



An analysis of the respective contributions of husband and wife in farming households in Kenya to decisions regarding the use of income: A multinomial logit approach

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ABSTRACT

This paper analyzes the socio-economic characteristics of households that affect husbands and wives' contributions to decisions regarding the use of income from crop and livestock sales in Kenya. Using a sample of 276 households, we apply a multinomial logit model to assess factors affecting decision-making. Results show that husbands make most decisions concerning agriculture, while wives mainly decide on daily household expenditure. Higher education levels were found to increase women's involvement in decision-making on income use. Group membership had a positive effect on joint decision-making on income use. The study recommends improving women's access to education, which will improve their access to productive resources, hence their decision-making power. Providing incentives for members of agricultural groups can provide avenues for learning. Gender-transformative approaches that empower women and sensitize men to allow space for women to engage in decision-making, can have an impact in improving the decision-making capacity of women in households.

1. Introduction

Gender inequality continues to exist in many parts of sub-Saharan Africa (SSA), with men and women facing unequal access to productive resources, and opportunities that would enable them to improve their agricultural productivity (Doss, 2011a). Despite their immense contributions to agriculture, women continue to face challenges in accessing resources such as land, credit and extension services, which are key for agricultural production, with the result that women have lower productivity than men (Seebens, 2011; Fischer & Qaim, 2012). Women are constrained mainly because of the existence of predominantly male-led African societies and the social and cultural norms that discriminate against them, but also by other factors such as lower levels of education (Colfer et al., 2015; Twyman et al., 2015).

A number of studies have found evidence of gender disparities with regard to access to agricultural resources in Africa. In most cases, compared to female-headed households, male-headed households have a larger land holding, better access to equipment such as oxen, donkey carts and water pumps (Gebreselassie et al., 2013), and better formal

education, which enables them to have better access to innovative production techniques (Ajewole et al., 2015). Moreover, while joint ownership of assets by a husband and wife is common in many households in several countries, men have stronger rights to the assets; in East Africa, for instance, a man can sell a piece of land without consulting his spouse (Johnson et al., 2016). Men's ownership and control of household assets gives them greater power to make decisions about the use of the income derived from these assets (Kikulwe et al., 2018).

Access to extension services, agricultural training forums, credit and off-farm income, and membership of an agricultural development group, are of critical importance for agricultural production. Some studies have assessed men's and women's access to these services, with varying results. For instance, findings by Muriithi (2015) showed that women were discriminated against with regard to joining farmer's groups and accessing horticultural training and extension services in central Kenya. A review of various studies by Ragasa (2012) showed that women are less likely than men to participate in agricultural training and extension activities due to the greater demands on their

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time as well as to cultural factors. As a result, women miss out on acquiring information and skills that could be used to improve their agricultural productivity. Van Eerdewijk and Danielsen (2015) observed in Ethiopia that membership of agricultural development groups was mainly reserved for the household members who sold produce or purchased farm inputs, which were usually the men. The same study in Kenya, however, found that the situation was different, with the majority of women reporting that they were members of a group. Group membership enables members to access services such as subsidized credit, inputs, and collective marketing, hence is beneficial for farmers. Women are generally constrained when it comes to accessing credit for agricultural use because they do not own most of the household assets and their engagement in off-farm economic activities is limited (Fletschner & Kenney, 2014). Some studies have found the reverse to be true; for example, Anang et al. (2015) found that women were more likely to receive credit in Ghana because they were observed to be more trustworthy and had better repayment rates than men.

In addition to experiencing challenges in accessing productive resources and services, women also face constraints with regard to making decisions within their households (Sikod, 2007). Household decision-making depends on the bargaining power of the individual members. Early studies on intra-household dynamics conceptualized the household as a single unit and thus applied a unitary approach when analysing its activities (Doss, 2011b; Udry, 1996). The household was viewed as possessing a single set of preferences, with members pooling resources for a common maximum household utility, and no single person making decisions for the benefit of the entire household (Quisumbing & Smith, 2007). This approach was later critiqued as household members have been found to have heterogeneous preferences regarding resource allocation and use. These individual preferences are then aggregated through a bargaining process, and the person with the greatest bargaining power usually has the most say in making decisions (Lecoutere & Jassogne, 2016; Quisumbing, 2003; Van Aelst, 2014).

Apart from cultural factors such as social norms and institutions, the bargaining power of individuals in the household is also influenced by ownership and control of assets and level of education as well as earned income or employment status (Colfer et al., 2015; Doss, 2011b). This bargaining power in turn influences an individual's role in making decisions concerning resources and agricultural production. Findings from Anderson et al. (2017) indicated that in Tanzania, a woman's age and education level were associated with having greater authority over farm decisions and money in Tanzania. As women have unequal access to and control over productive assets such as land and farming equipment, as well as limited access to services such as credit facilities and extension, their role in making household agricultural decisions is limited (Seebens, 2011).

The importance of strengthening women's power to make decisions is increasingly recognized by international organizations and governments; with greater power to make decisions on the use of resources, women have been found to spend more on food and health, and as a result, their households experience better food security, better nutrition and a higher level of education (Anderson et al., 2017; Ambler, Doss, Kieran, & Passarelli, 2017). This has been evidenced, for instance, in a study by Sneyers and Vandeplass (2013) that found a positive relationship between women's involvement in farm decision-making and dairy productivity in India.

