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FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE

Barriers to women's participation in coffee pest management learning groups in Mt Elgon Region, Uganda

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Abstract: There is insufficient empirical research on barriers to women's participation in mixed sex coffee Integrated Pest Management learning groups. Previous studies focused on socio economic factors with less emphasis on gender in a male dominated crop in Elgon Sub region of Uganda. The study used a cross sectional survey research design and a total 126 (71 men and 55 women) coffee IPM group members by census. A participation index was computed as a measure of level of participation in coffee IPM group processes while cross tabulations and correlation coefficients were used to analyze the relationship between level of participation and hypothesized barriers to women's participation. Qualitative data informed interpretation of the observed correlations. Findings revealed that about 46% of the men compared to 25% women rated high on the group participation index with a significant chi-square difference ($p < 0.05$). Age, ability to read and write English and lumasaba, organizational goals set, membership criteria, access to credit, marital status, mobility constraints, access to and control over coffee management inputs and benefits were significantly correlated to group participation. The study concluded that research and development approaches that utilize groups should identify and address barriers to women's participation and benefits from mixed sex group processes for better targeting of interventions.



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PUBLIC INTEREST STATEMENT

Participation in group activities is generally dominated by male farmers. In an era that seeks fairness, there is need to understand what could be done to secure increased and beneficial participation of women in the male-controlled crop. With the increased use of mixed farmers groups to channel integrated pest management methods for coffee pest management, there was need to establish the method's effectiveness in ensuring women farmers participation in these processes. The barriers to women's participation in these groups included; age, ability to read and write English and lumasaba (local language), farmer group goals set, membership criteria, marital status, mobility constraints, limited access to and control over coffee management inputs and benefits. The study findings have relevance for research and development practitioners with creative ways to reach vulnerable groups such as women, educators who train extension agents, policy makers and farmers who give feedback.

Subjects: Agricultural Development; Agriculture and Food; Gender Studies

Keywords: agriculture; integrated pest management; coffee stem borer; IPM CRSP; level of participation; gender and Uganda

1. Introduction

Farmer groups are useful entities to work with when reducing poverty and improving small producer livelihoods by governments and development partners (Oxfam, 2013). These institutions can among others improve access to information and knowledge (Herbel, Crowley, Ourabah Haddah, & Lee, 2012). Depending on the context, researchers use farmer groups to promote participatory technology testing, learning and dissemination of agricultural technologies such as integrated pest management (IPM) practices (Erbaugh, Donnermeyer, Amujal, & Kidoido, 2010). The farmer field school (FFS) approach is one classic example of the use of groups to promote IPM (Danielsen, 2011). FFSs were intended to reach out to marginalized groups who might not have access to training, knowledge and inputs (Erbaugh et al., 2010). Central in these group processes is member participation. Participation may be defined as an act of taking part in an activity usually with others (Farid, Mozumdar, Kabir, & Goswami, 2009). In other words, it refers to involvement of individuals and groups in development processes with an objective of ensuring self-reliance and improved standard of living (Mellouli, 2003; Nxumalo & Oladele, 2013). Equitable participation in producer groups by women and men is of great benefit to members and their families. For equity to be achieved then, both men and women are empowered to participate in meetings, activities and decision-making (Agarwal, 2001). For this study, participation refers to individual involvement in coffee IPM group activities in Mt Elgon region in Eastern Uganda.

Interventions in Mt Elgon, commenced after a baseline Survey of Arabica Coffee (*Coffea arabica* L.) producers in the districts of Sironko, Manafwa and Mbale that found that pesticide use was the main control method for stem borers (Erbaugh et al., 2006). The National Agricultural Research Organization (NARO) Coffee Research Program-Coffee Research (COREC) in collaboration with Integrated Pest Management Collaborative Research Support (IPM CRSP) under United States Agency for International Development (USAID) funding carried out studies in 2008 to compare the conventional method of pest control in coffee, which involved chemical pesticide application with IPM management tactics (stem smoothening and stem wrapping), and the later were found to be effective. Therefore, between 2009 and 2010, the IPM options were evaluated on farm (Kyamanywa et al., 2012). The results from the on-farm trial were positive, and so the IPM packages were up-scaled in 2009 through coffee IPM groups in two sub counties of Manafwa District. One sub county in Sironko district was added in 2010 (Kyamanywa et al., 2012). Coffee IPM group members would meet twice a month at a coffee demonstration field at a farmer's home. Learning methods were experiential, participatory and learner-centered. Men and women farmers followed the coffee IPM management activities listed on a coffee management calendar covering the entire year.

