

WORKING PAPER

**Beyond maize production: Gender relations along the maize value chain in  
Tanzania**

Rahma I. Adam<sup>1</sup>, Frank Mmbando<sup>2</sup>, Osmund Lupindu<sup>3</sup>, Rose M. Ubwe<sup>2</sup> and Pauline Muindi<sup>1</sup>

<sup>1</sup>International Maize and Wheat Improvement Center (CIMMYT), c/o The World Agroforestry Center, ICRAF House, United Nations Avenue, Gigiri, P.O. Box 1041, Nairobi 0062, Kenya  
Email addresses: R.Adam@cgiar.org and pmuindi@outlook.com

<sup>2</sup>Selian Agricultural Research Institute (SARI), P.O. Box 6024, Arusha, Tanzania  
Email addresses: fmmband@gmail.com and roseubwe@yahoo.com

<sup>3</sup>Ilonga Agricultural Research Institute, Private Bag, Kilosa, Morogoro, Tanzania  
Email address: osmund5050@gmail.com

*Correspondence Address:* Rahma I. Adam, International Maize and Wheat Improvement Center (CIMMYT), c/o The World Agroforestry Center, ICRAF House, United Nations Avenue, Gigiri, P.O. Box 1041, Nairobi 0062, Kenya. Email: R.Adam@cgiar.org

## Abstract

The maize-legume system has been identified as a potential solution to the problems of how to increase food security and improve soil fertility in Tanzania. This study used the following strategies to understand gender relations in the maize value chain in Tanzania: (i) a structured household survey; (ii) semi-structured key informant interviews with participants of the value chain; and (iii) sex-disaggregated focus-group discussions with smallholder farmers. The findings reveal that from production to processing, gendered patterns of behavior and resource distribution exist. Compared to male-headed households, female-headed households generally use less improved seed, produce less maize, rely more on child and adult female labor for maize production, and have less land. In the Coastal Zone of Tanzania, women participate in decision-making with regard to selling maize, and thus benefit from their labor, which is not the case for parts of the Northern Zone. Gender-based constraints should be isolated from general barriers to address gendered implications for the expansion of maize and the participation of women across all the nodes of the value chain.

**Key words:** Tanzania; gender relations; maize value chain; food security

## 1. Introduction

Government statistics note that nearly 70% 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, accounting for a third of caloric intake<sup>1</sup> (Minot, 2010). In the last five decades, Tanzania has been among the 25-top maize-producing countries in the world, ranking 4<sup>th</sup> in Africa (FAOSTAT, 2014), and 19<sup>th</sup> in the world<sup>2</sup>. In 2017 Tanzania produced over half a billion metric tons of maize<sup>3</sup>, 85% of which was grown by smallholder

farmers (Suleiman and Rosentrater, 2015). Value chains offer opportunities for development and for improving the competitiveness of smallholder activities (Kolavalli et al., 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. However, much less attention has been paid in these interventions to the impact of traditional gender roles, especially in the production of and access to markets for agricultural products.

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, Agri-ProFocus and IIRR, 2012). However, women's rights, the benefits they derive from participation, and their contribution, are not always recognized (Jeckoniah et al., 2012). Women's low level of participation in the marketing of crops in some patriarchal societies in the developing world has been documented (Agarwal, 1997; Doss, 2001 and Lastarria-Cornhiel, 2008). The existing gender-inequality in agricultural production affects economic development and benefits, especially for women (KIT, Agri-ProFocus and IIRR, 2012). Recently, value-chain development has been used as a key approach in increasing the income of small and medium producers and the economically-active poor. Thus, an understanding of gender relations in maize value-chain development is essential. Moreover, there is a dearth of literature about gender relations in maize value chains. This article attempts to expand the slim body of existing literature, and uses a gendered approach to value-chain analysis to examine the participation and

involvement of men, women and children, from the production to the selling and processing of maize.

## **2. Methods**

### **2.1 Conceptual Framework**

To analyze gender issues along the maize value chain, we used Gender Dimensions Framework (GDF), developed by Rubin and Barret (2009). The framework was used by Me-Nsope and Larkins (2016), when carrying out their analysis of gender relations along the pigeon value chains in Malawi. The framework has also been reported in Njuki et al., 2011. GDF allows for the classification of gender issues at each node of the chain under four dimensions of thematic areas: (i) access to and control over key productive assets; (ii) practices and participation; (iii) beliefs and perceptions; (iv) laws, legal rights, policies and institutions. These dimensions were used to design the questions tackled in this study by respondents.

The first dimension describes the social relationships that shape the distribution of resources necessary to be a fully active and productive participant in 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). The broad sociocultural context and intra-household rules and dynamics determine who within a household has access to which resources, and control over their use (Meinzen-Dick et al., 2011). Ownership of assets has huge 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 include the following: What are the resources – types of labor, capital, land size, etc. – needed to participate in the maize value chain?

