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Beyond maize production: gender relations along the maize value chain in Tanzania

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Maize is an important staple crop for smallholder farmers across sub-Saharan Africa. Yet gender-based opportunities, constraints, and dynamics in maize value chains are under-researched. A better understanding is necessary for gender-sensitive policy and development interventions. This study thus examines gender relations across the maize value chain in Tanzania, looking at gendered participation, decision-making patterns, and resources in maize/seed production, marketing, and sales. Data were collected using mixed methods: a survey of 551 households, key informant interviews, and focus group discussions. Our findings show that the higher nodes of the maize value chain are dominated by men. Women's participation is generally limited to maize production, and women face barriers to entry into higher nodes. Where they do participate in buying, trading, or retail, they face barriers to expansion of their business. Gendered decision-making patterns with regards to maize sales show regional variation, but overall men are primary decision-makers. Gender mainstreaming and gender transformative interventions targeted at higher nodes in the maize value chain are needed.

Keywords: Maize Value Chain, Gender Relations, Tanzania, Patriarchal System.

Introduction

Government statistics note that nearly 70 percent of the Tanzanian population (55.57 million people) live in rural areas, and almost all of them depend on the agricultural sector for their livelihood. Maize is the primary staple crop in Tanzania (Minot 2010), and in the last five decades, Tanzania has been among the top 25 maize-producing countries in the world, ranking fourth in Africa and nineteenth in the world (FAO 2014). In 2017, Tanzania produced over half a billion metric tons of maize, 85 percent of which was grown by smallholder farmers (Suleiman and Rosentrater 2015), usually in low input, rainfed conditions (Wilson and Lewis 2015). Maize is both a subsistence and a cash crop. Maize value chains thus offer opportunities for development, and for improving the competitiveness of smallholder activities (Kolavalli et al. 2015).

Women in developing countries play a major role in ensuring food security (Meinzen-Dick et al. 2011). However, women have less access than men to productive resources and capital, and fewer opportunities to apply their skills and knowledge (World Bank and IFRPI 2010). In agricultural value chains, women make

up a large part of the work force (KIT et al. 2012). However, women's rights, the benefits that women derive from participation, and their contribution are not always recognized (Jeckoniah et al. 2012). Women's low participation in, for instance, the marketing of crops has been documented across Africa, Latin America, and South Asia (Agarwal 1997; Doss 2001; Lastarria-Cornhiel 2008). The participation of women in the maize value chain is particularly important since some research has found that women are more likely than men to invest their income from agricultural crops in improving the health and well-being of their families (Aker et al. 2017; Sraboni et al. 2014). Thus, from this instrumental point of view, development interventions aimed at enhancing women's empowerment and agency make economic sense. Women's access to the same resources and market opportunities as men could increase women's productivity and income, which in turn would help produce economic and social benefits, including reductions in poverty and hunger (Chant 2016).

The importance of integrating gender issues into value chain analysis and development practice can also be argued from a social justice perspective, which states that men and women intrinsically hold an equal right to benefit from development. This is propounded in the new Sustainable Development Goals,

particularly in goal five on gender equality, with its wider commitment to leaving no one behind (UN Economic and Social Council 2017). Another argument is that there is a direct link between gender equity and poverty reduction: specifically, there is increasing evidence to suggest that countries that have improved gender equity have reached higher levels of economic growth and social wellbeing (Weeratunge et al. 2010). Lastly, there is the business-oriented argument, which suggests that inequity results in inefficiency in the allocation of human resources and in missed opportunities for innovation (Keeley 2015).

In Tanzania, the value-chain-development approach has been adopted by many development organizations, non-governmental organizations (NGOs), research institutions, and government programs (Tarimo et al. 2012). The focus of most of these value-chain interventions has been on facilitating smallholder farmers' links to the market, in order to increase profit and reduce poverty. The government has also been working with development partners to develop "pro-poor" value chains in agricultural crops and livestock. "Pro-poor" value chains are best designed when they bring together technical and social dimensions (UNIDO 2011). They are "pro-poor" when they promote sustainable, market-based solutions that respond to the recurrent needs of targeted producers/enterprises, whether these are micro, small-, or medium-scale enterprises (AFE 2013). The main aim of pro-poor value chains is to improve the way the market system operates, so that key market players, including development programs' target groups, will be able to benefit through increased income and jobs.

Studies have looked at gender dimensions in markets and value chains for legumes, e.g., pigeon peas in Malawi (Me-Nsope and Larkins 2016), roots and tubers, e.g., cassava (Masamha et al. 2018; Ao et al. 2019), and cereals, e.g., rice (Ayoola et al. 2012). However, much less attention has been paid to gender dimensions in the maize market value chain, with the exception of studies by Adam et al. (2019) in Mozambique, Adetonah et al. (2016) in northern and central Benin, and Farnworth and Mahama (2012) in Ghana. Overall, the findings from these studies show that in most cases women at all levels of the maize value chain face significant gender-based constraints (e.g., weak bargaining positions, women's reproductive roles, and no ownership of key assets) in addition to constraints which affect women and men equally. In this paper, we primarily aim to answer three questions that will expand existing literature in the above area of research: Are women and men able to participate equally in seed/maize production, seed sales and acquisition, and maize marketing, both on-farm and off-farm? What are the patterns of decision-making among women and men in maize production, marketing, and sales? What resources do women and men who are involved in maize marketing and sales have access to?

Methods

Conceptual framework

To analyze gender issues along the maize value chain, we used the Gender Dimensions Framework (GDF) developed by Rubin and Barret (2009). The framework has been used by Me Nsope and Larkins (2016), when carrying out their analysis of gender relations along the pigeon value chains in Malawi, as well as by Njuki et al. (2011). The GDF allows for the classification of gender issues at each node of the chain in four dimensions: (a) access to and control over key productive assets, (b) practices and participation, (c) beliefs and perceptions, and (d) laws, legal rights, policies and institutions. Due to the scope and limitations of our data, in this article we focus on the first two dimensions.

The first dimension, then, describes the social relationships that shape the distribution of resources necessary to be a fully active and productive member of society – socially, economically, and politically. These resources include access to land, labor, capital, natural resources, education, employment, and information (Rubin et al. 2009). The literature supports the premise that assets are not always pooled within the household (Haddad et al. 1997) and that there is a severe gender gap in access to opportunities and agricultural resources (Doss and Morris 2001; Quisumbing and Pandolfelli 2010). Both the broad sociocultural context and intra-household rules and dynamics determine who within a household has access to which resources and who has control over their use (Meinzen-Dick et al. 2011). Ownership of assets has important implications for livelihood outcomes such as food security, nutrition, and education, as well as increasing the bargaining power and well-being of the whole household (Meinzen-Dick et al. 2011). Therefore, the gendered nature of asset distribution might have implications for participation at different nodes of the value chain and for control over the benefits derived. The questions that we examine under this dimension are: What are the resources – types of capital, land, means of transportation of goods, among others – that are needed in order to participate in the maize value chain? Who has access to and control over these resources?