According to Christie (2010), "USAID recognizes that the advancement and empowerment of women worldwide is necessary for economic development and is committed to providing development assistance that improves the lives of women, men and children around the world (USAID-WID). Its Automated Directive Systems (ADS) requires all projects to promote gender equity and take gender into account in planning, implementation and evaluation". The Gender Global Themes (GGT's) as components of IPM CRSPs carried out research to produce and disseminate knowledge of gender issues in IPM. Against this background therefore, a gender analysis study using the Gender Dimensions Framework was commissioned to establish the constraints/barriers and opportunities of men and men in relation to participation in IPM practices (Christie, 2010) for coffee stem borer. Identifying these constraints/barriers and opportunities can lead to equity and inclusion strategies for involving men and women farmers in IPM research (Christie, 2010) and widen the knowledge base required for designing appropriate IPM packages.

Empirical studies elsewhere found that, participation in group processes together with the attendant benefits is not uniform across different categories of members. The variation in participation is affected by a number of factors. For instance, in various contexts, gender has been found to influence participation in group processes. Women are often excluded from participation, leadership and decision-making processes in various developing societies around the World countries (Agarwal, 2001; Gotschi, Njuki, & Delve, 2009; Tanwir & Safdar, 2013). Participation for women is further influenced by age, educational level, time, status, and previous membership in organizations, access to assets and resources, organizations' rules of entry, socio-cultural norms and enabling environment (Kaaria, Osorio, Wagner, & Gallina, 2016). In Mozambique, Gotschi et al. (2009) found that men control and manage most producer organizations, cooperatives, workers' unions and out grower schemes. According to Gyau, Mbugua, and Oduol (2016) gender, influenced the decision to participate in group activities by farmers in Kenya. Other studies identified gender as one among many factors that would influence individuals to participate in farmer groups in Uganda, Tanzania, Romania and Kyrgyz Republic (Bennin et al., 2008; Davis et al., 2010; Sabates Wheeler, 2006; Towo, 2004).

Participation in coffee IPM groups in Eastern Uganda was expected to be influenced by unique factors given the differing dynamic and contextual nature of social processes (Rubin, Manfre, & Barrett, 2009a, b; Tau & Hassen, 2007). A knowledge gap existed on gender related factors influencing participation in coffee IPM group processes and the inherent gender barriers. Comprehension of gender's contribution in group processes of a male-controlled enterprise like coffee is critical to coming up with ways in which to enhance the participation and benefit by women from IPM packages. A study was therefore conducted to identify the barriers to women's participation in farmer learning groups for IPM control of the coffee stem borer in Mt Elgon, Uganda.

2. Theoretical framework

The study conceptualization is informed by gender theory. García (2001) defines gender as a social construct linking sex, a biological variable, to expected socio-cultural characteristics and behavior. Essentially, gender is a construct that defines how society is organized and functions. Each society therefore because of its inherent perceptions, values, and cultural norms has conceived and structured what it means to be masculine and feminine. Gender determines the roles, responsibilities, obligations, entitlements, and restrictions within the various spheres of life at household and community level (Manyire & Apekey, 2013). It shapes how adult males and females; youth and children relate in the various contexts including the development arena. Consequently, participation in group activities which are situated within socio-cultural contexts are significantly influenced by the same societal power dynamics that shape gender relations and often pose limitations and support the decision to participation in any collective activity.

According to gender theory, the ability of women to make autonomous decisions to mobilize networks or get engaged in collective activity is an indicator of empowerment (Sraboni, Quisumbing, & Ahmed, 2013). The concept of empowerment can be defined as the expansion of freedom of women to take charge of their lives by making choices, taking actions, and exercising authority and control over the resources and decisions that affect their life (World Bank, 2001). Decisions to participate in public domains is not any different. Chambers (2005), raises issues about who participates, where, when, with whom and with what equality. Many gender responsive empirical collective action or participation studies have found there are different levels of participation by women and men. These differences are shaped by socio cultural, personal/demographic and institutional factors. In a survey on factors influencing Human Immune Virus (HIV) positive farmers' level of participation in support groups in Nigeria, Jummai (2012) found that women farmers' level of participation in the study area was low. A relationship between gender and farmer groups participation study in Tanzania, found that women participated less in farmer groups than men. This was explained by the lack of a gender mainstreaming strategy for the groups and lack of sensitization on gender issues. Heavy domestic workloads affected women's attendance of group meetings. Emphasis on export crops also limited women's involvement in groups as they lacked control over land necessary to engage in such crops (Towo, 2004). However, Sanginga, Lilja, and Tumwine (2001) found that women in East African groups had dominant community roles and responsibilities in relation to activities implemented by

