously with the production function, but this usually requires price variation. In addition, the Cobb-Douglas production functional form is not flexible for modeling complements and substitutes, such as the relationship of land and labor or the role of labor availability in choosing variable inputs (Saito, Mekonnen, and Spurling 1994).

[2] Output is calculated as the farmgate price multiplied by yields (including straw yields). The crops included in the total output were barley, chickpeas, faba beans, field peas, lentils, maize, rough peas, teff, and wheat.

8.2 Model Results

The estimates of the Cobb-Douglas production function are shown in Table 40. The coefficients of multiple determination adjusted for degrees of freedom indicated that the variation in gross value of output per hectare associated with the factors of production specified in the model was 72% and 82% in MHHs and FHHs, respectively.

The significant factors affecting gross value of output for MHHs were farmer's age, family labor, farm size, livestock units, and inorganic fertilizer; in FHHs, they were family labor, farm size, livestock units, inorganic fertilizer, hired labor, and extension contact.

In MHHs, a farmer's age had a significant and negative impact on gross output. A 10% increase in the farmer's age resulted in a 2.1% decrease in gross output. Family labor had a significant and positive impact on the gross value of output for both MHHs and FHHs. A 10% increase in the amount of labor resulted in a 2.3% and 1.8% increase in gross value of output for MHHs and FHHs, respectively. Farm size had a positive and significant impact on the gross value of output for MHHs and FHHs. A 10% increase in farm size resulted in a 5.6% and a 7.2% increase in gross value of output for MHHs and FHHs, respectively.

The number of livestock had a positive and significant impact on the gross value of output for both households. A 10% increase in the number of livestock for MHHs and FHHs resulted in a 1.3% and 0.7% increase in the gross value of output, respectively. The amount of inorganic fertilizer used had a positive and significant impact on the gross value of output in both types of households as well. A 10% increase in the amount of fertilizer resulted in a 1% increase in gross value of output for both MHHs and FHHs. Saito, Mekonnen, and Spurling (1994) found that the use of inorganic fertilizer on plots managed by women in Kenya increased the gross output to 1.6% compared to 1.3% for plots managed by men.

Table 40. Estimates of Cobb-Douglas production function by gender in Ada, Lume, and Gimbichu woredas, Ethiopia

	MHH		FHH	
Variable	Regression coefficient (b)	T-statistic	Regression coefficient (b)	T-statistic
Intercept	6.6271	9.41*	6.3330	8.38*
Age of household head (yr)	-0.2112	1.80***	-0.0817	0.74
Family labor (h/yr)	0.2342	2.54**	0.1809	2.05**
Farm size (ha)	0.5592	7.46*	0.7551	10.49*
Tropical livestock units (number)	0.1332	2.67*	0.0719	1.63***
Inorganic fertilizer (kg N/ha)	0.1012	1.69***	0.1027	1.92***
Herbicide (l/ha)	0.0679	1.36	0.0386	0.54
Insecticide (l/ha)	0.0367	0.43	0.1520	0.89
Hired labor (h/yr)	-0.0007	0.05	0.0278	2.56**
Extension contact (dummy)	-0.0461	0.77	-0.2844	4.04*
Education of head (dummy)	-0.0288	0.44	-0.0922	1.48
Adjusted R^2	0.72		0.82	
F-test	26.2*		35.8*	
Sample size (N)	100		77	

Note: * = significant at p<0.01; ** = significant at p<0.05; and *** = significant at p<0.1.

The use of hired labor for agricultural production positively and significantly affected the gross output for FHHs, although the impact was only very marginal, because a 10% increase in the amount of hired labor resulted in a 0.03% increase in gross output. Extension contact had a negative and significant impact on the gross output for FHHs. The gross output was lower for FHHs that had contact with extension services.

Allocative efficiency can be determined by comparing the marginal value product (MVP) of a factor with its opportunity cost (factor price). The MVP of a factor is the additional return from adding one more unit of that factor, holding all other inputs constant. In this study we have calculated the MVP using a 10% increase in the use of that factor. An MVP that exceeds its opportunity cost suggests that there is scope for raising productivity by increasing the use of that factor. Conversely, increasing the use of a factor for which the MVP is less than the associated opportunity cost will decrease productivity.