Some studies have analyzed decision-making patterns in agriculture in SSA, for example, Meijer et al. (2015) found that in Malawi, decisions about what crops to grow or inputs to use, and about rearing livestock, were commonly made jointly by a husband and wife. However, decisions about tree planting and management were generally made by men. Ajewole et al. (2015) found that in Nigeria, more than 80% of men reported that they took decisions on rice production and farm income alone, without consulting their spouse. In Kenya, Van Eerdewijk and Danielsen (2015) found that in maize production, women were

consulted about what crops to grow or inputs to use, and about how to allocate the harvest. Men, however, had greater decision-making power over major resources such as land. Ngigi et al. (2016) found that men were the sole decision-makers on land use in most of the households sampled in the eastern and western regions of Kenya. These findings all indicate that there is a gender gap with regard to intra-household decision-making; men have greater decision-making power overall, and even in cases where joint decisions are made, wives often have little input.

Studies on the gender dimension of intra-household decision-making in Kenya still remain limited, and the determinants of the respective contributions by husbands and wives to decisions about the use of income generated by agricultural sales have not received a significant amount of attention in empirical work. Our study intends to fill this gap in literature, as it will provide a greater understanding of the contribution to agricultural production of household decision-making by men and women, as well as inform policy on gendered approaches in agricultural development.

2. Data and methodology

2.1. Data

The study used data collected in 2013 by the International Maize and Wheat Improvement Center (CIMMYT), in collaboration with the Kenya Agricultural and Livestock Research Organization (KALRO). The survey covered five counties: Bungoma and Siaya in western Kenya; and Embu, Meru and Tharaka Nithi in eastern Kenya. These counties were selected due to the diversity of their agro-ecological conditions and farming systems. Within these two regions, proportionate sampling was used to select the number of households to be sampled in each county, based on the total number of households in the county. After selecting the counties, further sampling was done through a multi-stage process where subsequent divisions, locations, sub-locations, wards and villages were sampled for the study (Kassie et al., 2014).

The data were collected in two stages through in-depth, face-to-face interviews with the respondents. The first stage involved interviewing the household head about general household characteristics, for instance, housing composition, plot ownership, crops grown and their yields, inputs used, and conservation practices applied. The second stage of interviews targeted both the household head and the spouse (where available), who were interviewed separately but concurrently. This was in order to collect gender-disaggregated data on the socio-economic characteristics of the individuals, such as group membership, access to credit and extension services, household savings, household assets, social networks, knowledge and adoption of improved crop varieties, climate change adaptation strategies, household food security status, and roles in decision-making in the household. Since this study was examining intra-household decision-making by husbands and wives, households where the head was single, widowed, divorced or separated were excluded. The resultant sample size was 276 households. About 50% of the households were from each region (western and eastern).

2.2. Empirical model

Within households, husbands and wives make decisions on income use either jointly or separately, depending on the negotiating power that they have in the family. Joint decision-making does not necessarily equate to equality, as one party may have more input into the decision than the other (Bjornlund et al., 2019).

This study assessed decision-making on income derived from the sale of crops and livestock. The husband and wife in each household were asked separately to answer the question 'Did you participate in decisions about how to use the income from the sale of crops or livestock?' They were further asked about the degree of their input into the

Table 1
Socio-economic profiles of the respondents (as reported by each respondent).

	Husbands (n = 276)	Wives (n = 276)	χ^2 Measure of difference	Significance level (p-value)
Average age (years)	52.0	43.7		0.000**
Average household land size (acres)	3.9	3.9		
Average household size (persons)	6	6		
Average household savings amount (KES)	17470.3	17470.3		
Average number of years lived in village	36.2	22.2		0.000**
Average annual income (KES)	53350.3	36076.4		0.024**
Average value of assets owned (KES)	1572288.3	822571.6		0.037**
Average years of education	8.2	7.2		0.001**
<i>Education level(categories)</i>				
No formal education (I = Yes)	3.3	6.5	10.270	0.006**
Primary level (I = Yes)	61.1	69.1		
Post-primary level (I = Yes)	35.7	24.4		
Group membership (I = Yes)	67.4	77.9	7.667	0.006**
Received extension (I = Yes)	66.9	63.6	0.667	0.414
Received credit (I = Yes)	64.1	70.4	0.169	0.681
Earned off-farm income(I = Yes)	63.8	53.8	4.664	0.036**
Saved money in past two years (I = Yes)	92.4	90.3	0.448	0.489

Source: Adoption Pathways project data, 2013.

** Significant at 5% level.

decisions with the question: ‘How much input did you have in making the decisions?’ This was recorded on a Likert Scale, where 1 represented no input and 5 represented input in all decisions. Three categories were then formed – those where decisions were made jointly, those where the wife had greater input, and those where the husband had greater input. As household decision-making thus has three possible outcomes, a multinomial logit model was used to analyze how the socio-economic characteristics of a household affected the probability that the decision-making of the household falls under one of these outcomes.

The multinomial logit model is an extension of the binary logit model, which is used when the dependent variable has several categories that are unordered (Gujarati & Porter, 2009). If the dependent variable has M categories, M-1 equations are estimated, with one category being used as the baseline or reference category to which the other outcomes are compared (Williams, 2018).

