PARTICIPATORY GENDER ANALYSIS OF SORGHUM PRODUCTION, PROCESSING, AND UTILIZATION IN EASTERN HARARGHE ZONE, OROMIA REGION, ETHIOPIA

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List of Acronyms

CSA	Central Statistical Agency
DA	Development Agency
DAP	Di-ammonium Phosphate
EIAR	Ethiopia Institute of Agriculture Research
ESIP	Ethiopian Sorghum Improvement Project
FHH	Female-headed Household
FGD	Focus Group Discussion
FTCs	Farmers' Training Centers
HU	Haramaya University
IAR	Institute of Agriculture Research
IDRC	International Development Research Center
KII	Key Informant Interview
MHH	Male-headed Household
NGO	Non-Government Organization
OARI	Oromia Agriculture Research Institute
OSU	Oklahoma State University
PRA	Participatory Rural Appraisal
SMIL	Sorghum and Millet Innovation Lab
SoPARI	Somali Pastoral and Agro-Pastoral Research Institute
USA	United States of America
USAID	United States Agency for International Development
WoBoA	Woreda Bureau of Agriculture

Executive Summary

Most cereal crops produced in Ethiopia, including sorghum, are used as staple foods. In addition to supporting farmers' livelihoods in the Eastern Hararghe Zone, sorghum is also used for medical/health treatments, the stalks and leaves are fed to ruminants as the grazing land is scanty, and other parts of the plant serve as fuel and construction materials to build farmers' houses.

Gender is one of the concerns in farm production and the resulting farmers' livelihoods. Gender affects farm production in general, and specifically affects the areas of sorghum production, processing, and utilization. This study investigated gender issues in sorghum production, processing, and utilization in two woredas (Haramaya and Meta) in Eastern Hararghe Zone, Oromia Region, Ethiopia. The study employed PRA technique such as FGD, KII, and personal observations to obtain relevant and substantial information from sorghum producing farmers. FGD participants were sorghum-producing farmers from a sampling frame of four kebeles and stratified into three gender-specific groups.

As a result, the study identified structures within the three gender-based strata of respondents and noted certain similarities and disparities across sorghum production, processing, and utilization. The groups differ across some areas related to distribution of resources, productive, reproductive, and community maintenance-related workloads, and decision-making. Some of the differences belonged to intra-household gender concerns, while the remainder were found in inter-household gender disparities across sorghum production, processing, and utilization.

From these findings, the research team recommended new methods and concepts for gender-based service delivery, extension services and subjects for further research.

1. INTRODUCTION

1.1. Sorghum Production in Eastern Ethiopia

Because sorghum is a major food crop and livelihood source, people in Eastern Hararghe zone depend upon its production. In the production year 2015-16, for instance, around 429,067 householders indicated sorghum as a major food crop (CSA, 2016). Sorghum is considered as food, feed and tree crop in this zone. As a food crop, various types of dishes are prepared from it. Sorghum leaves, stalks, and chaff are widely used as a feed crop for ruminants because grazing land is scanty and less productive in this region. It is considered a tree crop because it provides fuel wood and is used as construction material to build farmers' houses. Sorghum generally is produced for home consumption. Farmers have been growing sorghum for a significant amount of time; the estimated time of cultivation is at least or greater than 500 years (20 generations), each generation being about 25 years (Mekbib, 2009).

Sorghum was predominantly grown next to khat (the area cash crop) by eastern Hararghe farmers. Key Informant Interviews (KII) indicated that the highest proportion (74%) of the grain produced was consumed at the household level with the remainder used for sale and seed purposes. The grain was used for preparation of different local staple food products such as leavened bread (*injera*), porridge, and local beverages requiring specific grain quality characteristics. Grain size and color are important traits to farmers when selecting sorghum varieties (Beyene, 2010). Increased grain size with corneous endosperm is preferred, and larger seeded varieties fetch a better price, possibly due to higher milling yields and higher water absorbance (Mindaye, *et al*. 2016). Sorghum stalks, which have uses as animal feed, fuel and construction of fences, is often valued as highly as grain yield, hence taller varieties are preferred by farmers (Mindaye, *et al*. 2016).

Sorghum commonly is sown by hand, either by broadcasting or row planting. Nearly all of the people in the study area used the row planting method because of land shortages. Farmers sowed one sorghum variety or a mixture of varieties. Depending on the ecology of sorghum production, the range of planting time spanned from mid-March to mid-June. However, because of rain delays, lowland communities planted until mid-July. Sorghum was alley cropped with coffee and khat,

intercropped with bean, groundnut, potato and sweet potato, and mixed cropped at various stages with cereals such as wheat, maize, barley, and teff.

Improved sorghum varieties released in Ethiopia have had very low adoption rates. These released varieties lack many of the farmers' preferred traits, which is a major impediment to their wider adoption (Mekbib, 2006 and Mindaye, *et al*. 2016). The majority (85%) of the improved varieties released for use in lowland and intermediate environments were developed using lines introduced from outside Ethiopia; these are characterized by short plant stature, early maturity and lower grain size (Adugna, 2007 and Mindaye, *et al*. 2016). Because of this, various studies projected possible components and compliments of sorghum research and extension that would help improve its production and adoption. These studies, however, tended to lack reflection on gender perspectives in the research and service delivery efforts.

Gender affects the distribution of resources, wealth, work, decision-making and political power, as well as the enjoyment of rights and entitlements within the family and in public life (Welch *et al.,* 2000). Women from poor households engage in a variety of income-generating and expenditure-saving activities. In some cases, these activities supplement males' contribution, while in others they are the primary or the sole source of household livelihoods (Kabeer, 2003). Women are twice as likely as men to be involved in agriculture-related activities (Odame *et al*., 2002), and although women do participate actively in both agricultural production and productivity work, in rural parts of Ethiopia their contribution remains invisible.

1.2. Study Objectives

This study analyzed gender issues in sorghum production, processing, and utilization in Eastern Hararghe Zone, Oromia Region, Ethiopia. In this study area, the research team observed and inquired about major sorghum-related facts and gender gaps in sorghum production, processing, and utilization.

2. Methodology

2.1. Approaches and Processes in the Gender Analysis

This study employed extensive qualitative and holistic approaches (e.g., PRA and value-chain-based gender analysis) for sorghum production, processing, and utilization. The process began with an in-depth literature review and continued with analysis of secondary data on sorghum production and gender disaggregate activities related to sorghum production, processing, and utilization.

The literature review specifically involved analysis of:

- general background about the study area;
- area coverage, production, and productivity of sorghum in the last 10 years;
- importance of sorghum, sorghum production and other management practices;
- role of women in sorghum production;
- major constraints of sorghum production, processing, and marketing;
- sorghum research achievements, current activities and future focus; and
- methods for further improvement from a gender perspective.

The research team planned the PRA to identify context-based gender concerns in sorghum production, processing, and utilization. To do this, a five-person team with expertise in plant breeding, agronomy, rural development and agricultural extension, food sciences, and agro-economics was established. Finally, team members were provided with brief training on Participatory Tools for Gender Analysis in Sorghum Production, Processing, and Utilization – an activity immediately followed by the team's deployment to complete the field work.

2.2. Selection of Study Area

The criteria for selecting study locations were: whether or not the site was a major sorghum producing area, whether the area was located within the SMIL project, and the agro-ecological diversity and position of the location on a map. These criteria were referenced while selecting both woredas and rural kebeles. Meta and Haramaya woredas were selected from East Hararghe Zone based on the stated criteria (Figure 1). Two kebeles were selected from each woreda: Burka Jalala

and Hawi Bilisuma from Meta, and Biftu Geda and Tinike from Haramaya. Teams of researchers and additional contacts from the Woreda Office of Agriculture were involved in identifying appropriate locations for the study.

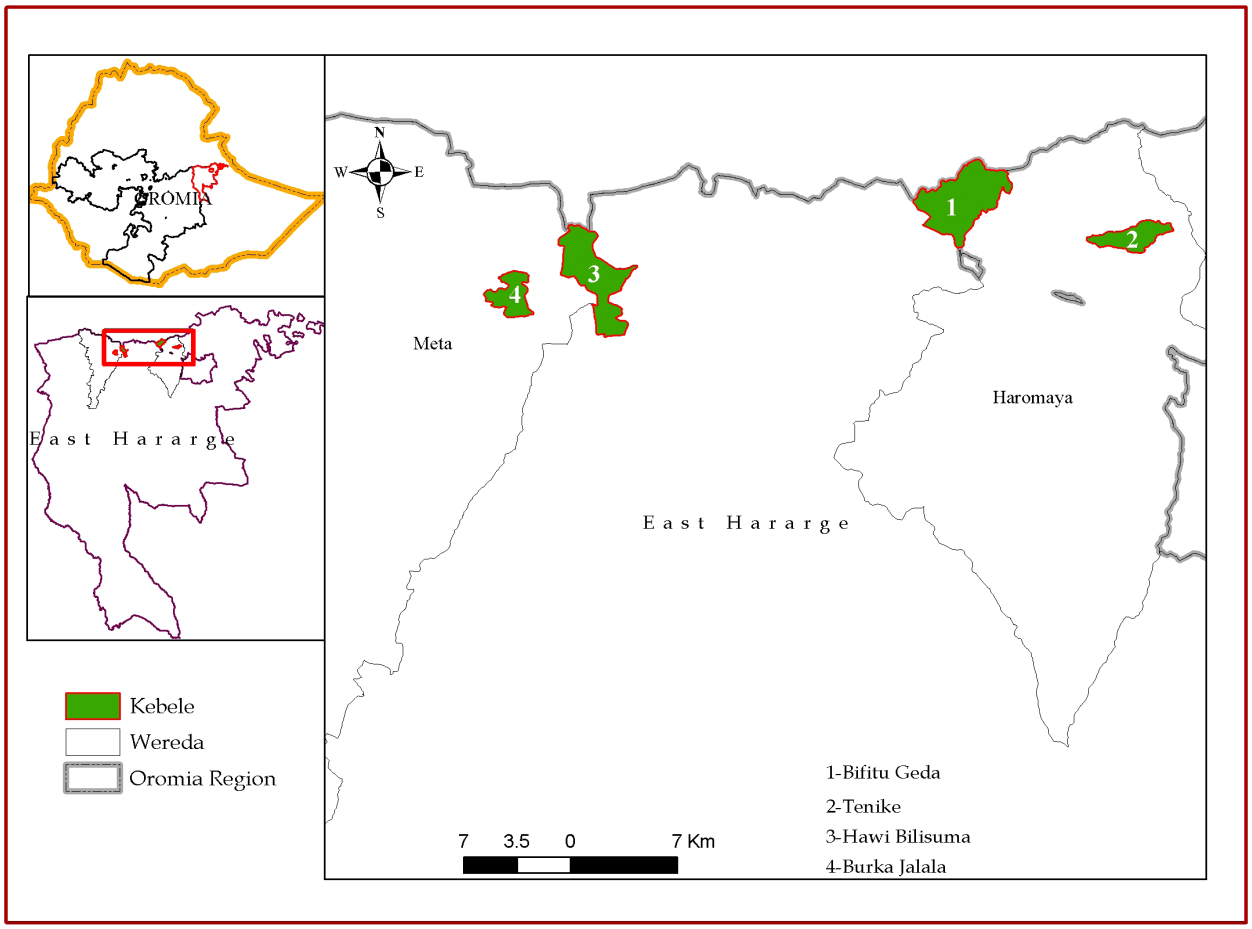

Figure 1. Map of the study location.