MVPs for family labor, farm size, and fertilizer were determined for MHHs and FHHs. Table 41 shows the MVPs and factor prices for the significant variables for MHHs and FHHs using a 10% increase in the actual use of inputs. Thus, for FHHs 126.3 hours (10% of 1,263 h/yr) were added. The factor price was then calculated using a daily wage rate of Birr 5.5/day. The duration of a working day was 8 hours. Factor prices for farm size and fertilizer were calculated by using the average rent (Birr 311/kert) and actual fertilizer prices (Birr 5.2 per kilogram of N/ha). These prices were multiplied by a 10% increase in farm size (0.3 ha for MHHs and 0.24 ha for FHHs) and fertilizer use (6.4 kg N/ha for MHHs and 4.4 kg N/ha for FHHs). The MVP of family labor compared to its price (wage rate) is higher in MHHs and lower in FHHs, indicating that MHHs could increase their productivity by using more family labor. A study by Quisumbing (1993) also found that the marginal product of women's labor was lower than that of men's. Also, Quisumbing (1996) cites a study in India in which the marginal product of male labor is greater than that of female labor.

The MVP of farm size was lower than its factor price for MHHs and higher for FHHs; thus FHHs could increase their productivity by cultivating more land. The MVP for inorganic fertilizer was higher than its factor cost for both MHHs and FHHs, which indicates that both types of household could increase their productivity by increasing their use of inorganic fertilizer.

In general, MHHs had more land, labor, and capital (particularly cattle) than FHHs. It was also shown that MHHs had more access to formal education than FHHs.

Table 41. MVP and factor prices (in Birr) for significant variables by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	MHH		FHH	
Factor	**MVP**	**Factor price**	**MVP**	**Factor price**
Family labor (h/yr)	145.70	114.74	82.05	86.72
Farm size (ha)	353.36	372.96	356.33	299.32
Inorganic fertilizer (kg N/ha)	62.55	33.07	47.02	23.11

The production function analysis showed that elasticities for the significant factors affecting the gross value of output for MHHs were farmer's age (-0.21), fertilizer (0.10), farm size (0.56), labor (0.23), and livestock (0.13). For FHHs the elasticities were fertilizer (0.10), farm size (0.76), labor (0.18), livestock (0.07), hired labor (0.03), and extension (-0.28). The negative elasticity for extension implies that policymakers and the Ministry of Agriculture should specifically target FHHs to mitigate extension's negative effect on gross value of output for FHHs.

The comparison of MVP with the factor cost showed that MHHs could increase productivity by using more labor and fertilizer, while FHHs could do so by using more land and fertilizer. MHHs (Birr 6,456/ha) had a higher gross output compared to FHHs (Birr 4,776/ha). However, the gross value of the output was 1.3% higher for FHHs if the average value of inputs from MHHs were used. This suggests that no significant productivity differences between MHHs and FHHs would exist if FHHs had equal access. Moock (1976) in Kenya also found that women obtained 6.6% more output at the mean levels of input compared to men. Saito, Mekonnen, and Spurling (1994) found that women in Kenya obtained about 22% more output than men if they had equal access to resources as men. Quisumbing (1996), however, stated that these kinds of simulations should be interpreted with caution, since we do not know how the levels of inputs could be raised for FHHs.

9.0 GENDER DIFFERENTIALS IN TECHNOLOGY ADOPTION

9.1 Factors Affecting the Adoption of Wheat Production Technologies

In 1997, about 59% and 42% of MHHs and FHHs, respectively, grew wheat. Local wheat varieties were grown by 70% of MHHs and 86% of FHHs. A significantly higher proportion ($t=5.7$, $p<0.05$) of MHHs (30%) grew improved wheat varieties than FHHs (14%). In FHHs, the decision to grow improved wheat varieties was always made by the head; in MHHs it was either a joint decision between the head and wife (55.6%) or a decision by the head alone (44.4%). About five years ago, the adoption of improved wheat varieties was over 90% in the same study area (Workneh et al. 1994). The decline can be partly attributed to farmers who considered their recycled improved wheat seed as local. Furthermore, most farmers reported that the seed of the preferred wheat variety was not avalailable.