the groups making them more likely to participate than men. Beard (2005) found that in Indonesian communities, women participated less in groups due to cultural limitations on their level of public engagement. The traditional gender roles in many cultures dictate that men participate in public spheres, take on husbandry roles-productive activities and income generating activities (Agarwal, 2001; Food & Agriculture Organization of the United Nations [FAO] 2010–2011; Pandofelli, Meinzen-Dick, & Dohrn, 2007; Tanwir & Safdar, 2013; Westermann, Ashby, & Pretty, 2005), while women concentrate within the domestic sphere. Regardless of the mixed results, the implication is that, fewer women are likely to participate in the public sphere and consequently in producer organizations (Massolo, 2007; Meinzen-Dick & Zwarteveen, 1998).

Research conducted by Subedi (2008) in Nepal found that, in mixed groups women are more constrained in terms of access to all forms of information including extension services, farming inputs, and mobility. This is often due to heavy workloads at home as per the time-use surveys across a wide range of countries (FAO, 2011, 2015, 2016). Women spent between 85 and 90% of their time on domestic chores and other care activities (FAO, 2011, 2015). This has great implications on their ability to participate in activities outside the home stead including attending producer organization meetings or related training/extension opportunities due to time challenges (Tanwir & Safdar, 2013).

2.1. Personal/demographic factors

Women and men have different interests that can influence their willingness to participate in producer organizations (FAO, 2011; Pandofelli et al., 2007). Women for example might opt to join producer organizations that emphasize food self-sufficiency and not cash crops (IFAD, 2010). Men by virtue of their gender roles and interests in income generating crops can be motivated to join producer groups to access markets (Kariuki & Place, 2005). This finding is in agreement with Agarwal's (2000, 2001) work on forest user groups who demonstrated that men might be motivated by income and may promote strict controls on forest areas mainly for sale.

Studies by Oxfam (2013), Agarwal (2001), Warner, Al-Hassan, and Kydd (1997) found that older women from wealthier households tended to participate more in producer groups as opposed to the younger ones from poorer households. This perhaps is due to better access to assets and resources by the former. Coleman and Mwangi (2013) found that education significantly affects women's participation in producer organizations in Bolivia, Kenya, Mexico and Uganda. The probability to participate in producer groups and attend meetings increased with years of schooling. Women face significant barriers participating in and benefiting from farmer field schools and other training and extension opportunities as compared to their male counterparts (World Bank, 2009).

2.2. Institutional factors

A range of institutional factors including organizational goals, membership criteria, group leadership, access to extension services, infrastructure have been found to influence farmers' participation in groups. Datta (2007) recognized that successful community groups in Bangladesh had strong leadership, were transparent in information-sharing and decision-making, had trustworthy and competent leaders and a specific quota for women elected as leaders. At an individual level, mutual trust and respect among the members served as important factors for effective participation. Marriage as an institution is another great contributor to women's restricted mobility in some contexts (Gotschi et al., 2009; Manfre & Rubin, 2012; Oxfam, 2013). In Mozambique, married women may not participate in groups without the permission of their husbands (Gotschi et al., 2009). Group leadership has an influence on participation in groups. Leadership depends on the styles with democratic leadership styles leading to better participation as opposed to exclusionary and autocratic styles (Sseguya, 2009). Access to infrastructure such as a tarmac road may influence participation in farmer groups. Davis et al. (2010) found that distance to tarmac roads was negatively related with participation in a FFS in Kenya, Tanzania and Uganda, suggesting that farmers in remote areas are less likely to take part in the FFS. Female as compared to male farmers, participate less in group activities due to limited access to transportation, coupled with long distances to the training venues.

