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Published online: 28 Apr 2021.

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Marketing Efficiency among Gender-Based Decision-Making Farm Households in Southern Ethiopia

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ABSTRACT

This study examines the effect of gender on marketing efficiency among maize producing households using data collected in the Dawuro zone, southern Ethiopia. Results indicate that the amount of maize assigned to the first ranked (most efficient) channel for male, female and joint decision-making households is significantly larger than that of the second, third, and fourth ranked channels, respectively. Significant results vary across gender categories at the same stage of marketing channel. Female decision-making households receive a lower producer price, as well as cover higher marketing costs and margins of middlemen, as compared to male and joint decision-makers at the same stage of the marketing channel. This study also found a limited financial ability for local institutions to establish maize storages in the study area. There is a need for an integrated agricultural marketing information system that would help female decision-making maize producers to better engage in available market opportunities.

Introduction

Smallholder farmers in sub-Saharan Africa suffer from persistent poverty and food insecurity (Handschuch & Wollni, 2016). The price that farmers receive for their agricultural products can have significant implications for food security, poverty alleviation and the overall agricultural development of region. A basic concern of agricultural development practitioners is related to efficiency in agricultural marketing (Musara, Musemwa, Mutenje, Mushunje, & Pfukwa, 2018). Access to efficient agricultural markets is considered an essential tool for lifting farmers out of poverty and food

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insecurity (Fafchamps, Gabre-Madhin, & Minten, 2005; Handschuch & Wollni, 2016; Panda & Sreekumar, 2012); however, agricultural markets do not work efficiently for smallholder farmers in sub-Saharan Africa (Abate et al., 2015; Amani, 2014; Goletti & Babu, 1994; Jayne, Mangisoni, & Sitko, 2008; Mgale & Yunxian, 2020; World Bank, 2018). Information asymmetry among smallholder farmers, coupled with high transport and search costs affect prices, resulting in inefficiency in agricultural markets (Alene et al., 2008; Jaleta & Gardebroek, 2007; Jayne et al., 2008; World Bank, 2018; Mango et al., 2018).

Smallest and less endowed farmers have not been able to enter agricultural markets in developing countries because of high transaction costs that result from market risks, deficient infrastructure, and little coordination along the value chain (Barrett, 2008; Key, Sadoulet, & de Janvry, 2000; Shiferaw, Obare, & Muricho, 2008). This limit bargaining power and channel choices for these farmers (Omiti, Otieno, Nyanamba, & Mccullough, 2009). Such limitations are found to be especially high for female farmers (Handschuch & Wollni, 2016; Maertens & Swinnen, 2012). As a consequence, women are less beneficiary from modern supply chains in developing countries. Indeed, markets are not always rational, nor optimal, but sometimes heuristic and emotional (Lo, 2004). Market efficiency is dynamic and can change over time (Tran & Leirvik, 2019). By increasing marketable surplus through minimizing losses arising from inefficient storage, processing, and transport; farm households can increase efficiency in their product marketing and hence raise their farm profitability (Crawford, 1997; Das & Prakash, 2002). Increased profitability may in turn help farm households improve their production and marketing in ways that increase land use intensity or make unused land productive, hence expanding the scale of on-farm business enterprise (Courtois & Subervie, 2015; Jensen, 2010).

A farm household's decisions that influence producing more, selling more, and receiving higher prices for their agricultural produce depend on the socially constructed relationship between men and women within the household (Smith, Usha, Aida, Lawrence, & Reynaldo, 2003; The Food and Agriculture Organization (FAO), 2011; Asian Development Bank, 2013; Nijuki, Parkins, Kaler, & Ahmed, 2016; Gebre, Isoda, Amekawa, Nomura, & Watanabe, 2021). That is, men's and women's roles in agricultural activities are determined through communication and negotiations between men and women within the household, and the allotted gender roles vary widely between local contexts as well as among households (Swiss Agency for Development and Cooperation (SDC),), 2015; United Nations Conference on Trade and Development (UNCTD), 2015; Gebre, Isoda, Rahut, Amekawa, & Nomura, 2020). One frequent distinction made in the literature on gender and agriculture is that cash crops are men's while

subsistence food crops are women's (e.g. Doss, 2002; The Food and Agriculture Organization (FAO), 2011; Quisumbing et al., 2014; Swiss Agency for Development and Cooperation (SDC), 2015; Handschuch & Wollni, 2016; Nijuki et al., 2016). This distinction may represent a common perception in the development arena, too, yet this may risk oversimplifying the reality. Women in parts of sub-Saharan Africa are as active as men in cash crop production; gender disparities could lie more in the amount of produce sold to the market and the degree of control over income from marketing than in the gender division of crop cultivation (United Nations Conference on Trade and Development (UNCTD), 2015; Eerdewijk & Danielsen, 2015). Meanwhile, men may take overproduction of a traditional crop which primarily women cultivated previously when it becomes financially lucrative to do so (The World Bank, Food & Agriculture Organization, & International Fund for Agricultural Development, 2009). The classification of crops as men's and women's has implications on the investment dedicated to the crop. For example, analysis by Swiss Agency for Development and Cooperation (SDC) (2015) in Zimbabwe indicated that classification of crops as men's and women's determine size of land under cultivation, quality of seed, fertilizers, labor and even attention given to the crop. As per SDC findings, women in Zimbabwe tend to their crops during their 'spare time' while men's crops take most of the household's resources including land under cultivation, time or labor, money and attention. When and if multiple crops mature at the same time, priority is given to major cash crops that are controlled by men. This is true in this study, as women in Ethiopia engage in both productive and reproductive activities (Gebre, Isoda, Rahut, Amekawa, & Nomura, 2019).

In Ethiopia, agricultural activities are carried out either collectively or individually by male and/or female members of the household (Aregu, Puskur, & Bishop-Sambrook, 2011; Gebre et al., 2019, Gebre et al., 2021). They produce staple crops for their own consumption and marketing (Gebre et al., 2020). Among staples, maize is dominant in terms of the amount of production (30%) and the number of households involved (over 9.8 million) (Central Statistical Agency (CSA) of Ethiopia, 2019). Efficient marketing of maize thus becomes important given its significant contribution as the source of income for the millions of farm households in the country.

The patterns of the market channel choice and associated cost-benefit trajectories differ significantly between male and female maize farm households in Ethiopia[1]. Men sell the bulk of maize by traveling to distant markets to secure higher prices. In contrast, women sell smaller quantities on a frequent basis at local markets and tend to receive lower prices (Aregu et al., 2011; Eerdewijk & Danielsen, 2015). Due to liquidity constraints, inadequate storage facilities, and price volatility, the majority of maize farm

households sell maize immediately after harvest in Ethiopia (The Food and Agriculture Organization (FAO), 2015; Abate et al., 2015, World Bank, 2018). However, compared to men, women tend to sell maize earlier, and as a result, receive lower prices than men even at the same stage of a marketing channel. This is particularly true in our study area. Women's travel to distant markets is culturally restricted for the majority of rural households in Ethiopia. Women in households with greater numbers and higher proportions of men tend to have less control over income and benefit-sharing from the sale of marketable produce. As a result, some women in male-dominant households secretly sell small amounts of produce in order to acquire some cash for their social obligations, which results in further losses to market efficiencies (Aregu et al., 2011). Because their sales are secret, they are not able to bargain for better prices, and thus have to sell maize at a lower than market price. If men, in particular husbands, hear that a female family member (such as a wife) is selling things in secret, this could lead to conflicts within the household.