2.3. Design of the Study

The study was conducted following a cross-sectional research design. Study team members observed regional experiences, knowledge and attitudes by utilizing FGDs and KIIs. The study included multiple communities from different geographical locations to improve the representativeness of observations about gender perspectives and sorghum production. The research also contained qualitative information; this detailed analysis was intended to form a basis for future adaptive research aiming to address gender equality in sorghum production and related interventions.

2.4. Selection of FGD Participants and Key Informants

A three-stage sampling procedure was employed to select farmers for participation in FGDs (Figure 2). In the first stage, the research team obtained a list of farming households from the selected rural kebeles that grow sorghum; this list constituted the sampling frame. The sampling frame was divided into list of female-headed households (FHH) and male-headed households (MHH). Finally, a systematic random sampling method was used to select at least nine heads of household from the list of MHHs and FHHs in each rural kebele. Eventually, married women from the MHHs also were included in FGDs. In cases where either of the spouses were missing, other sorghum-producing households were included so that each FGD included a minimum of six members. Key informants were principally DAs and development supervisors. Study participants were selected as a result of discussions between the research team and key contact persons at the woreda level.

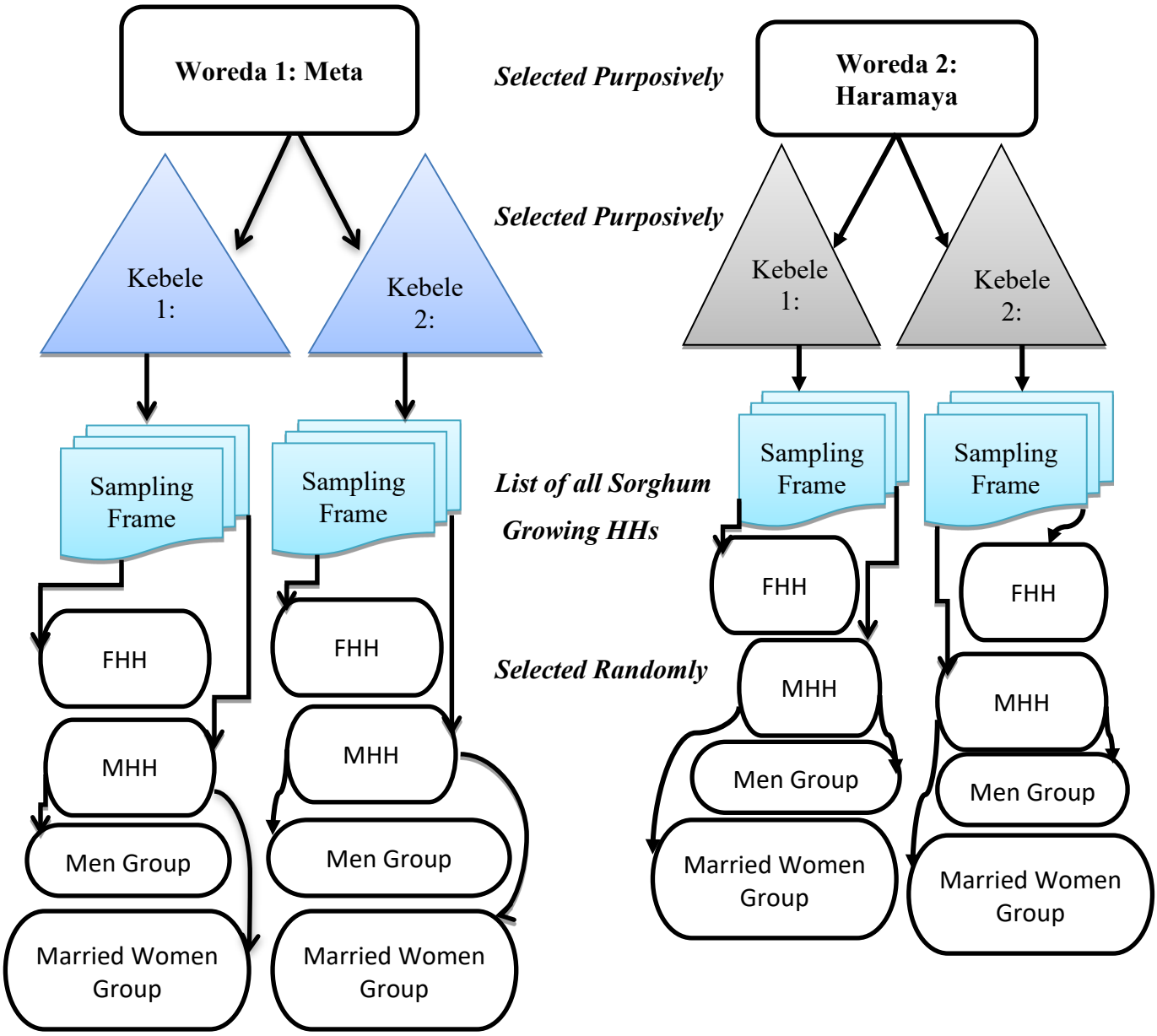

Figure 2. Sampling Procedure

2.5. Data Collection Methods

The research project contains qualitative observations obtained through PRA-based tools including FGDs, KIIs, and case studies. FGDs were conducted with spouses (male and female) from MHHs, as well as women from FHHs. KIIs were conducted with DAs and development agent supervisors from different kebeles in this study area. Discussions and interviews utilized checklists that

contained a questionnaire. Pair-wise and direct matrix rankings, seasonal diagramming, and proportional piling were all used to collect and analyze data. Research team members encouraged participants of FGDs to assign piles and draw diagrams independently, which made them a reliable data source for analysis using quantitative techniques.

Note that some figures and other data refer to the Ethiopian calendar (E.C.). This calendar differs from the Gregorian calendar used in most countries around the world. A year in the E.C. is 13 months long: 12 months have 30 days each, and the last month of the year has five days in a common year (six days during a leap year). This results in a calendar that is seven to eight years behind the Gregorian calendar.

3. Results

3.1. Overview of the Study Area

3.1.1. Agro-ecology.

Haramaya and Meta woredas were chosen as representative woredas for this study area. Both are known for their sorghum production potential. While a few kebeles from Meta woreda have shown tendencies to shift to maize and khat production (associated with a recent increase in precipitation), Haramaya woreda continues to produce sorghum as a major food crop.

Meta woreda has 42 kebeles: three urban and 39 rural. This woreda contains three agro-ecologies. Eleven kebeles are considered lowlands, 17 kebeles are considered midlands, and the remaining 14 kebeles are considered highlands. The area receives 350 to 900 mm of annual precipitation, has a temperature range of 17 to 27^{o} C, and has an altitude of 1400 to 2800 m.

Haramaya woreda is situated in the semi-arid tropical belt of eastern Ethiopia. It receives 600-1260 mm annual rainfall with bimodal distribution. Relative humidity varies between 60 to 80 percent, and the annual temperature ranges from 6^{o}C to 12^{o}C (minimum) and 17^{o}C to 25^{o}C (maximum). A mixed crop and livestock production system is practiced in the woreda, and sorghum, maize and vegetable crops are produced.

3.1.2. Demographic characteristics.

The estimated total population of Haramaya is 352,031, out of which 172,495 are females. Meta woreda has an estimated population of 318,458. Out of this, 158,124 are females (CSA, 2013). Table 1 illustrates the demographics from two specific kebeles in the woredas.

Table 1. Demographic Character of the Study Area

Woreda	Kebele	Women	Men	Total	FHH	MHH	Total
Meta	Hawi Bilisuma	2731	3989	6720	33	873	906
Haramaya	Tinike	583	345	928	38	545	583

Oromo and Amhara are the two ethnic groups in the study area, with Oromo being the largest of the two. The two major religions in the study area are Islam and Christianity; the majority of the people are Muslim.

3.1.3. Social Networks

Farmers in the study area cooperate in various ways during different seasons and activities. One of these methods of cooperation is *Afosha*, which is the most dominant social network in the region, and the main means of reciprocity in the eastern region of Ethiopia.

3.2. Regional Gender Policy, Efforts for Implementation, and Limitations

Like other areas in this region, the study area does have a formal gender policy. Various challenges, however, make these policies difficult to implement. The gender policy rules against polygamous marriages, but this rule cannot be implemented due to the woreda court and local religious beliefs. In the woreda, a male can marry two or more females, based on his personal wealth.

Although relevant policies have been drafted to address gender gaps in the study area, there remain challenges which include:

- divorced women have poor access to important productive assets such as land (specifically, women lack tenure rights to such properties);
- men practice polygamy (in violation of current woreda policies);
- underage marriage is common for girls, but families and woreda courts do not oppose this; and
- women have poor access and control over income from agriculture when compared to men.

Unfortunately, these challenges continue to be exacerbated by frequent disputes between the woreda gender office and woreda courts over related issues. According to the woreda gender office, courts do not hear cases between spouses in a timely manner. As a result, women cannot raise enough money to participate in the legal process or lodge legal appeals. The woreda gender office makes efforts to support the area's women; in certain kebeles, the gender office provides advice for women on how they can improve their own income by producing different vegetables.