The second dimension examines how gender structures people's behavior and actions: specifically, what they do, and the way they engage in activities. We seek to understand the productive, reproductive, and community roles and responsibilities of women and men and to determine the implications and rewards of participation in the value chain (Rubin and Barret 2009). The questions examined here are these: Who is involved in what activities? Why? What are the barriers that prevent men or women from playing a particular role?

Power – a theme that runs through both dimensions – means having control over material, human, intellectual, and financial resources (Rubin 2011). Access to power is influenced by relationships and social norms. It affects one's ability to exercise decisions over affairs of the household, community, municipality, and state and the use of individual economic resources.

Data collection

In order to decipher gender relations along the maize value chain, we employed a mixed-methods approach, integrating both qualitative and quantitative methods and using the following techniques: (a) a structured household survey of smallholder maize farmers, (b) semi-structured key informant interviews (KIIs) with participants of the maize value chain – maize breeders, agro-dealers, retailers, processors, local buyers and traders, and (c) gender disaggregated focus-group discussions (FGDs) with smallholder farmers of both genders. The main reason for the mixed-methods approach was to capture both maize farming households and other actors in the maize value chain. This approach also helped us to triangulate and validate data.

The dataset of the 2013 International Maize and Wheat Improvement Center (CIMMYT) Adoption Pathways’ household survey provided quantitative data for 551 households. The data was collected in October and November 2013. The survey targeted two maize-legume-based farming systems in eastern and northern Tanzania: Gairo, Kilosa, Mvomero districts (in Morogoro region) in what we termed the eastern zone, following a classification of Tanzania’s agro-ecological zones proposed by Mowo et al. (1993); and Mbulu (part of Manyara region) and Karatu (Arusha region) districts in what we will refer to as the northern zone. Administratively, Tanzania is divided into thirty-one regions. Each region is subdivided into districts that are further sub-divided into divisions and then again into local wards. Wards are further subdivided into streets (for urban wards) or villages (for rural wards).

The three selected regions were assigned an equal number of households. Proportionate sampling was carried out by ensuring that the households sampled in each region were distributed across districts proportionately to the total number of households per district. Multistage sampling was used to select lower-level sampling clusters: districts, divisions, wards, and villages. A total of 5 districts, 39 wards, and 60 villages were selected for data collection across all three regions. Efforts were made to ensure that the sample was representative of the population of the study areas. Proportionate random sampling was used to select divisions from each district, wards from each division, villages from each ward, and households from each village. In total, 551 households were interviewed. The survey provided detailed information about socio-economic conditions, labor participation, and adoption of improved maize seed by male-headed households (MHHs) and female-headed households (FHHs). Since for this study we were more interested in how maize was utilized than the effect of plot characteristics, we decided to focus on analyzing the characteristics of the household head rather than plot-level char-

acteristics. Table 1 provides information about the gender of the respondents. The data shows that 59.5 percent (328) of the respondents were male and 40.5 percent (223) were female. Of these, 327 men and 77 women were heads of households, 146 women were spouses in MHHs, and one respondent was an adult man from a FHH.

The KIIs and FGDs were carried out in six villages from March to June 2016. The villages were Kilimatembo, Bashay and Changarawe in Mbulu district (representing the northern zone), and Mandela, Muungano and Msimba in Kilosa district (representing the eastern zone) (Figure 1). Because of the limited research budget, we had to choose one district in each province to collect the qualitative data. Scientists from the Selian Agricultural Research Institute (SARI), which is part of the National Agricultural Research System (NARS) of Tanzania, helped to identify villages in each of the two districts that were diverse in terms of agro-ecological and socio-economic characteristics and proximity to markets, ensuring that the site selections represented contrasting conditions. The villages selected were those that had taken part in the CIMMYT 2013 Tanzanian household survey, thus providing pockets of multi-layered information (Geertz 1994) within the general intervention area. However,

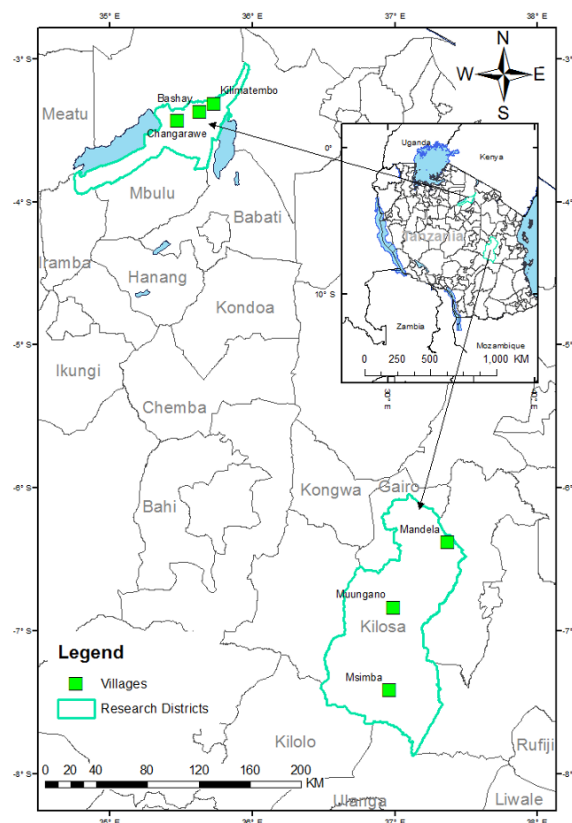


Figure 1 Selected research areas in the northern and eastern zones of Tanzania. (Source: authors.)

	MHHs (n=473)	FHHs (n=78)	Total (n=551)	χ^2	p-value
Male	69.1 (327)	1.3 (1)	59.5 (328)	127.592	0.0000*
Female	30.9 (146)	98.7 (77)	40.5 (223)		

MHH: male-headed household; FHH: female-headed household.
 Note: Figures in parentheses are frequencies.
 *Significant at the 5% level (the difference in occurrence of MHH and FHH).

Table 1 Gender of the respondents (%)

because of attrition and other factors, it was decided that for the FGDs it was not necessary to interview people from the households that had already participated in the household survey.