Farm households in this study sold their maize through different marketing channels and received various marketing margins. In the majority of marketing channels, two or more intermediaries exist between maize producers and final consumers. They charge high prices to consumers and share only a small portion of it with producers. Under such exploitative relations, maize farm households choose the best marketing channel with the greatest potential of a good return. Choosing the most efficient or best marketing channel ensures the highest price for a product (Das & Prakash, 2002; Mkunda, Lassen, Chachage, Kusiluka, & Pasape, 2020; Panda & Sreekumar, 2012; Saediman, Ibrahim, & Ono, 2004), which leads to increased income, and improves the overall living conditions of smallholder farmers (Mgale & Yunxian, 2020; Rahman, Takeda, & Mohiuddin, 2006). Apparently, a shorter channel, or a channel with fewer intermediaries, is better for the healthy development of the market; however, this may not be true all the time (Kausar & Alam, 2016), or for all farm households. Higher return on agricultural produce can depend on a farmer's bargaining power in the market (Handschuch & Wollni, 2016; Maertens & Swinnen, 2012); however, male and female agricultural producers may not have equal negotiating power because of gender norms. Indeed, in this study, not all farm households were in the same negotiating position with buyers about their maize price. Not all the marketing channels were equally important for farm households either. Even in the same market, farmers may receive different prices for the same amount and standard of product. These scenarios have consequences in the processes of gendered maize marketing channel efficiency in the area under study. Thus, there is a need to comparatively examine the efficiency of different marketing channels that maize farm households used. Results from this study could have potentially significant

implications for gendered agricultural policy and programming in Ethiopia and sub-Saharan Africa in general by enhancing understanding of how gender norms and practices shape joint and individual (either men or female) decision-making farm households in agricultural marketing systems across diverse contexts in Ethiopia.

Previous studies on marketing channel efficiencies in developing countries (e.g. Panda & Sreekumar, 2012; Handschuch & Wollni, 2016; Mgale & Yunxian, 2020) have conducted quantitative analyzes based on the assumption of farm households as a unitary model –the assumption that both male and female household members have the same preferences and receive equal returns at the same stages of marketing channels. These studies did not separately examine the marketing efficiency of men and women decision-making farm households. Moreover, they lack analysis on the marketing efficiency of joint decision-making farm households. Existing evidence shows that agricultural households do not act in a unitary manner when making decisions, and women and men within a household do not always have the same preferences (Agarwal, 1997; Meinzen-Dick et al., 2011; Wilson, 1991). Indeed, farm households exhibit various dimensions of cooperation and conflict, as captured in Amartya Sen's notion of 'cooperative conflict' (Sen, 1987). In Ethiopia, farm households' marketing decisions vary from one household to another: in some cases, male and female family members (mostly husband and wife) make decisions jointly; in other cases, either a male or female dominates and makes decisions independently (Aregu et al., 2011, Gebre et al., 2021). Henceforth, we argue that these farm household receive different levels of returns at the same stage of marketing channel, depending in part on their gender-differentiated bargaining power in the market.

Therefore, using data collected from Dawuro zone, southern Ethiopia, this study examines different maize marketing channels according to the three different categories of gender-based decision-making involving: male, female, and joint decision-making households for maize marketing. This study asks whether there are differences in levels of maize marketing efficiency among male, female and joint decision-making households.

The rest of the paper is organized as follows: Section "Materials and Methods" provides materials and methods, section "Results and Discussion" presents' results and discussion, and section "Conclusion and Recommendation" concludes the paper.

Materials and methods

Agricultural marketing efficiency measures

Agricultural marketing efficiency is defined as the movement of agricultural product from producer to consumers at the lowest cost consistent with the

provision of services consumers' desire (Abbott & Makeham, 1981). Crawford's (1997) defined agricultural marketing efficiency as the maximization of input-to-output ratio.

The efficiency of agricultural marketing has been measured through various approaches. For example, it can be measured using Shepherd's (1993), Acharya and Agarwal (2007), and the composite index methods. Shepherd's, as well as Acharya and Agarwal's approaches use input-to-output ratio to measure efficiency of agricultural marketing. They give more emphasis on static nature of agricultural marketing, neglecting its dynamic nature in real life. The composite index method uses different indicators to measure marketing efficiency, which may consider both the static and dynamic nature of agricultural marketing. Hence, in this paper, the composite index method proposed by Rajagopal (1986) and Ramakumar (2001) is adopted to highlight both the static and dynamic features of maize marketing efficiency in Ethiopia. As per composite index method, marketing efficiency of each channel is computed using six performance indicators: (i) percentage of maize produce which moves through a channel; (ii) relative marketing cost; (iii) level of intermediaries' margin; (iv) producer share; (v) price deviation (i.e. differences between the maximum and minimum price in a month); and (vi) seasonal price variability (i.e. price variability in lean and peak periods). These indicators were widely used to measure efficiency of agricultural product marketing, especially, in South and Southeast Asia countries. Examples of this include Rajagopal (1986), Ramakumar (2001), Matin, Baset, Ala, Karim, and Hasan (1970), Kumar (2014), Omar and Hoq (2014), Kausar and Alam (2016), and Azad (2013), who measured the marketing efficiency of rice, coconut, mangoes, potatoes, maize or other high value agricultural crops, respectively. The procedure in this study for measuring the efficiency of maize marketing is:

i.   Percentage of maize run through a marketing channel is computed by summing up the proportion of maize handled by each middleman in that channel. The channel with the highest amount of product moved is ranked as the first and the channel with the lowest amount ranked as the last.

ii. Producer's share of the retailer/consumer price is derived by the ratio of the average price received by producers to the weighted average price of maize, which is given as:

$$P_{si} = \frac{p_{pi}}{p_{ri}} \times 100 \qquad (1)$$

where P_{si} is the producer's share in the Pth channel; P_{ri} is the average price received by the producer in the ith channel; p_{ri} is the weighted

average price of maize at the retail level in the ith channel; and i is the number of maize channels.[2] The maize channel which gives the highest share to farmers is ranked as the first and the lowest share as the fourth.

iii. The cost of maize marketing is calculated in Ethiopian currency (Birr). The lowest cost marketing channel is ranked as the first and the highest cost marketing channel ranked as the last. The marketing cost incurred by farmers and intermediaries are estimated by:

$$MC = MC_f + MC_{m1} + MC_{m2} + \ldots \ldots MC_{mi} \tag{2}$$

where MC is marketing cost of maize; MC_f is marketing cost incurred by farmers during the sale of the maize; and MC_{mi} is the marketing cost incurred by ith intermediaries in the transaction process.

iv. The marketing margin of intermediaries is defined as the difference between sale and purchase prices of maize in each channel. For ranking margins, the same approach is applied with the ranking of marketing cost. Gross margin of maize is estimated as:

$$GM_i = P_{Ri} - P_{Pi} \tag{3}$$

where GM_i is the gross margin for ith intermediary; P_{Ri} is the price received by ith intermediary; and P_{Pi} is the price paid by ith intermediary.

v. The deviation between the maximum and minimum maize price in each month in the respective channels are computed by:

$$\bar{d} = \left(\frac{\sum d}{N}\right) \tag{4}$$

where $\bar{d}$ is average price deviation; N is the total number of months in which maize is sold in the market; and d is deviation between the maximum and minimum price.

vi. The seasonal price variability is computed by using the simple standard deviation:

$$\delta = \sqrt{\left(\frac{1}{T}\right) \sum W_t(P_t - P)^2} \tag{5}$$

where δ is seasonal price variability index in each channel; P is the average farm gate price of maize of the season in each channel; P_t is the average farm gate price for maize for the agricultural year; and W_t is the ratio of the sum of monthly maize sales in each channel to the sum of monthly maize sales of all the channels combined. The entire season of maize marketing is divided into lean and peak periods. The peak periods for maize marketing in the study are the five months

from April to August, and the lean period is the four months from September to December. To understand the effect of seasonal price variability, prices from the two periods were separately estimated. A lowest value shows that the maize producer price was not affected by seasonal price variations, and vice versa. The final ranking of all six indicators for all four channels was computed using the composite index formula for estimating efficient marketing channels for male, female, and joint decision-making maize farm households. The composite index is written as:

$$I = \frac{\sum I_i}{N} \tag{6}$$

where I refers to the rank of each channel; I_i is the total value of ranks of all indicators in that channel; and N is the number of indicators used for computation.