Decision-making (y) in a given household (i) on a specific income source (k) could be one of three possible outcomes: egalitarian, i.e. joint decision-making ($y_{ik} = j$); skewed to the wife ($y_{ik} = w$), where the wife has more input than the husband; or skewed to the husband ($y_{ik} = h$), where the husband has more input than the wife. The observed outcome of the level of decision-making (y_{ik}) in household i on income source k is given as:

$$y_{ik} = X_{ik}\beta_k + \varepsilon_{ik} \tag{1}$$

where X is a vector of household-specific characteristics and other socioeconomic factors that affect the bargaining power of a husband and a wife in a given household who are deciding to use income from different sources of agricultural activities (in this case, $k = \text{income from the sale of crops and livestock}$). Thus, the observed outcome, say a joint decision between a husband and a wife ($y_{ik} = j$), happens when the likelihood of j's occurrence is greater than h and w. That is;

$$Prob(y_{ik} = j | X) = Prob\{y_{ik}^j > \max(y_{ik}^h, y_{ik}^w)\} \tag{2a}$$

Similarly, for $y_{ik} = h$ and $y_{ik} = w$, it is specified as:

$$Prob(y_{ik} = h | X) = Prob\{y_{ik}^h > \max(y_{ik}^j, y_{ik}^w)\} \tag{2b}$$

$$Prob(y_{ik} = w | X) = Prob\{y_{ik}^w > \max(y_{ik}^j, y_{ik}^h)\} \tag{2c}$$

Assuming that ε_{ik} are mutually independent, $0 \leq Prob(y_{ik} = r) \leq 1$ for all $r = j, h, w$; and $\sum_r Prob(y_{ik}^r) = 1$; then suppressing the income sources (k), the probability that a specific decision-making outcome (say, j) is observed in a given household is given as:

$$Prob(y_i = j | X) = \frac{\exp(X_i\beta_j)}{\exp(X_i\beta_j) + \exp(X_i\beta_w) + \exp(X_i\beta_h)} \tag{3}$$

Considering the degree of decision-making skewed towards men as a reference, the probability that the decision-making outcome on the income from the kth source is a joint decision (j) is given as:

$$Prob(y_{ik} = j) = \frac{\exp(X_{ik}\beta_{k,j})}{1 + \exp(X_{ik}\beta_{k,j}) + \exp(X_{ik}\beta_{k,w})} \tag{4a}$$

Similarly, considering the degree of decision-making skewed towards men as a reference, the probability that the intensity of decision-making on income from the kth source is skewed to the woman (wife) is given as:

$$Prob(y_{ik} = w) = \frac{\exp(X_{ik}\beta_{k,w})}{1 + \exp(X_{ik}\beta_{k,j}) + \exp(X_{ik}\beta_{k,w})} \tag{4b}$$

In this analysis, the degree of decision-making skewed towards the husband was used as the reference category, and the explanatory variables considered were the following: age, group membership, group membership of spouse, land size, number of years resident in village, education level, and the differences in age, education level, income and assets between the spouses.

3. Results and discussion

3.1. Socio-economic characteristics of the respondents

The mean equality test of the selected socio-economic characteristics of the 276 sample households with husband and wife living together is presented in Table 1. There is a significant difference between the education level of the husbands and that of their wives. Most of the husbands and wives have attained primary education as their highest education level, with more husbands than wives having studied beyond primary level. Moreover, the proportion of wives who have no formal education is higher than the proportion of husbands. This reinforces what has already been found in most of the literature on gender (see for example FAO, 2011; Muriithi, 2015), which is that women generally have a lower level of education than men due to various social and cultural factors that differ across societies. This in turn limits their access to resources such as extension services, credit and even the adoption of new technologies for use in production.

Group membership of the household is given in Table 2. In most of the households, both husband and wife were members of a group.

Table 2
Intra-household group membership of the respondents.

Group membership of the households	Percentage
Husband is a member and wife is not	12.68
Wife is a member and husband is not	23.19
Both are members	54.71
Neither are members	9.42

However, overall, more wives than husbands were found to belong to various social and agricultural development groups such as farmers' groups, cooperatives, savings associations, women's groups and youth groups. This is similar to the results found by Van Eerdewijk and Danielsen (2015) and Ngigi et al. (2016), who found that a greater number of women than men who were interviewed in western and central Kenya belonged to various self-help groups and community-based organizations. This could be due to women's need to support each other in running their households as well as in contributing to the development of their communities. According to the World Bank (2009), group membership helps to build social capital, which in turn improves the sharing of information and resources, and can sometimes provide a source of subsidized credit for members. It can also help improve the bargaining capacity of members, which can in turn give them a greater voice in decision-making.

More husbands than wives were found to have earned off-farm income for the household, and had earned higher incomes than their wives. This is plausible, given that in addition to providing agricultural labor, women have many domestic responsibilities which leave them with little or no time to take part in off-farm, income-generating activities (Seebens, 2011). The value of assets owned by the husbands is also greater. Gender inequality with regard to asset ownership limits women's control over household resources and reduces their bargaining power.

About 70% of wives in the sample households received agricultural credit, compared to 64% of husbands. This could perhaps be due to women's higher membership of farmer groups and merry-go-rounds, which makes it easier for them to access loans for use in agricultural production.

3.2. Amount of input contributed to various household decisions

Table 3 shows the percentage of contributions by husbands and wives to decisions on various farming aspects. Generally, the husbands had more input than the wives in most decisions concerning farm production — such as crops to grow, inputs to use, sales of crops and livestock, and rearing of livestock — and major household expenditure. For instance, about 61% of husbands reported having had an input in most decisions about growing cash crops, compared to 35% of wives. Ajewole et al. (2015) also found that men were the main decision makers with regard to productive resources, plot management and household income among rice farming households in Nigeria. This result reaffirms what has already been found in most of the literature, that due to the patriarchal nature of most African societies, men dominate in most decision-making. This calls for greater empowerment of women in order to bridge the gender inequality gap.