A total of 25 KIIs were conducted with the following value-chain actors: two maize breeders from the SARI, eight agro-dealers/input suppliers, six retailers, six local buyers and traders, and three processors. The above stakeholders were chosen because they represented the key actors in the maize value chains. Purposive sampling was used to identify these interviewees. We were only able to hold 25 KIIs due to budget- and time-constraints for the qualitative part of the study. We conducted a total of 12 FGDs in six villages; separate FGDs were held with men and women maize growers. The respondents were selected by extension staff and local village leaders, and had to be aged between 18 and 70. A balance was ensured between married, widowed and divorced participants, and participants were of varied socio-economic status. On average, there were between nine and eleven participants at each FGD, with a total of 134 FGD participants: 72 women and 62 men (see Table 2).

The FGDs included questions on seed sources, cultivation practices, decision-making, the gendered division of roles in production and marketing, access to and control over resources, control over revenue from maize sales, and relationships along the value chain. These questions were followed by several open-ended questions, to which the respondents provided detailed answers. Checking was systematically carried out to minimize potential bias resulting from time differences in data collection periods between the survey conducted in 2013 and the FGDs and KIIs in 2016. Specifically, member checking was carried out by sharing all of the research findings with the participants involved. This allowed participants to critically analyze the findings and to provide their views, feelings, and experiences.

Data analysis

The household survey data were coded in Excel and transferred to SPSS version 24 that was used for analysis. We used descriptive statistics from the 2013 CIMMYT survey to capture the social, economic and demographic characteristics of the sampled households (Table 3). The analysis of variance statistical test was used to analyze the following: (i) adoption of improved maize varieties by gender of the household head (Table 4), (ii) participation in farm labor by gender of the household head (Table 5), and (iii) plot ownership and decision-making (Table 6). In addition, the results of Tobit regression were employed to determine the relationship between the quantity of maize sold and a number of independent variables related to the following: (i) farmers' individual characteristics (gender, age, and education of the household head, and whether or not extension advice had been obtained about maize varieties, output markets, and prices), (ii) household socio-economic characteristics (household size, off-farm income, land size, ownership of livestock, membership of the household head in a farmers' group, whether credit had been obtained, ownership of a mobile phone, radio, or bicycle, and whether hired labor was used), and (iii) community-level characteristics (by zone) (Table 7).

Value chain node	Data collection mode	Female	Male	Total respondents
Maize breeders	KIIs (2)	0	2	2
Agro-dealers/input suppliers	KIIs (8)	2	6	8
Producers	FGDs (12)	72	62	134
Processors	KIIs (3)	0	3	3
Retailers	KIIs (6)	2	4	6
Local buyers and traders	KIIs (6)	1	5	6
Total		77	82	159

KII: key informant interview; FGD: focus-group discussion

Table 2 Data collection for the qualitative part of the research study

We also coded the KII- and the sex-disaggregated FGD data using NVivo version 11 Pro software. Qualitative data from the FGDs and KIIs were coded for textual analysis. Data recorded in the field were analyzed using NVivo software, and the lead researcher developed a coding tree. Different themes were classified, and then the data was manually coded in NVivo. All data were coded in a sex-disaggregated way wherever possible and then analyzed. The themes formed column headings of the coding matrix, while each transcript was coded in a row. Similar methods of coding as the one used in Adam et al. (2019) were applied. For instance, answers to the following three questions: (a) "Who within the household usually makes the decision to sell maize?", (b) "Who decides how much maize to sell?", and (c) "Where do you mostly sell your maize?" were classified under the code *maize marketing by men and women farmers*. Answers to the following four questions: (a) "How many employees (men/women) are there?", (b) "What kind of jobs/activities are involved in the operation of this business?", (c) "What skills are necessary for each activity and who does the activity?", and (d) "Where do you usually sell your processed goods?" were classified under the code *practices and participation by processors/traders/agro-dealers*. Data from KIIs and FGDs were transcribed and coded for textual analysis following the procedures outlined by Glaser (1998, 140). To protect the respondents' anonymity, all the names of the study participants were replaced with pseudonyms.

Results

Household demographic and socio-economic characteristics

The Adoption Pathways dataset of 2013 shows that the majority of households (86 percent) were MHHs (Table 3). Men and women who were heads of household were aged between 41 and 60 years. The average level of formal education of the household heads was five years, although men who were household heads were on average more educated than women household heads. In total, the majority of the household heads (both men and women) reported farming as their main occupation (95.1 percent), followed by other (2.4 percent), salaried employment (1.8 percent) and off-farm self-employment (0.7 percent). As expected, MHHs had the highest percentage of married couples

Variable	MHHs (n=473) (86%)	FHHs (n=78) (14%)	Total (n=551) (100%)
Age of HH head (average years)	49.1	54.8	49.9
Age: 18-40 (%)	33.4	19.2	31.4
Age: 41-60 (%)	43.1	46.2	43.6
Age: 61+ (%)	23.5	34.6	25
Education level of HH head (average years)	5.6	4.3	5.4
Education: none (%)	17.5	35.9	20.1
Education: primary education (1-7 years) (%)	74.6	61.5	72.8
Education: secondary + (%)	7.8	2.6	7.1
Main occupation of HH head (% households)			
Agriculture, self-employed, farming	95.3	93.6	95.1
Salaried employment	2.1	0	1.8
Self-employed off farm	0.8	0	0.7
Others	1.7	6.4	2.4
Marital status of the HH head (% of households)			
Married living with spouse	93	12.8	81.7
Married but spouse away	2.3	9	3.3
Never married	1.1	2.6	1.3
Divorced/separated	1.7	24.4	4.9
Widow/widower	1.9	51.3	8.9
Household size (absolute numbers)	6	4.6	5.8
Household size (adult equivalents)	3.2	2.8	3.1
Female members (in numbers)	3	2.6	2.9
Male members (in numbers)	3.1	2	3
Members aged 0-17 (in numbers)	3.1	2	3
Members aged 18-60 (in numbers)	2.5	2.1	2.4
Members aged 61+ (in numbers)	0.4	0.5	0.4
Land size holding (acres)	6.5	3.7	6.1
Area under maize production (acres)	3.21	1.94	3.03
Ownership of livestock (% yes)	88.14	80.77	87.09
Obtained extension services (% yes)	29.24	14.1	27.09
Obtained market information (% yes)	4.45	1.28	4
Used hired labor (% yes)	66.45	57.69	65.19
Own radio (%)	67.3	51.28	65.03
Own mobile phone (%)	70.28	50	67.4
Own bicycle (%)	67.09	44.87	63.93
Maize produced (kg/ha)	1515.26	1143.67	1461.08
Maize sold (kg/ha)	519.7	284.37	485.64

MHH: male-headed household; **FHH:** female-headed household.