The two models frequently used in adoption studies are logit and probit (Feder, Just and Zilberman 1985). For this study, the logit model is used to analyze factors affecting decisions in MHHs and FHHs to adopt improved wheat varieties. It is hypothesized that the use of improved wheat varieties is influenced by a combined (simultaneous) effect of a number of factors related to farmers' objectives and constraints (CIMMYT 1993). The variables were hypothesized to influence the adoption of improved wheat varieties positively (+), negatively (-), or positively and/or negatively (+/-).

Following Gujarati (1988) the model is specified as:

$$[2]\ \ln(P/(1-P)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e$$

where:

X_1 = RADIO (owned) (+);
X_2 = LUNITS (number of livestock owned) (+);

X_3 = MEMBCOOP (membership in a service cooperative) (+);
X_4 = HHSIZE (household size) (+);
X_5 = EXTCON (extension contact during the last 3 months) (+);
X_6 = EDUHEAD (education level of the head) (+);
X_7 = DISTMKT (average distance from farm to market in km) (-);
X_8 = AREALAND (area of farm in hectares) (+);
X_9 = AGEHH (age of the household head in years) (+/-); and
e = error term.

9.2 Model Results

The logistic model explains 84% and 89% of the total variation specified in the model for MHHs and FHHs, respectively (Table 42). The chi-square indicates that the parameters are significantly different from zero at the 1% level for MHHs and FHHs.

The odds in favor of adopting improved wheat varieties increased by a factor of 22.1 for MHHs that had access to extension services. MHHs benefited more from extension than FHHs. Other studies (Moock 1976; Saito, Mekonnen and Spurling 1994) have found similar results.

Radio ownership increased the odds in favor of adopting improved wheat varieties by a factor of 5.9 for FHHs. Chilot, Shapiro and Demeke (1996) also found that radio ownership significantly and positively affected the adoption of improved wheat varieties.

Table 42. Parameter estimates of a logistic model for factors affecting adoption of improved wheat varieties in Ada, Lume, and Gimbichu woredas, Ethiopia

	MHH		FHH	
Household characteristic	**Parameter estimate (β)**	**Wald Statistic**	**Parameter estimate (β)**	**Wald statistic**
Intercept	-5.2808**	5.01	-12.5913***	0.08
Radio	0.1031	0.0136	-1.7676	0.8156
Livestock (TLU)	0.0517	0.30	0.0609	0.11
Membership in cooperative	-1.8079	1.48	8.9540	0.04
Household size (number of people)	0.1958	1.71	-0.0012	-
Extension contact	3.0973***	18.27	1.5066	2.27
Education	1.1862	2.08	1.8381	2.48
Distance to market (km)	-0.0155	0.04	-0.1714	1.82
Farm size (kert)	0.1285*	3.21	0.1650*	3.74
Age (yr)	0.0012	-	-0.0160	0.09
Chi-square	47.74***		20.42***	
Overall predicted	84.3%		89.2%	
N	89.0		65.0	

Note: * = significant at p<0.1; ** = significant at p<0.05; and *** = significant at p<0.01.

If farm sizes are increased, the odds in favor of adopting improved wheat varieties increase by a factor of 1.1 for MHHs and 1.2 for FHHs. The average farm size, area under wheat, and livestock units were significantly higher for MHHs than FHHs. If the farm size of both MHHs and FHHs increased, the probability of adopting improved wheat varieties would increase almost equally.

The results showed that MHHs were more likely to adopt improved wheat varieties than FHHs. However, the availability of seed of improved wheat varieties should be addressed, because lack of seed has discouraged adoption. In FHHs, the decision to grow improved wheat varieties was always made by the head, while in MHHs it was either a joint decision between the head and the wife (55.6%) or a decision by the head alone (44.4%). Some studies have also shown that women and men are faced by differential access to new technology, education, health care, and other resources (Ahmed 1985, Stamp 1989, Abu and Oppong 1987).

10.0 GENDER DIFFERENTIALS IN ACCESS TO RURAL INSTITUTIONS

10.1 Credit Services

Credit availability, by increasing risk-taking capacity, increasing the ability to invest, and improving access to other productive inputs and assets, is very important for improving farm productivity and returns.

The high price of fertilizer and agro-chemical supplies (implying the need for more cash) and the non-availability of loans (as much as required) from the bank and informal credit sources are among the major problems of crop production. This problem is very much reflected in the list of items (fertilizer, seed, chemicals, and equipment, in order of importance) purchased by farmers with the credit they obtained (Table 43).