Study area, data collection and sampling techniques

The study area for this research is Dawuro zone of southern Ethiopia, which is one of the major crop production areas of the country. The principal crops produced in Dawuro include enset (*enseteventricosum*), teff (*eragrostis tef*), maize, sorghum, wheat, barley, oats, coffee, beans, peas, spices, vegetables, and fruits. Among these crops, maize is dominant in terms of the amount of production and the number of households involved in the zone. Maize provides the highest share (20%) of national per capita calorie intake (Central Statistical Agency (CSA) of Ethiopia, 2019). In Ethiopia, the unit cost of calories from maize is the cheapest among all major cereals including teff, wheat, barley, and sorghum, making it the primary source of calories and the most important food security crop for poor households (The Food and Agriculture Organization (FAO), 2015). This applies in the context of the Dawuro zone. It is a source of income for producers and a source of food for consumers. The Dawuro zone has ample potential for agricultural production. However, farm productivity remains very low in the area due to the use of traditional means of production, dependence on natural rainfall, coupled with poor market access, making the livelihood of farm households persistently stagnant (Gebre et al., 2019). Both males and females are involved in agricultural activities in Dawuro, and females are a particularly vulnerable social group because of their relative lack of access to farmland, relative lack of ownership of draft animals, and shortage of farm labor.

The data used in this study was collected through household surveys, key informant interviews, and focus group discussions conducted in two rounds in the Dawuro zone. In the first round (April-June in 2018), a survey was
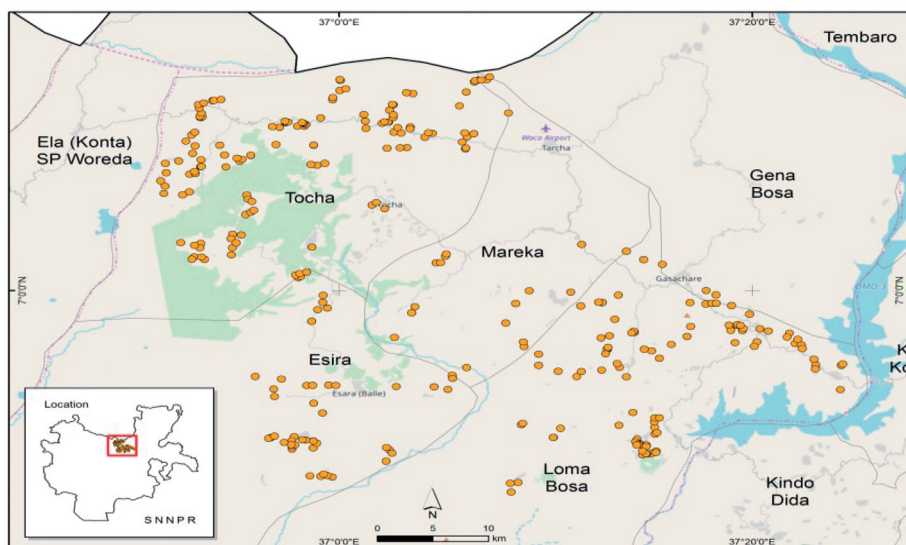
Figure 1. Map of the area under study (Dawuro zone) in southern Ethiopia Source: Author's sketch by using GPS data (2018).

carried out to collect data from maize farm households. In the second round (June-July in 2019), key informant interviews (KII) and focus group discussions (FGD) were conducted to collect data from intermediaries and other stakeholders involved across the maize value chain. The main aim of the KII and FGD was to supplement the results from survey data in order to get more insights on how gender norms and practices shape men's and women's decision-making within joint and individual decision-making farm households, in the maize marketing system in Ethiopia.

Multistage sampling techniques were used to select smallholder maize farm households. In the first stage, four districts were selected based on their maize production and marketing potential (Figure 1): Loma bosa (including Disa), Mareka, Esara, and Tocha (Kachi & Tarcha zuriya). In the second stage, 6-8 kebeles[3] where maize was grown were selected from each district. In the third stage, an average of 20 maize growing households were selected from each kebele for a total of 560 smallholder maize farm households. Since male and female family members work either separately or jointly on the maize farm, the person most responsible for production, consumption, and marketing decisions in the household was interviewed using a semi-structured questionnaire. This was based on the assumption that the individual who has more power in the household makes production, consumption and marketing decisions. The survey research also involved data collection for the identification of each respondent household into three gender decision-making categories: male, female, and joint.

All the household respondents were asked a total of 20 gender-disaggregated questions (Appendix Table A1.)[4]. The first 12 questions pertained to the ownership of farmland and other farm-related assets, maize production decisions, and maize production activities such as variety choice, maize farm preparation, planting, fertilizer use, weeding, harvesting, and collection. The remaining **eight** questions were related to the decision-making around the amount of maize allocated between home consumption and sale, the responsible person in the household for the sale of maize, choice of buyer, price decisions, and utilization of money from the sale of maize. All responses indicated that decisions about maize production, consumption, and marketing were made by either men or women, or together. In addition to a key household informant, an additional family member was separately asked some supplemental questions; for example, they were asked who makes decisions about maize production, consumption, and sale in the market. This is because information collected from a single respondent may not accurately describe intra-household gender dynamics. In a few cases, men and women from the same household gave different answers to the same questions. In such cases, both respondents were jointly asked who makes decisions in the household regarding maize production, consumption, and marketing. In doing so, they reached a consensus. Finally, the collected responses were clustered into the three household decision-making categories – male, female, or joint.

In addition, from each *kebele,* key informants from agricultural experts, community elders, and market intermediaries (collectors, retailers, or wholesalers) were interviewed. The selection of agricultural experts and community elders was based on the information provided by *kebele* level agricultural development agents[5] who have closely worked with farmers, community elders, and other agricultural experts in each *kebele.* Accordingly, 12 experts and 16 community elders were selected and interviewed about the influence of gender norms and practices across the agricultural value chain in the region. The selection of maize marketing intermediaries (collectors, retailers, and wholesalers) was based on the information provided by marketing agents at the district level. Accordingly, 8 maize collectors, 16 retailers, and 4 wholesalers were interviewed about who sets maize price in the market, from whom and how much maize they buy, per unit price, their relationship with maize farmers, and other logistic and infrastructure related issues in the study area. Moreover, in each sampled district, three separate focus group discussions (each comprising of a male group, a female group or a joint group) were carried out to supplement the data collected through the household survey. Six to eight decision-makers participated in each group discussion[6]. The selection of male decision-makers, female decision-makers, and joint decision-makers for

Table 1. Descriptive statistics of socio-demographic characteristics of the households.

| | | | | | Test statistics | | |
Descriptions	Pooled [1]	Male [2]	Female [3]	Joint [4]	Difference [2] − [3]	Difference [2] − [4]	Difference [3] − [4]
Female headed household	0.27	0.05	0.72	0.23	−0.67***	−0.18***	0.49***
Male headed household	0.73	0.57	0.02	0.41	0.55***	0.16***	−0.39***
Size of household	6.18	6.29	6.24	6.00	0.05	0.29	0.24
Age of household head in years	42.60	42.40	41.20	43.50	1.20	−1.10	−2.30**
Education level of household head in years	3.43	3.10	3.63	3.02	−0.53	0.08	0.61
Access to credit service	0.38	0.36	0.35	0.33	0.01	0.03	0.02
Access to market information	0.71	0.70	0.67	0.75	0.03	−0.05	−0.08
Maize productivity (ton/ha)	2.44	2.69	2.24	2.18	0.45***	0.51***	0.06
Maize varieties used							
Improved	0.65	0.68	0.63	0.65	0.05	0.03	−0.02
Local	0.35	0.32	0.37	0.35	−0.05	−0.03	0.02
Number of observations	560	240	118	202			

Source: Survey result (2018). *** and ** denote levels of significance at 1% and 5%, respectively.

focus group discussions was based on the information from the survey of maize farm households. The names, addresses, and identity numbers of individual farm households included in the survey (the first-round data collection) were registered along with their survey responses. This information was used for the selection of maize marketing decision-maker(s) for focus group discussions (the second-round data collection).