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 men and women, and to determine the implications and rewards for participation in the value chain (Rubin and Barret, 2009). The questions that are examined in this dimension include the following: Who is involved in what activities? Why? What are the barriers that prevent men or women from playing a particular role?

The third dimension looks at how beliefs and perceptions shape gender identities and behavior, and how men, women, boys and girls conduct their daily lives (Rubin, 2011). This dimension details who knows what and how and describes how these domains of knowledge may differ by gender. Cultural belief systems prescribe gender identities and behavior, define roles for men women, boys and girls, and dictate how they go about their daily lives (Rubin and Barret, 2009).

The fourth dimension examines how gender affects the way people are regarded and treated by both customary law and the formal legal code and judicial system. Gender may affect rights to ownership and inheritance of, for example, land; obtaining legal documents such as identity cards and property titles; voter registration; reproductive choice; representation and due process (Rubin and Barret, 2009).

Power – a theme that runs through all four 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.

## 2.2 Data Collection

The study employed a mixed-methods approach, integrating both qualitative and quantitative methods, including (i) a structured household survey of smallholder women and men farmers who grew maize; (ii) semi-structured, key informant interviews (KIIs) with participants of the maize value chain – maize breeders, agro-dealers, retailers, processors, local buyers and traders; and (iii) sex-disaggregated focus-group discussions (FGDs) with smallholder farmers of both sexes. The main reason for the mixed-method approach was the fact that only farmers were captured in the household survey, and other actors in the maize value chain were ignored. In addition, the sex-disaggregated FGDs allowed us to gain a deeper understanding of the gender relations along the chain.

The dataset of the 2013 International Maize and Wheat Improvement Center (CIMMYT) Adoption Pathways households survey provided quantitative data for 551 households. The survey targeted two maize-legume based farming systems in the Coastal and Northern Zones of Tanzania: Kilosa, Mvomero and Gairo, (in Morogoro region) in the Coastal Zone; and Mbulu (part of Manyara region) and Karatu (Arusha region) districts in the Northern Zone.

A combination of purposive and stratified sampling methods was used to select the districts. As the project focus was on maize-based farming systems, maize production was used as an important criterion to select districts, wards and villages. A total of 39 wards were sampled. Through a multi-stage random sampling procedure in each district, wards were selected with probability proportional to size, and the number of villages selected with probability proportional to size was 60. In every selected village, probability proportional to size sampling was used to identify the households that were interviewed. We used the survey to investigate differences in socio-economic conditions, labor participation, and adoption of improved seed between male-

headed households (MHHs) and female-headed households (FHHs). It was not possible to do a plot-level analysis of data in the regions under study, because in most cases a husband and a wife farmed together/shared farming plots.

Because of budget constraints, both the KIIs and the sex-disaggregated FGDs were carried out in only six villages in March-June 2016. The first three villages were in Mbulu district: Kilimatembo, Bashay and Changarawe, and the last three villages were in Kilosa district: Mandela, Muungano and Msimba (Figure 1). The Selian Agricultural Research Institute (SARI) 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, 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 actors: maize breeders from NARS (2); agro-dealers/input suppliers (8); retailers (6), local buyers and traders (6) and processors (3) Purposive sampling was used to identify the interviewees.

[Table 1 near here]

We conducted a total of 12 FGDs in six villages, and separate FGDs were held with men and women maize growers. On average, each FGD had 9 to 11 participants, bringing the number of total FGD participants to 72 women and 62 men. The FGD respondents were selected by extension staff and local village leaders and had to be aged between 18 and 70. A balance was made to ensure that there were married, widowed and divorced people, and people of varied socio-economic status: a household was considered poor if (i) their house roof was made of grass and the walls of mud, and (ii) if the household did not own any cattle. A household was

considered well off if (i) the house roof was made of iron sheets and the walls of bricks, and (ii) the farmer owned cattle. The FGDs included questions on seed sources, cultivation practices, decision making, 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 full, 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 in 2016.

### 2.3 Data Analysis

We first coded the household survey data in Excel and then transferred to a STATA package for statistical analysis. We also coded the KIIs and the sex-disaggregated FGD data recorded in the field notebooks for textual analysis, to draw together themes that correlated with the questions posed. We used Nvivo software to analyze the qualitative data collected. Qualitative data from KIIs and FGDs were transcribed and coded for textual analysis following the procedures outlined by Creswell (2007). To protect the respondents' anonymity, all study participant names were replaced with pseudonyms.