All the sampled MHHs, and 96.3% and 95.7% FHHs in Ada and Lume, respectively, said they used some kind of credit facility. Although credit sources included the bank, co-operative, local lenders, and relatives, farmers' use of credit varied among the woredas.

More than 85% of MHHs and FHHs across the woredas required collateral to obtain credit. The type of collateral used was generally co-signature in Ada (71.9% for MHHs and 92% for FHHs) and Lume (97% for MHHs and 95.5% for FHHs). This form of collateral was less common in Gimbichu where group guarantee was used more frequently (76.7% for MHHs and 82.6% for FHHs). Land and future crop were used less frequently as collateral. The head of the household was mainly responsible for putting up collateral in all households.

All farmers in Ada reported that they obtained credit from the bank and not from the service co-operative, whereas farmers in the other two woredas (except 4.2% of FHH in Lume) said they obtained credit from their respective service co-operatives. Over 85% of both MHHs and FHHs in the three woredas did not secure any credit from local moneylenders. Sample households in Lume woreda are different because they use irrigation throughout the year and plant a lot of cash crops, especially horticultural crops like tomatoes.

The credit that farmers received from the co-operative was tied to the extension program. Access to credit in this case was possible if one was willing to buy inputs included in the extension program at a given price. As Chipande (1987) has pointed out, extension programs use credit as a means of persuading farmers to adopt a certain package of technology. When the initial credit strategy is analyzed, two

Table 43. Some selected variables on credit facilities by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Use credit	100.0	32	96.3	26	100.0	35	95.7	23	100.0	33	100.0	27
Collateral is required	100.0	32	96.2	25	94.3	33	95.7	22	90.9	30	85.2	23
Type of collateral												
Co-signature	71.9	23	92.0	23	97.0	32	95.5	21	23.3	7	17.4	4
Group guarantee	15.6	5	–		3.0	1	4.5	1	76.7	23	82.6	19
Land	9.4	3	8.0	2	–		–		–		–	
Future crop	3.1	1	–		–		–		–		–	
Who put up collateral?												
Head	100.0	32	91.7	22	97.0	32	100.0	22	96.7	29	87.0	20
Wife	–		–		3.0	1	–		–		–	
Head and wife	–		–		–		–		3.3	1	–	
Son	–		8.3	2	–		–		–		13.0	3
Where was credit obtained?												
Bank	100.0	32	100.0	27	–		–		–		–	
Co-operatives	–		–		100.0	35	95.8	23	100.0	33	100.0	27
Local money lenders	15.6	5	7.4	2	14.3	5	4.2	1	–		3.7	1
Relatives	–		3.7	1	8.6	3	–		–		–	
Items purchased by credit												
Fertilizer	100.0	32	100.0	26	100.0	35	100.0	23	100.0	33	100.0	27
Seed	12.5	4	11.5	3	42.9	15	21.7	5	3	1	–	
Chemicals	3.1	1	–		42.9	15	30.4	7	–		–	
Equipment	–		–		34.3	12	17.4	4	–		–	
Reason for not using credit												
No need	–		100.0	1	–		–		–		–	
Lack of awareness	–		–		–		100.0	1	–		–	
Membership in a service co-operative	75.0	24	74.1	20	100.0	35	100.0	24	97.0	32	100.0	27
Co-operative Services												
Marketing services	–		–		68.6	24	58.3	14	6.3	2	14.8	4
Technical services	8.3	2	–		34.3	12	16.7	4	50.0	16	51.9	14
Credit services	–		–		97.1	34	95.8	23	100.0	32	96.3	26
Farm input	62.5	15	85.0	17	77.1	27	54.2	13	75.0	24	74.1	20
Membership in a women's group	46.9	15	51.9	14	94.3	33	95.8	23	93.1	27	92.6	25
Main activities of women's group												
Business activities	–		–		84.8	28	91.3	21	–		–	
Social activities	–		–		100.0	33	100.0	23	100.0	27	100.0	25
Women's group affiliation with another agency or institution												
Research	100.0	15	78.6	11	18.2	6	9.1	2	–	–	–	–
Aid agencies	100.0	15	100.0	14	100.0	6	100.0	2	–	–	–	–
Average amount (Birr) and duration (months) of credit from co-operatives and bank												
Amount	762.71	32	635.00	26	1,046.57	35	736.69	23	1,296.21	33	1,056.77	27
(t –value)	NS				2.09*				NS			