Results and discussion

Socio-demographic characteristics of maize farm households

Table 1 provides a descriptive summary of the socio-demographic characteristics of the sampled maize farm households. Out of the sampled households, 73% had a male head while 27%were female-headed, which is similar to the national average. In 43% of the households, decisions were made by male decision-makers, 21% had female decision-makers, and 36% of the households made decisions jointly. Of the male-headed households, 57, 2, and 41%, were male, female, and joint decision-making households, respectively. Of the female-headed households, 72, 5, and 23%were female, male and joint decision-making households, respectively. This indicates that females in male-headed households and males in female-headed households were separately or jointly making decisions across the maize value chain in southern Ethiopia. This tells us that the studies using the headship or unitary household model fail to capture the actual patterns of gender heterogeneity in farm household decision-making across the agricultural value chain.

The average size of the families in the sample was 6.18, which is higher than the national average of 4.8. The average age of head in joint decision-making households was significantly higher than female decision-making households. The average years of education of the head of household was

3.43. However, this was higher in female decision-making households than male and joint decision-making households. On average, about 65% of the sampled households grew improved maize varieties while the remaining 35% grew local or traditional maize varieties. Compared to male decision-making households, female and joint decision-makers exhibited lower average maize productivity.

Marketing efficiency of maize among farm households

In this section, the paper presents the marketing efficiency of maize which is measured by using six performance indicators. The results from each indictor and associated discussion are:

Channel-wise maize produce movement

Table 2 shows the proportions of maize moved through different channels. The study identified the four most dominant channels through which maize flows from farmers to consumers. Every channel starts with farmers and ends with consumers. These are:

    I.   Producer → Consumer,
   II.   Producer → Retailer → Consumer,
  III.   Producer → Wholesaler → Retailer → Consumer, and
  IV.   Producer → Collector → Wholesaler →Retailer → Consumer.

In the study area, maize produce reaches consumers without processing. This situation is consistent with other studies on maize marketing in Ethiopia such as Abate et al. (2015) and the World Bank (2018), who note that there is limited or no contribution of processors in maize value chains in Ethiopia. The survey results of all the household respondents show that about 22.85%, 18.70%, and 17.45% of maize moved through channel I, II and III, respectively, while the remaining 41% was moved through channel IV, which is dominated by local collectors who play a substantial marketing role in the maize value chains of the area under study. These results indicate that the amount of maize moved through channel IV is significantly different from the amounts moved through channel I, II and III. In short, the largest amount of maize was moved through channel IV followed in descending order by channel I, II, and III, respectively.

According to key informants and focus group discussions, most maize farm households sell maize to local collectors to repay credit loans that they had borrowed in advance of household consumption. Local collectors directly purchase maize from producer households, and sell it to wholesalers located in distant areas, where it reaches consumers through retailers'

Table 2. Proportion of maize moved through different channels by the gender of household decision-makers.

Particularizes Channels	Whole sample				Male				Female				Joint			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Presentage (%)	22.85	18.70	17.45	41	10.72	17.22	26.75	45.31	32.65	24.22	20.13	23.00	28.00	21.40	13.95	36.65
Rank (l_1)	2nd	3rd	4th	1st	4th	3rd	2nd	1st	1st	2nd	4th	3rd	2nd	3rd	4th	1st
Difference between channels	18.15**	22.30**	23.55***	—	34.59***	28.09**	18.56**	—	—	8.43*	12.52***	9.65*	8.65*	15.25**	22.70***	—
Difference between channels by gender (male vs. female)	—				21.93***	7.00**	−6.62*	−22.31***	—				—			
Male vs. joint	—				—				—				−17.28***	−4.18*	12.80***	8.66**
Female vs. joint	—				—				4.65*	2.82	6.18**	−13.65***	—			

Source: Survey result (2018). ***, ** and * denote levels of significance at 1, 5, and 10%, respectively. Difference between channels show the differences between the first ranked channel and other channels (e.g. 2nd 3rd and 4th ranked channels).

outlet. This typifies grain value chains in developing countries which pass through many intermediaries, usually starting with local traders. Local consumers and retailers are the second and third most important buyers of maize from farm households respectively. They buy maize either in the local market or in the main market. Some adjacent wholesalers also directly purchase maize from grower households.

With respect to the gender of decision-makers, results show that the largest amount of maize is moved through channel IV by male and joint decision-makers, while it is channel I for female decision-makers. The second and third most important channels for male decision-makers are channel III & II, while for female decision-makers use channel II & IV, respectively. The second and third most important channels for joint decision-makers are channel I & II, respectively. Statistical results indicate that the amount of maize assigned to the first ranked channel for male, female and joint decision-making households is significantly larger than that of the second, third, and fourth ranked channels, respectively. However, there are significant variations across gender-based decision-making categories. The amount of maize moved through all four channels by male decision-makers is significantly different from that moved by female and joint decision-makers in their respective channels. Between female and joint decision-makers, the significant difference is found in the first and third ranked channels. These results show that the emphasis on maize in the allocation of agricultural produce across different marketing channels differs among male, female, and joint decision-making farmers.

According to key informants' interviews and focus group discussions, men and joint decision-making farmers in the study area have more access to distant markets than women. Indeed, women in Ethiopia are more likely to sell farm produce directly to local consumers, whereas men sell it to traders (Aregu et al., 2011). In channel IV, local collectors take control of maize production as many male and joint decision-makers receive credit from collectors in advance of maize harvest. Meanwhile, women may fear risks associated with borrowing advance loans from traders, and rely more on selling things directly to consumers in the local market (Channel I) even though the prices they receive there are lower than the prices in other markets. This might be consistent with the notion that women are inclined to take fewer risks than men (Eckel & Grossman, 2008). Further, this might be related to the negotiated control over income between male and female household members. Key informant interviews, as well as the existing evidence (Ola, 2020), suggest that women family members tend to lose income and control of income the more a product moves from the farm to distant markets. The main reason for this is that women are not as

mobile as men due to community cultural norms and their home care responsibilities.

Producers' share, total marketing cost and margins of middlemen

Table 3 presents producers' share, total marketing costs, and the gross margins of middlemen in each channel. The results of the entire sample and gender-based decision-makers reveal that maize farmers received the highest share of producer prices in channel I, followed in descending order by channel II, III, and IV. In Channel I, farmers sell maize directly to consumers; as a result, they take 100% of its price share. As the number of middlemen increases, the producer's shares from consumer price decrease. Thus, if farmers sold marketable portions of maize directly to consumers in local markets, they could get a higher proportion of market price from their maize sales.

Regarding the gender differentiated levels of maize price received by decision-makers, female decision-makers received a lower price in each channel compared to male or joint decision-makers. This suggests that female decision-makers are less efficient, in terms of the price received, compared to other households. This is also consistent with existing evidence that female farmers tend to receive lower prices for agricultural produce in developing countries (Peterman, Behrman, & Quisumbing, 2010; Aregu et al., 2011; The Food and Agriculture Organization (FAO), 2011; Eerdewijk & Danielsen, 2015). On the other hand, joint decision-makers received a higher price in each channel than male or female decision-making farmers. This may be an indication of their bargaining position in the market compared to male or female dominated decision-making farm households.