## 3. Results

### 3.1 Socio-Economic Characteristics of the Study Area

#### 3.1.1 Household Demographic Characteristics

The Adoption Pathways dataset of 2013 shows that the majority of households (86%) were MHHs (Table 2). The majority of household heads in both MHHs and FHHs were between the ages of 41 and 60 years. The average level of formal education of the household heads was five years, although on average, heads of MHHs were more educated than heads of FHHs. In total, the majority reported farming as their main occupation (95.1%), followed by other (2.4%), salaried employment (1.8%) and self-employed, off farm (0.7%). Almost 85% of household



heads were married, 1.3% never married, 4.9% divorced/separated, and 8.9% widowed. As expected, MHHs had the highest percentage of married couples (95.3%) compared to FHHs (21.8%). The largest percentage of divorcees and widows came from FHHs. The average size of the surveyed households was six, but three when converted into adult equivalents. FHHs had fewer household members (adult equivalents) than MHHs (2.8 compared with 3.2). FHHs had on average a smaller land size (3.7 acres) than MHHs (6.5 acres). The total amount of maize harvested was higher for MHHs (612.17 kgs/acre) than for FHHs (462.84 kgs/acre).

[Table 2 near here]

### 3.1.2 Cultural Norms, Land Ownership, Crop Production and Management Decisions

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 own land that was allocated to them in 1974, when each household was given a minimum of three acres. In Muungano, some families own land allocated to them by the village authority in 1992, when each household was allocated a minimum of two acres. A man or woman can inherit land from their parents. A household can buy land from another household or individual by arrangement between a seller and the village office. It is usually the husband who owns the land, which bears his name if there is a title deed or customary letter from the village head. 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. There are customary rights and user rights, whereby the land has demarcations, and official village documents are used to identify owners. Very few people hold title deeds issued by Central Government. For the farmers who have title deeds, the land is usually in the name of the husband.

The decision about how much land can be allocated to each crop is usually made by the husband. As noted by Salima from Bashay, *'The husband decides about all the planting issues,*

*with little consultation with his wife.*’ However, as noted by Theresia from Changarawe, ‘If the husband is a drunkard, the wife can decide.’ On the other hand, couples that are amicable discuss and reach a mutual agreement, as reported by James from Muungano: ‘*The decision 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 they agree together.

In both zones, a husband and wife 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, a wife must ensure that the food security of her household is well secured and may cultivate a separate plot. Farmland is cultivated with a variety of crops: the main cereals grown are maize and sorghum, and the main legumes are pigeon peas and cowpeas. Other crops grown in the region are sunflowers, barley, finger millet, sesame, green grams, *dolichos lablab*, sorghum, tomatoes, cassava and sweet potatoes. Maize is grown for household consumption and the surplus is sold.

### 3.2 Gendered Participation and Gender Roles along the Maize Value Chain in Tanzania

Figure 2 presents a sketch map of the maize value chain in Tanzania that details the points of access and nodes of activity for men and women. Input suppliers include all actors involved in supplying crop-related inputs to the farmers, e.g. seeds, fertilizers, pesticides and herbicides, among others. Farmers usually sell their maize to local brokers/rural assemblers, who then sell it to small or large traders (e.g. for export trading). Traders sell the maize to wholesalers and processors; wholesalers sell to retailers, who then sell the maize to consumers.

### 3.3 Agro-dealers/Input Suppliers

The researchers interviewed six men and two women agro-dealers. The main farm inputs sold by agro-dealers were fertilizers, seeds, agro-chemicals, livestock inputs, sprayers, gumboots and irrigation equipment. Most customers were farmers or small seed retailers from different villages. According to the agro-dealers, about three-quarters of customers for improved maize varieties were men. Seed was usually paid for in cash; only in very rare circumstances would credit be given. According to Thomas the agro-dealer, *‘Women prefer to buy OPV seeds than hybrids, because they are lower-priced, but they may decide to purchase a few hybrid or improved seeds for their high-yielding qualities.’*

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. Men and women shop owners were heavily involved in purchasing and ordering. Women working in agro-dealer shops were involved in all the activities except purchasing, which was done by the shop owner, and off-loading cargo, which was usually done by casual laborers. 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. Two females and two male respondents replied that anyone was suited for any of the jobs. As Salome answered, *‘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.’* However, two male agro-dealer shop owners believed differently, as well put 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.’* Two male respondents thought that men were better-suited to any of the jobs in the agro-dealer industry. Three reasons were given: men had

sufficient knowledge 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 big loads. The six male agro-dealers had started their businesses using money gained from savings made from other activities, e.g. livestock keeping or selling harvested rice from their farms. The two female agro-dealers had started and/or expanded their businesses with the help of loans. As noted by Halima, ‘I started my business after getting loan from my brother.’ Joan, a widow, said the following, ‘*I inherited my business from my husband, since it was small, and I wanted to grow it I decided to take a loan from the National Microfinance Bank.*’

### 3.4 Production of Maize by Farmers

#### 3.4.1 Maize Seed Acquisition and Access

The 2013 household survey showed that about 98% of the households had grown maize during the survey reference period. Several improved maize varieties are grown by farmers in Tanzania, both hybrids and open-pollinated varieties (OPVs). About 31% of the households sampled had adopted improved OPVs, while almost 28% had adopted improved hybrid maize varieties (Table 3). A difference in the adoption of improved hybrid maize varieties was observed between MHHs, (29%) and FHHs, (19%), although the results were not significant. Moreover, more MHHs adopted OPVs (31.5%) compared to FHHs (29.5%), although again the difference was not significant.