The Pearson Chi-square values are below 0.05, indicating that there is a significant association between gender and the amount of input contributed to decision-making. This is true except for non-farm business activities and own wages.

For minor household expenditure, women have more input than men. This is to be expected considering that in African societies women are the primary custodians of home care, and have responsibility for most domestic chores, sometimes including planning and managing household expenditure. This is comparable to the results of the study by Colfer et al. (2015), which found that women dominated in making

Table 3
Percentage of husbands and wives in the households who contributed to most decisions.

Decision	Input in most/all decisions (%)		χ^2 measure of difference	Significance level (p-value)
	Husbands (n = 276)	Wives (n = 276)		
Food crops to grow	58.6	40.6	17.661	0.000**
Cash crops to grow	60.7	34.7	23.752	0.000**
Seed to buy	57.9	40.1	15.863	0.000**
Fertilizer to buy	58.8	39.8	18.056	0.000**
Food crops sale	55.5	41.5	8.632	0.003**
Cash crops sale	54.8	33.8	13.748	0.000**
Livestock raising	60.4	41.5	23.463	0.000**
Livestock sale	62.3	41.6	14.657	0.000**
Off-farm business activity	44.5	47.1	0.177	0.674
Own wage/salary	59.8	50.0	1.850	0.174
Major household expenditures	60.8	45.5	4.289	0.038**
Minor household expenditures	45.3	55.8	7.676	0.006**

All decision variables are asked as Yes = 1 and 0 = No.

** Significant at 5% level.

decisions about household food consumption in Indonesia.

3.3. Amount of input in making decisions about generated income

Fig. 1 shows the proportion of husbands and wives who contributed to household decisions on the use of income generated from various activities. While there is no significant difference between the number of men and the number of women who contributed to most of the decisions that concerned engaging in off-farm business activities, and own wages and salaries, a greater number of men than women contributed to decisions about income generated from the sale of crops and livestock. These results show that, within households, men have greater decision-making power than women in making decisions about income matters.

The degrees of decision-making are given in Table 4. It shows that most decisions on income use are undertaken either jointly, or with the husband having an input in most of the decisions. In very few instances (less than 10%) did the wife have an input in all the decisions regarding the use of income from the sale of crops and livestock.

3.4. Factors affecting the level of input into decision-making

Tables 5 and 6 show the results of a multinomial logistic regression of the level of input into decision-making against the socio-economic characteristics of the households, for the husbands and wives respectively. Tables 7 and 8 give the marginal effects for these regressions.

Being a member of a group increases the likelihood of decisions being taken jointly about the use of income from the sale of crops, rather than decision-making being skewed towards the husband. This is so for both husbands and wives. For the husbands, if their wives belong to a group, the likelihood that he will have greater decision-making power will be reduced. This is probably because groups encourage the sharing of ideas and resources, and the members then replicate this in their households. These results are similar to those of a study made by Padmaja and Kondapi in 2018 in India, which found that women who were members of a self-help seed group reported that there was less conflict and increased cooperation in household decision-making.

A larger land size reduces the likelihood of decisions about the use of income from crop sales being made jointly. It also reduces the likelihood of decision-making being skewed towards the wife, and increases the probability that it will be skewed towards the husband. In

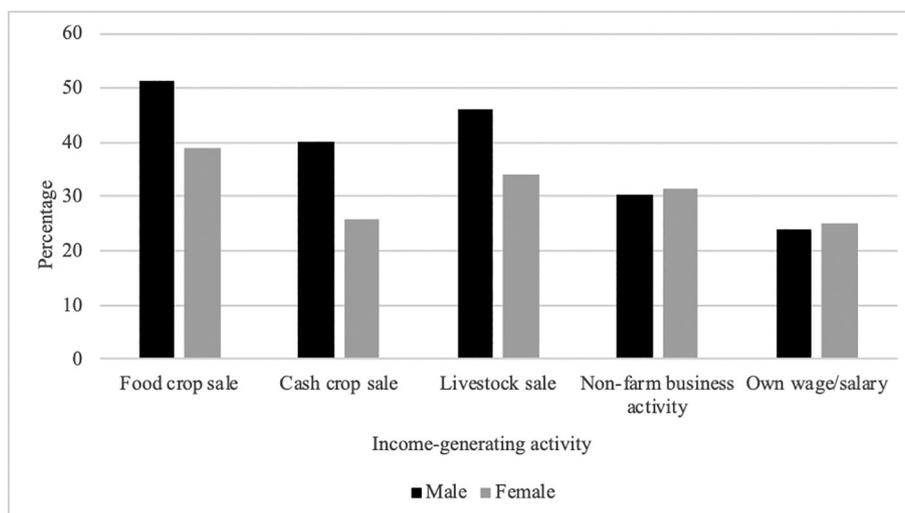


Fig. 1. Percentage of men and women who contribute to most of the decisions on income generated.

African societies, most land is owned by men, hence they have a greater say in its use. Bjornlund et al. (2019) found that women in southern Africa (Mozambique, Tanzania and Zimbabwe) who had whole or partial ownership or control over land had a greater say in decisions about its use. Similarly, Santos et al. (2014) found in Rwanda that husbands had greater decision-making power than their wives on how to use the proceeds from the sale of crops.