Total marketing costs in this study refers to the sum of the costs incurred in the process of moving maize from the point of production to the point of consumption. They include the cost of transportation, packaging, storage (rent), loading and unloading, information search, electricity bills, market tax, and other personnel-related expenses. For each category of decision-makers, those costs influence the total cost of maize marketing in different channels. Results reveal that the total marketing costs of female decision-makers in each channel is higher than that of male or joint decision-making households. This could be because the costs related to informational search or transport are higher among female decision-makers than the costs incurred by male and joint decision-makers. Women stay at home partly because of their reproductive duties, while men move outside the home and have more opportunities to connect with traders. As a result, men have greater access to maize markets than women in the area studied. This result is consistent with the notion that women in developing countries tend to have poor access to markets and a lack of information on

Table 3. Producers' share in market price, total marketing costs, and gross margins by the gender of decision-makers in different channels (ETB/100 kg).

Particularizes Channels	Whole sample				Male				Female				Joint			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Producer price	782.25	780.52	755.7	745.57	802.97	815.12	776.9	768.92	720.4	732	690	687.12	820	835	787.40	777.42
Market price	782.25	987.84	1158	1271.28	802.97	987.84	1158	1271.3	720.4	987.84	1158.06	1271.3	820	987.84	1158.06	1271.3
Producer share (%)	100	79.01	65.26	58.64	100	82.51	67.09	60.48	100	74.10	59.58	54.05	100	84.52	68	61.15
Rank (l_2)	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Marketing costs of producer	36.14	35.10	25.00	14.21	35.29	34.25	24.70	14.21	41.37	41.37	26.00	18.20	34.44	32.70	24.00	13.50
Marketing costs of middlemen	0	50.00	92.30	173.52	0	50.00	92.30	173.52	0	48.96	92.77	169.67	0	50.70	92.34	173.61
Total marketing cost	36.14	85.10	117.3	187.73	35.29	84.25	117	187.84	41.37	90.33	118.77	187.87	34.44	83.4	116.34	187.11
Rank (l_3)	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Gross Margin of middlemen	0	207.32	402.36	525.71	0	172.72	381.14	502.36	0	255.84	486.06	584.16	0	152.84	370.66	493.58
Net margin of middlemen	0	157.32	310.06	352.19	0	122.72	288.84	328.84	0	206.88	393.29	414.49	0	102.14	278.32	319.97
Rank (l_4)	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th

Source: Author's computation from the survey results (2018). All values in the table are indicated in BIRR (Ethiopian currency).

Table 4. Monthly price deviation (between maximum and minimum) in different marketing channels (ETB/100 kg).

Month	Whole sample				Male				Female				Joint			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Sep	67	50	95	100	40	71	101	94	55	81	97	52	13	82	32	114
Oct	53	78	60	120	72	42	89	123	61	79	114	98	32	57	60	75
Nov	67	60	75	150	23	19	47	56	36	81	85	57	45	80	23	67
Dec	45	120	87	170	65	38	110	97	142	182	148	110	120	96	92	110
Jan	57	98	150	235	110	79	107	100	100	113	124	62	53	114	100	132
Feb	102	112	147	275	150	100	100	150	91	120	56	200	120	150	98	175
Mar	97	100	168	240	175	143	120	133	78	157	185	210	130	123	215	230
Apr	103	114	202	250	143	117	202	178	100	150	170	190	82	147	135	200
May	115	120	215	170	250	213	145	289	55	115	118	200	100	117	205	234
Jun	150	142	153	140	234	123	210	312	87	130	120	100	120	101	145	235
Jul	177	158	147	200	162	100	119	230	135	160	140	250	40	152	132	153
Aug	162	116	82	139	124	65	104	142	112	124	59	241	111	63	83	99
Total	1195	1268	1581	2189	1548	1110	1454	1904	1052	1492	1416	1770	966	1282	1320	1824
$\frac{\sum d}{N}$	99.58	105.67	131.75	182.41	129	92.5	121.17	158.67	87.67	124.33	118	147.5	80.5	106.83	110	152
Rank (I_5)	1st	2nd	3rd	4th	3rd	1st	2nd	4th	1st	3rd	2nd	4th	1st	2nd	3rd	4th

Source: Author's computation from survey data (2018).

prices (The Food and Agriculture Organization (FAO), 2011; World Bank, 2018). Overall, for male, female, and joint decision-making farm households, total marketing costs are highest in channel IV and lowest in channel I. Hence, channel I is the most efficient channel while channel IV is the least efficient in the study area. The same results are also true regarding the marketing margins of middlemen.

The deviation between the maximum and minimum price in different channels

Table 4 shows monthly price deviations of the four channels for the year 2018. The results from all farm household samples show that the deviation between the maximum and minimum price is highest in channel IV and lowest in channel I. Regarding male decision-makers, channel IV shows the highest price deviation while channel II exhibits the lowest price deviation. As for female and joint decision-making groups, channel I shows the lowest price deviation while channel IV the highest. Hence, monthly price deviation among farm households shows that, on average, male decision-making households are more efficient in selling maize through channel II than female and joint decision-making households, and that female and joint decision-making households are more efficient in selling through channel I than male decision-making households.

Seasonal price variability of maize

Table 5 shows the seasonal price variability of maize for the four marketing channels. In the study area, maize prices usually fall from September to December, as an increased flow of newly harvested maize reaches the market. Starting from January, maize prices normally stabilize until the end of

Table 5. Seasonal price variability for the four marketing channels by the gender of household decision-makers (ETB/100 kg).

Channels		All				Male				Female				Joint			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Lean Season																	
Sep	Wt (Pr-P)²	815.94	2475.41	3199.68	16398.4	2273.77	947.30	3013.97	8801.1	881.50	3413.8	15625	10187.5	2743.95	994.16	4255.20	16412.92
Oct		7128.00	11027.3	4225.74	21656.9	10312.5	7368.63	3917.80	13562	12976.54	12594.72	17956	11707.31	6952.27	7573.92	4455.78	17186.58
Nov		1795.49	3682.72	1915.80	9818.5	2293.57	1107.08	355.99	1232.3	1985.32	6472.28	12642.75	8243.07	2168.49	2550.66	2296.81	8859.13
Dec		1069.09	2343.78	1250.00	6406.25	667.20	896.70	1300.00	4500.0	276.10	240.43	5041	3286.73	99.27	217.41	1774.50	6844.50
Σ Wt(Pr-P)²		10808.5	19529.2	10591.22	54280.1	15547.04	10319.72	8587.77	28095.0	16119.47	22721.23	51264.75	33424.62	11960.0	11336.16	12782.29	49303.13
Number of lean months		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Σ Wt(Pr-P)²/4		2702.13	4882.29	2647.80	13570	3886.76	2579.93	2146.94	7023.8	4029.86	5680.30	12816.19	8356.15	2991	2834.04	3195.57	12325.78
SD of lean season		51.98	69.87	51.45	116.49	62.34	50.79	46.33	83.80	63.48	75.36	113.20	91.41	54.69	53.23	56.53	111.02
Rank (I_s) lean season		2nd	3rd	1st	4th	3rd	2nd	1st	4th	1st	2nd	4th	3rd	2nd	1st	3rd	4th
Peak season																	
Apr	Wt(Pt-P)²	1213.5	1045.04	38.64963	198.079	412.5	980.22	86.60029	2819.9	2549.741	546.208	223.5025	145.7236	1351.353	327.015	34.02	131.22
May		2279.9	1545.41	84.03265	430.667	815.445	1639.761	351.52	4	5154.69	789.0625	2.25	1.467	3148.475	998.2578	0.25	0.98
June		5082.9	5052.96	539.4956	2764.91	3345.83	7369.5	1228.219	7023.8	12149.05	2680.75	1160.084	756.3745	6187.5	6140.615	1916.74	7393.15
Jul		8800	7368.42	776.18	3977.92	6082.56	10622.49	1516.32	3660.5	19438.68	3848.003	930.25	606.523	9750.645	6360.56	1774.5	6844.5
Aug		3812.4	4680.36	605.7984	3104.72	2788.5	5737.5	1352.52	2190.8	5369.83	1442.331	256	166.912	5545.1	3689.615	443.62	1711.12
Σ (Wt (Pt-P)²)		21188	19692.2	2044.156	10476.3	13444.84	26349.47	4535.179	15699	44661.99	9306.354	2572.086	1677	25983.07	17516.06	4169.14	16080.9
Number of peak months		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Σ Wt(Pt-P)²/5		4237.74	3938.44	408.8313	2095.26	2688.97	5269.894	907.0359	3139.7	8932.399	1861.271	514.4172	335.4	5196.615	3503.21	833.83	3216.2
SD of peak season		65.1	62.75	20.22	45.77	51.85	72.59	30.11	56.03	94.51	43.14	22.68	18.32	72.08	59.18	28.87	56.71
Rank (I_s) peak season		4th	3rd	1st	2nd	2nd	4th	1st	3rd	4th	3rd	2nd	1st	4th	3rd	1st	2nd
Sum of two season SD		117.08	132.63	71.67	162.26	114.20	123.38	76.45	139.84	157.99	118.51	135.88	109.72	126.77	112.42	85.40	167.73
Rank (I_s) two seasons		2nd	3rd	1st	4th	2nd	3rd	1st	4th	4th	2nd	3rd	1st	3rd	2nd	1st	4th