3.3. Participation in Sorghum Production: Distribution of Roles and Responsibilities

According to FGD participants, females and males performed different roles in the area's sorghum production. Females were major contributors in all farm-related activities in general, and crop

processing in particular. Females were almost solely responsible for reproductive tasks such as food preparation, washing utensils, washing clothes, childbearing and child rearing, cleaning house, fetching water and collecting fuel. On the other hand, males normally restricted themselves to land preparation, sowing, pesticide application, fertilizer application, harvesting and threshing. In both woredas, FHHs reported that women were involved more in community activities such as water source maintenance and care for the elderly and/or sick. Married women from MHHs also indicated that women equally were involved in events such as weddings, funerals, and public or government works.

The data collected from all FGD groups in regard to division of labor in sorghum production and reproductive work indicated that females were responsible for the majority of the hard farm labor, compared to males (Tables 2, 3 and 4). FHHs usually employed outside labor for many farm activities. However, it was found that there were a large percentage of females participating in physical activities such as digging holes for planting, weeding, applying pesticides, sowing, and bird scaring. Women also participated in marketing and transporting the harvest. Like in FHHs, females in MHHs were found in alternative study woredas to be more responsible than their male counterparts for activities such as marketing of harvest and bird scaring. In the woredas, childcare was divided along gender lines: women cared for the girls, while the men were responsible for the boys. Therefore, girls were involved with the older women in households in reproductive roles such as cooking, washing, house cleaning, fetching water and firewood collection, while boys worked with the men on agronomic practices like land preparation, sowing, pesticide application, fertilizer application, harvesting and threshing.

Table 2. MHH (Men) Proportional Piling Responses (Percentages) for Roles and Responsibilities

Roles	Haramaya				Meta			
Productive Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Plowing using oxen	0	0	80	20	0	0	83	17
Digging using hand hoe	0	0	100	0	8	0	51	41
Sowing	0	0	82.5	17.5	11.5	23	40.5	25
Weeding	12.5	12.5	40	35	6.5	18.5	17.5	57.5
Applying pesticides	2.5	0	75	22.5	10	10	56	24
Applying fertilizers	0	0	45	55	11	7.5	73	8.5
Bird-scaring	0	20	5	75	21.5	40	4.5	34
Harvesting	0	0	39	61	14.5	11	47.5	27
Transporting harvest from field	42.5	5	22.5	30	10	9.5	15	65.5
Threshing	0	0	35	65	2.5	0	81.5	16
Winnowing	0	0	40	60	0	0	84	16
Marketing	57.5	42.5	0	0	72.5	16	5.5	6
Reproductive work	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Food Preparation	61	39	0	0	63	37	0	0
Washing utensils	53	47	0	0	56	39	0	5
Washing clothes	46.5	53.5	0	0	49	41	0	10
Childbearing and child rearing	57.5	42.5	0	0	49	22	9	20
Cleaning house, etc.	55.5	44.5	0	0	51	42	0	7
Building and maintenance of houses/fences	0	0	80	20	5	0	53	42
Fetching water	27.5	57.5	2.5	12.5	15	37	33	15
Collecting fuel								
• Collecting fuel wood	70	8	12	10	33	14	24	29
• Collecting animal dung	80	20	0	0	24	0	19	57
Community Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Management/maintenance of water sources	45	5	47.5	2.5	86	0	14	0
Water Committee meetings	50	0	50	0	86	0	14	0
Cleaning water source	52.5	5	37.5	5	86	0	14	0
Care for old/sick persons	50	0	50	0	42	23	19	16
Working/participating in:								
• Weddings	45	2.5	45	7.5	46	18	17	19
• Funerals	50	0	50	0	46	18	17	19
Involvement in Village meetings	37.5	0	62.5	0	33	0	67	0
Involvement in public works	45	0	55	0	30	9	61	0
Involvement in NGO projects	55	0	45	0	27	0	73	0
Involvement in political activities	38.5	0	61.5	0	46	0	34	20
Membership in community organizations	36.5	0	55.5	8	35	0	65	0
Involvement in leadership of community organizations	25	0	75	0	63	0	37	0

Table 3. Married Women Proportional Piling Responses (Percentages) for Roles and Responsibilities

Roles	Haramaya				Meta			
Productive Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Plowing using oxen	0	0	60	40	0	0	68	32
Digging using hand hoe	9.5	0	55	35.5	0	0	95	5
Sowing	31.5	14	24.5	30	19.5	5.5	45.5	29.5
Weeding	33	20	14	33	0	10	55.5	34.5
Applying pesticides	0	0	62	38	0	0	100	0
Applying fertilizers	0	0	68	32	33	20	28.5	18.5
Bird-scaring	4	39	6	51	10	43	0	47
Harvesting	3.5	7.5	54	35	0	0	58.5	41.5
Transporting harvest from field	9	43.5	11.5	36	11.5	11	54.5	23.0
Threshing	0	0	61.5	38.5	0	0	68	32
Winnowing	0	0	79	21	17	0	67.5	15.5
Marketing	72	28	0	0	69.5	30.5	0	0
Reproductive work	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Food Preparation	61.5	38.5	0	0	66	34	0	0
Washing utensils	29.5	70.5	0	0	52	48	0	0
Washing clothes	20	68	0	12	48	52	0	0
Childbearing and child rearing	49	51	0	0	77	23	0	0
Cleaning house, etc.	19	81	0	0	45.5	54.5	0	0
Building and maintenance of houses/fences	0	0	74	26	13.5	8	60.5	18
Fetching water	31	63	0	6	36	38	0	26
Collecting fuel								
Collecting fuel wood	60.5	24	15.5	0	77	23	0	0
Collecting animal dung	46	54	0	0	77	23	0	0
Community Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Management/maintenance of water sources	0	0	63	37	0	0	77	23
Water Committee meetings	33.5	0	66.5	0	70	0	30	0
Cleaning water source	0	0	67	33	60	0	40	0
Care for old/sick persons	44.5	20	28.5	7	100	0	0	0
Working/participating in events such as:								
• Weddings	46	4	44.5	5.5	61.5	0	38.5	0
• Funerals	42.5	4	48	5.5	50	0	50	0
Involvement in Village meetings	25	0	75	0	50	0	50	0
Involvement in public works (government)	22.5	0	77.5	0	40	0	60	0
Involvement in NGO projects	15	13	61	11	48	0	52	0
Involvement in political activities	38	0	62	0	39	7	44.5	9.5
Membership in community organizations	64	0	36	0	0	0	100	0
Involvement in leadership of community organizations	36.5	0	63.5	0	0	0	100	0

Table 4. FHH Proportional Piling Responses (Percentages) for Roles and Responsibilities

Roles	Haramaya				Meta			
Productive Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Plowing using oxen	0	0	N/A	100	0	0	N/A	100
Digging using hand hoe	50	0	N/A	50	0	0	N/A	100
Sowing	0	0	N/A	100	51	7.5	N/A	41.5
Weeding	25	25	N/A	50	35	28	N/A	37
Applying pesticides	50	0	N/A	50	0	0	N/A	100
Applying fertilizers	0	0	N/A	100	31.5	15	N/A	53.5
Bird-scaring	Bird attack is rare				20	30	N/A	10
Harvesting	0	0	N/A	100	15.5	8.5	N/A	76
Transporting harvest from field	25	25	N/A	50	54	12	N/A	34
Threshing	0	0	N/A	100	35	0	N/A	65
Winnowing	0	0	N/A	100	18	0	N/A	82
Marketing	100	0	N/A	0	80	20	N/A	0
Reproductive work	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Food Preparation	95	5	N/A	0	60.5	39.5	N/A	0
Washing utensils	90	10	N/A	0	22.5	77.5	N/A	0
Washing clothes	75	25	N/A	0	48.5	46.5	N/A	10
Childbearing and child rearing	75	25	N/A	0	66.5	26.5	N/A	14
Cleaning house, etc.	75	25	N/A	0	23	77	N/A	0
Building and maintenance of houses/fences	0	0	N/A	100	27.5	21	N/A	62
Fetching water	50	25	N/A	25	22.5	60	N/A	17.5
Collecting fuel								
Collecting fuel wood	50	0	N/A	50	79	21	N/A	0
Collecting animal dung	50	50	N/A	0	34.5	55	N/A	10.5
Community Activities	**Women**	**Girls**	**Men**	**Boys**	**Women**	**Girls**	**Men**	**Boys**
Management/maintenance of water sources	5	0	N/A	95	80	0	N/A	20
Water Committee meetings	50	0	N/A	50	90	0	N/A	10
Cleaning water source	25	0	N/A	75	0	0	N/A	100
Care for old/sick persons	100	0	N/A	0	65	24	N/A	11
Working/participating in events such as:								
Weddings	50	0	N/A	50	59	24	N/A	17
Funerals	50	0	N/A	50	88	10	N/A	2
Involvement in Village meetings	50	0	N/A	50	100	0	N/A	0
Involvement in public works (government)	75	0	N/A	25	100	0	N/A	0
Involvement in NGO projects	50	0	N/A	50	100	0	N/A	0
Involvement in political activities	75	0	N/A	25	100	0	N/A	0
Membership in community organizations	50	0	N/A	50	100	0	N/A	0
Involvement in leadership of community organizations	50	0	N/A	50	100	0	N/A	0

3.3.1. Gender-based labor contribution to productive activities across different woredas.

Productive activities at Meta: These included all activities, from land preparation to marketing. Men and boys undertook the majority of the productive responsibilities, with these two groups contributing about 75.67% of the work (Table 5). Women and girls contributed the remaining 24.34%. The activity where women and/or girls were responsible for an equal share of the productive activities was sowing, and women were responsible for the majority of the marketing activities.