The number of years lived in the village reduces the likelihood that decisions about the use of income from crop sales will be made jointly, and increases the likelihood that they will be made by the husband. This is true for both regressions. The descriptive results show that men have lived in the villages for longer, which could mean that they have stronger social networks within the area, and hence are more resourceful and have greater bargaining power in decision-making.

Age skews decision-making towards the wives. The older the husband, the more likely it is that making decisions on using the income from crop sales will be done by the wife. It is possible that with old age, men tend to entrust making decisions about income use to their wives. Moreover, the greater the age difference between husband and wife, the greater the likelihood that decision-making will be skewed towards the wife.

An increase in the wife's level of education increases her involvement in decision making and the likelihood that decisions about the use of income from crop sales will be made jointly. Similar results were obtained by Hagos et al. (2017) in Ethiopia, where women's level of education was found to have a positive effect on household decision-making. When women are educated, they have more opportunities for employment and self-employment, which leads to increased income and hence greater decision-making power in the household (Johnson et al., 2016).

The greater the difference in the value of the assets owned by the spouses, the higher the likelihood that decision-making on the income from the sale of livestock will be skewed towards the wife, perhaps because more affluent husbands have other business ventures and leave their wife in charge of the farming activities.

Table 4
Frequencies for degrees of decision-making on income use (%).

	Joint decision-making	Decision-making skewed towards wife	Decision-making skewed towards husband
Food crop sale	53.85	6.15	40.00
Cash crop sale	51.65	4.40	43.96
Livestock sale	53.40	2.91	43.69

4. Conclusions and policy implications

The results of the present study provide an insight into two important scholarly and policy questions. First, what are the gender-related patterns in household decision-making in developing countries in SSA? Second, to what degree are decisions about the use of income made by the wife, the husband or jointly? Empirical evidence relating to who within a household with a husband and wife is responsible for making decisions about the use of income derived from the sale of crops and livestock, is crucial to policy makers, who are trying to find ways to reduce gender inequalities in several areas of development, and to empower women economically and socially. Kenya provides a good example for us to examine whether these efforts have really borne fruit in rural households of the country.

Our study extends existing work in several ways. We assessed the degree of contribution by both spouses to decisions concerning the use of income derived from the sale of crops and livestock. The husband and wife in each household were asked separately to answer the different questions presented to them, thus reducing the possibility of bias in a spouse's response to the question. Most importantly, we used the multinomial logit model to determine the factors affecting the degree of contribution by the husband's and the wife's contribution separately within a household, a method that has not been used before in previous studies (see for example Muriithi, 2015; Ngigi et al., 2016). This method allowed us to understand what factors explained the variation between the degree of contribution by the wife, and the degree of contribution by the husband. In addition, this study was carried out in western Kenya, where no similar studies have ever been conducted. Ngigi et al. (2016) carried out a different study in western Kenya that analyzed intra-household climate change perceptions and adaptation strategies, but most previous studies done have been conducted in central Kenya (Muriithi, 2015).

The key findings from the analyses show that there is a gender gap with regard to resource access and decision-making within households. The results show that men dominate most household agricultural production decisions, as well as decisions about the utilization of the

Table 5
Multinomial logistic regression results of level of decision-making against socio-economic characteristics of the husbands.

	Income from food crop sale		Income from cash crop sale		Income from livestock sale	
	Joint decision-making	Skewed towards wife	Joint decision-making	Skewed towards wife	Joint decision-making	Skewed towards wife
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Age	0.0301 (0.0230)	0.1278* (0.0604)	0.0285 (0.0262)	0.1318 (0.1057)	0.0182 (0.0231)	0.0673 (0.0894)
Age difference with spouse	-0.0230 (0.0373)	0.0787 (0.0844)	-0.0215 (0.0437)	0.1595 (0.1926)	-0.0007 (0.0368)	0.0259 (0.1310)
Group membership	-0.3177 (0.4571)	-3.4404** (1.5832)	0.1530 (0.5921)	-0.1245 (1.8842)	-0.8417 (0.5386)	-1.6936 (1.6367)
Group membership of spouse	1.3040** (0.5591)	2.6501* (1.5674)	0.4863 (0.6456)	13.8891 (1136.61)	0.3066 (0.5550)	14.2139 (776.9423)
Land size	-0.0890* (0.0526)	-1.5135** (0.7339)	-0.0876 (0.0566)	-1.5978 (0.2830)	-0.0979 (0.0595)	-0.5798 (0.6238)
Number of years lived in village	-0.0255* (0.0135)	-0.7540** (0.0285)	-0.0078 (0.0124)	0.0035 (0.0418)	-0.0065 (0.0106)	-0.0151 (0.0314)
Education level (years)	0.0131 (0.0821)	0.4180 (0.2805)	0.0352 (0.0925)	0.7990 (0.5536)	0.0033 (0.0849)	0.2207 (0.2998)
Difference in education years with spouse	0.1138 (0.0940)	-0.0434 (0.2281)	0.1231 (0.1128)	0.7990 (0.5536)	-0.0051 (0.0892)	-0.1544 (0.3070)
Difference in income with spouse	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0276 (0.0000)	0.0000 (0.0000)	0.0001 (0.0000)
Difference in value of assets	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0003 (0.0000)	0.0000 (0.0000)	0.0000* (0.0000)
Constant	-0.6003 (1.3614)	-8.5578** (3.9180)	-1.3400 (1.6418)	-28.9575 (1136.64)	0.2770 (1.3968)	-19.4162 (776.9563)

Source: Adoption Pathways project data, 2013; Figures in parentheses are standard errors.