Source: Author's computation from survey data (2018).

March. From early April to the end of August, the prices increase to peak levels. Results indicate that during the lean season, maize price variability is lowest in channel III and highest in channel IV. Thus, during the lean season, maize producers' price is affected less by seasonal variation in channel III and more in channel IV. According to key informant interviews and group discussions, the main reason for the high price variability in channel IV is that the majority of maize farm households sell maize to collectors immediately after harvest, at a price that is lower than market. According to the farmers, the majority of maize farm households are not positioned to delay their sale of maize in order to obtain better prices. Most smallholder maize producers in the study area borrowed credit from local collectors and sold maize to them prior to harvest, with the agreement that the former pays the latter in kind (e.g. maize produce) immediately after harvest when the price is the lowest of the season. Moreover, local collectors set different prices for different sellers based on their negotiation power over price. Hence, most producers do not benefit from better prices due to their untimely sales and weak bargaining power. On the other hand, collectors, wholesalers, and retailers also sell maize immediately after purchasing it from their respective sellers. This is due to a lack of financial capability for local institutions in the study area to invest in maize storage. This was confirmed in the observations during our rapid market appraisal and interviews with maize traders. The maize traders indicated that their levels of return in holding maize stocks were very low in the lean season. Traders in the area did not own or have access to enough capital to establish a maize storage facility that could keep maize for a long period without deteriorating its granular quality.

With regard to the gender of decision-makers, results show that maize prices for male and joint decision-making households were affected more by seasonal price variation in channel IV, while the price for female decision-makers was affected more in channel III during the lean season. In the peak season, male decision-making households were affected more in selling maize through channel II while female and joint decision-makers were affected more in selling through channel I. Regarding the maize price volatility over the whole year, male and joint decision-making households were able to benefit more from channel III and were less able to benefit from channel IV, while female decision-making households were able to benefit more from channel IV and less from channel I.

Overall efficiency of maize marketing channel

Table 6 reports the overall efficiency of various maize marketing channels based on the selected six indicators. The results of the whole sample as well as the gender-based decision-making categories show that channel I has the

Table 6. Overall efficiency of different marketing channels.

Performance Indicators	Whole sample Channels I	II	III	IV	Male Channels I	II	III	IV	Female Channels I	II	III	IV	Joint Channels I	II	III	IV
Product move (I_1)	2	3	4	1	4	3	2	1	1	2	4	3	2	3	4	1
Producer share (I_2)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Marketing cost (I_3)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Marketing margin (I_4)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Price deviation (I_5)	1	2	3	4	3	1	2	4	1	3	2	4	1	2	3	4
Seasonal price (I_6)	2	3	1	4	2	3	1	4	4	2	3	1	3	2	1	4
Composite index	1.33	2.33	2.83	3.50	2.00	2.17	2.33	3.50	1.50	2.17	3.00	3.33	1.50	2.17	2.83	3.50
Final ranking	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th

Source: Author's computation from survey data (2018).

highest marketing efficiency in the study area. As seen earlier, the producer's share in the consumer price is highest (i.e. 100%) in that channel. This means that maize farm households are better off if they trade maize through channel I than other channels in the study area. Channel I marks the highest rank in the deviation between the maximum and minimum price as well as marketing cost and margin for all household categories. These composite index results suggest, from the dynamic perspective of maize marketing efficiency, that if maize farm households should trade maize through channel I (directly sell to consumers), they are better off than other channels in the study.

Conclusion and recommendation

Like other developing countries, maize value chains in Ethiopia may contain intermediaries between the farm and consumers, and a chain containing more intermediaries is likely longer in distance. However, distance and the number of intermediaries involved between the farm and table may not necessarily be proportional to the actual efficient working (or lack thereof) of maize marketing channels. Even at the same stages of the market chain, there is gender-based price discrimination for the same products. That is, based on their negotiation capability males may receive higher prices than females in the same market. Hence, this study seeks to gauge the efficiency of different marketing channels from a gender-based decision-making perspective of maize grower households. This study identified four major maize marketing channels through which harvested maize flows from producers through intermediaries to consumers. Every channel in the study does away with any kind of processing or other value-adding operations on maize output. Results reveal that about 41% of maize produce was sold through collectors' channels, which is the longest and least efficient among the four types of available marketing channels in the study area. Most smallholder maize producers sold maize to collectors prior to harvest, with the agreement that the former pays the latter in kind (e.g. maize produce)

immediately after harvest when the price is the lowest of the season. Hence, most producers do not benefit from better prices due to their untimely sales and weak bargaining power. It is proposed that publicly-led, more egalitarian credit services be provided for smallholder maize producers to make guaranteed and routinized household investments, thus reducing their dependence on local collectors.

With regard to the gender of decision-makers in the household, the patterns of marketing channel choice and associated cost-benefit trajectories among male, female, and joint decision-making households are heterogeneous. Male and joint decision-making households sell larger amounts to collectors, whereas female decision-making households sell more to consumers in the local market, at a price which is lower than the market price.

Maize farmers receive the highest share of the market price through direct sale to consumers in the local market. However, as the number of intermediaries increases in a channel, the producer's share decreases accordingly. With regard to gender, female decision-making households receive lower prices and have higher marketing costs and margins of middlemen than other households at the same stage of a marketing channel. That is, female producers are less efficient in terms of the price received, marketing costs and middlemen margins incurred. There is a need for an integrated agricultural marketing information system to help female decision-making maize producers engage in existing and new market opportunities in the study area and beyond.

In the lean season, maize producers are affected more by seasonal price variation in selling maize to collectors in channel IV immediately after harvest than other channels. Maize farm households are not positioned to delay their sale of maize for better prices. There is also a lack of financial capabilities within local institutions to establish maize storages in the area. Maize traders operating in the study area do not own enough capital to establish a modern maize storage facility that can keep maize for a long period without deteriorating its quality. Hence, promotion of a large investment in commercial logistics such as modern maize storage is needed in the area in order to add value to the product and lead to a better market price for producers and traders.

The overall results of efficiency measurement from the analysis of composite indexes indicates that among the four major marketing channels, direct sale of maize to consumers in the local market makes maize producers of any gender category better off than other channels, from the dynamic perspective of marketing efficiency. However, given that farmers cannot regularly sell in bulk in the local market, there is a need to link maize producers to alternative market opportunities in the area and beyond to improve their income from maize production.