conclusions can be drawn. First, the credit package did not take into account that land resources, managerial ability, and labor resources varied across households, so a number of farmers received credit packages that were inappropriate for their needs and resources. Naturally such households defaulted (Kinsey 1974). Second, there was a close relationship between defaulting and the mean labor units available to the household. This finding suggests that labor-deficient households were offered labor-intensive packages that they were unable to manage adequately. This resulted in poor yields that in turn led to defaults. The observation that labor-deficient households were likely to default led to a reorientation of the criteria for granting credit. During the second stage, the emphasis was on the "ability to repay" principle. Credit was granted only to those deemed credit-worthy and FHHs lost out.

The average amount of credit obtained from the bank by households in Ada amounted to Birr 762.71 (MHHs) and Birr 635 (FHHs). The amount obtained from cooperatives in Lume was relatively higher. However, FHHs received smaller amounts than their male counterparts from either the bank or cooperative. No credit programs were designed especially for women.

More women were members of women's groups in Lume and Gimbichu than Ada. All group activities were social in Gimbichu but included business actitivies as well in Lume. The women's group in Ada was affiliated to a research institute, while in Lume it was affiliated to aid agencies.

In MHHs, the decision to use credit was made either by the head alone or in conjunction with the wife. In FHHs, the head made the decision with some participation from the son (Table 44).

10.2 Extension Services

Adams (1983) defined extension as assistance to farmers to help them to identify and analyze their production problems and to become aware of the opportunities for improvement. Rolling (1988) on the other hand defined agricultural extension as a communication process geared towards bringing voluntary behavioral change. Ban van den and Hawkins (1988) have defined extension as the conscious communication of information to help people form sound opinions and make good decisions.

Table 44. Decision-making on the use and payment of credit by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Who decides whether to use credit?												
Head	37.5	12	84.6	22	80.0	28	100.0	23	78.8	26	92.6	25
Head and wife	62.5	20	–		20.0	7	–		3.0	1		
Son	–		15.4	4							3.7	1
Who repays the credit?												
Head	97.1	34	100.0	23	40.6	13	100.0	26	87.9	29	88.9	24
Wife	2.9	1	–		–		–		3.0	1	–	
Head and wife	–		–		59.4	19	–		–		–	
Son	–		–		59.4	19	–		–		–	

Extension provided agricultural and vocational training on the use of fertilizer, insecticides, improved seed, land use practices, animal husbandry, and home economics. In Lume, 48.6% of MHHs reported that they received agricultural and vocational training as compared to 9.4% in Ada. In FHHs, it was 3.7% in Ada and 25% in Lume (Table 45).

All households in Lume and 37.5% of MHHs and FHHs in Ada indicated that they were taught how to use fertilizer. In Lume 62.9% of MHHs and 45.8% of FHHs received information on the use of insecticides and 51.4% of MHHs and 16.7% of FHHs received information on the use of improved seed. About 91% of MHHs and 62.5% of FHHs in Lume were taught land use practices, and all households were taught animal husbandry. In Ada farmers were taught neither land use practices nor animal husbandry. In Lume 54.2% of FHHs were taught home economics but none were taught in Ada.

In Gimbichu, the extension messages were related to credit services (all MHHs and 96.3% of FHHs), farm inputs (75% of MHHs and 74.1% of FHHs), and marketing services (6.3% of MHHs and 14.8% of FHHs).

The extension contact of households differed from woreda to woreda in the last three months. About 81% (MHHs) and 88.9% (FHHs) in Ada and 45.7% (MHHs) and 58.3% (FHHs) in Lume reported that they had no contact with extension agents (Table 46). In both cases the figure for FHHs was slightly lower, indicating again their lack of access to extension facilities. Farmers in Lume had better contact with extension agents than in Ada, but here as well, it was relatively less for FHHs.