2.3. Access to assets and resources, rules of entry and requirements

There is evidence that, women as compared to men in many developing countries have less control over land, use fewer agro-inputs and have less access to extension services (FAO, 2011). This limited access to productive assets may decrease women's bargaining power in and outside the household consequently, limiting their ability to join producer organizations that require ownership of assets such as land (Agarwal, 2001; Pandofelli et al., 2007; Wiig, 2013). According to Ouattara et al. (2010), lack of income and economic empowerment can affect women's self-confidence and prevent them from obtaining leadership positions in producer organizations (Ouattara et al., 2010). In Ghana's mango out-grower scheme group entry requirement was a bag of maize, a man's cash crop and a woman's food crop. This limited women's ability to register with the company as out-growers (FAO, 2013). In Mozambique, when only one member per household was allowed to participate in a producer organization, the husband was more likely to participate than the wife, limiting women's participation (Gotschi et al., 2009).

From the above theoretical and empirical evidence, there is insufficient empirical sex disaggregated data on the level of participation of men vis-a-vis women in farmer groups in relation to the coffee and integrated Pest management package in particular. Previous studies had a different focus in terms of type crop (cash/food crop), the pest and related control methods used, and other socio economic and institutional variables considered. Most recent existing studies concentrated on other commercial crops other than coffee (Ahuja, Negi, Narayan, Ahuja, & Jain, 2016; Allahyari, Damalas, & Ebadattalab, 2016; Alyokhin et al., 2015; Borkhani, Rezvanfar, Fami, & Pouratashi, 2013; Farrar, Baur, & Elliott, 2016; Isabirye, Nankinga, Mayamba, Akol, & Rwomushana, 2016; Kabir & Rainis, 2013; Korir et al., 2015; Lefebvre, Langrell, & Gomez-y-Paloma, 2015; Mangan, Sahito, Rais, & Rais, 2016; Mohammadrezaei & Hayati, 2015; Muriithi, Diiro, Affognon, & Ekesi, 2016; Prasad & Malathi, 2016; Rousan, Makhadmeh, & Abu-Alsheeh, 2016; Slone & Burrack, 2016; Trapero, Wilson, Stiller, & Wilson, 2016; Xu & Khachatryan, 2015). Even though some studies looked at tree crops, these differ in terms of pests and Integrate Pest Management (IPM) methods employed. In terms of socio economic and institutional variables considered, there is a heavy focus on demographics and other economic attributes with limited focus on gender. In many cases, gender is modelled or mentioned as one of the demographic characteristics without a clear gender analysis of the IPM package use. Studies that carried out a gender analysis (Christie, Van Houweling, & Zseleczy, 2015; Mwangi, Erbaugh, Sibuga, Maerere, & Waiganjo, 2015) didn't focus on coffee IPM specifically while those that did (e.g. Erbaugh, 2011; Erbaugh et al., 2010; Kyamanywa et al., 2011) have limited gender scope.

Generalizing findings from these studies is not a good idea given the dynamism and context specific nature of gender related variables. More research to understand the barriers to women's participation in mixed sex groups that promote agricultural technologies such as IPM in diverse contexts was needed.

The concept of this study therefore, is based on group organization. Organizing diverse gender categories into groups should ideally enhance participation. This is because various people come in with creative ideas based on invaluable expertise to solve of more complex farm challenges. On the contrary, bringing such people together in a typical patriarchal society re-enforces imbalances with the minority groups such as women benefiting less from such efforts. Specifically, the questions of who is able participate, where, when, with whom and with what equality goes without mention (Chambers, 2005; Subedi, 2008). Empirical studies in various locations and contexts show Women face significant constraints participating in and benefiting from farmer training and extension opportunities compared to men (World Bank, 2009). On this basis therefore, the level of gendered participation in mixed sex coffee IPM group processes could be influenced by a range of socio cultural norms, Personal/demographic and institutional factors.

3. Research methods

The study was carried out in the Mt Elgon region of Uganda in the districts of Sironko (Buwalasi Sub County) and Manafwa (Bumbo and Bupoto sub counties). These study sites were purposively selected because due to the high incidence of coffee stem borer (23%), IPM was being promoted there to control the pest through group approach (Kyamanywa et al., 2012). Sironko district has a total area of 1,091 square kilometers (421 sq mi). The district lies between approximately 1,299 meters (4,262 ft) and 1,524 meters (5,000 ft) above sea level. Manafwa district on the other hand has a total area of 451 square kilometers (174 sq mi). Manafwa has low land, upland and mountain climatic zonation. The coordinates of the Sironko and Manafwa districts are: 01 14 N, 34 15E and 00 54 N, 34 20E respectively (Google Earth, 2013).