* Shows significance at 10% level while.

** Shows significance at 5% level.

income generated. Women generally have more say in the day-to-day running of the household. The main factors found to affect the degree of contribution to decision-making by the spouses were group membership, land size, education level, length of time living in the village, and

age. These findings complement those found in the literature, namely, that women are disadvantaged when it comes to decision-making in the household, due mainly to the patriarchal society in Kenya, which is largely male-dominated. Women also have less bargaining power and

Table 6
Multinomial logistic regression results of level of decision-making against socio-economic characteristics of the wives.

	Income from food crop sale		Income from cash crop sale		Income from livestock sale	
	Joint decision-making	Skewed towards wife	Joint decision-making	Skewed towards wife	Joint decision-making	Skewed towards wife
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Age	0.0415 (0.0255)	0.1701** (0.0825)	0.0435 (0.0328)	0.2996 (0.2036)	0.0301 (0.0262)	0.0736 (0.1082)
Age difference with spouse	-0.0052 (0.0357)	0.1437* (0.0847)	0.0050 (0.0419)	0.5485 (0.4325)	0.0189 (0.0354)	0.0873 (0.1148)
Group membership	1.3190** (0.5516)	2.3792 (1.7126)	0.4788 (0.6440)	15.3614 (910.8134)	0.3541 (0.5590)	14.1321 (784.0956)
Group membership of spouse	-0.2061 (0.4606)	-2.0411* (1.1656)	0.1910 (0.5929)	-0.3674 (1.7725)	-0.7655 (0.5418)	-1.4882 (1.5794)
Land size	-0.0955* (0.0571)	-1.6647** (0.7210)	-0.0893 (0.0577)	-3.2731 (2.7672)	-0.0962 (0.0610)	-0.6003 (0.6253)
Number of years lived in village	-0.0379** (0.0186)	-0.1098** (0.0467)	-0.0255 (0.0261)	-0.1199 (0.1034)	-0.0219 (0.0192)	-0.0242 (0.0734)
Education level (years)	0.0426** (0.0829)	0.5371* (0.2781)	0.0422 (0.0921)	1.2892 (0.9456)	0.0052 (0.0848)	0.2329 (0.2984)
Difference in education years with spouse	0.1588 (0.0805)	0.4066* (0.2187)	0.1613* (0.0973)	0.1209 (0.3955)	-0.0096 (0.0833)	0.0704 (0.2687)
Difference in income with spouse	0.0000 (0.0000)	0.0000 (0.0000)	0.0001 (0.0000)	0.0001 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
Difference in value of assets	-0.0000 (0.0000)	-0.0001 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)	0.0003* (0.0000)
Constant	-1.4783 (1.4369)	-11.0541** (4.7278)	-1.7624 (1.6991)	-39.5106 (910.9819)	-0.1253 (1.4525)	-19.7301 (784.1134)

Source: Adoption Pathways project data, 2013; Figures in parentheses are standard errors.

* shows significance at 10% level while.

** shows significance at 5% level.

Table 7
Marginal effects for the multinomial logistic regressions for the husbands.

Variable	Food crop sale			Cash crop sale			Livestock sale		
	Joint decision-making	Skewed to husband	Skewed to wife	Joint decision-making	Skewed to husband	Skewed to wife	Joint decision-making	Skewed to husband	Skewed to wife
Age	0.0030	-0.0069	0.0038	0.0043	-0.0073	0.0029	0.0031	-0.0045	0.0014
Age difference with spouse	-0.0086	0.0049	0.0037	-0.0073	0.0029	0.0044	-0.0006	-0.0000	0.0007
Group membership	0.0244	0.0917	-0.1161	0.0361	-0.0305	-0.0056	-0.1670	0.1964	-0.0293
Group membership of spouse	0.2097	-0.2705	0.0609	-0.1083	-0.2415	0.3499	-0.1592	-0.1964	0.3556
Land size	0.0217	0.0308	-0.0525	0.0054	0.0344	-0.0398	-0.0132	0.0263	-0.0131
Number of years lived in village	-0.0035	0.0055	-0.0020	-0.0018	0.0016	0.0002	-0.0013	0.0015	-0.0002
Education level (years)	0.0085	-0.0063	0.0148	-0.0046	-0.0154	0.0200	-0.0028	-0.0027	0.0055
Difference in education years with spouse	0.0257	-0.0211	-0.0047	0.0374	-0.0192	-0.0181	0.0013	0.0025	-0.0038
Difference in income with spouse	0.0000	-0.0000	0.0000	0.0000	-0.0000	0.0000	0.0000	-0.0000	0.0000
Difference in value of assets	0.0000	0.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000	-0.0000	0.0000

hence less decision-making authority in the household because they have limited ownership of and control over productive assets, especially land, as well as lower education levels compared to men. This shows a need to strengthen women's decision-making power in the household.

An increase in women's level of education was found to increase their participation in household decision-making regarding income use; this highlights the importance of women's education, and focus on this area would improve their decision-making power. Encouraging women to further their education, and making it easier for them, for instance, by awarding scholarships, would not only help to raise their level of education, but would also help to improve their access to resources, for example land. Their low access to resources was found to limit their power to make decisions. Group membership should be encouraged for both men and women, perhaps by providing incentives such as subsidized inputs to group members, as membership of a group was found to increase the likelihood that decisions would be made jointly. Groups also provide avenues for learning through the sharing of information, which empowers the members. These recommendations can help to reduce the inequalities that exist with regard to intra-household decision-making. Studies have provided evidence that increasing women's decision-making power leads to improved children's nutrition and access to education, better health and overall improved household welfare (Agarwal, 1997; Kabeer, 2012).