Table 5. MHH (Male and Female Spouses) Labor Contribution to Sorghum Production in Meta Woreda

Productive Activities	Women	Girls	Men	Boys
Plowing using oxen	0	0	75.5	24.5
Digging using hand hoe	4	0	73	23
Sowing	15.5	14.25	43	27.25
Weeding	3.25	14.25	36.5	46
Applying pesticides	5	5	78	12
Applying fertilizers	22	13.75	50.75	13.5
Bird-scaring	15.75	41.5	2.25	40.5
Harvesting	7.25	5.5	53	34.25
Transporting harvest from field	10.75	10.25	34.75	44.25
Threshing	1.25	0	74.75	24
Winnowing	8.5	0	75.75	15.75
Marketing	71	23.25	2.75	3
Total	**164.25**	**127.75**	**600**	**308**
Average	**13.69**	**10.65**	**50**	**25.67**

Productive activities at Haramaya: These activities included all agricultural work from land preparation to marketing. In an even greater contrast than Meta woreda, men and boys were responsible for productive activities more than three-quarters of the time (Table 6). In fact, men were reported to have the greatest share of the total responsibility, with 44.15%. While women and girls did participate minimally in some activities (digging using hand hoe, sowing, and

applying pesticides), they reported greater responsibility for weeding and transporting the harvest from the field. Women and girls were responsible for all of the marketing.

Table 6. MHH (Male and Female Spouses) Labor Contribution to Sorghum Production in Haramaya Woreda

Productive Activities	Women	Girls	Men	Boys
Plowing using oxen	0	0	70	30
Digging using hand hoe	4.75	0	77.5	17.75
Sowing	15.75	7	53.5	23.75
Weeding	22.75	16.25	27	34
Applying pesticides	1.25	0	68.5	30.25
Applying fertilizers	0	0	56.5	43.5
Bird-scaring	2	29.5	5.5	63
Harvesting	1.75	3.75	46.5	48
Transporting harvest from field	25.75	24.25	17	33
Threshing	0	0	48.25	51.75
Winnowing	0	0	59.5	40.5
Marketing	64.75	35.25	0	0
Total	**138.75**	**116**	**529.75**	**415.5**
Average	**11.56**	**9.67**	**44.15**	**34.63**

3.3.2. Gender-based labor contribution to reproductive activities across different woredas.

Reproductive activities – work completed in and around the home – was mainly considered the responsibility of women and girls. In Meta woreda, about 46.5% and 29.75% of reproductive activities were shared by women and girls, respectively. The only activities where men or boys played any significant role was in building and maintaining houses and fences, fetching water and collecting animal dung (Table 7). Haramaya woreda had a similar gender gap when it came to reproductive work. As shown in Table 8, over 80% of reproductive activities were conducted by women and girls. Men and/or boys had some responsibility for building and maintaining houses and fences and collecting fuel. Male involvement in other reproductive activities in Haramaya was minimal.

Table 7. Gender-based Labor Contribution to Reproductive Activities in Meta Woreda (Average of Proportional Piling Results from Male and Female Spouses in MHHs)

Reproductive work	Women	Girls	Men	Boys
Food preparation	64.5	35.5	0	0
Washing utensils	54	43.5	0	2.5
Washing clothes	48.5	46.5	0	5
Childbearing and child rearing	63	22.5	4.5	10
Cleaning house, etc.	48.25	48.25	0	3.5
Building and maintenance of houses/fences	9.25	4	56.75	30
Fetching water	25.5	37.5	16.5	20.5
Collecting fuel				
• Collecting fuel (wood)	55	18.5	12	14.5
• Collecting fuel (animal dung)	50.5	11.5	9.5	28.5
Total	**418.5**	**267.75**	**99.25**	**114.5**
Average	**46.5**	**29.75**	**11.03**	**12.72**

Table 8. Gender-based Labor Contribution to Reproductive Activities in Haramaya Woreda (Average of Proportional Piling Results from Male and Female Spouses in MHHs)

Reproductive work	Women	Girls	Men	Boys
Food preparation	61.25	38.75	0	0
Washing utensils	41.25	58.75	0	0
Washing clothes	33.25	60.75	0	6
Childbearing and child rearing	53.25	46.75	0	0
Cleaning house, etc.	37.25	62.75	0	0
Building and maintenance of houses/fences	0	0	77	23
Fetching water	29.25	60.25	1.25	9.25
Collecting fuel				
• Collecting fuel (wood)	65.25	16	13.75	5
• Collecting fuel (animal dung)	63	37	0	0
Total	**383.75**	**381**	**92**	**43.25**
Average	**42.64**	**42.33**	**10.22**	**4.81**

3.3.3. Gender-based labor contribution to community activities across different woredas.

Community activities, such as participating in organizations or attending meetings, was shared between the genders. In Meta woreda, females undertook the majority responsibility for community activities (averaging about 62.76%), while the responsibility was more equally divided in Haramaya woreda (Table 10). In Meta woreda, there were no community activities where men and women had zero involvement, although boys were not involved in village meetings, public works, NGO projects or community organization leadership (Table 9). In Haramaya woreda, Women had no zero involvement in any activity, while girls had zero responsibility for water committee meetings, participation in village meetings, public work meetings, political activities, community organizations, or leadership of community organizations.

Table 9. Gender-based Labor Contribution in Community Activity in Meta Woreda (across all FGDs)

Community Activities	Women	Girls	Men	Boys
Management/maintenance of water sources	55.33	0.00	30.33	14.33
Water committee meetings	82.00	0.00	14.67	3.33
Cleaning water source(s)	48.67	0.00	18.00	33.33
Care for old/sick persons	69.00	15.67	6.33	9.00
Working/participating in weddings	55.50	14.00	18.50	12.00
Working /participating in funerals	61.33	9.33	22.33	7.00
Involvement in village meetings	61.00	0.00	39.00	0.00
Involvement in public works (government)	56.67	3.00	40.33	0.00
Involvement in NGO projects	58.33	0.00	41.67	0.00
Involvement in political activities	61.67	2.33	26.17	9.83
Membership in community organizations	45.00	0.00	55.00	0.00
Involvement in leadership of community organizations	54.33	0.00	45.67	0.00
Total	**708.83**	**44.33**	**358.00**	**88.83**
Average	**59.07**	**3.69**	**29.83**	**7.40**

Table 10. Gender-based Labor Contribution in Community Activity in Haramaya Woreda (across all FGDs)

Community Activities	Women	Girls	Men	Boys
Management/maintenance of water sources	16.67	1.67	36.83	44.83
Water committee meetings	44.50	0.00	38.83	16.67
Cleaning water source(s)	25.83	1.67	34.83	37.67
Care for old/sick persons	64.83	6.67	26.17	2.33
Working/participating in weddings	47.00	2.17	29.83	21.00
Working/participating in funerals	47.50	1.33	32.67	18.50
Involvement in village meetings	37.50	0.00	45.83	16.67
Involvement in public works (government)	47.50	0.00	44.17	8.33
Involvement in NGO projects	40.00	4.33	35.33	20.33
Involvement in political activities	50.50	0.00	41.17	8.33
Membership in community organizations	50.17	0.00	30.50	19.33
Involvement in leadership of community organizations	37.17	0.00	46.17	16.67
Total	**509.17**	**17.83**	**442.33**	**230.67**
Average	**42.43**	**1.49**	**36.86**	**19.22**

3.4. Patterns of Household Decision-making

As identified in the FGD results, both sorghum sales and decisions to give away sorghum at no cost were made solely by women in Meta woreda. However, in Haramaya woreda, both men and women participated in this decision-making, although men had no sole responsibility for any of these decisions (Table 11). Women had the majority of responsibility for sorghum sales (83%); sorghum sales (17%) and decisions to give sorghum away at no cost were made jointly by women and men (58%) and the rest of the time by women alone (about 42%).

Table 11. Participation by Gender in Household Decision-making

	Meta woreda			Haramaya woreda		
Decision	**Women**	**Men**	**Jointly**	**Women**	**Men**	**Jointly**
Sale of sorghum products	100	-	-	83.335	0	16.67
Give at no cost	100	-	-	41.665	0	58.34
Average	*100*	-	-	*62.5*	*0*	*37.5*

In both woredas visited during this gender analysis study, all decisions of sorghum production starting from the choice of plot to the use of income sales and decisions to give sorghum away at no cost were generally made either by the household head alone or in consultation with his spouse in the case of MHHs. In FHHs, decisions were made by the household members, with either elders or family relatives consulted periodically (Table 12).

The implication of these findings is that in addressing the issue of transferring improved sorghum technologies efficiently, both the head of household and spouses first were consulted and involved in the decision-making process in MHHs, whereas the head of household alone was responsible in FHHs.

In general, female heads of household that took part in FGDs recognized that they can quickly make decisions concerning their households when compared to women in MHHs. They alone made decisions on what to produce, what to buy and sell and whether or not to participate in crop production and community activities.

Table 12. Differentiated Decision-making Patterns in Sorghum Production in Haramaya and Meta Woredas

FGDs	DECISION	Haramaya			Meta		
		Women	**Men**	**Jointly**	**Women**	**Men**	**Jointly**
MHH (males)	Sale of Sorghum Products	-	-	100	100	-	-
	Give Away To	50	-	50	50	-	50
FHH		**Haramaya**			**Meta**		
	Sale of Sorghum Products	100	-	-	100	-	-
	Give Away To	100	-	-	100	-	-
Married women		**Haramaya**			**Meta**		
	Sale of Sorghum Products	100	-	-	50	-	50
	Give Away To	-	-	100	-	-	100

3.5. Gender Based Differences in Access to and Control Over Sorghum Production Related Extension Services in Study Woredas

3.5.1 Access to and control over resources in Meta woreda.

Extension education: According to the findings of this study, women had more access to and control over extension education in Meta Woreda (Table 13). Respondents indicated that they observed an increasing number of local government- and project-based interventions in the recent decade which gave emphasis to female farmers' empowerment through frequent productive and non-productive capacity-building programs. These interventions involved the promotion of improved sorghum production packages in the woreda; this factor has likely caused improved levels of women's access to extension education and corresponding components relative to the ones found in Haramaya Woreda.

Use of fertilizer: As shown in Table 13, men have better access and control over the use of fertilizer compared to their spouses. The result implies that though the female spouses had nearly equal access to fertilizer at the household level, men tended to possess a significantly higher level of decision-making power over the use of fertilizer for cultivation.

Use of income from sorghum: Table 14 shows that women in the study area were found to have better access to and control over use of the income obtained from sorghum (86.5% and 75% respectively). The result is not significantly different for the two sampled study woreda. FGD participants explained that sorghum is not the area's major cash crop and hence fetches an income amounting to a maximum of the expenses that women could be able to incur only for purchasing salt, fuel, and payment for milling. The result can be also paralleled with the finding on gender disparity in marketing activity as a productive role (depicted in either of Table 2,3, or 4 above).