The zone is characterized as banana-Coffee farming system where mixed farming is predominant. The zone has the following characteristics: deep fertile soils-volcanic alluvial, well drained loam to black loams over red sandy clay loams, well distributed rainfall, relatively high altitude and areas with large tree vegetation coverage. Food crops include beans, groundnuts, sorghum, maize, millet, cassava, potatoes and sweet potatoes. Coffee and cotton are the main cash crops. Fruits and vegetables grown in the district include passion fruit, tomatoes, onions and cabbage. Livestock reared in this zone include cattle, goat, and sheep. This zone has a variety of other activities, such as timber cutting and sales, trade, and formal employment. The main source of cash income is sale of crops and livestock. Agricultural inputs and farm produce are obtained and sold within the districts as well as in the city of Mbale. A host of risks are associated with this zone, such as crop pests and diseases, livestock diseases, fluctuating crop prices, soil erosion and landslides in high areas, degradation, and high population density. As a result, there is increased land pressure and fluctuating market prices. According to 2016 population estimates, UBOS puts Sironko district's population at about 251,600 and Manafwa at 369,100 people. The majority of the people belong to the Bagisu ethnic group and lugisu is the most widely spoken language.

3.1. Research design

The study adopted a cross sectional survey research design and data was collected in two phases between May and July 2012. In the first phase, key informant interviews were conducted to gain in-depth understanding of the group processes and gender issues affecting men and women's participation. Phase two consisted of a cross-sectional survey aimed at obtaining data on the extent of participation in the Coffee IPM groups by both men and women members, and to determine the factors influencing participation.

3.2. Population and sampling

The target population comprised men and women in coffee IPM farmer groups in the target districts. The Integrated Pest Management Collaborative Research Support Program (IPM CRSP) project had worked with three groups and all were included in the study. The list of IPM CRSP farmer group members which served as sampling frame were obtained from group leaders. These groups consisted of a total membership of 42 (22 men, 20 women) for Kibowa, 45 (24 men, 21 women) for Kesemulira and 54 (30 men, 24 women) for Sosyo. The study sought to include all group members in the study. However, the available sample included 71 men and 55 women drawn from the three groups to bring the total to 126 respondents. All the three farmer groups formerly farmer field schools had been graduated by the IPM CRSP project and preliminary studies sighted unavailability of some members. Researchers therefore had to interview as many people available for proper representation.

3.3. Instrumentation and data collection

A structured interview schedule that had been subjected to content validation with a panel of experts, and suitability tests through pretesting was used to collect data from the sample. The survey tool was pre-tested in Bumasaba parish in Sironko district, which was comparable population that was not participating in the study. The field testing exercise helped to test for clarity and the logical flow of the questions and duration of the interview. Data quality was ensured through thorough

training of enumerators and using enumerators who are proficient in the local dialects. Team debriefs were also held every day after the data collection exercise to share lessons and challenges so as to ensure a uniform interpretation of the household survey questions.

Key informants were interviewed individually in their homes or offices for one to two hours on average. A voice recorder was used to capture the interview/discussion and the recordings were later played to enhance accuracy of the field notes. Survey data was collected by the researchers with the help of the research assistants. Appointments to visit the selected farmers were made and consent was sought prior to the interview. The purpose of the study was clearly explained to the respondents as part of the process of securing informed consent.

Focus group discussion, were also held in Buwalasi and Bumbo sub Counties of Sironko and Manafwa districts respectively. A total of two FGDs were conducted together with the farmer group members stratified by sex to triangulate findings collected from key informant interviews. With the help of two field enumerators, the separate male and female sub-groups were assigned tasks to generate their responses about the coffee stem borer, damage, spread, management, groups' activities and what limits or enhances women's participation in coffee group processes. For each coffee group, two FGDs of 1.5–2 hour were conducted. Notes were captured for a deeper analysis of the conversations at a later time.

The major challenge faced by researchers during data collection was the fact that, the farmer group members interviewed were graduated farmer field schools by IPM CRSP. This therefore made tracing of the members difficult. Some members had resorted to invest in other enterprises other than coffee.