Finally, the results of the present study have important policy implications, in particular, that there is a need to empower women so that they are able to participate fully in making decisions about the utilization of the revenue derived from crop and livestock sales. Moreover,

there is a need to sensitize men so that they give space for women to engage fully in discussions about income use. Gender Transformative Approaches (GTA) are needed to address the social norms and barriers that constrain women, and communication approaches aimed at changing behavior, such as the formation of adult-learning subgroups, and focus group discussions (FGDs) with male and female groups (Kantor et al., 2015). Furthermore, intra-household dynamics need to be considered, through the inclusion of other family members in various sessions (Beuchelt & Badstue, 2013).

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Declaration of competing interest

None.

Table 8
Marginal effects for the multinomial logistic regressions for the wives.

Variable	Food crop sale			Cash crop sale			Livestock sale		
	Joint decision-making	Skewed to husband	Skewed to wife	Joint decision-making	Skewed to husband	Skewed to wife	Joint decision-making	Skewed to husband	Skewed to wife
Age	0.0038	-0.0094	0.0055	0.0051	-0.0118	0.0068	0.0057	-0.0071	0.0014
Age difference with spouse	-0.0054	-0.0005	0.0059	-0.0073	-0.0062	0.0135	0.0029	-0.0048	0.0019
Group membership	0.2121	-0.2672	0.0551	-0.1283	-0.2451	0.3734	-0.1466	-0.2061	0.3527
Group membership of spouse	0.0167	0.0582	-0.0750	0.0480	-0.0360	-0.0120	-0.1508	0.1762	-0.0254
Land size	0.0292	0.0341	-0.0633	0.0302	0.0496	-0.0798	-0.0123	0.0260	-0.0137
Number of years lived in village	-0.0049	0.0081	-0.0032	-0.0038	0.0064	-0.0026	-0.0046	0.0049	-0.0003
Education level (years)	-0.0069	-0.0132	0.0201	-0.0103	-0.0210	0.0313	-0.0026	-0.0033	0.0058
Difference in education years from spouse	0.0219	-0.0333	0.0114	0.0340	-0.0345	0.0005	-0.0033	0.0014	0.0019
Difference in income from spouse	0.0000	-0.0000	0.0000	0.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000
Difference in value of assets	0.0000	0.0000	-0.0000	0.0000	0.0000	-0.0000	-0.0000	-0.0000	0.0000