Table 3 Household socio-economic and demographic characteristics

(95.3 percent) compared to FHHs (21.8 percent). The largest percentage of divorcees and widows came from FHHs. The average size of the surveyed households was six. When converted into adult equivalents, the average household size was three. FHHs had fewer household members (adult equivalents) than MHHs (2.8 compared with 3.2). FHHs on average owned less land (3.7 acres for FHHs and 6.5 acres for MHHs) and had smaller areas under maize production than MHHs (1.9 acres versus 3.2 acres, respectively). There were significant differences in the total amount of maize harvested and maize sold between the MHHs and FHHs: the total amount of maize harvested and maize sold was higher for MHHs (1515.3 kg/ha and 519.70 kg/ha, respectively) than for FHHs (1143.7 kg/ha and 211.96 kg/ha, respectively). The reason for this, according to the 2013 datasets, is that MHHs tend to have more available labor (number of household members and hired labor), more assets (size of land holding and livestock), more area under maize production, and better access to extension services than FHHs. In addition, off-farm income was higher for MHHs than for FHHs (1013.09 USD versus 413.76 USD). Thus, MHHs are in a better position overall than FHHs as maize producers and sellers, as they have more resources, more land, more available labor, more access to extension services and market information, own more bicycles, mobile phones, and radios, and have more financial resources that they can use to pay for hired labor and farm inputs.

Gendered participation and division of roles along the maize value chain

Figure 2 presents a sketch map of the maize value chain in Tanzania. Farmers, breeders, seed companies, agro-dealers, traders/buyers, processors, wholesalers, retailers, and consumers are all actors in the maize value chain. We started the gender analysis of the chain by examining farmers’ perspectives on seed acquisition.

i. Men and women’s participation in seed production, sale and acquisition

Data from the 2013 survey showed that about 98 percent of households (540) had grown maize during the survey reference period. Both hybrids and open-pollinated varieties (OPVs) are grown in Tanzania, and 58 percent of the sampled households had adopted the use of improved maize varieties (hybrids or OPVs). A gender differential was present in the choice of maize variety: more MHHs had adopted improved varieties (59.4 percent) than FHHs (48.7 percent), and the difference was statistically significant (Table 4). A difference in the adoption of improved hybrid maize varieties was also observed between MHHs (29 percent) and FHHs (19 percent), and these results too were statistically significant.

The prohibitive cost of improved varieties of maize seed often compels farmers to recycle their own local seed saved from the harvest. The FGDs also revealed that, regardless of gender and location, most farmers used recycled seed, followed by seed purchased from agro-dealers, retail shops, local markets, neighboring farmers, farmers’ associations, research institutes, particularly the Ilonga Agricultural Research Institute (ARI-Ilonga) and the NARS research institute in the east of the country. Seed was occasionally also purchased through government subsidies or gifted by relatives, neighbors, or friends. Both men and women paid cash for seed in nearly all the studied villages, but in some villages in the Morogoro region, particularly Muungano and Msimba, both male and female farmers were able to acquire local seed by working for it on another farm. In Msimba village, farmers also acquired seed by trading in kind (in exchange for another food item, such as beans). Samuel from Muungano stated:

It is usually us men who work for other farmers and in return we get local maize seed to grow.
(FGD, Muungano, 2 May 2016)

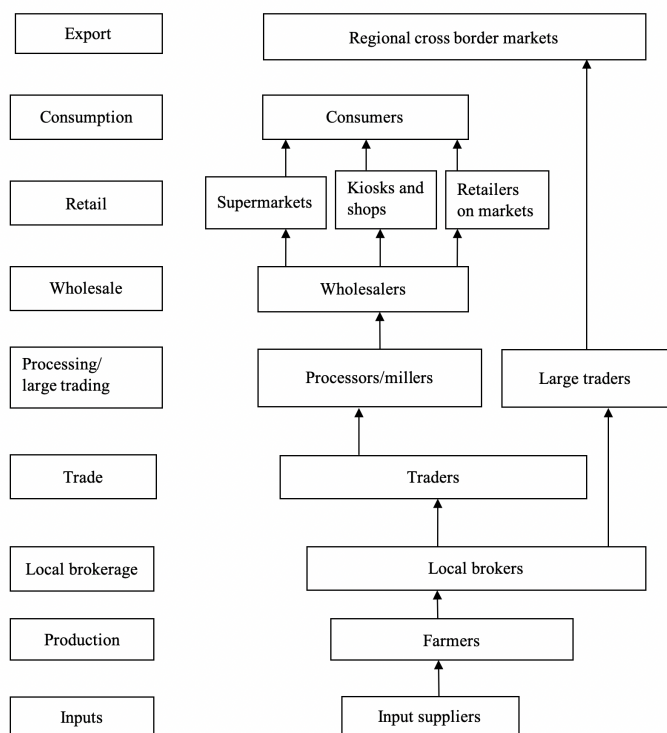


Figure 2 Map of the maize value chain in Tanzania

Maize variety	MHHs (N=473)	FHHs (N=78)	Total (N=551)	X ² -value	p-value
Grew maize	97.9	100.0	98.2	1.680	0.195
Improved hybrid	29.0	19.2	27.6	3.175	0.075
Improved OPV	31.5	29.5	31.2	0.126	0.823
All improved (hybrid/OPV)	59.4	48.7	57.9	3.139	0.076

MHH: male-headed household; FHH: female-headed household; OPV: open-pollinated variety.

Table 4 Adoption of improved maize varieties by gender of the household head (% households)

Maria, in the same village, reported, “us women, we give credit seeds to each other”.

It is important to note that the use of recycled seed has little to do with a lack of availability of improved seed. The few farmers who during FGDs noted that there were no improved varieties of maize available when needed came from Msimba village. Farmers in that village used recycled seed primarily because there are very few agro-dealers in the villages. Most agro-dealers are concentrated in town centers where village-based farmers, especially women, are unlikely to go to buy improved seed. This, in turn, has implications for yields. Seed quality was the main problem noted by farmers with regard to bought seed. As expressed by Johari from Bashay, “Many agro-dealers are untrustworthy, and some sell grain obtained from farmers”. In addition, sometimes a specific variety of maize, e.g. Staha, is unavailable.

The two NARS breeders from Tanzania reported that they ensured that the varieties they released were the ones best suited for farmers’ needs. According to Joseph, one of the breeders:

Male farmers prefer traits like seed weight and size of kernel, while women prefer poundability, sweetness, and other culinary traits.

(KII, Arusha, 6 April 2016)

Unfortunately, for this study we do not have data on trait-preferences from on-farm participatory varietal evaluation (PVE) by men and women farmers to report.