3.4. Data analysis

To determine the barriers to women farmers' participation in coffee IPM group processes, a descriptive analysis was carried out to generate percentages, means and standard deviation. Independent *t* tests and chi-square were used to test for differences in means and proportions respectively between the men and the women as separate groups. Cross tabulations were used to measure the relationship between selected institutional and demographic factors influencing the level of women's participation in coffee IPM group processes using cross sectional data. Qualitative data was used to complement and interpret the observed relationships and gender gaps in participation level of women.

3.5. Estimation of participation index for group processes adopted and modified after Borkhani, Fami, Rezvanfar, and Pouratachi (2011)

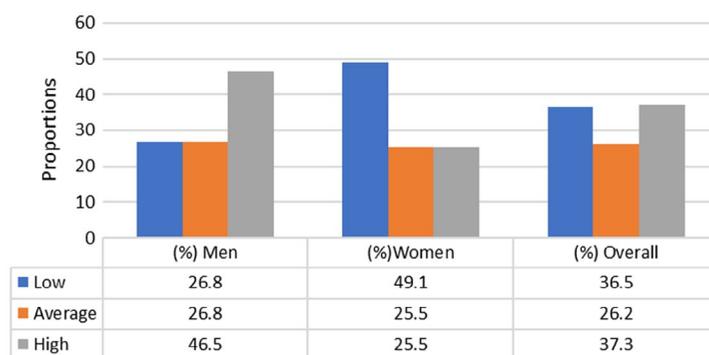
Participation was defined as the involvement of men and women farmers in IPM group processes measured using a participation index (PI). The Participation index was computed based on (i) the number of meetings attended, (ii) the number of ideas contributed, and (iii) the number of ideas taken, and (iv) the rating of the level of satisfaction with the benefits obtained from Coffee IPM group trainings in the last 6 months. For questions (i)–(iii) the scale used was: 0 = "Never", 1 = "Seldom", 2 = "Frequent" and 3 = "Very Frequent"; for question (iv) 0 = minimal; 1 = fairly satisfied; 2 = average or moderately satisfied; 3 = highly satisfied. The total score was calculated by adding individual scores that each respondent obtained for all statements. Participation Index was calculated as follows:

$$PI = \sum_{i=1}^4 CGPFS_i \tag{1}$$

where PI is participation index, CGPFS_{*i*} is coffee group process frequency score (0 = never, 1 = seldom, 2 = frequent and 3 = very frequent; 0 = minimal; 1 = fair; 2 = average; 3 = high) and *i* = number of Coffee IPM group activities ranging from 1 to 4.

Figure 1. Level of participation in Coffee IPM group processes by men and women.

Note: Pearson χ^2 (2) = 7.9258; p = 0.019.



$$PI = \sum_{i=1}^4 ATTEND + \sum_{i=1}^4 CONT_IDEA + \sum_{i=1}^4 IDEA_TAKEN + \sum_{i=1}^4 BEN_RATING \quad (2)$$

4. Results and discussion

4.1. Women’s participation in coffee IPM group processes

Analysis of level of participation reveals that women participate less in group processes compared to men (Figure 1). Gender analysis of the scores on the composite participation index revealed significant gender gaps. Among the high-level participants, about 47% were men as compared to 26% who were women. This had significant difference as per the Pearson chi-square tests at $p < 0.05$ implying a significant difference between men and women’s level of participation. In terms of specific parameters, 58% of the men contributed ideas frequently in group meetings compared to 37% of the women. During implementation, 58% of the men’s ideas were adopted compared to 40% for women. This too had a significant Pearson chi-square difference of $p < 0.05$. Finally, the majority of group members had benefited from coffee IPM groups (about 81%) but slightly under a half (about 49%) were men. The major benefit was knowledge/skills (about 98%) with more men benefiting.

Generally, the study found that men’s capacity to attend group meetings, contribute accepted ideas and benefit from group processes more than women could be associated with differences in power and status (Narayan, 1999) in the society. This has a potential of leading to discontentment as women end up marginalized from active participation in group activities. The lower participation of women in group activities is consistent with results from other studies. For instance, level of women farmers’ participation in support groups in Nigeria was low (Jummai, 2012). In Mozambique, more husbands than wives participated in a producer organization (Gotschi et al., 2009). The level of participation could be explained by a number of factors, for example in the relationship between gender and farmer groups in Tanzania, Towo’s (2004) study found that women participated less in farmer groups than men due to most groups putting emphasis on export crops which often have less women’s involvement because they lack control over key production inputs like land. Other factors responsible for such variation is demographic, institutional factors and access to and control over production inputs.