In Kakamega District of Kenya, 40% of the women interviewed knew nothing about the extension services' credit program and no woman manager had ever obtained a loan (Due, Mollel, and Malone 1987). A survey in Nigeria's Ogun State Agricultural Development Project revealed that extension agents visited only 10% of women farmers every week, whereas 70% of male farmers were visited weekly (Elabour-Idemudia 1991). Apart from outright discrimination, a number of factors account for women's low participation in extension programs. The methods used to disseminate technical information, such as the contact farmer approach and the use of training centers, tend to channel information to farmers who have more resources and who are generally men (Berger, Delancey, and Mellencamp 1984).

Table 45. Type of extension services provided by gender of household head in Ada, Lume, and Gimbichu woredas Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Agricultural and vocational training	9.4	3	3.7	1	48.6	17	25.0	6	33.3	11	–	–
Fertilizer use	37.5	12	37.0	10	100.0	35	100.0	24	87.9	29	51.9	14
Insecticide use	3.1	1	–	–	62.9	22	45.8	11	36.4	12	11.1	3
Improved seed use	12.5	4	11.1	3	51.4	18	16.7	4	30.3	10	14.8	4
Land use practices	–	–	–	–	91.4	32	62.5	15	18.2	6	11.1	3
Animal husbandry	–	–	–	–	100.0	35	100.0	24	9.1	3	–	–
Home economics	3.1	1	–	–	–	–	54.2	13	15.2	5	3.7	1

Table 46. Selected variables on extension activities by gender of household head in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Extension contact in the last three months	18.8	6	11.1	3	54.3	19	41.7	10	36.4	12	14.8	4
Once in three months	33.3	2	33.3	1	15.8	3	30.0	3	30.8	4	–	–
Once a month	–		–		47.4	9	50.0	5	15.4	2	100.0	4
Twice a month	16.7	1	–		15.8	3	–		38.5	5	–	–
Thrice a month	–		–		15.8	3	10.0	1	–		–	–
Four or more times	50.0	3	66.7	2	5.3	1	10.0	1	15.4	2	–	–
Gender of extension agent												
Male	–		–		57.9	11	60.0	6	76.9	10	–	–
Female	100.0	6	100.0	3	42.1	8	40.0	4	23.1	4	100.0	4
Individual extension visit	100.0	6	100.0	3	100.0	20	100.0	10	100.0	13	100.0	4
Preferred gender of agent												
Male	3.2	1	7.4	2	37.1	13	30.4	7	9.5	2	–	–
No preference	96.8	30	92.6	25	62.9	22	69.6	16	90.5	19	100.0	17

The frequency of contact for households varied from one to four or more times a month (Table 46). Respondents from Lume had more extension contact (where the highest frequency reported was once a month), although some said once in three months and others three times a month. What can be discerned from this pattern is that there is no definite visit schedule as the replies were so divergent.

All households in Ada indicated that they had a female extension agent. In Lume about 40% of MHHs and FHHs had contact with a female extension agent. Visits were usually on an individual basis. A majority of the sampled households were indifferent to the gender of the extension agent, with the exception of Lume, where 37.1% of MHHs and 30.4% of FHHs indicated they preferred male extension agents.

In Ada, Lume, and Gimbichu, more than half of MHHs indicated that extension agents talked to male members only, while most FHHs in Lume and Gimbichu said that extension agents talked to female members only. On the other hand, 50%, 47.4%, and 50% of MHHs in Ada, Lume, and Gimbichu, respectively, indicated that extension agents talked to both male and female members as compared to 100%, 20%, and 50% of FHHs in Ada, Lume, and Gimbichu (Table 47).

Table 47. Gender of household heads with whom extension agents make contact in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Male members only	50.0	3	–	–	52.6	10	10.0	1	50	6	–	–
Female members only	–	–	–	–	–	–	70.0	7	–	–	100.0	4
Male and female members	50.0	3	100.0	3	47.4	9	20.0	2	50	6	–	–

Eighty percent of MHHs and 87.5% of FHHs in Ada indicated that they had not adopted recommended practices at all (Table 48). On the other hand, more than half of MHHs and FHHs in Lume said they adopted recommended practices sometimes. Recommended practices were very often adopted by 25.7% of MHHs and 4.2% of FHHs in Lume, whereas 11.4% of MHHs and 12.5% of FHHs said they seldom adopted them.