References

- Agarwal, B. (1997). Bargaining and gender relations: Within and beyond the household. *Feminist Economics*, 3(1), 1–51.
- Ajewole, O., Opeyemi, E., Ojehomon, V., Agboh-Noameshie, R., & Aliou, D. (2015). Gender analysis of agricultural innovation and decision-making among rice farming households in Nigeria. *Journal of Agricultural Informatics*, 6(2), 72–82.
- Ambler, K., Doss, C., Kieran, C., & Passarelli, S. (2018). *He says, she says: Exploring patterns of spousal agreement in Bangladesh* (IFPRI Discussion Paper No. 1616). Retrieved from the International Food Policy Research Institute website: <http://www.ifpri.org/publication/he-says-she-says-exploring-patterns-spousal-agreement-bangladesh>.
- Anang, B., Timo, S., Stefan, B., & Jukka, K. (2015). Factors influencing smallholder farmers' access to agricultural microcredit in northern Ghana. *African Journal of Agricultural Research*, 10(24), 2460–2469.
- Anderson, L., Reynolds, T., & Gugerty, M. K. (2017). Husband and wife perspectives on farm household decision-making authority and evidence on intra-household accord in rural Tanzania. *World Development*, 90, 169–183.
- Beuchelt, T. D., & Badstue, L. (2013). Gender, nutrition- and climate-smart food production: Opportunities and trade-offs. *Food Security*, 5, 709–721.
- Bjornlund, H., Zuo, A., Wheeler, S. A., Parry, K., Pittock, J., Mdemu, M., & Moyo, M. (2019). The dynamics of the relationship between household decision-making and farm household income in small-scale irrigation schemes in southern Africa. *Agricultural Water Management*, 213(2019), 135–145.
- Colfer, C., Achdiawan, R., Roshetko, J. M., Mulyoutami, E., Yuliani, L., Mulyana, A., ... Erni (2015). The balance of power in household decision-making: Encouraging news on gender in southern Sulawesi. *World Development*, 76, 147–164.
- Doss, C. (2011a). The role of women in agriculture. *Food and Agricultural Organization (FAO) agricultural and development economics division (ESA) working paper no. 11-02*.
- Doss, C. (2011b). Intra-household bargaining and resource allocation in developing countries. *World Development Report*, 2012.
- Fischer, E., & Qaim, M. (2012). Gender, agricultural commercialization and collective action in Kenya. *Food Security*, 2012(4), 441–453.
- Fletschner, D., & Kenney, L. (2014). Rural women's access to financial services: Credit, savings and insurance. *Food and Agricultural Organization (FAO) agricultural and development economics division (ESA) working paper no. 11-07, March 2011*.
- Food and Agricultural Organization of the United Nations (FAO) (2011). *The state of food and agriculture: Women in agriculture: Closing the gender gap for development*. FAO.
- Gebreselassie, K., De Groote, H., & Friesen, D. (2013). Gender analysis and approaches to gender responsive extension to promote quality protein maize (QPM) in Ethiopia. *A paper presented at the 4th international conference of the African Association of Agricultural Economists, September 22–25, 2013, Hammamet, Tunisia*.
- Gujarati, D., & Porter, D. (2009). *Basic econometrics* (5th ed.). New York: Mc-Graw-Hill Education.
- Hagos, T., Berihun, T., Assefa, A., & Andarge, G. (2017). Women's position in household decision-making and violence in marriage: The case of north Gondar Zone, Northwest Ethiopia. *Journal of Economics and Development Studies*, 5(4), 63–70.
- Johnson, N., Kovarik, C., Meinzen-Dick, R., Njuki, J., & Quisumbing, A. (2016). Gender, assets and agricultural development: Lessons from eight projects. *World Development*, 83, 295–311.
- Kabeer, N. (2012). Women's economic empowerment and inclusive growth: Labour markets and enterprise development. *SIG working paper 2012/1*. Ottawa: IDRC.
- Kantor, P., Morgan, M., & Choudhury, A. (2015). Amplifying outcomes by addressing inequality: The role of gender-transformative approaches in agricultural research for development. *Gender, Technology and Development*, 19(3), 292–319.
- Kassie, M., Ndiritu, S., & Stage, J. (2014). What determines gender inequality in household food security in Kenya? Application of exogenous switching treatment regression. *World Development*, 56, 153–171.
- Kikulwe, E., Okurut, S., Ajambo, S., Gotor, E., Ssali, R. T., Kubiriba, J., & Karamura, E. (2018). Does gender matter in effective management of plant disease epidemics? Insights from a survey among rural banana farming households in Uganda. *Journal of Development and Agricultural Economics*, 10(3), 87–98.
- Lecoutere, E., & Jassogne, L. (2016). We're in this together: Changing intra-household decision-making for more cooperative smallholder farming. *Institute of Development Policy and Management, University of Antwerp working paper/2016.02*.
- Meijer, S., Sileshi, G., Kundhlande, G., Catacutan, D., & Nieuwenhuis, M. (2015). The role of gender and kinship structure in household decision-making for agriculture and tree planting in Malawi. *Journal of Gender, Agriculture and Food Security*, 1(1), 54–76.
- Muriithi, B. (2015). Smallholder horticultural commercialization: Gender roles and implication for household well-being in Kenya. *Paper presented at the 29th international conference of agricultural economists, Milan, Italy, August 9–14, 2015*.
- Ngigi, M., Mueller, U., & Birner, R. (2016). Gender differences in climate change perceptions and adaptation strategies: An intra-household analysis from rural Kenya. *Centre for Development Research, University of Bonn. Discussion paper on development policy no. 210*.
- Quisumbing, A. (2003). What have we learned from research on intra-household allocation? *Household decisions, gender and development: A synthesis of recent research* (pp. 1–16). IFPRI.
- Quisumbing, A., & Smith, L. (2007). Intra-household allocation, gender relations and food security in developing countries. *Case study #4–5 of the program: Food policy for developing countries: The role of the government in the global food system*.
- Ragasa, C. (2012). Gender and institutional dimensions of agricultural technology adoption: A review of literature and synthesis of 3 case studies. *Poster prepared for presentation at the International Association of Agricultural Economists (IAAE) triennial conference, Foz do Iguacu, Brazil, August 18–24, 2012*.
- Santos, F., Fletschner, D., & Savath, V. (2014). An intra-household analysis of access to and control over land in the Northern Province, Rwanda. *Paper prepared for presentation at the 2014 World Bank conference on land and poverty, Washington DC, March 24–27, 2014*.
- Seebens, H. (2011). Intra-household bargaining, gender roles in agriculture and how to promote welfare-enhancing changes. *Food and Agricultural Organization (FAO) agricultural and development economics division (ESA) working paper no. 11-10, March 2011*.
- Sikod, F. (2007). Gender division of labour and women's decision-making power in rural households in Cameroon. *African Development*, 32(3), 58–71.
- Sneyers, A., & Vandeplass, A. (2013). Girl power in agricultural production: How much does it yield? A case study on the dairy sector in India. *LICOS Centre for Institutions and Economic Performance discussion paper 341/2013*.
- Twyman, J., Useche, P., & Deere, C. D. (2015). Gendered perceptions of land ownership and agricultural decision-making in Ecuador: Who are the farm managers? *Journal of Land Economics*, 91(3), 479–500.
- Udry, C. (1996). Gender, agricultural production and the theory of the household. *Journal of Political Economy*, 104(5), 1010–1046.
- Van Aelst, K. (2014). Household decision-making and gender relations in Tanzania. Literature and theory review. *Institute of Development Policy and Management, University of Antwerp working paper/2014.02*.
- Van Eerdewijk, A., & Danielsen, K. (2015). *Gender matters in farm power*. CIMMYT Publication.
- Williams, R. (2018). *Multinomial logit models - Overview*. <https://www3.nd.edu/~rwilliam/stats3/Mlogit1.pdf>.
- World Bank, Food and Agricultural Organization of the United Nations, (FAO), & International Fund for Agricultural Development (IFAD) (2009). *Gender in agriculture sourcebook*. World Bank.