Table 13. Percentage from Proportional Piling on Access to and Control over Extension Services in MHHs (Average results from Male and Female Spouses)

Meta Woreda				
	Access to		**Control over**	
Types of resources	**Women**	**Men**	**Women**	**Men**
Extension Education	61.75	38.25	51.5	48.5
Use Improved Sorghum variety	50	50	50	50
Use of Fertilizer	47.5	52.5	35	65
Use of Income from Sorghum	86.5	13.5	75	25
Haramaya Woreda				
	Access to		**Control over**	
Types of resources	**Women**	**Men**	**Women**	**Men**
Extension Education	38.8	61.3	21.5	78.33
Use Improved Sorghum variety	22.0	78.0	12.5	87.50
Use of fertilizer	32.9	67.1	20.85	79.15
Use of income from sorghum	69.2	30.8	71	29.0
Others				

3.5.2 Access to and control over resources in Haramaya woreda.

Extension education: According to study results, men in Haramaya were found to have more access to extension education (61.3%). Men also had significantly greater control over extension education (78.33%) when compared to women in the woreda (Table 13).

Use of fertilizer: Men in Haramaya had more access to and control over fertilizer use as well (Table 14). Study participants indicated that men had 67.1% of the access to fertilizer use, and 79.17% of the control over fertilizer use.

Use of income from sorghum: Table 13 shows that women in Haramaya woreda were found to use more income from sorghum production (69.2%). In addition to utilization, income from sorghum production was also controlled by women (71%). This is due to the fact that sorghum was not the area cash crop and the income generated from sorghum crops was not more than the expenses used by women in purchasing salt, fuel and payment for milling.

3.5.3 Use of Income from Sorghum.

There was an observed difference in the family members' involvement when selling sorghum. According to FGDs in Haramaya and Meta woredas, household members' involvements were based on the amount of sorghum to be sent to market. In the case of FHH members, girls were involved more in selling sorghum than the other household members, if the amount of sorghum to be sold was less than 50 kg. However, when the amount of sorghum to be sold was more than 50 kg, the women were involved more than other household members.

In MHHs women and girls were involved more in selling sorghum, if the amount of sorghum to be sold was less than 30 kg. When the amount of sorghum to be sold was greater than 30 kg, the men were involved more than other household members. Females in MHHs had a limited role when the amount of sorghum to be sold was more than 30 kg. In both FHHs and MHHs, boys' involvement selling sorghum was small.

3.6 Importance of Sorghum in the Area as Described by Farmers and Information from Ministry of Agriculture

Sorghum was the most important staple food crop in the study area, with more than 90% of the sorghum crop produced for food purposes. In the study area, different types of food items such as; *injera*, *shumo*, *ganfo*, *kita*, and local beverages (*tela* and *areke*) were prepared from sorghum. While sorghum grain was used for food, the stalk was used for animal feed, fence construction and constructing small local grass houses.

In different villages within the study area, the processing method and the food uses varied. *Kita* and *shumo* are special foods prominently known to be prepared from sorghum by farmers in Haramaya woreda. *Kita* is made first by de-hulling the glume, washing it in water and grinding using mortar and pestle. Wheat and or barley flour is added and mixed with water. *Kita* was often taken to relatives to be shared during socio-cultural celebrations. The other type of food made from sorghum was *shumo*. *Shumo* is a medicinal food, prepared especially in Tinike kebele in Haramaya woreda. It is made by first de-hulling the glume, boiling the grain and then cooking with butter until the grain is broken into pieces. *Shumo* was given to any in the community with broken bones to aid their recovery, and it was said to have remarkably fast results for patients.

3.6.1. Importance of sorghum in comparison to other crops.

3.6.1.1. Importance of sorghum as compared to other crops by FHHs.

Women in FHHs agreed that sorghum was dominant over maize, wheat, and beans in terms of its yield, disease and drought resistance, as well as for its bio-mass to be used for construction and fuel. As shown in Table 14, the majority of FHHs also preferred sorghum over other crops for good quality *budena* (a large chapatti often baked on clay plates), for fetching fair market price and for animal feed. FHHs preferred maize and wheat over sorghum for bread and porridge and said that sorghum use for these foods was very rare. FGDs also revealed that the sorghum seed varieties available to almost a quarter of the FHHs were inconsistently maturing when compared to other crops. FHHs have accepted that sorghum, similarly to the other three enterprises, is a low-cost and or low-input business.

A majority of FHHs groups gave a high rank to the possibility of sorghum fetching a good price, and this was a unique result when compared to the other groups. It even appeared to understate the findings that indicated sorghum was less important when compared to other crops in terms of income generation. Capitalizing on interventions related to improved market strategies and marketable sorghum technologies would be relevant for improving sorghum farming outcomes for FHHs and also enhance their income.

Table 14. Rank of Sorghum Traits over Other Major Cereals by FHHs

Trait	Ranking by 4 groups of FHHs: frequency and percentage by rank			
	1st	**2nd**	**3rd**	**4th**
Yield	4 (100%)			
Budena/*injera* quality	3 (75%)		1 (25%)	
Bread quality			1(25%)	
Gonfo/porridge			1(25%)	
Market price	3(75%)			1(25%)
Feed	3(75%)	1(25%)		
Construction	4(100%)			
Fuel	4(100%)			
Consistent maturity	1(25%)	2(50%)		1(25%)
Early maturity		2(50%)		2 (50%)
Disease resistance	4(100%)			
Drought resistance	4(100%)			
Low input/cost	1(25%)	1(25%)	1(25%)	1(25%)

***Note**: The comparison was made with maize, wheat, and haricot beans. Maize is the second most important food crop. Majority of the FHHs were found not producing potato like the MHHs, and hence the ranking was done with 4 items.*

3.6.1.2. Importance of sorghum as compared to other crops by married women in MHHs.

Married women in MHHs had many similar responses to responses from FHHs. As shown in Table 15, one exception was that the majority of married women in MHHs believed sorghum production was a low-input, low-cost business when compared to the other four enterprises. This could be due to the fact that their comparison of input requirements for sorghum with input requirements for potato (as a relatively more expensive enterprise, but not considered in FHHs) might have eschewed the result. Another possibility was the women's position as female spouses in MHHs might have given them access to a low-input sorghum production package. Further investigation is required.

Table 15. Rank of Sorghum Traits over Other Major Cereals by Married Women in MHHs

Trait	Sorghum ranking by 4 groups of women in MHHs: frequency and percentage by rank				
	1st	2nd	3rd	4th	5th
Yield	4 (100%)				
Budena quality	4(100%)				
Bread quality		1(25%)			
Gonfo/porridge	2 (50%)		2 (50%)		
Market price	4(100%)				
Feed	4(100%)				
Construction	4(100%)				
Fuel	4(100%)				
Consistent maturity			1(25%)	2 (50%)	1(25%)
Early maturity	1(25%)		1(25%)	1(25%)	1(25%)
Disease resistance	4(100%)				
Drought resistance	4(100%)				
Low input/cost	3 (75%)				1(25%)

Note: The comparison was made with maize, wheat, potatoes, and haricot beans. Maize is the second most important food crop.

3.6.1.3. Importance of sorghum as compared to other crops by MHHs.

As shown in Table 16, male farmers tended to agree that the locally available sorghum varieties were better than other crops for animal feed, construction purposes, fuel, and such traits as disease resistance and drought tolerance. Compared to the other FGD groups, however, male participants assigned lower values to sorghum in terms of its advantages related to yield, food, and market outcomes. Respondents did indicate that they considered these traits to be competitive with the corresponding traits from other crops.

Table 16. Rank of Sorghum Traits over Other Major Cereals by MHHs

Trait	**Sorghum Ranking by 4 groups of MHHs (Frequency and Percentage)**				
	1st	**2nd**	**3rd**	**4th**	**5th**
Yield	1(25%)	2(50%)			1(25%)
Budena Quality	1(25%)	2(50%)			
Bread Quality		1(25%)			
Gonfo/porridge		1(25%)			
Market price	1(25%)	1(25%)	1(25%)	1(25%)	
Feed	2(50%)	1(25%)	1(25%)		
Construction	3(75%)	1(25%)			
Fuel	3(75%)	1(25%)			
Consistent maturity	1(25%)	1(25%)	1(25%)	1(25%)	
Early maturity		1(25%)	1(25%)		2(50%)
Disease resistance	3(75%)	1(25%)	1(25%)		
Drought resistance	3(75%)			1(25%)	
Low input/cost		1(25%)	1(25%)	1(25%)	1(25%)

Note: The comparison was made with maize, wheat, potatoes, and haricot beans. Maize is the second most important food crop.

In order to draw implications for gender-based interventions related to the preferences of sorghum traits, it is important to investigate gender roles in sorghum production, processing, and utilization. Study results revealed that females were the largest participants in food preparation and sorghum marketing, therefore their preferences for related sorghum traits should have priority. Service delivery and further research intervention should consider the discrepancies in gender preferences; it would be safe

to conclude that working toward improving other sorghum traits such as yield, and early maturity should be seen as a preference by sorghum-producing farmers in the study area.

3.7 Responses of Farmers on Status of Sorghum Production

3.7.1 Trends in sorghum production since 2000 (EC).

Trends of sorghum production in Haramaya: The trends of sorghum production in 2000-2001 were positive (Table 17). From 2002, there was a slight decrease in production which continued to 2005. The lowest production trends were from 2006-2008. The reason for this production decrease was weather conditions, particularly rainfall and in forested areas.

Trends of sorghum production in Meta: Sorghum production trends were steady from 2000-2002. There was medium production from 2003-2006, increased during 2007 and then decreased in 2008. Weather, particularly rainfall, was the reason behind fluctuating production.

Table 17. Sorghum Production Trends for 2008 – 2016 (G.C.)