The reasons given for not adopting recommended practices in Ada were the lack of awareness, that the practice was not used by anybody, and that there was no need. A few observed that the recommendation was too technical. In Lume, some respondents said it was too risky and not applicable.

Very few farmers in Ada and Lume (except 22.9% of MHHs in Lume and 6.1% in MHHs in Gimbichu) were contact farmers. When asked whether they would be interested in being contact farmers, 15.6% of MHHs in Ada, and 22.2% of MHHs and 12.5% of FHHs in Lume, were interested. The main incentive to be a contact farmer was to get new ideas (Table 49).

Table 48. Frequency of adopting recommended practices in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Frequency												
Very often	10.0	3	–	–	25.7	9	4.2	1	18.2	6	3.7	1
Sometimes	6.7	2	8.3	2	54.3	10	50.0	12	9.1	3	1.1	3
Seldom	3.3	1	4.2	1	11.4	4	12.5	3	18.2	6	25.9	7
Not at all	80.0	24	87.5	21	8.6	3	33.3	8	54.5	18	59.3	16
Reason for not adopting recommended practices												
Too expensive	–	–	–	–	–	–	2.5	1	–	–	6.3	1
Too technical	4.2	1	–	–	–	–	–	–	44.4	8	37.5	6
Don't apply	8.3	2	–	–	33.3	1	37.5	3	–	–	–	–
Too risky	–	–	–	–	33.3	1	12.5	1	11.1	2	37.5	60
No need for it	33.3	8	28.6	6	33.3	1	12.5	1	11.1	2	6.3	1
No one use them	33.3	8	42.9	9	–	–	25.0	2	27.8	5	12.5	2
Lack of awareness	20.8	5	28.6	6	–	–	–	–	5.6	1	–	–

Table 49. Is the household head a contact farmer, and reasons for wanting to be a contact farmer in Ada, Lume, and Gimbichu woredas, Ethiopia

	Ada				Lume				Gimbichu			
	MHH		FHH		MHH		FHH		MHH		FHH	
	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)	(%)	(Respondents)
Is contact farmer	–	–	–	–	22.9	8	–	–	6.1	2	–	–
Is interested in being a contact farmer	15.6	5	–	–	22.2	6	12.5	3	22.6	7	7.7	2
Reason to be a contact farmer												
To get new ideas	100.0	5	–	–	100.0	6	66.7	2	66.7	2	100.0	1
To get improved seed	–	–	–	–	–	–	33.3	1	33.3	1	–	–

11.0 CONCLUSION AND POLICY IMPLICATIONS

On the whole the differences in endowments (land rights, education), access to technologies, factors of production, and support services had implications for agricultural productivity in both types of households.

The major problems faced by all farmers, male or female, were: insufficient land; shortage of family labor; high price of fertilizer and agro-chemical supplies; lack of loans from formal and informal sources; distance from market centers; the shortage of appropriate storage facilities; and inadequate extension services. Of these, the biggest constraints were the shortage of land and labor, the high cost of labor, and poor soils. While these problems affected all respondents equally, the degree and magnitude varied between households. Differences and similarities were observed between the two groups with respect to access to resources, division of labor, decision-making, and adoption of improved wheat varieties.

11.1 Access to Resources

Male heads of household were more educated than female heads of household. MHHs had better land, bigger households, and owned more cattle than FHHs. MHHs also had better access to formal and informal financial institutions and extension services. They owned more ox plows and were thus better able to prepare their land on time. Both types of households owned the same number of farm implements.

11.2 Division of Labor

There was a very high and varied involvement of all household members, including male and female heads, in various farm activities. Across all three woredas, land preparation was the responsibility of male members of both types of households. Female household members (wives and daughters in MHHs and heads and daughters in FHHs) were primarily responsible for non-agricultural tasks such as food preparation, household maintenance, and childcare. Sons, relatives and non-relatives were mainly responsible for planting. All household members participated in weeding, harvesting, and animal husbandry.

11.3 Decision-Making

The inter- and intra-household decision-making pattern used as a proxy to portray the control that one has over a certain resource in a household also gave some indication of the degree of power the head of the household exercised over other household members. As result of the differences in endowment and access to resources, however, the capacity of FHHs and MHHs to adopt improved agricultural technology is different (see next section).