4.2. Barriers to women’s participation in coffee IPM groups

4.2.1. Demographic factors

4.2.1.1. Age: Women who tended to participate in coffee IPM group process were older. Their ability to participate could be attributed to the nature of the coffee enterprise which is a long-term perennial crop that tends to attract older people who have more access to and control over factors of production such as land compared to the younger people. Some of these elderly women were off age and don’t have more reproductive roles compared to the young (20–35 years). This is confirmed by a positively and significantly correlated between the age of a farmer and participation in coffee

IPM group process at $p < 0.05$: Women who tended to participate in coffee IPM group process were older. Their ability to participate could be attributed to the nature of the coffee enterprise which is a long-term perennial crop that tends to attract older people who have more access to and control over factors of production such as land compared to younger people. Some of these elderly women were off age and don't have more reproductive roles compared to the young (20–35 years). There are mixed results about the above variable with some previous studies agreeing and other disagreeing. Studies in Uganda, Tanzania, Romania and Kyrgyz Republic on the relationship between age and farmer participation in groups found significant results (Bennin et al., 2008; Davis et al., 2010; Sabates Wheeler, 2006; Towo, 2004). In addition, Fonjng and Fongkimeh (2007) demonstrated that farmers are highly involved in agricultural production in their late reproductive and productive (ages) life compared to relatively young farmers. On the contrary, study results by Davis et al. (2010) who found that, in East Africa (Tanzania, Kenya and Uganda), younger farmers were more likely to participate in farmer field school groups than the older farmers possibly because of the attractive nature of enterprises promoted in the FFSs were not in agreement. The variations could be explained by the nature of the enterprise and other contextual factors.

4.2.1.2. Education level: Educational level was another variable hypothesized to be a barrier to women's participation in group processes. The average number of years in school ranged between 6 and 7 years which seemed low and didn't have a significant relation with participation. On the contrary, thought, ability to read and understand both English (34.1% of men and 26.2% of women) and lumasaba/lugisu (42.1% of men and 32.5% of women) by both men and women was correlated to participation at $p < 0.05$. Comparison, across women at various levels of participation confirms the results (60%). The findings agree with Borkhani et al. (2011) who found that educational level was positively and significantly correlated with the extent of IPM practices application. Chowdhury and Ray (2010), Truong Thi (2008), Maraddi, Hirevenkanagoudar, Angadi, and Kunnal (2007) and Atreya (2007) agree with the previous author. Since the ability to read and write English and Lumasaba was skewed in favor of men, the low capacity of women's is thus a great hindrance towards participation. It's not surprising therefore to note that, Coleman and Mwangi (2013) found that *education* significantly affects women's participation in producer organizations of Bolivia, Kenya, Mexico and Uganda. On the contrary, Bonabana-Wabbi (2002) found that educational level was not correlated with the extent of IPM practices application.

4.3. Institutional factors

Institutional factors include ownership of coffee gardens, organizational goals, membership criteria, leadership, access to credit, marital status, access to and control over coffee management inputs and benefits, mobility constraints and Rules and requirements by the group.

4.3.1. Ownership of coffee gardens

Ownership of coffee gardens give one the right to make decision and carryout any related activities on such at will. This variable was hypothesized to influence group participation since at production women are more involved and so would seek more information to ensure high farm production. Though ownership of gardens was associated with participation, it was not significant. A female respondent during the focus group discussion pointed to the fact that most gardens are shared since their access to land is by virtue of their marital status. Most gardens were therefore shared and women had to carryout coffee production related activities regardless of the ownership. After all, they obtained income to purchase household items and pay petty bills such as school fees, food and clothing.

4.3.2. Organizational/farmer group goals

Farmer group goals may not necessary match the individual farmer's. This conflict of interest can motivate or demotivate one from participating in group activities.

Results from both key informants and other interviews indicate that, the coffee IPM groups were established to upscale the Coffee IPM packages through a group approach. This is because the farmers were challenged by the coffee stem borer and yet use pesticides as the only remedy. Pesticides are harmful to the environment and human health. Coffee being a commercial crop attracted more of men than women. This is confirmed by the negative but significant correlation between farmer group goals set and participation of women at $p < 0.05$. For women alone, their majority (about 31%) had the coffee IPM group goal as a barrier to participation. This is because, women and men have different interests that can influence their willingness to participate in producer groups (FAO, 2011; Pandofelli et al., 2007). Men by virtue of their gender roles and interests on income generating crops can be motivated to join producer organizations to access markets (Kariuki & Place, 2005) while women opt to join producer organizations that emphasize food self-sufficiency and not cash crops (IFAD, 2010). In Tanzania, women participated less in farmer groups, than men due to most groups putting emphasis on export crops which often have less women's involvement because they lack control over key production inputs like land (Towo, 2004).