FGDs	Haramaya Woreda								
	Years								
	2008	2009	2010	2011	2012	2013	2014	2015	2016
FHH	H	H	H	M	M	M	L	L	L
Married Women	H	H	H	H	H	M	M	L	L
MHH	M	H	H	M	M	M	M	H	L
	Meta Woreda								
FHH	M	H	M	M	M	L	M	H	L
Married Women	M	H	H	M	M	M	M	H	L
MHH	M	H	H	M	M	M	M	H	L

H=highest, M=Medium and L=Lowest

Note: Majority of respondents perceive a sorghum yield harvest ranging from 2-3 Quintals/Qindi (a local unit of land size) to be considered as high yield since they remember that there are times, they harvested a little more than 3 Quintals/Qindi (considered as highest in this study). A harvest of 1 Quintals/Qindi to a little smaller than 2 Quintals/Qindi is considered relatively medium by the respondents, and hence any amount of sorghum yield taken to home below 1 Quintal/Qindi is taken as Lowest in this study. Qindi is approximately equated to 1/8 of a hectare of cultivable land (1250m^2).

3.7.2 Cropping calendar.

The cropping calendar for sorghum, maize and wheat is described in Table 18. Land preparation activities for sorghum were conducted in February and March, but for maize the land preparation time was in March. Since this responsibility was one undertaken by mostly male farmers, February and March was a labor-intensive time for men. Sorghum and maize planting occurred in April, which was an activity conducted mostly by men. Weeding activities for sorghum and maize – a responsibility undertaken mostly by boys – were conducted in June, July and August. Sorghum and maize harvests were conducted in November and December, with much of the work done by boys. Threshing and winnowing of maize and sorghum was completed during December and January, respectively. These activities were also done mainly by boys. Land preparation for wheat often was completed in May, and wheat planting and weeding activities were conducted in June and July. During these times, more activities were conducted by men and boys. Harvesting, threshing and winnowing activities for wheat were conducted in November and December, and these activities were often left for boys.

Table 18. Cereals Production Calendar

Crop type	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Sorghum	10,11, 12	1, 12	2,3, 12	4,5, 12	6,12	7	8					9
Maize	12	12	1,2,3	4,5	6	7	8				9,	10,11, 12
Wheat	12				1,2,3	4,5	6,7	8			9	10,11, 12

1. Land clearing; 2. 1st Cultivation; 3. 2nd Cultivation; 4. 3rd Cultivation; 5. Planting;6. 1st Weeding; 7. 2nd Weeding; 8. 3rd Weeding; 9. Harvesting; 10. Threshing; 11. Winnowing/Sorting or Inspecting; 12. Marketing

The production calendar also shows that the different categories of respondents (MHHs, FHHs, and female spouses) had a more or less homogenous timing for farm activities for the various crops. This also was true for the different woredas (Haramaya and Meta).

3.7.3 Activities and farming tools.

In the study area, major production activities were completed using locally found farm tools rather than using improved technology. The most common means used to prepare land were oxen and hand digging, while some of the MHHs indicated that they also utilized tractor machines. Other farm activities such as planting, weeding, harvesting and threshing were often carried out using available manpower, rather than technologies. Oxen also were involved in threshing, while donkeys were the most important means of transportation for harvest.

Spouses in MHHs did tend to have better access to farming equipment and materials (tractors), especially during land preparation. Recently, the government arranged for farmers to purchase tractors using collateral or a 50% down payment. One concern was whether or not such interventions considered FHHs. FGD responses revealed that FHHs were not in the position to receive equal access to tractors. If FHHs were underrepresented in such efforts, inter-household gender gaps could increase, either from the relative shortage of farm labor in FHHs or from the financial advantage that MHHs could earn from contracting out the machinery. A future study on relationships between oxen- or tractor-ploughed plots with production capacity and productivity of the plots for sorghum might provide ideas for possible gender interventions.

Table 19. Activities and Associated Farming Tools and Equipment

FGD Group	Activities	Farm Equipment and Tools
FHH	Land preparation	Oxen, (*Maresha*, *Irfi*, and *Mofer*), and hand digging (*Akafa*, *Gaso*)
	Planting	man power
	Weeding and cultivation	Hand weeding (*Akafa*)
	Harvesting	Man power (Sickle/*Hamtu*, *Mencha*)
	Threshing	Man power and sometimes oxen (*Ule*/Stick)
	Transporting	Donkey and also man power (*Luka*/Sack, *Gubo*
		And other tools such as *safi*, *qoto*, *nuguya*
MHHs (men)	Land preparation	They use oxen, (*Maresha*, *Irfi*, and *Mofer*), and hand digging (*Akafa*, *Gaso*), some use tractors
	Planting	Man power
	Weeding and Cultivation	Hand weeding (*Akafa*)
	Harvesting	Man power (Sickle/*Hamtu*, *Mencha*)
	Threshing	Man power and sometimes oxen (*Ule*/Stick)
	Transporting	Donkey and also man power (*Luka*/Sack, *Gubo*)
		And other tools such as *safi*, *qoto*, *nuguya*
Married Women	Land preparation	Oxen, (*Maresha*, *Irfi*, and *Mofer*), and hand digging (*Akafa*, *Gaso*), some use tractors
	Planting	Man power
	Weeding and cultivation	Hand weeding (*Akafa*)
	Harvesting	Man power (Sickle/*Hamtu*, *Mencha*)
	Threshing	Man power and sometimes oxen (*Ule*/Stick)
	Transporting	Donkey and also man power (*Luka*/Sack, *Gubo*
		And other tools such as *safi*, *qoto*, *nuguya*

3.8 Use of Improved Sorghum Technologies

The parameters used to understand the use of improved sorghum technologies in the study area included a study of the types of sorghum seed varieties, their traits and people's preference for those traits, sources of improved seeds, cropping methods, fertilizer, chemicals, farm equipment, milling methods, and storage methods. It should be noted from the list of sorghum production package components that the term 'improved' should be used cautiously, as some types were conventional and local in their nature. One of these components was the sorghum seed variety used by farmers in the study area.

3.8.1 Sorghum varieties in use.

Table 20. Sorghum Varieties Cultivated in the Study Area

Types of sorghum varieties				
Woreda	**Kebele**	**MHHs (men)**	**Married Women**	**FHH**
Haramaya	Tinike	*Muyira, Fendisha/Kaila*	*Fendisha/Kaila, Muyira 1,2, Fendisha/White*	*Muyira, Fendisha/Kaila*
Haramaya	Biftu Geda	*Muyira, Fendisha/Kaila, Charchar, Nano, Hamdiye*	*Muyira, Fendisha*	*Muyira, Fendisha/Kaila, Charchar, Nano, Hamdiye*
Meta	Burka Jalala	*Danga, Witibile*	*Witibile, Danga*	*Danga, Witibile*
Meta	Hawi Bilisuma	*Muyira, Fendisha/Kaila, Charchar, Nano, Hamdiye*	*Muyira, Fendisha*	*Muyira, Fendisha/Kaila, Abshir*

As depicted in Table 20, most of the sorghum varieties grown in the study area were local. The most recently certified variety is *Muyira*, but there was negligible difference in use of it among the categories of FGD members.

Little could be derived from FGD information to specify gender differences in sorghum production, since nearly all varieties were produced in FHHs and MHHs. A unique finding in this regard related to the view of FHH of Hawi Bilisuma in relation to *Abshir* (Table 21).

Table 21. Comparison of Different Sorghum Varieties in Hawi Bilisuma

Trait	*Muyira*	*Fendisha*	*Abshir*
Yield	2	1	3
Budena quality	2	-	3
Bread quality	-	-	-
Gonfo/porridge	1	2	3
Market price	1	2	2
Feed	1	2	3
Construction	1	2	3
Fuel	1	1	3
Consistent maturity	-	-	-
Early maturity	2	2	1
Disease resistance	1	2	2
Drought resistance	2	2	1
Low input/cost	1	1	3

Though *Abshir* was used only by FHHs, it was found to be the least preferred variety in terms of major traits such as yield, suitability for food, feed, market, fuel, construction, etc. These results could reflect that *Abshir* was not adaptable to the studied areas as they were mostly considered midland agro-ecology. A variety's trait could have been the initial and most important predictor of preference heterogeneity among package. This study evidenced that there remained hardly any difference in seed variety choice among categories of respondents, implying that sorghum seed variety selection was gender-neutral in the context of east Hararghe.

One possible lesson was that sorghum seed distribution (whether through informal or formal sources), was addressed in terms of agro-ecological, physical fitness/suitability and demographic proportion, rather than in terms of gender. Haramaya University/Woreda BOA was one dominant source of seed; seed varieties were distributed based on agro-ecological suitability and demographic quotas such as FHH and MHHs. Though equity was as important as any other criterion to consider when implementing agricultural development and research interventions, much of these efforts confused reaching a quota of female demography with gender-sensitive thinking and practices geared towards improving productivity and household welfares.

3.8.2 Sources of improved seed.

This study found that sources of improved seed for MHHs and FHHs were accompanied by a lack of formal institutional focus, which constrained the use of improved sorghum seed by gender. The most common source of seed for the study area was either the family grain stock or seed borrowed from neighborhoods' stock; both MHHs and FHHs appeared to have relied on a few well-known sources of sorghum seed from one production season to another. This implies that informalities and proximities have facilitated access to seed for both types of HHs. Though rarely indicated, formal sources (such WoBoA through FTCs) also were found relatively unbiased across FHHs and MHHs.

3.8.3 Cropping methods and inputs.

Cropping methods did not differ significantly between the household categories. Area farmers mostly sowed sorghum in a row, but MHHs did utilize broadcast sowing depending on the type of soil, intercropping alternatives, and landscaping. Row cropping was common to most other crops in the area, and it would not be uncommon to find that households applied the same methods even in the absence of improved seed and production practices. Interventions to enhance production and productivity of other cereals, such as maize, might have introduced farmers to row cropping.

Respondents commonly agreed that they were often short of chemicals (pesticide, fungicide, herbicide, insecticide etc.), while such pests as *Geri* (local name for Sorghum Midge/Coquillett) caused serious crop damage. Inorganic fertilizer (such as DAP and Urea) were accessible to farmers, and local farmers indicated they used *korki*[1] to drop a sizable amount of fertilizer under the plants.

The clear difference between MHHs and FHHs in input application appears to be organic fertilizer and chemicals such as pesticides and insecticides. MHHs seem to have the advantage in terms of the two inputs when compared to FHHs. The result indicates that there could be

[1]The cap of soft drink bottles

disparities between MHHs and FHHs in access to and control over sources of organic fertilizers (animal dung, and manure for instance) and chemical fertilizers.