[Table 3 near here]

The prohibitive cost of improved varieties of maize seed often compels farmers to recycle their own local seed saved from the harvest. The data from the survey show that, regardless of the gender of the household heads, both MHHs and FHHs mostly tended to use a greater quantity of their owned saved seed than of bought seed (see Table 4). However, overall MHHs tended to purchase more maize seed than FHHs (10.6 kg/household compared to 4.2kg/household). FHHs tended to use non-purchased seed more than MHHs (12.7kg/household compared to

17.5kg/household). The findings from the household survey are also supported by the response from the interviews with agro-dealers. All the agro-dealers in the surveyed area reported 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 as regards 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 not have been sufficient; and (iv) the price of seed was too high for women farmers to afford.

[Table 4 near here]

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, research institutes, particularly ARI-Ilonga, and farmers' associations, and occasionally through government subsidies. Seed was also gifted by relatives, neighbors or friends. Both men and women paid cash for seed in nearly all the villages, but in some villages in Morogoro region, particularly Muungano and Msimba, both male and female farmers were able to acquire local seed by working for it on another farm, and in kind in Msimba village only. As reported by Samuel from Muungano, *'It is usually us men who work for other farmers and in return we get local maize seed to grow.'* Furthermore, as noted by Maria in the same village, *'...us women, we give credit seeds to each other.'*

It is worth mentioning that the use of recycled seed has very little to do with lack of availability of improved seed. As reported in the FGDs, very few farmers, particularly the ones from Msimba, noted that improved varieties were not available when needed. Farmers use recycled seed primarily because there are very few agro-dealers at village level. Most are concentrated in town centers where few farmers, particularly women, can go to buy improved seed; this has implications for yield.

Seed quality was the main problem noted by farmers with regard to bought seed. Farmers expressed the following concerns: (i) poor germination, (ii) poor yield, and (iii) incorrectly-labelled packaging. As expressed by Johari from Bashay, ‘Many *agro-dealers are untrustworthy, and some sell grain obtained from farmers.*’ In addition, sometimes a specific variety, e.g. Staha, is unavailable.

However, the two interviewed NARS breeders from Tanzania reported that they ensured that the varieties they released were the ones best suited for farmers’ needs. Breeders do their best to discover men’s and women’s preferences when choosing varieties, by conducting participatory varietal selection and seed promotion. 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.*’ The breeders saw the challenges faced in the seed system as the following: (i) state-released varieties were rarely promoted by private seed companies; (ii) there was a conflict of interest between the Agricultural Seed Agency (ASA) and seed companies; (iii) there was no policy to support seed companies’ varieties; and (iv) lack of funding. To address these challenges, they suggested the formulation of a relevant policy that would support the released varieties of NARS and seed companies, and investment in the program by development donors. A summarized table of the challenges faced by farmers in the maize seed systems in Tanzania can be found in Table 5.

[Table 5 near here]

#### 3.4.2 Gendered Division of Labor in Maize Production

The following activities are involved in maize production: seed storage; land preparation and planting; disease and pest control; weeding; harvesting; threshing; storage; transportation; marketing; and cooking.

*Seed storage:* 67% of FGD respondents reported that only adult females participated in this activity, while 33% stated that both adult males and females were involved.

*Land preparation and planting:* Table 6 shows that regardless of the gender of the household head, most land preparation and planting activities are done by the family (80.6% for MHHs and 81.3% for FHHs). In MHHs, these activities are primarily done by adult males (35.3%), followed by adult females (32.8%) and children (12.5%). Hired labor constituted 19.3% for MHHs. In FHHs, adult females are the main participants (38.6%), followed by adult males (25.8%) and children (16.9%). Hired labor constituted 18.6% for the FHHs. Overall, there is no statistically-significant difference between MHHs and FHHs in this activity; though participation by adult males is greater in MHHs than in FHHs, while participation by adult females and children is greater in FHHs.

[Table 6 near here]

*Disease and pest control:* During FGDs, the farmers reported that only men were involved in this activity. Women were excluded because respondents believed that chemicals were dangerous, and if women sprayed their farms, this might affect their reproductive capability.

*Weeding:* Table 6 shows that regardless of the gender of the household head, most weeding activities are done by the family (75.5% in MHHs and 81.8% in FHHs). In MHHs, 36.6% of adult females carry out this activity, followed by adult males (27.8%) and children (10.5%). Hired labor constituted 24.8% for MHHs. In FHHs, 49.2% of adult females take part in weeding, followed by males (37.1%) and children (11.1%). Hired labor constituted 24.8% for the FHHs. Overall, the results show a statistically-significant difference between MHHs and FHHs in this activity for female labor participation, for it being higher in FHHs than in MHHs.