Agro-dealers supply farm inputs to farmers, e.g. seed, fertilizers, pesticides and herbicides, among others. For our study, six men and two women agro-dealers were interviewed. Most customers were farmers or small seed retailers from different villages. According to the agro-dealers, about three-quarters of the customers who bought improved maize varieties were men. Seed was usually paid for in cash; only in very rare circumstances would credit be given. According to Thomas, an agro-dealer:

Women prefer to buy OPV seeds rather than hybrids, because they are lower-priced, but they may decide to purchase a few hybrid or improved seeds for their high-yielding qualities.

(KII, Changarawe, 5 April 2016)

All the agro-dealers interviewed thought that men purchased larger quantities of maize seed than women. They gave the following reasons for this: (i) men were the decision-makers in their household with regards to financial issues, (ii) men had more land than women, (iii) women were resource-constrained, and if they had been given money by their husbands to purchase seed, it may have been insufficient, and (iv) the price of seed was too high for women farmers to afford.

As regards the gender division of labor in shop operations, most of the agro-dealers reported that men were involved in all the activities associated with operating the business: purchases/orders, looking for customers, off-loading, storing, sales, providing an advisory service to customers, and accounts. Women working in agro-dealer shops who were not owners of the business were also involved in all the above listed activities except for the purchasing of goods for sale, which was done by the shop

owner, and the off-loading of cargo, which was usually done by casual laborers. Both men shop owners and the two women shop owners were heavily involved in purchasing and ordering goods to sell. The findings show that although gender-specific roles exist within the agro-dealer shop, owners of agro-dealer shops carry out the same tasks regardless of their gender. When the agro-dealers were asked if they thought men or women were suited to any job in the business of selling inputs, mixed responses were given. The two female and two of the male respondents replied that anyone was suited for any of the jobs. As Salome said:

Any person can do any of the jobs really..., it depends on how committed one is to work in the business, how good one’s knowledge of the business, and whether the person is willing to seek information on how to perform the job.

(KII, Muungano, 9 May 2016)

However, two male agro-dealer shop owners believed differently, as expressed by Jacob:

Women are better suited for selling, because they are honest, listen carefully to customers’ needs, and serve them politely, as opposed to men who are impatient with some questions or needs of customers, and men are suited for buying, transportation, and supplying to customers.

(KII, Morogoro town, 8 May 2016)

This response indicates the desirability of training women in accounts and finance. The remaining two male respondents thought that men were better-suited to any of the jobs in the agro-dealer industry. They gave three reasons: men were better able to give customers information compared to women, most of whom had not gone to school; it was easy for men to get initial capital; and men were strong and able to carry heavy loads.

ii. Men and women’s participation in maize production

In the study region, farmland is cultivated with a variety of crops: the main cereals are maize and sorghum, and the main legumes pigeon peas and cowpeas. Other crops grown in the region are sunflowers, barley, finger millet, sesame, green grams, *dolichos lablab*, tomatoes, cassava, and sweetpotatoes. Maize is grown for household consumption and the surplus sold.

Maize production involves the following activities: seed sorting and cleaning, seed storage, land preparation and planting, disease and pest control, weeding, harvesting, threshing, storage, transportation, and marketing. Regardless of the gender of the household head, in all the activities listed above, most of the work was done by families (meaning men, women and children within a household), followed by hired labor (see Table 5). The only activities that were captured in the survey were land preparation, planting, weeding, harvesting, and threshing. Information about the remaining maize production activities were collected through FGDs.

FGD respondents acknowledged that *seed sorting and cleaning* was mainly done by women. The major reason given by both men and women was that – according to FGD participants – unlike men, women like to pay attention to small details, and they do not get tired when they sit for long hours sorting and cleaning seeds. Along the same lines, *seed storage* was mostly

Farm activity	MHHs (N=473)	FHHs (N=78)	Total (N=551)	t-value	p-value
Land preparation & planting by children	12.5	16.9	13.2	1.066	0.287
Land preparation & planting by men	35.3	25.8	33.8	1.642	0.101
Land preparation & planting by women	32.8	38.6	33.8	1.005	0.316
Land preparation & planting by family	80.6	81.3	80.9	0.145	0.884
Land preparation & planting by hired labor	19.4	18.6	19.1	0.166	0.868
Weeding by children	11.1	12.0	11.3	0.233	0.816
Weeding by men	27.8	20.9	26.9	1.274	0.203
Weeding by women	36.6	48.9	37.8	2.070	0.039
Weeding by family	75.5	81.8	76.0	1.214	0.225
Weeding by hired labor	24.8	18.3	24.0	1.248	0.213
Harvesting by children	12.1	30.4	14.7	4.230	0.000
Harvesting by men	28.7	24.7	28.3	0.728	0.467
Harvesting by women	28.7	28.9	28.7	0.036	0.971
Harvesting by family	69.4	84.0	71.7	2.646	0.008
Harvesting by hired labor	30.6	16.0	28.3	2.646	0.008
Threshing by children	16.7	27.6	17.7	2.309	0.021
Threshing by men	33.3	20.7	32.3	2.219	0.027
Threshing by women	33.3	42.5	33.8	1.583	0.114
Threshing by family	83.3	90.8	83.8	1.690	0.092
Threshing by hired labor	16.7	9.2	16.2	1.689	0.092

MHH: male-headed household; FHH: female-headed household.

Table 5 Farm labor participation, by gender of the household head (% of households)

women's responsibility. However, there were a few respondents (again, both men and women) in the FGDs who said that men were also involved. *Land preparation and planting* was mainly carried out by men in MHHs, and by women and children in FHHs, as shown in Table 5. However, *disease and pest control* was carried out by men. The reason given for women's exclusion from this activity by the communities in the study areas was the belief that that chemicals were dangerous and that if women sprayed their farms their reproductive capability might be affected. In addition, as Table 5 shows, most *weeding*, *harvesting*, and *threshing* activities were done jointly by men, women, and children within a household or by hired labor, regardless of the gender of the household head. Overall, the results show a statistically significant difference between MHHs and FHHs for the following three activities: *weeding*, where female labor participation was higher in FHHs than in MHHs; *harvesting*, where family participation was higher in FHHs than in MHHs, while participation by hired labor was higher in MHHs than in FHHs; and *threshing*, where participation by adult children was higher in FHHs than MHHs, and participation by men was higher in MHHs than in FHHs.