Notes

1. A male farm household in this study is a household in which farm decisions are mainly made by male family members while a female farm household is a household in which farm decisions are mainly made by female family members.
2. In this study, the conversion ratio of 1.45 is used to convert wet maize to dry maize (Kausar & Alam, 2016).
3. In Ethiopia, kebele is the smallest administrative unit followed by Woreda (district).
4. The information collected through gender-disaggregated questions (attached in Appendix) were used only for classification of sampled households into male, female, and joint decision-making categories.
5. Agricultural development agents in Ethiopia are also known as "extension agents" who graduated from either the Agricultural Technical and Vocational Education Training Colleges or Agricultural Universities. They work, particularly, at the kebele level. Three agricultural development agents are assigned to each kebele to provide effective extension services for farmers in the areas of crop and livestock production and natural resource management.
6. The aim of KII and focus group discussion were to get more insights on how gender roles influence farm household decisions in the maize marketing system. Moreover, it helped the study to get more insights on community perception, thoughts, and awareness about gender roles and practices in the agricultural value chain in the study area. The results from KII and focus group discussion were used only to support quantitative results, not separately analyzed in this study. It helped the study to reach conclusive results.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References

Abate, G. T., Kasa, L., Minot, N., Rashid, S., Lemma, S. & Warner, J. (2015). *Maize value chain in Ethiopia. Structure, conduct, and performance*. Washington, DC: International Food Policy Research Institute (IFPRI), Markets, Trade, and Institutions Division.
Abbott, J. C., & Makeham, J. P. (1981). *Agricultural economics and marketing in the tropics*. Burnt Mill, Harlow, Essex, UK: Longman Group Limited.

Acharya, S. S., & Agarwal, N. L. (2007). *Agricultural marketing in India* (4th ed., pp. 385–417). New Delhi: Oxford and IBH Publishing Co.

Agarwal, A. (1997). Bargaining' and gender relations: Within and beyond the household. *Feminist Economics*, 3(1), 1–51. doi:10.1080/135457097338799

Alene, A. D., Manyong, V., Omanya, G., Mignouna, H., Bokanga, M., & Odhiambo, G. (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, 33(4), 318–328. doi:10.1016/j.foodpol.2007.12.001

Amani, S. (2014). *Smallholder farmers' marketing choices P4P global learning series*. Management SystemsInternational. Retrieved from https://documents.wfp.org/stellent/groups/public/documents/reports/WFP285379.pdf?_ga=1.113473857.77531865.1488831444 (accessed September 15, 2019).

Aregu, L., Puskur, R., & Bishop-Sambrook, C. (2011). *The role of gender in crop value chain in Ethiopia*. Paper presented at the Gender and Market Oriented Agriculture (AgriGender 2011) Workshop, Addis Ababa, Ethiopia, 31st January–2nd February 2011, Nairobi, Kenya: ILRI.

Asian Development Bank. (2013). *Gender equality and food security: Women's empowerment as a tool against hunger*. Mandaluyong City, Philippines.

Azad, S. A. K. (2013). *High-value agriculture products in Bangladesh: An empirical study on agro-business opportunities and constraints* (PhD dissertation). Submitted to the Department of Marketing, University of Dhaka.

Barrett, C. B. (2008). Smallholder market participation. Concepts and evidence from Eastern and Southern Africa. *Food Policy*, 33(4), 299–317. doi:10.1016/j.foodpol.2007.10.005

Central Statistical Agency (CSA) of Ethiopia. (2019). Agricultural sample survey 2018/19 (2011 E.C.) Report on area and production of major crops. Private Peasant Holdings, Meher Season, Volume I.

Courtois, P., & Subervie, J. (2015). Farmer bargaining power and market information services. *American Journal of Agricultural Economics*, 97(3), 953–977. doi:10.1093/ajae/aau051

Crawford, I. M. (1997). *Agricultural and food marketing management*. http://www.fao.org/3/w3240e/W3240E00.htm.

Das, K. J., & Prakash, O. (2002). Measuring marketing channel efficiency and strategy to improve income to local communities dependent on tropical forests. *Journal of Sustainable Forestry*, 15(4), 27–52. doi:10.1300/J091v15n04_02

Doss, C. (2002). Men's crops? Women's crops? The gender patterns of cropping in Ghana. *World Development*, 30(11), 1987–2000. doi:10.1016/S0305-750X(02)00109-2

Eckel, C. C., & Grossman, P. J. (2008). Men, women and risk aversion: Experimental evidence. In Charles R. Plott & Vernon L. Smith (Eds.), *Handbook of experimental economics results* (edition 1st ed., vol 1, chapter 113, pp. 1061–1073). Elsevier.

Eerdewijk, V. A., & Danielsen, C. (2015). *Gender matters in farm power*. Amsterdam, the Netherlands: Royal Tropical Institute.

Fafchamps, M., Gabre-Madhin, E., & Minten, B. (2005). Increasing returns and market efficiency in agricultural trade. *Journal of Development Economics*, 78(2), 406–442. doi:10.1016/j.jdeveco.2004.10.001

Gebre, G. G., Isoda, H., Rahut, B. D., Amekawa, Y., & Nomura, H. (2020). Gender gaps in market participation among individual and joint decision-making farm households: Evidence from Southern Ethiopia. *European Journal of Development Research*, doi:10.1057/s41287-020-00289-6

Gebre, G. G., Isoda, H., Amekawa, Y., Nomura, H., & Watanabe, T. (2021). What explains gender gaps in household food security? Evidence from maize farm households in Southern Ethiopia. *Soc Indic Res*, doi:10.1007/s11205-020-02600-8

Gebre, G. G., Isoda, H., Rahut, B. D., Amekawa, Y., & Nomura, H. (2019). Gender differences in the adoption of agricultural technology: The case of improved maize varieties in southern Ethiopia. *Women's Studies International Forum*, 76, 102264. doi:10.1016/j.wsif.2019.102264

Goletti, F., & Babu, S. (1994). Market liberalization and market integration of maize markets in Malawi. *Agricultural Economics*, 11 (2–3), 311–324. doi:10.1016/0169-5150(94)00005-0

Handschuch, C., & Wollni, M. (2016). Traditional Food Crop Marketing in Sub-Saharan Africa: Does Gender Matter? *The Journal of Development Studies*, 52(3), 343–359. doi:10.1080/00220388.2015.1068289

Jaleta, M., & Gardebroek, C. (2007). Farm-gate tomato price negotiations under asymmetric information. *Agricultural Economics*, 36(2), 245–251. doi:10.1111/j.1574-0862.2007.00202.x

Jayne, T. S., Mangisoni, J., & Sitko, N. (2008). *Social analysis of Malawi's maize marketing reforms*. Report to the World Bank. Lilongwe: World Bank-Malawi Office.

Jensen, R. T. (2010). Information, efficiency, and welfare in agricultural markets. *Agricultural Economics*, 41, 203–216. doi:10.1111/j.1574-0862.2010.00501.x

Kausar, A. K. M. G., & Alam, J. M. (2016). Marketing efficiency of maize in Bangladesh. *Asian Journal of Agricultural Extension, Economics & Sociology*, 11(2), 1–12. doi:10.9734/AJAEES/2016/26170

Key, N., Sadoulet, E., & de Janvry, A. (2000). Transactions costs and agricultural household supply response. *American Journal of Agricultural Economics*, 82(2), 245–259. doi:10.1111/ajae.2000.82.issue-2

Kumar, S. (2014). Marketing efficiency analysis: A case of broiler marketing in Anand district of Gujarat. *International Journal of Commerce and Business Management*, 7(1), 186–190.