*Harvesting:* Table 6 shows that regardless of the gender of the household head, most harvesting activities are done by the family (84% for MHHs and 69.4% for FHHs). In MHHs, 28.7% of adult males carry out this activity, followed by adult females (28.7%) and children

(12.1%). Hired labor for MHHs constituted 30.6%. In FHHs, adult children take the lead (30.4%), followed by females (28.9%), adult males (24.7%), and hired labor (16.0%). Hired labor constituted 16% for FHHs. Overall, the results show a statistically-significant difference between MHHs and FHHs in this activity, with family labor and children participation being higher for FHHs than MHHs and hired labor being higher for MHHs than FHHs.

*Threshing:* Regardless of the gender of the household head, most threshing activities are done by the family (83.3% in MHHs and 90.8% in FHHs). In MHHs, 33.3% of these activities are done by adult males, adult females also cover 33.3 % and children (16.7%). Hired labor for MHHs constituted 13.6%. In FHHs, adult females take the lead (42.5%), followed by children (27.6%), and adult males (20.7%). Hired labor for FHHs constituted 9.2%. Overall, the results show a statistically-significant difference between MHHs and FHHs in this activity, with children participation levels being higher for FHHs than MHHs and adult males' participation being higher for MHHs than for FHHs.

*Storage:* In the FGDs, the farmers reported that both adult males and females were involved in this activity, as there were both heavy and light tasks. Men were mostly involved in arranging bags, while taking care of bags in the store was women's responsibility.

*Transportation:* In the FGDs, about 90% of respondents reported that adult males, adult females, children and hired laborers were involved, while 10% said that only adult males were involved. The participants reported that men supervised transportation from farms, while hired labor carried the goods.

*Marketing:* In the FGDs, 42% of respondents reported that marketing was done by adult males and females; 33% said that the activity was carried out by males, and 25% reported that marketing was done by females and hired labor.



*Cooking:* All the FGDs participants agreed that cooking was done by women.

To summarize, the level of participation by children and adult females in the production of maize is higher in FHHs than in MHHs. Moreover, adult females participation levels in weeding is relatively higher than that of adult males for both MHHs and FHHs.

### 3.5 Gender Disparities in Access to and Participation in Markets

In both zones, maize is mostly sold at the farm gate in the form of dry grains. The main buyers of maize in the market are local consumers, rural intermediate buyers (middlemen) and rural assemblers. Traders usually go to village 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.

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, the husbands or in some cases wives or adult women/men in FHHs are forced to send their maize to Karatu market in order to get the necessary money to address an urgent need. On the other hand, in Msimba, the main buyers of maize are local consumers, mostly women who use maize to make local alcohol. The FGDs revealed that there were differences in the level of participation between married women farmers in the Northern Zone and those in the Coastal Zone. Below we look at these differences.

In the Northern Zone, in all the male FGDs, it was 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, though, the results were as follows: in Kilimatembo 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.*' These findings show that women in the Northern Zone see the husband as the dominant person when deciding 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 the man who negotiates with the trader on the selling price. In most cases, men are the main transporters of maize to market. Male FGD participants in the Northern Zone reported that women were heavily involved in household chores and child bearing; their lack of knowledge about marketing and measurements was the reason that limited women farmers' access to markets. Female farmers in the Northern Zone believed that the following factors limited their access to market: male supremacy in the household – husbands wanted to oversee household management and financial matters at home; and fear of being robbed of the sale money on the journey.

In the three villages in the Coastal Zone, husband and wife decide together about whether to sell maize or not. The household needs are identified by both, so to solve a problem, there needs to be negotiation between them. 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.*' In the Coastal Zone, both men and women transport maize, except for Mandela village, where men transport the maize.

Overall, women and men farmers from both zones reported that limited access to market information, and poor road infrastructure leading to high transaction costs, were challenges to maize marketing that forced the majority of farmers to sell maize at the farm-gate at a low price.

### 3.6 Control over Income

Control over income from maize sales is also gendered. In the Northern Zone, farmers reported that the revenue from maize was controlled by men. As reported by John from Bashay, '*I am in*

*charge of the revenue from sales, because I am the head of the household.'* This revenue is used for household expenditure, although men retain some money for their own spending. Men have greater control over income, which allows them to spend money in a way not pleasing to their wives e.g. for alcohol consumption. However, in the Coastal Zone, we find that joint decisions were made after maize sales on how to use the revenue. Elias from Mandela explained: *'Men take only a small amount for themselves after maize sales, and the rest is usually controlled by women, who are mostly trustworthy and economical.'* In Muungano village, both men and women had control over income, either jointly, or depending on who had harvested his or her plot.