Both men and women were involved in maize *storage*, including in both heavy and light tasks. Men were mainly involved in arranging bags, while taking care of bags in the store was women's responsibility. Maize *transportation* involved men, women, children and hired laborers. Men supervised the transportation from farms, while hired labor carried the goods. *Marketing* was done jointly by men and women, sometimes by a man or woman alone; hired labor was also sometimes used.

iii. Men and women's participation in maize marketing (on-farm and beyond the farm)

The FGDs revealed that in both zones maize is mostly sold at the farm gate in the form of dry grain. The main buyers of maize in the market are local consumers, rural intermediate buyers ("middlemen") and rural assemblers. Traders usually go to villages to buy maize during the harvest season, and maize is transported from there to the selling point by a vehicle organized by the trader. Few farmers take their maize to local markets because of high transport costs, but when they do, in most cases it is men who go. However, in some cases, as was reported in Changarawe, when money is needed urgently or when the harvest is too poor to justify traders coming to the village, farmers are forced to send their maize to Karatu market (northern zone, about 14 km away) to get the funds necessary to address an urgent need. In Msimba (eastern zone), the main buyers of maize are local consumers, mostly women who use maize to make alcohol. Overall, women and men farmers from both zones reported that limited access to market information and high transaction costs due to poor road infrastructure were challenges to maize marketing that forced the majority of farmers, regardless of their gender, to sell maize at the farm gate at a low price.

With regards to *gender disparities in access to and participation in markets*, we asked what factors are responsible for influencing the participation of farmers in the maize market. Our analysis identified eight factors that showed significant statistical association with market participation by farmers and the quantity of maize sold (Table 6). Below, we explain the results of the

Tobit regression model, indicating the implications of the independent variables that have a statistically significant influence on the dependent variable, *quantity of maize sold*, as can be seen in Table 6.

Individual characteristics play an important role in access to and participation in maize markets. The gender of the household head influences the quantity of maize sold and participation in the market. Controlling for the other factors, MHHs would on average sell 201 kg more maize than FHHs. This is plausible, as MHHs produce more maize than FHHs (see Table 3). Interestingly, receiving training or accessing extension services was negatively associated with the quantity of maize sold. This could be due to the type of training received, perhaps on crops other than maize, or the poor quality of the extension services provided.

Household characteristics, and especially assets, also play a pivotal role in access to and participation in maize markets. The larger the plot size, the greater the chance that the household will sell maize. A one-acre increase in land area increases the quantity of maize sold by about 5.9 kg. A larger land size leads to the production of more maize, so that the surplus can be sold. Household assets also play an important role in influencing a household's market participation. For instance, households that own cows are likely to sell more maize than those that do not. Ownership of a bicycle is also positively associated with the amount of maize sold: bicycles can be used by farmers to transport produce to markets for sale. Having sufficient funds to hire labor is also associated with bigger maize sales, since the more labor is available to cultivate maize, the greater the yield and the greater the quantity of surplus maize available for sale. It can also be extrapolated that having assets increases the likeli-

hood of the household being able to participate in the market: in the majority of cases, FHHs and women farmers have relatively meager assets or access to assets compared to MHHs and men farmers, which disadvantages them in the maize market.

As well as gender, situational/community characteristics play an important role in influencing access to and participation in maize markets. People from the eastern zone on average sell more maize than those in the northern zone, when controlling for other factors. The eastern zone is closer to Dar es Salaam, which is the largest region and city in Tanzania, with a population density higher than any other region. Hence the demand for maize for food is high, and eastern zone farmers are able to sell their maize to help meet this demand.

Buyers and traders also form part of the maize value chain nodes. The buyers and traders in this study buy dry maize grain from farmers and brokers to sell to the large export buyers or processors located in urban areas and cities such as Arusha, Morogoro, and Dar es Salaam. We were able to interview five men and one woman, who jointly own the business with their spouses. One of the most important gender lessons learned is that it is hard for a woman to take on the role of maize trader or buyer. The KIIs revealed three reasons why it was hard for women to break into the business: (i) men had always been involved in buying and trading, so had more confidence and experience, (ii) women had to stay at home to care for children, cook, and perform domestic chores, (iii) the work of a trader involves traveling to different areas searching for maize, which can be difficult for women because of the domestic responsibilities they have to attend to. Regardless of gender, all buyers/traders reported that maize trading was governed by local availability, seasonality, and demand. Several of the activities involved in running a busi-

Variable	Coefficient	Standard error
Male household head (reference group)	201.264*	121.793
Years of formal education of household head	6.081	8.831
Household off-farm income	0.000**	0.000
Land size	5.850**	2.328
Ownership of cows	211.198*	117.613
Ownership of sheep and goats	107.174	103.605
Ownership of poultry	-62.029	129.897
Obtained credit	0.423	1.084
Obtained extension services	-163.505*	96.335
Ownership of bicycle	200.596**	91.710
Used hired labor	201.385**	87.713
Zone (eastern)	271.353**	110.237
Constant	-181.201	178.296
Log likelihood:	-4415.727	
Pseudo R ²	0.0074	
N=551		

Note: We did not find multi-collinearity in our variables, all of which registered variance inflation factors of less than 2.50.

**Significant at the 5% level.

*Significant at the 10% level.

Table 6 Tobit regression results for quantity of maize sold against household characteristics

ness are also gender-segregated, for instance the purchasing of crops, which requires negotiating skills, and the collection, loading, unloading, and re-bagging of maize, which are heavy-duty activities, are generally done by men. Sorting and winnowing are mainly done by women. Selling in the shop can be done by either a man or a woman, and a husband and wife can be involved together or at different times, which is good for the business. The buyers purchased maize from local farmers and intermediate buyers, and 60 to 70 percent of their customers were men.

Interviews were also held with maize processors, who form part of the maize value chain, and with small-scale maize processors from Arusha and Kilosa towns. The processors were all men as the researchers were not able to find any women who owned a processing business during the time of the study. The processors obtained supplies directly from farmers and intermediate buyers. The researchers talked to 10 male and 21 female employees of the processing facilities, and found that men and women usually assumed different roles. Male employees were involved in marketing, receiving the grain, dehulling, milling, selling, and transportation. Both women and men respondents said that men usually performed these tasks because they were strong and good at dealing with machines. Moreover, the tasks required a lot of traveling, which was not possible for most women. Women employees were usually involved in cleaning, packing, and selling the grain. As noted by one of the male processors: “Women are trustworthy, and good at weighing and grading”. The final, processed products were taken to consumers, as well as to wholesalers and retailers.

iv. Decision-making in maize/crop production, marketing and sales

Decisions about allocating plots to growing crops were most commonly made jointly by spouses (in 43 percent of households in the northern and 46 percent of households in the eastern zone), followed by men as the sole decision-maker (35 percent in the northern and 36 percent in the eastern zone) and finally, in a few cases, single or married women (6 percent in the eastern and 12 percent northern zones) were the sole decision-makers regarding the allocation of land to crops (Table 7). These findings from the survey are also borne out by the findings from the FGDs. As reported in the FGDs, couples that are amicable discuss and reach a mutual agreement, as reported by James from Muungano: “The decision regarding the allocation of land to crops can also be made jointly by husband and wife”. However, sometimes the husband decides how much land can be allocated to grow crops, but “sells” the idea to his wife, who can advise him before a decision is reached together. In other cases, though, the husband is the sole decision-maker. As noted by Salima from Bashay: “The husband decides about all the planting issues, with little consultation with his wife”. In extreme cases, the opposite becomes the case, as reported by Theresia from Changarawe: “If the husband is a drunkard, the wife can decide”. The above findings show a variety of responses to the question of how households decide to allocate land for crop production, including maize.