Lo, A.W. (2004). The adaptive markets hypothesis. *The Journal of Portfolio Management*, 30(5), 15–29. doi:10.3905/jpm.2004.442611

Maertens, M., & Swinnen, J. F. M. (2012). Gender and modern supply chains in developing countries. *Journal of Development Studies*, 48(10), 1412–1430. doi:10.1080/00220388.2012.663902

Mango, N., Mapemba, L., Tchale, H., Makate, C., Dunjana, N., & Lundy, M. (2018). Maize value chain analysis: A case of smallholder maize production and marketing in selected areas of Malawi and Mozambique. *Cogent Business & Management*, 5(1), 1503220. doi:10.1080/23311975.2018.1503220

Matin, M. A., Baset, M. A., Ala, Q. M., Karim, M. R., & Hasan, M. R. (1970). Mango marketing system in selected areas of Bangladesh. *Bangladesh Journal of Agricultural Research*, 33(3), 427–438. doi:10.3329/bjar.v33i3.1602

Meinzen-Dick, R., Quisumbing, A., Julia Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., … & Beintema, N. (2011). *Engendering agricultural research, development, and extension: Priority setting, research &development, extension, adoption, evaluation*. Washington: IFPRI.

Mgale, Y. J., & Yunxian, Y. (2020). Marketing efficiency and determinants of marketing channel choice by rice farmers in rural Tanzania: Evidence from Mbeya region, Tanzania. *Australian Journal of Agricultural and Resource Economics*, 59, 1–21.

Mkunda, J. J., Lassen, J., Chachage, B., Kusiluka, J. L., & Pasape, L. (2020). Analysis of marketing efficiency of processed sardine products of Lake Victoria: Case of Tanzania.

African Journal of Science, Technology, Innovation and Development, *12*(1), 85–96. doi:10.1080/20421338.2019.1609783

Musara, J. P., Musemwa, L., Mutenje, M., Mushunje, A., & Pfukwa, C. (2018). Market participation and marketing channel preferences by small scale sorghum farmers in semi-arid Zimbabwe. *Agrekon*, *57*(1), 64–77. doi:10.1080/03031853.2018.1454334

Nijuki, J., Parkins, J. R., and Kaler, A., & Ahmed, S. (2016). Gender, agriculture, and food security: Where are we? In J. Njuki, J. R. Parkins, and A. Kaler (Eds.), *Transforming gender and food security in the global south* (pp. 1–18). New York: Routledge.

Ola, K. O. (2020). Micro-determinants of Women's Participation in Agricultural Value Chain: Evidence from Rural Households in Nigeria. In E. S. Osabuohien (Ed.), *The Palgrave handbook of agricultural and rural development in Africa*. Cham: Palgrave Macmillan.

Omar, M. I., & Hoq, M. S. (2014). Analysis of growth rate, marketing efficiency and seasonal price variation of potato in selected areas of Bangladesh. *Journal of Natural Sciences Research*, *4*(5).

Omiti, J. M., Otieno, D. J., Nyanamba, T. O., & Mccullough, E. B. (2009). Factors influencing the intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African Journal of Agricultural and Resource Economics*, *3*, 57–82.

Panda, R. K., & Sreekumar, R. (2012). Marketing channel choice and marketing efficiency assessment in agribusiness. *Journal of International Food & Agribusiness Marketing*, *24*(3), 213–230. doi:10.1080/08974438.2012.691812

Peterman, A., Behrman, J., & Quisumbing, A. (2010). *A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries* (IFPRI Discussion Paper 975). Washington: International Food Policy Research Institute (IFPRI).

Quisumbing, A. R., Meinzen-Dick, R., Raney, T. L., Croppenstedt, A., Behrman, J. A., & Peterman, A. (Eds.). (2014). Gender in agriculture, doi:10.1007/978-94-017-8616-4

Rahman, M. S., Takeda, J., & Mohiuddin, M. (2006). Rise farmers' marketing efficiency in southwestern part of Bangladesh. *Journal of Applied Sciences*, *6*(9), 2043–2050. doi:10.3923/jas.2006.2043.2050

Rajagopal, A. K. (1986). Economic efficiency of paddy marketing system in Madhya Pradesh: A case study. *Indian Journal of Agricultural Economics*, *41*(4), 583–590.

Ramakumar, R. (2001). Cost and margins in coconut marketing: Some evidence from Kerala. *Indian Journal of Agricultural Economy*, *56* (4), 668–682.

Saediman, S., Ibrahim, R.P., & Ono, M. (2004). Marketing margin of vegetables in Kendari of Southeast Sulawesi. *Indonesia Journal of Rural Economics* (special issue). 434–440.

Sen, A. (1987). Gender and cooperative conflict. WIDER working paper 18.

Shepherd, A. W. (1993). *A guide to marketing costs and how to calculate them*. Rome: Food and Agriculture Organization of the United Nations.

Shiferaw, B., Obare, G., & Muricho, G. (2008). Rural market imperfections and the role of institutions in collective action to improve markets for the poor. *Natural Resources Forum*, *32*(1), 25–38. doi:10.1111/j.1477-8947.2008.00167.x

Smith, L. C., Usha, R., Aida, N., Lawrence, H., & Reynaldo, M. (2003). *The importance of women's status for child nutrition in developing countries* (IFPRI Research Report 131). Washington, DC: IFPRI.

Swiss Agency for Development and Cooperation (SDC). (2015). Gender analysis of maize post-harvest management in Zimbabwe: A case study of Shamva district.

The Food and Agriculture Organization (FAO). (2011). *The state of food and agriculture. Women in agriculture: Closing the gender gap for development*. Washington, DC.

The Food and Agriculture Organization (FAO). (2015). Analysis of price incentives for maize in Ethiopia (Technical notes series). In M. B. Wakeyo & B. Lanos (Eds.), Rome: MAFAP.

The World Bank, Food and Agriculture Organization, and International Fund for Agricultural Development. (2009). *Gender in agriculture: Sourcebook*. Washington, D.C.: World Bank Publications.

Tran, L. V., & Leirvik, T. (2019). A simple but powerful measure of market efficiency. *Finance Research Letters*, *29*, 141–151. doi:10.1016/j.frl.2019.03.004

United Nations Conference on Trade and Development (UNCTD). (2015). The least developed countries report: Gender-based patterns and constraints in rural development: Chapter 4

Wilson, G. (1991). Thoughts on the cooperative conflict model of the household in relation to economic method. *IDS Bulletin*, *22*(1), 31–36. doi:10.1111/j.1759-5436.1991.mp22001005.x

World Bank. (2018). Cereal market performance in Ethiopia: Policy implications for improving investments in maize and wheat value chains.

World Food Program and Central Statistical Agency (CSA) of Ethiopia. (2019). Comprehensive food security and vulnerability analysis (CFSVA) of Ethiopia 2019.

Appendix

Table A1. Questionnaires used to cluster households into male, female and joint decision-making groups. Household decision-making and labor division for maize production, consumption and marketing in 2018.

	Questions	Men	Women	Both
			Responses	
1	Who in the household owns maize farmland?			
2	Who in the household owns farm equipment?			
3	Who in the household owns the crop produce?			
4	Who in the household makes decisions on maize to plant?			
5	Who in the household controls maize farmland?			
6	Who in the household makes decisions on fertilizer use?			
7	Who in the household makes decisions on improved maize seed to use?			
8	Who in the household prepares land for maize production?			
9	Who in the household plants maize on the farmland?			
10	Who in the household weed maize farm?			
11	Who in the household harvests maize?			
12	Who in the household collects the harvested maize to store?			
13	Who in the household made the decision on amount of maize to consume at home?			
14	Who in the household made the decision to sell the maize?			
15	Who in the household decides when to sell?			
16	Who in the household decides when or time of selling?			
17	Who in the household transports the produce to the market?			
18	Who in the household sells maize in the market?			
19	Who in the household makes decisions to choose buyers?			
20	Who in the household makes decision on the use of money obtained from maize sale?			