3.8.4 Milling and storage methods.

There was a negligible difference among FGD participants responses about methods for milling and means of storing sorghum grain. Farmers used two different methods for storing sorghum grain: they stored sorghum that they plan to use for seed in a pit, and all other sorghum was stored in sacks inside houses. Sorghum stored in pits was chemically treated and wrapped in plastic. For milling, people took their grain to *hofcho*, a mill house located close by. Female household members were responsible for food preparation and taking the grain to millhouses, while construction and maintenance of storage facilities – like the pits – was reserved for males.

3.9 Main Sources of Information on Sorghum Production to Farmers and Extension Services

Findings related to extension services for sorghum-producing households showed that sorghum production often was deprived of very important packages. Farmers participating in FGDs indicated that they rarely received access to information, knowledge or skills about improved sorghum production package components, like seed varieties. Access to improved sorghum production-related training, demonstration, field days, and DA visits to farm lands was limited similarly. Formal delivery of such services conventionally was dominated by the WoBoA, and there was a passive attention to improving sorghum production and productivity in the study area. Neighborhoods and farmer-to-farmer exchange strategies were indicated as the most common forms of inputs and information sharing related to sorghum. As shown in Table 22, this finding was consistent in both MHHs and FHHs.

Table 22. Access to Extension Services

Extension Services: types, sources, and application			
Services related to improved sorghum production	**MHHs (men)**	**Married women**	**FHH**
Seed info	FTC/DA/WoBOA (but not on sorghum); neighbors (local varieties' performances)	FTC/DA/WoBOA (but not on sorghum); neighbors (local varieties' performances)	FTC/DA/WoBOA (but not on sorghum); neighbors (local varieties' performances)
Training	Rarely, and not directly related to sorghum	Rarely, and not directly related to sorghum	Rarely, and not directly related to sorghum
Demonstration	Rarely, and about row cropping	Rarely, and about row cropping	Rarely, and about row cropping
Field days	Rarely, but not directly related to sorghum	Rarely, but not directly related to sorghum	Rarely, and not directly related to sorghum
DA field visit	Yes, but infrequent, and negligible for sorghum	Yes, but infrequent, and negligible for sorghum	Yes, but infrequent, and negligible for sorghum
Farmer-to-farmer info exchange	Most common	Most common	Most common

In an area sorghum was one of the major food crops, it is unclear why sorghum farmers received fewer formal extension services than expected for this region. Observations supported a trend in farm plots allocated to sorghum changing over to major cash crops such as khat or onion, and there were also seasonal shifts of crop allocation from sorghum production, when rain was scarce, to the seasons when good rainfall supported maize production.

Area farmers indicated a strong need for various extension interventions, including: access to and application techniques of improved seed varieties (early-maturing, high-yielding, disease and drought tolerant), inorganic fertilizer, improved disease management strategies (for treating leaf disease for instance), irrigation schemes and post-harvest technologies (such as seed safety/quality keeping techniques). Farmers indicated a current decline in harvest, which pointed to exhausted local seed varieties and conventional production. This underscored the demand for sorghum production package components. Sorghum-growing FHHs even expressed that they would prefer to shift to growing vegetables and pulses if current production challenges continued. These farmers also showed interest in credit and saving schemes to help them get access to financial services.

Table 23. Gaps on Extension Services according to the FGD's

Extension Services Required for Sorghum Production		
MHHs (men)	**Married Women**	**FHH**
• Fertilizer and improved sorghum seed, • Chemicals (for leaf disease), • Post-harvest technology, • Water harvesting technology	• Irrigation schemes, • Improved sorghum seed (specially on early maturing), • Disease management	• Fertilizer and improved sorghum seed • But they have greater interest in vegetable and pulses • Modern, access and credit on small-scale irrigation pump

3.10 Sorghum as an Available Food Resource

3.10.1 Availability of sorghum for food year-round.

January was the month of the year when sorghum was most available as a household food resource in Meta and Haramaya. This was due to the production calendar, because January was the threshing and storage period. The month with the lowest sorghum availability for home consumption was July, because there was less household grain available after sowing. However, both men and women indicated that, after August, sorghum amounts became negligible, indicating that sorghum was unavailable for year-round consumption. The availability of sorghum used for food gradually decreased due to shortage of grain supply, production, land, income and inputs (Table 24).

Table 24. Availability of Sorghum Produce for Home Consumption

Meta Woreda											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
H	H	H	M	M	L	L	N	N	N	N	H
Haramaya Woreda											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
H	H	H	M	L	L	N	N	N	N	N	N

3.10.2 Coping strategies during food shortages.

During seasons of food shortages, study participants explained that they coped with the shortfall by using wages, selling vegetable and fruits, borrowing money and grain from neighbors, and sometimes selling livestock (Table 25).

Table 25. Coping Strategies in Use During Food Shortages

Woreda	Kebele	FGD Type	Coping Strategy during Food shortage
Haramaya	Biftu Geda	MHH (men)	Participating in daily labor; using credit from neighboring farmers; reducing amount of food consumed per day
		Married Women	Using income from khat and potato sales
		FHH	*Kuli*/wage, selling vegetables, etc.
	Tinike	MHH (men)	Income wages, selling vegetables, borrowing money and grain from neighbors
		Married Women	Using income from sales of khat, potato, sheep and goats
		FHH	Income wages, selling vegetables, borrowing money and grain from neighbors
Meta	Burka Jalala	MHH (men)	Using income from the sale of cattle, khat, and grass
		Married Women	Buying grain, borrowing from neighbors
		FHH	Using the income received from in daily labor
	Hawi Bilisuma	MHH (men)	*Kuli*/wage, selling vegetables, etc.
		Married Women	Using income from khat and vegetable sales; government support (very rarely)
		FHH	Using income from khat, vegetable, chicken and sheep sales; government support

3.10.3 Variation of sorghum prices over the year.

As shown in Table 26, area sorghum prices fluctuated during the course of a year. The average sorghum price ranged from 387.5 ETB to 725 ETB in Meta woreda; during harvest time, the price fell to 387.5 ETB and over time the price increased to 725 ETB. After maize crops matured and were harvested, sorghum prices again decreased. Sorghum prices in Haramaya

woreda also fluctuated, from a minimum price of 533.3 ETB to a maximum price of 850 ETB. Sorghum prices were higher in Haramaya than Meta due to differences in varieties grown.

Table 26. Variation of Sorghum Price Over the Year (ETB/Qtl)

Meta Woreda											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
387.5	425	487.5	550	637.5	700	700	725	725	725	725	537.5
Haramaya Woreda											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
533.3	550.0	650.0	700.0	733.3	783.3	816.7	883.3	883.3	850.0	816.7	766.7

When graphed, price fluctuations in Meta woreda showed increases from the beginning of the year (Figure 3). They remained steady from the months of August to November, but then sharply decreased in December. In Haramaya, prices were at their lowest in January. They increased steadily each month until August and September, when they began declining through the end of the year (Figure 4).

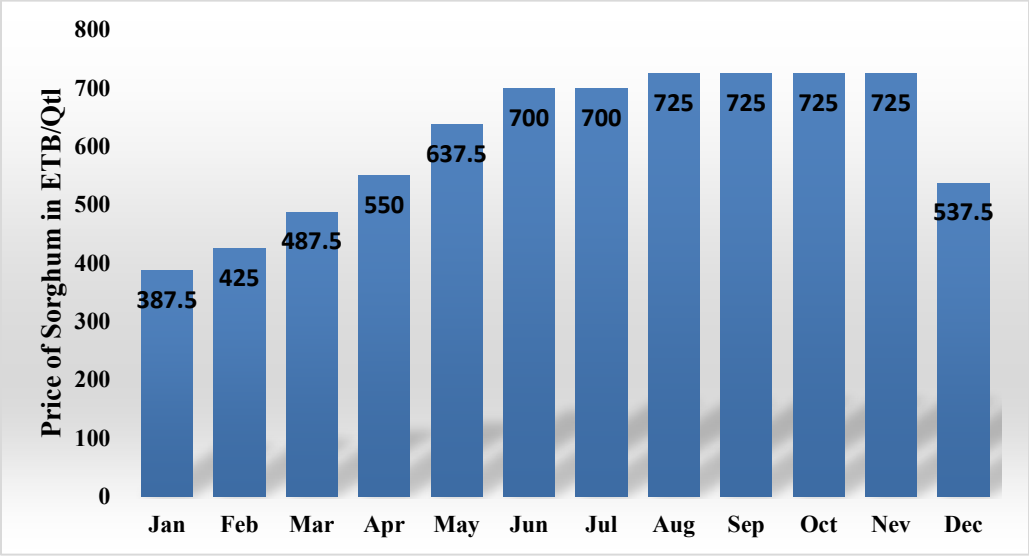

Figure 3. Sorghum price variation in Meta woreda.

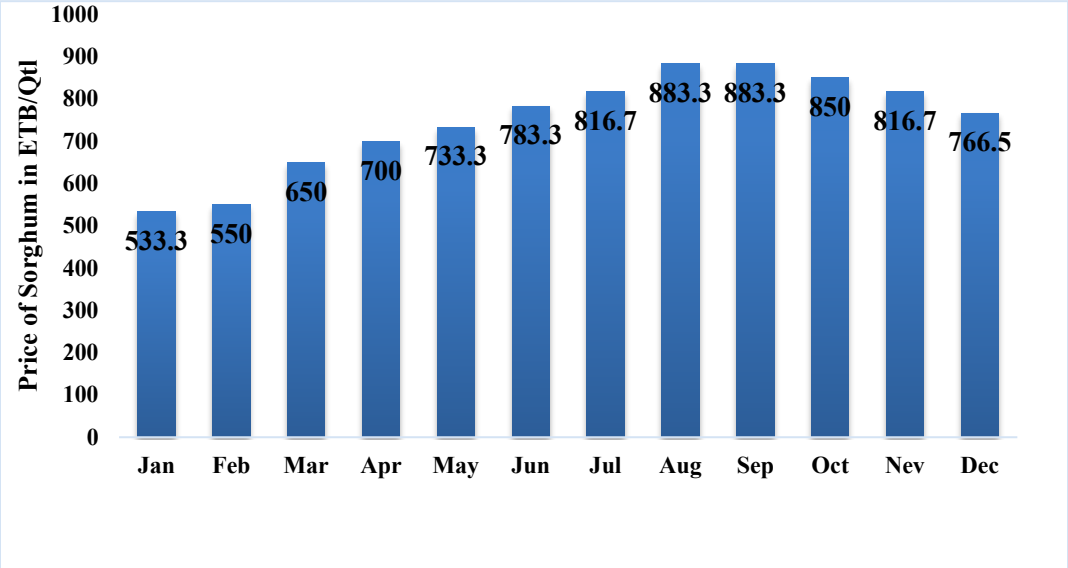

Figure 4. Sorghum price variation at Haramaya.