Decision-making about the sale of maize was also gendered within households. The results from the FGDs showed that there were differences between zones in the capacities of men and

women involved in maize marketing, with married women in the eastern zone having more input into decisions about maize sales than those in the northern zone. In all the male FGDs in the northern zone, men reported that the decision about whether or not to sell maize and about how much maize to sell was made jointly by husbands and wives. In the female FGDs, however, the results were different: in Kilimatambo and Bashay, the women said that the decision was made by the husband in consultation with the wife, although the husband had the final say; in Changarawe, women reported that the decision was made solely by the husband. As reported by Ziada, a woman from Changarawe:

I cannot sell maize on my own, my husband is the one who decides whether we should sell maize or not, it is not something that I do on my own.
(FGD, Changarawe, 16 May 2016)

These findings show that women in the northern zone see their husbands as the decision-maker who decides when and how much maize should be sold, even though they might be able to give their opinion. Moreover, in all three villages, it is men who negotiate with the trader on the selling price. In most cases, men are also the main transporters of maize to the market. Male FGD participants in the northern zone reported that women were heavily involved in household chores and child-rearing. Men believed women’s lack of knowledge about marketing and measurements limited women farmers’ access to markets. Women farmers in the same zone instead gave the following reasons for their limited access to markets: patriarchy in the household – husbands wanting to oversee household management and financial matters at home – and fear of being robbed of the sale money on the journey.

In contrast, in Muungano and Msimba villages in the eastern zone, although not in Mandela village, husbands and wives decide together whether to sell maize or not. The household needs are identified by both, so to solve a problem, there needs to be negotiation. Joint decisions are made on how much maize needs to be sold and on who negotiates the price. As noted by Salome from Muungano:

Here the women have been liberated and cannot just let the man decide on his own or sell crops without consulting us.
(FGD, Muungano, 2 May 2016)

In the third eastern zone village of Mandela, however, it was noted by women in FGDs that men may sell several bags of harvested maize and use the income without consulting their wives, as it is men who decide on the sale of maize. In addition, women in Mandela were obliged to work in the jointly- or husband-owned plots before cultivating their own separate plots, with crops such as cowpeas, and thus have little time to spare. In the eastern zone, both men and women transport maize, except for Mandela village, where it is transported by men.

With regards to decision-making, regardless of gender, all the traders except one man reported that the decision about how to spend the money from sales was made jointly with their spouse.

	Plot owner/decision-maker						ANOVA		
	Man	Married woman	Single woman	Joint (spouses)	Other household member	Other	Total	F value	p-value
Plots owned (%)	40.08 (305)	7.75 (59)	9.72 (74)	40.21 (306)	1.18 (9)	1.05 (8)	100.00 (761)	7.10	0.0167*
Plots owned in the northern zone villages (%)	37.65 (122)	11.11 (36)	9.26 (30)	40.74 (132)	0.93 (3)	0.31 (1)	100.00 (324)	7.07	0.0169*
Plots owned in eastern zone villages (%)	41.88 (183)	5.26 (23)	10.07 (44)	39.82 (174)	1.37 (6)	1.60 (7)	100.00 (437)	9.88	0.0073*
Plot decision-maker (%)	35.74 (272)	8.54 (65)	9.33 (71)	44.68 (340)	1.18 (9)	0.53 (4)	100.00 (761)	3.54	0.0776
Plot decision-maker in the northern zone villages (%)	35.19 (114)	12.04 (39)	8.33 (27)	42.59 (138)	1.54 (5)	0.31 (1)	100.00 (324)	11.15	0.0054*
Plot decision-maker in eastern zone villages (%)	36.16 (158)	5.95 (26)	10.07 (44)	46.22 (202)	0.92 (4)	0.69 (3)	100.00 (437)	11.17	0.0054*

ANOVA: analysis of variance.

Note: The northern zone villages are Bashay, Changarawe and Kilimatambo, and the villages in the eastern zone are Mandela, Muungano and Msimba.

Note: Figures in parentheses are frequencies.

*Significant at the 5% level.

Table 7 Plot owners & decision-makers (%)

The research team also interviewed two women and four men maize retailers who were based in Karatu central market (northern zone) and Kilosa central market (eastern zone). Most men retailers said that they made joint decisions with their wives with respect to the operation of the business. The women retailers reported that they owned the business, and that their husbands were involved in a different business. However, they still did not have the authority to make decisions regarding business operations or to control the income from the business. As noted by one woman retailer:

Ownership of the business does not necessarily translate to greater decision-making power or greater control over income from the business.

(KII, Bashay, 11 April 2016)

This shows that men exercise significant authority in the business of selling maize since they are the final decision makers with regards to business operations, making it harder for women to establish themselves.

v. Ownership of resources for maize/crop marketing and sales

Our analysis revealed that across all the villages about 40 percent of plots were owned jointly by husbands and wives, 40 percent by men only, 10 percent by single women, 8 percent by married women, and 2 percent by other household members (widowers or widows, among others) (Table 7). FGD data from the qualitative study show that in both zones farmland is acquired through inheritance, village allocation, purchase, and lease. In Changarawe, some families owned land that was allocated to them in 1974, when each household was given a minimum of three acres. In Muungano, some families owned land allocated to them by the village authority in 1992, when each household was allocated a minimum of two acres. Both men and women can inherit land from their parents. A household can buy land from another household or individual by arrangement between the seller and the village office. In most cases, a title deed or customary letter issued by the village head bears the name of the husband. However, if a woman inherits land from her parents, then the land will bear her name, although both she and her husband may use it. In both zones, the FGDs research par-

ticipants reported that there are customary rights, whereby the land has demarcations, and official village documents are used to identify owners. According to research participants in both zones, very few people hold title deeds issued by the central government. For the farmers who have title deeds, the land is usually in the husband's name.

Land is an important asset and its usage in farming is, in both zones, gendered. Husbands and wives almost always grow their crops on the same plot. However, sometimes the woman has a separate plot to grow cowpeas, green peas, and vegetables for household consumption. Women can also earn cash from selling dry green peas. If the husband has several wives, each wife must ensure that the food security of her household is secured, and she may cultivate a separate plot.