### 3.7 Buyers/Traders and Gender Disparities in Access to Business Capital/Credit

Buyers and traders buy dry maize grain from farmers and brokers to sell to the large export buyers or processors located in urban areas, such as Arusha, Morogoro and Dar-Es-Salaam. There are gender differences when it comes to buying and trading maize. In both zones, there are more men than women involved. Three reasons were given for this: (i) men had always been involved in buying and trading, so had more experience and confidence; (ii) women had to stay at home to care for children, cook, and perform domestic chores; (iii) the work of a trader involved travelling to different areas searching for maize, which was difficult for a woman. The respondents reported that they traded maize depending on local availability, seasonality and demand. Several activities involved in running a business are also gender-segregated. The following are those done mostly by men: purchasing crops (requiring skill and negotiation); collection and loading (heavy-duty activities); transportation (requiring skill), unloading and re-bagging (heavy work always done by men). Sorting and winnowing are mostly done by women. Selling in the shop can be done by either a man or a woman; a husband and a wife can be involved together or at different times selling in the shop, which is good for the business.

All six respondents (five males and one female) reported that they owned their own business jointly with their spouse. All said that their initial source of capital was savings, acquired through various means, e.g. farming, laboring, transporting goods, or working as a crop collector for other farmers. Only two male respondents said that they 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.’* The buyers purchased maize from local farmers and intermediate buyers, and most of their customers, (60% to 70%), were men. All the traders reported that the decision on how to spend money from sales was made jointly with their spouse, with the exception of one male trader. Access to transport is essential when purchasing grain from farmers or brokers, or when transporting it for sale to large export buyers or processors. Four of the six respondents reported that they 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.

### 3.8. Retailers

The research team interviewed four male and two female maize retailers. The retailers were based in Karatu Central Market (Northern Zone) and in Kilosa Central Market (Coastal Zone). Most male retailers reported that they made joint decisions with their wife with respect to the operation of their business. The women retailers interviewed reported that they owned the business while their husbands were involved in another business. However, these women said that they made joint decisions with their husband on what varieties to stock, the price at which to sell and the use of the revenue generated from the business. This was attributed to the man’s position as head of the household. As one-woman retailer put it, *‘Ownership of the business does not necessarily translate to greater decision-making power or greater control over income from*

*the business.*” A summarized table of the challenges faced by maize retailers can be found in Table 7.

[Table 7 about here]

### 3.9 Processors

The research team also interviewed three small-scale maize processors in Arusha and Kilosa towns, who were all men. The processors obtained supplies directly from farmers and intermediate buyers. The employees were men and women, who usually assumed distinct roles. Male employees were involved in marketing, receiving the grain, dehulling, milling, selling and transportation. The 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 travelling around, 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 processors, *‘Women are trustworthy, and good at weighing and grading.’* The final, processed products are taken to consumers, as well as to wholesalers and retailers.

The following are the major challenges in running a processing business: packaging – materials are expensive and not easily available, and printing is done in Nairobi, Kenya; the high number of competitors; difficulty in getting enough customers; high running costs due to frequent machine maintenance; an unreliable electricity supply; expensive road tolls for crops when transporting maize flour; and the amount of paperwork involved when exporting processed products.

## **4. Discussion and Conclusion**

The study revealed that 42.1% of the households use local seed. FHHs lag behind MHHs in the use of hybrid and improved OPV seed. Men still control and own more land than women farmers, and FHHs produce less maize than MHHs. The participation of children and adult females in maize production and post-production is higher in FHHs than MHHs, indicating the

need to find avenues for intervention to help FHHs increase their capacity in participation in the value chain, as they have meager man power and resources. In the Coastal Zone, however, women have started to participate actively in the market, as well as having control of income from the sale of maize. Even though this glimmer of hope is to be applauded, there are still some women farmers who have yet to see the full fruits of their labor, such as those observed in the Northern Zone of Tanzania, who operate in a strong patriarchal system.

In addition to the challenges faced by men and women smallholder farmers, other actors in the maize value chain face their own challenges. While male agro-dealers are able to start and expand their business through savings from other economic activities, women agro-dealers have to seek loans. More men are involved in the buyer/trader node of the value chain than women, because of the nature of the work and the societal gender roles and norms that expect women to take care of children and other household chores. Lack of capital/assets also prevents women from participating in the value chain as traders. In the retail part of the value chain, the women reported that ownership did not mean control of income from the business, or decision-making power with regard to the business, meaning that their husband oversaw their retail business. It is important to recognize the gendered roles played by women in other nodes of the value chain, e.g. agro-dealer shops, buying/trading and processing, and to find ways to maximize the job opportunities that are available for women in these positions.

The government can play a pivotal role by making and implementing policies that ensure that input and output markets are gender friendly and working closely with the private sector to stimulate farmers', and especially women farmers' demand for certified seed. Moreover, the government can create legal, taxation, and other formal and informal systems, e.g. financial markets/loan facilities that facilitate the access to credit and can increase the flow of market information (via Information and Communication Technologies) to reduce information

asymmetries and increase market competitiveness. Transport and other infrastructure systems should be made more accessible and available, to support women and men farmers, agro-dealers, traders, retailers, processors and other business-development providers.