11.4 Adoption of Improved Wheat Varieties

About five years ago, the adoption of improved wheat varieties was over 90% in the study area (Workneh et al. 1994). Sample farmers in this study, however, reported growing a smaller percentage of improved wheat. The apparent decline in adoption of improved wheat varieties can be

attributed to the fact that many farmers considered their recycled improved wheat seed to be local, and to the unavailability of the preferred variety of seed in the market.

The findings indicate that MHHs were more likely to adopt improved wheat varieties than FHHs. However, the availability of seed of improved wheat varieties should be addressed, because lack of seed has discouraged adoption

In FHHs, the decision to grow improved wheat varieties was always made by the head; slightly more than half of MHHs made the decision jointly.

The odds in favor of adopting improved wheat varieties increased by a factor of 22.1 for MHHs who had access to extension services, while in FHHs, radio ownership increased the adoption of improved wheat varieties by a factor of 5.9. These data reflect the bias of extension services in favor of MHHs. Other farmers (29% of MHHs and 26% of FHHs) constituted another source of information about improved varieties.

With increasing farm size, adoption of improved wheat varieties increased by a factor of 1.1 for MHHs and 1.2 for FHHs. While the average farm size, area under wheat, and livestock units were significantly higher for MHHs than FHHs, the probability of adopting improved wheat varieties would increase almost equally for MHHs and FHHs if farm sizes were increased.

11.5 Gender Differentials in Agricultural Productivity

Gender differences in gross output were considerable. MHHs had a gross output of Birr 6,456/ha, while FHHs had a gross output of Birr 4,776/ha. These differences can be explained partly by the lower quantities of inputs used by FHHs. The use of average values of these inputs from MHHs resulted in a gross output of Birr 6,541/ha in FHHs (1.3% higher than MHHs). This suggests that if both types of households had equal access to inputs, no productivity differences would exist.

The significant factors affecting gross value of output for MHHs were the farmer's age, family labor, farm size, livestock units, and the use of inorganic fertilizer; in FHHs, they were family labor, farm size, livestock units, the use of inorganic fertilizer, hired labor, and extension contact.

Labor and farm size had a significant and positive impact on the gross value of output for both MHHs and FHHs. A 10% increase in labor resulted in a 2.3% and 1.8% increase in gross value of output for both types of households; a 10% increase in farm size resulted in a 5.6% and 7.2% increase in gross value of output for MHHs and FHHs, respectively. In MHHs, a farmer's age had a significant and negative impact on the gross output. A 10% increase in farmer's age resulted in a 2.1% decrease in gross output.

The number of livestock owned and amount of fertilizer used had a positive and significant impact on the gross value of output for both types of households. A 10% increase in the number of livestock resulted in a 1.3% increase in the gross value of output for MHHs and a 0.7% increase for FHHs; a 10% increase in fertilizer use resulted in a 1% increase in gross value of output in both types of

household. Extension contact also had a negative and significant impact on gross output in FHHs– gross output was lower for FHHs that had contact with extension services.

The production function analysis showed that the elasticities for the significant factors affecting the gross value of output for MHHs were farmer's age (-0.21), fertilizer (0.10), farm size (0.56), labor (0.23), and livestock (0.13). For FHHs the elasticities were fertilizer (0.10), farm size (0.76), labor (0.18), livestock (0.07), hired labor (0.03), and extension (-0.28). The negative elasticity for extension implies that policymakers should specifically target extension services for FFHs to mitigate extension's negative effect on gross value of output in these households.

The production function analysis therefore shows that the significant factors affecting gross value of output per hectare in FHHs were household size, farm size, livestock units, inorganic fertilizer, hired labor, and extension contact.

The logit analysis showed that in MHHs, farm size and extension contact significantly and positively affected the adoption of improved wheat variety, while in FHHs it was farm size and ownership of a radio.

Based on these findings, it is recommended that to increase agricultural productivity in both MHHs and FHHs**,** it is crucial to improve the provision of credit and the supply of preferred variety of improved seed in time for planting. To increase agricultural productivity in FHHs specifically, it is recommended that technologies take into account their resource base and improve FHHs access to resources. Extension services should also target FHHs to ease their constraints and facilitate adoption of improved varieties. Furthermore, female farmers' decision-making power and control of resources should be positively exploited by exposing them to different opportunities.

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