4. Discussion

4.1. Identified Gender Factors in Sorghum Value Chain

Findings from this study revealed that sorghum seed varieties available to half of the FHH participants were late-maturing while a quarter expressed that the varieties were inconsistently maturing in comparison to the other three crops in consideration. FHH members perceived that sorghum was similar with other crops in terms of its advantages related to market price and input cost. Female spouses in MHHs discussed the high cost of inputs such as fertilizer and chemicals, while FHHs' concerns highlighted a more significant problem: lack of access to inputs. These factors could be seen as important determinants of gender disparities.

Though equity was as important as any other criterion to be considered in agricultural development and research interventions, much of these efforts confused reaching a demographic quota of females with gender-sensitive thoughts and practices geared toward improving productivity and households' welfares. For instance, interventions often addressed some percentage of FHHs as main targets, but inter- and intra-household investigations as well as studies on gender and intergender issues were lacking.

4.2. Priority Problems in Sorghum Production

There were 11 sorghum-related problems indicated by FGD participants (Table 27). In the course of the study, it was discovered that less than half (four out of 11) of the problems commonly were perceived as major constraints to sorghum production in the study area, while the remainder were unique to specific categories of respondents. The most significant constraints were: drought, lack of improved sorghum seed, frost, disease, pests and birds[2]. In addition to these listed, married women in MHHs also listed shortage of land as a major constraint to sorghum production.

Drought was the largest contributor to frequent sorghum production failure and one of the deciding factors for farmers to produce sorghum. In decreasing order of importance, farmers also listed lack of improved seed, frost, disease, pests and birds as problems for sorghum production. In FHHs, frost was considered a more significant issue than lack of improved seed. This difference in ranked

[2]Are rare problems compared to diseases and pests.

problems might point to inter-household gender concerns: service delivery interventions can enhance FHHs' capacity to respond to or withstand frost prior to assisting these households with access to improved seeds.

The other sorghum production constraint that appeared to be a gender concern was post-harvest handling. This issue was indicated uniquely by married women in MHHs. Though it was the lowest-ranked among major problems commonly agreed upon by both spouses, issues with post-harvest handling was evidenced from observing, for instance, how households (including FHHs) traditionally stored grains in backyard pits and sacks.

Table 27. Rankings of Major Constraints to Sorghum Production, Processing, and Utilization

SN	Constraints	Married Women		MHH		FHH	
		Total	Rank	Total	Rank	Total	Rank
1	Drought	9	1st	12	1st	14	1st
2	Lack of improved seed	6	2nd	7	2nd	6	3rd
3	Shortage of land	5	3rd	-	-	-	-
4	Frost	4	4th	5	4th	7	2nd
5	Disease and pests (such as shoot fly, *Geri*, and birds)	3	5th	4	5th	4	4th
6	High price of inputs (e.g., fertilizer)	2	6th	3	6th	-	-
7	Shortage of inputs (e.g., fertilizer)	-	-	-	-	2	5th
8	Post-harvest handling problem	0	7th	1	7th	-	-
9	Shortage of labor	-	-	-	-	1	6th
10	Shortage of income	-	-	6	3rd	-	-
11	Lack of information on improved sorghum production, processing, and utilization	-	-	0	8th	-	-

Land shortages were an issue solely expressed by married women in MHHs, while shortage of income was a typical response from their men counterparts. This finding shows that there was a tendency among intra-household genders to possess different feelings about problems relating to their common assets. Shortage of labor, however, was more likely to be an inter-household genders concern in FHHs than in MHHs.

The unique concern from female spouses regarding shortage of land could be considered a tendency to desire land or property expansion; this could form the basis of a study to be conducted on the feelings about land ownership and its related status. Shortage of income – indicated solely

by male spouses – highlighted the lack of credit service delivery in the study area. Service delivery interventions might need to capitalize on training, inputs, and financing directed toward intensive farming. This would relate ultimately to the constrained ability of a household to afford buying inputs which was reflected by male spouses stating that they paid high prices for inputs like fertilizer. However, it should be noted that problems related to inputs like fertilizer go beyond paying high prices: FHHs failed to have access to these resources. Favoring these categories during input deliveries should address such a problem.

The other unique problems for sorghum production were shortage of labor (expressed by FHHs) and the lack of information on improved sorghum production, processing, and utilization (indicated by male spouses). Shortage of labor in FHHs would become a particularly significant problem during labor-intensive farm activities such as land preparation and cultivation. Shortage of labor for FHHs might also have been aggravated by the fact that FHHs were found to have poor access to improved farm machineries like tractors. However, interventions to assist farmers to get better access to relevant information on sorghum production, processing, and utilization could be of paramount importance if leveraged towards both intra-household and inter-household gender concerns.

5. Conclusions and Recommendations

Sorghum is one of the major cereal crops produced in the study area and is relevant across the communities' food-value chains and social structures. Despite this, sorghum production and productivity are frequently hampered by physical (e.g., poor soil fertility level and undulating terrain), environmental (e.g., drought, frost), biological (e.g., disease, pest, birds) and institutional (e.g., lack of extension services) constraints.

The prevalence of gender concerns across sorghum production and productivity as well as corresponding factors also were investigated across the study area. At a macro level, gender appeared to impact sorghum production and productivity less when compared to other constraints, such as the ones indicated above. However, responses from FGDs and KIIs revealed that there are some inter- and intra-household level gender disparities among family members in the production, reproduction, and community maintenance activities. The study discovered differences between members of MHHs and FHHs in their level of participation across a range of sorghum production-related, processing-related, and utilization-related household decisions, access to and control over resources, use of income from sorghum, preference of sorghum crop and its traits to other crops, access to sorghum production technologies, possession of farming tools and production trends.

Results showed that females were the largest contributors to food preparation, transporting sorghum to millhouses and marketing of sorghum. Learning how the different household members utilize existing varieties would provide additional information about gender issues in sorghum production. For instance, considering the fact that sorghum was the major food crop in the area, and that the role of food preparation dominantly belonged to female household members, future FGDs could attempt to identify the sorghum variety mostly preferred for food use. Capitalizing on interventions related to improved market strategies and marketable sorghum technologies would, therefore, become feasible and relevant to improving sorghum farming outcomes for sorghum-producing householders in general and that of FHHs specifically.

Post-harvest technological interventions (for improving grain storage for instance) is a better focus for male farmers in the study area, since they were responsible for this facet of production. It would

be relevant to plan for a host of improved and adaptable post-harvest handling strategies as well as to conduct further intensive gender-based adaptability studies of proposed technologies.

Issues such as soil type, intercropping alternatives, and landscape conditions of sorghum plots may require adaptive research and extension interventions. Study results also indicated possible disparities between the MHHs and FHHs in access to and control over sources of organic (animal dung, and manure) and chemical fertilizers. This study also noted the absence of magnified differences in cropping techniques among households, which may not necessarily eliminate gender concerns. Future research could investigate why FHHs prefer mostly row cropping sorghum when compared to MHHs who choose from a variety of cropping methods. In this regard, issues such as soil type, intercropping alternatives, and landscape conditions of the sorghum plots being cultivated by MHHs and FHHs may need to be subject to adaptive research and extension interventions.

Simple row-cropping machines, improved soil management practices, appropriate intercropping alternatives and fertilizer use should be prominent in research and extension efforts. Specifically, the use of *korki* as a means to apply fertilizer lacks precision and requires significant labor. Seeking alternatives and improved farm practices or equipment would save energy, thereby contributing to the alleviation of challenges in fertilizer application methods. A hypothesized study on the production capacity and productivity between oxen- and tractor-ploughed plots might also provide insights for gender interventions in the study area.

Results highlighted the importance of rethinking how conventional extension service delivery systems can address the gaps in sorghum production and gender parities with changing farming priorities. Interventions also might capitalize on a blend of formal and informal service delivery strategies. While the resulting improved state of sorghum production could be linked to missing community or business-oriented advisory services, it will help open an alternative wave of opportunities to address yield and gender gaps in sorghum production. In the study area, the role of selling crops for cash, for instance, was often given to women members of the family; innovative business-oriented advisory services could be channeled specifically towards these women once market surplus of sorghum is secured. Female spouses also indicated a unique concern about land shortages, which indicates the need for future studies on land ownership attitudes and its

accompanying status. Male spouses' concern about income shortages demonstrated the lack of credit service delivery in the study area. Service delivery interventions might also need to capitalize on training, inputs, and financing directed toward intensive farming. Creating gender-considerate financial institutional strategies would, therefore, be of great importance to both spouses and would thereby enhance household-level sorghum production status.

Another recommendation is labor substitutions, specifically oriented toward sorghum-producing FHHs. Interventions to allow farmers improved access to relevant information on sorghum production, processing, and utilization could be of paramount importance if leveraged toward both intra-household and inter-household gender concerns.

Neighborhood and farmer-to-farmer exchange strategies were indicated as the most common forms of inputs and information sharing related to sorghum. This finding was relatively consistent in both MHHs and FHHs and, therefore, efforts to improve this should be addressed across sorghum-producing communities. Farmers in the study area indicated the need for the following extension interventions: access to and application techniques of improved seed varieties (early maturing, high yielding, disease and drought tolerant), inorganic fertilizer; improved disease management strategies (for treating leaf disease for instance), irrigation schemes, and post-harvest technologies (such as seed safety/quality keeping techniques). Farmers have already exhausted local seed varieties and conventional production techniques, resulting in a discouraging harvest. This could be the reason why their concerns included the majority of sorghum production package components. Sorghum-growing FHHs even have expressed that they would prefer to shift away from growing sorghum to growing vegetables and pulses if current production challenges continue.

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