Development agencies and practitioners, researchers, and the private sector have a key role to play in the initial stages of development of farmer organizations (Hellin, Lundy and Meijer, 2009). A case could be made for a partnership approach between farmer organizations and the following entities i.e., national agricultural research system (NARS), non-governmental organizations (NGOs), institutions that focus on rural finance, among others to work together in order to address bottlenecks that women, youth and men farmers face as they participate in the maize value chain. The achievements made by some Agricultural Innovation Platforms in Rwanda on gender and equitable benefit-sharing mechanisms (Adam et al., 2018) provide a good example of how women and men can farm together, access improved varieties of seeds and other agricultural inputs, produce good harvests and be effective in linking smallholders to markets. Another study done by Hellin, Lundy and Meijer (2009) in La Fralesca, a region in the southern Mexican state of Chiapas reported that farmer organizations do not provide clear benefits in terms of farmers accessing maize markets, but that they facilitate farmers' access to agricultural inputs such as credit and seeds. Studies done by Barham and Chitemi (2009) and Majurin (2012) have shown that cooperatives can raise members' productivity and increase their social inclusion through the provision of additional services, such as access to credit, technical assistance, and agricultural inputs. Further studies need to be done to determine whether partnerships of this kind would be beneficial to other actors in the value chain, as well as to women and men farmers. and whether they could bring about positive transformational changes. Farmer organizations have been seen to facilitate gender equity in agriculture, and research should be done to determine whether public and private investment, donor funding and subsidies alone are sufficient and/or are the right mechanisms to sustain these organizations.

## Disclosure statement

Conflict of interest: All authors declared that they have no conflict of interest.

## Data availability statement

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

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## Notes

1. Cassava is second and rice is third, contributing 8% of caloric intake. Wheat and sorghum each represent 4%.

2. <https://www.indexmundi.com/>

3. <https://www.indexmundi.com/>

## Notes on contributors

Rahma Isaack Adam is a Gender and Development Specialist at the International Maize and Wheat Improvement Center (CIMMYT). Adam holds a BA in Biology and minor in Anthropology, a Master of Public Policy and a PhD in Rural Sociology.



Frank Mmbando is a senior researcher at Selian Agricultural Research Institute (SARI), Arusha, Tanzania. Mmbando has BSc in Agriculture, Master's in international agriculture, and PhD in Agricultural Economics.

Osmund Lupindu is a deputy head of socio-economic department at Ilonga Agricultural Research Institute, Morogoro, Tanzania. Lupindu has a BSc in Agricultural Economics and Agribusiness and Masters of Economic Development.

Rose M. Ubwe is a senior researcher at SARI. Ubwe has a BSc in Agriculture and MSc in Tropical Animal Production.

Pauline Muindi is a Gender Research Associate at CIMMYT. Muindi holds BA in Sociology and minor in Political Science and MA in Gender and Development Studies.

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## Tables and Figures

Table 1 Data collection

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

Table 2 Household demographic characteristics

<b>Variable</b>	<b>MHHs (n=473)</b>	<b>FHHs (n=78)</b>	<b>Total (n=551)</b>
<i>Age of HH head (average years)</i>	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	25.0
<i>Education level of HH head (average years)</i>	5.6	4.3	5.4
Education: none (%)	17.5	35.9	20.1
Education: primary education (1-7 yrs) (%)	74.6	61.5	72.8
Education: secondary + (%)	7.8	2.6	7.1
<i>Main occupation of HH head (% of households)</i>			
Agriculture, self-employed, farming	95.3	93.6	95.1
Salaried employment	2.1	0.0	1.8
Self-employed off farm	0.8	0.0	0.7
Others	1.7	6.4	2.4
<i>Marital status of the HH head (% of households)</i>			
Married living with spouse	93.0	12.8	81.7
Married but spouse away	2.3	9.0	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)	6.0	4.6	5.8
Household size (adult equivalent)	3.2	2.8	3.1
Female members (in numbers)	3.0	2.6	2.9
Male members (in numbers)	3.1	2.0	3.0
Members aged 0-17 (in numbers)	3.1	2.0	3.0
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

Table 3 Adoption of improved maize varieties by gender of the household head (% households)

Maize variety	MHHs (N=473)	FHHs (N=78)	Total (N=551)	X <sup>2</sup> -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

Table 4 Maize seeds: non-bought seed (kg/No) (own saved, farmers to farmers exchange, etc), and bought seed, including using credit