Access to financial resources also differ by gender. The six male agro-dealers interviewed had started their business using money from savings made from other activities, such as keeping livestock or selling harvested rice from their farms. The two female agro-dealers had started and/or expanded their business with the help of loans. As noted by Halima: "I started my business after getting a loan from my brother". Joan, a widow, said:

I inherited my business from my late husband. Since the business was small, and I wanted to grow it, I decided to take a loan from the National Microfinance Bank.

(KII, Morogoro, 10 May 2016)

With regard to sources of capital and means of transportation of goods, all six interviewed buyers and traders (five men and one woman) reported that they owned their business jointly with their spouse. All reported that savings were their initial source of capital, acquired through various means. Two male respondents had generated additional capital for the business through bank loans. The woman trader mentioned financial obstacles to expanding her business:

Farming is one major source of my finance, but this itself is insufficient for me to run my business successfully and thus I rely on my husband for additional financial support, using revenue generated from his business.

(KII, Arusha, 14 April 2016)

Access to transport is essential when purchasing grain from farmers or brokers, or when transporting it for sale to large export buyers or processors. The five male respondents owned their own vehicle. The woman trader did not have her own vehicle: she hired a motorcycle or other vehicle to transport the grain when she had more than five bags to sell. The above findings show that as agro-dealers, buyers, and traders, women are at a comparative disadvantage because of a lack of capital for expansion and even for the daily running of the business.

Conclusion

Our study shows that the maize value chain is gendered. The participation of women within the value chain is heavily concentrated at the points of the chain where few resources are required

to carry out the necessary activities. Women are involved in most of the activities related to the production of maize but are prevented from taking part in the higher nodes of the maize chain by their lack of assets and their triple roles – cooking and childcare, farming, and community work. Women's activities are limited to land preparation and planting, weeding, harvesting, and threshing. However, the participation of adult children and women in maize production and post-production is higher in FHHs than MHHs. Development actors and the government should therefore find ways to help FHHs increase their capacity to participate in the value chain as they have less available labor and resources. Social norms clearly play a role in determining the choices women make and the actions they take.

Our findings show that a patriarchal societal structure is dominant in the study areas: there is a set of social relations based on financial advantage, which enables men to have power over women (Stacey 1993; Aina 1998). As shown in our study, in this system there are clearly defined gender roles, due to which, for instance, women participate in domestic work and men do not.

The role of women and the effects of gender inequality have been explored in the literature on land access throughout Africa (Drimie 2002; Zuka 2015). An interesting finding of our study is that even though men mainly have control of the land, in some villages in the eastern zone, such as Muungano and Msimba, control of land does not necessarily translate into men having total decision-making power over the sale of maize. This finding could be interpreted as women in these villages exhibiting some elements of "power within" – a transformation of individual consciousness that leads to self-confidence in the ability to act (Rowlands 1997). Feminist theory has long considered "power within" to be a critical element of empowerment and the critical consciousness that makes individuals aware of their ability to make their own life choices. Still, many women farmers, especially those in the northern zone of the country, operate in a strongly patriarchal system. Further studies are needed for a deeper understanding of gendered beliefs in the two zones, and to expand upon the reasons why women in the eastern zone are better able to participate in maize markets than those in the northern zone.

Findings from the regression analysis, again, show that FHHs are in a disadvantageous position when it comes to selling maize and that MHHs tend to sell more maize than FHHs. To address the issue of women farmers not benefitting equitably from their participation in the maize value chain, we recommend a partnership approach between farmers' organizations and entities such as the NARS, NGOs, and institutions that focus on rural finance, among others. In partnering with farmer's organizations, these entities can address the bottlenecks faced by women, men, and young farmers as they participate in the maize value chain. The achievements made by some Agricultural Innovation Platforms (AIPs) in Rwanda provide a good example of how women and men can farm together, access extension services, improved varieties of seeds, and other agricultural inputs, and produce good harvests (Adam et al. 2018). The Rwanda AIPs are effective in linking smallholders to markets and sharing benefits equally. Studies by Barham and Chitemi (2009) and Majurin (2012)

have also shown that cooperatives can raise members' productivity and increase their social inclusion through the provision of services such as access to credit, technical assistance, and agricultural inputs. If cooperatives are well-structured and well-governed, the opportunity of cooperative membership would thus be beneficial to women.

As we move up the value chain from maize cultivation, we see fewer and fewer women taking part in the higher nodes of the chain. In the agro-dealer node, while men can start and expand their business through money saved from other economic activities, women have to seek loans to start or expand their business. As both men and women play an increasingly important role as agro-dealers in supplying inputs to small-scale farmers, encouraging and training women entrepreneurs to own and run agro-dealerships can increase the access to and availability of inputs for farmers in remote rural areas. This could especially benefit women farmers who due to social norms may prefer to interact with female agro-dealers (IFC 2016).

The power and authority of men in the maize value chain is also seen in the higher nodes of the chain, specifically in buying and trading, processing, and retailing. Men have more power than women in terms of decision-making and financial matters. Men's dominance in the higher value chain nodes can, again, be explained as mainly due to patriarchal norms. Kandiyoti (1988) explains the here relevant concept of the "patriarchal bargain". Kandiyoti argues that women operate within a set of specific constraints, which calls for different strategies to maximize their security and optimize their life options, with varying potential for active or passive resistance in the face of oppression. Our study shows that women in the post-production part of the value chain are cognizant of the societal structure in which they operate. In order to increase the participation of women in the higher nodes of the value chain, we thus suggest gender transformative and gender mainstreaming approaches.

Gender mainstreaming approaches (GMAs) provide a possible solution for dealing with the visible gap in gender equity in the maize value chain. GMAs involve training women and men on better farming methods in order to produce greater maize yields; provide all farmers, but especially women, with the micro-credit or grants needed to purchase farm inputs, such as improved varieties of maize seeds, fertilizer, and pesticides; and provide access to the capital needed to start an agro-dealer, trader/buyer, retailing, or processing business. Gender transformative approaches (GTAs) address the gendered social norms and barriers that prevent women from benefitting from and increasing their participation in the value chain. A possible solution would be to merge technical training and social messages.

Finally, we recognize that one limitation of our study is its partial reliance on aggregated household-level data. We suggest future studies examine the gender dimensions of markets and value chains of agricultural commodities based on intra-household, gender-disaggregated data, at plot level if possible. This is in line with the recognition that gender differences are most apparent in the complexities of intra-household relations, participation roles, resource distribution, and decision-making.

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Availability of data

The authors confirm that the data supporting the findings of this study are available within the article.

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