Crop grown	N (Households growing crops)			Quantity of non-bought seed (kg/No) (Own saved, farmers to farmers exchange, etc.)			Quantity bought seed including using credit (kg/No)		
	MHH	FHH	Total	Sex of the household head			Sex of the household head		
				Male	Female	Total	Male	Female	Total
Maize	469	72	541	17.5	12.7	16.9	10.6	4.2	9.8

Table 5 Challenges in the maize seed system in Tanzania

Type of constraint	Identification	Implication (s)
	Some of the agro-dealers sell fake seeds with poor germination	Fake seed discourages farmers to invest in improved seed, leading to low yields
Production	In some cases, unavailability of improved maize seed at village level	Men and women farmers end up using recycled seeds, which then lead to low productivity Affects profitability and discourages investment in high-yielding seed varieties among smallholder women and men farmers, leading to low yields and small marketable surpluses
Marketing	High price of improved maize seeds	

Table 6 Farm labor participation by gender of the household head (percent gender contribution)

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 males	35.3	25.8	33.8	1.642	0.101
Land preparation & planting by females	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 males	27.8	20.9	26.9	1.274	0.203
Weeding by females	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 males	28.7	24.7	28.3	0.728	0.467
Harvesting by females	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 males	33.3	20.7	32.3	2.219	0.027
Threshing by females	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

Table 7 Constraints in maize retailing

Type of constraint	Identification	Implication (s)
General constraints	Inadequate capital (but this affects women's entrance into the business much more)	This limits the size, performance, and profitability of the business
Gender-based constraints	Lack of marketing skills such as negotiation power by women retailers	Forced to sell at a low price, reducing the overall profitability of the business



Figure 1: Selected research areas in northern and coastal zones of Tanzania

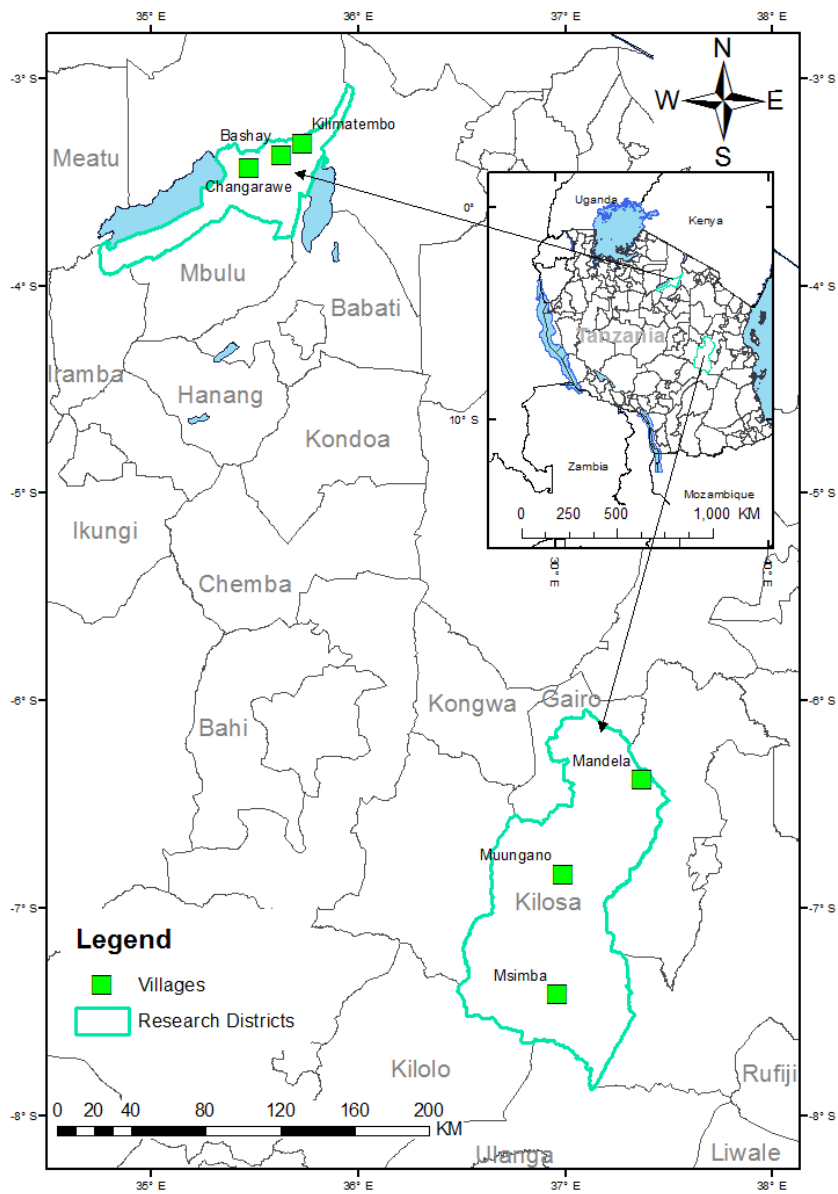


Figure 2: Map of the maize value chain in Tanzania