4.3.3. Membership criteria

Membership are minimum attributes set for one to be a member. Requirements such payment of membership fee, maintaining financial penalties for failure to attend meetings, single member per household and having a coffee garden hindered women's participation in farmer groups were generally seen as stringent by women. For virtually all the group meetings attended by the researchers, women were fewer than men. The group meeting times of 9 am to 10 am and 2–3 pm East African Time though earlier agreed upon by both men and women, was found not to favor women who were more involved with domestic work. Literature has revealed that 85–90% of African rural women's time is spent on domestic and other care activities such as childcare, water and food collection, cooking (FAO, 2011, 2015). Furthermore, lack of sensitization about these gender issues by the IPM program and the domestic workloads hindered women from attending group formation meetings. In addition, the nature of the enterprise affected women participation. Coffee is a commercial crop which often has less women's involvement because they lack control over key production resources like land. Women mostly grew maize (about 30%), beans or soy beans (about 24%) and banana (about 23%), vegetables (about 17%) and coffee (about 7%). Women's inability to meet such requirements can be explained by their position in society that is shaped by the cultural setting characterized by low access to institutions. Many are times, women were pushed to reproductive roles by men who had negative perceptions about women participating in groups. Majority of the women (about 32%) participated less in group activities. In Ghana's mango out-grower scheme, the entry requirement was a bag of maize, a man's cash crop and a woman's food crop. This limited women's ability to register with the company as out-growers (FAO, 2013) because women could let their families starve in the pretext of securing entry to a group. In Mozambique, when only one member per household was allowed to participate in a producer organization, the husband was more likely to participate than the wife, limiting women's participation (Gotschi et al., 2009).

4.3.4. Leadership

Another variable that was anticipated to influence women's participation in coffee IPM groups was leaderships. Results indicated that, Women held lower positions in groups such as committee members as compared to men who held the four-top group leadership positions i.e. Chairperson, Vice, General Secretary and treasurer. According to key informants and other group members, one woman, in Sosyo coffee IPM group known to hold a leadership position had no decision-making powers. There was no special arrangement like the case for Bangladesh community groups to allocate specific quotas for women to be elected as leaders (Datta, 2007). This was thus a great demotivator participation by women's in groups activities. More over leadership positions come with some privileges such as being a signatory, access to incentives such as agro-inputs and contributing ideas that are most likely taken up. According to Ouattara et al. (2010) lack of income and economic empowerment can affect women's self-confidence and prevent them from obtaining leadership positions in producer organizations. Indeed, women in the study sites, because of low income, network due to immobility and time constraints could not allow them diversify their income generating activities

resulting into dis-empowered status. A possible implication, is women’s voices not represented or heard in coffee IPM groups.

4.3.5. Access to credit

In the overall sample, slightly more women (about 42%) sourced credit to finance coffee production from the bank (about 18%) as well as friend/relatives (14%) compared to men (about 28%) with the same sources, while those who did not borrow cited fear of debts as a major obstacle to credit acquisition especially by men (about 16 men and 11% women). Also, more women (14%) compared to men (about 9%) borrowed from friends, bank and neighbors/relatives to finance coffee IPM activities. Access to credit was significantly correlated to coffee IPM group processes for low participants at $p < 0.05$. In other words, access to credit by women influenced participation only to certain extension above which becomes a limiting factor. In Table 1, majority (about 34%) of women who accessed credit were ranked low in terms of participation. This implies that, the more women accessed credit, the more they invested and allocated their time to other enterprises and income generating activities than coffee. Which control of coffee stem borer using IPM techniques was the reason to participate in coffee IPM group process. This implies that, the more women accessed credit, the more they invested and allocated their time to other enterprises and income generating activities than coffee. Involvement of women in off farm activities upon further investigation did not have any relationship with participation.

Table 1. Summary of the result of the Chi-square (χ^2) test of relationship between socio-economic characteristics and the level of participation in groups by women ($n = 55$)

Variable	Group participation rank proportions			χ^2	df	p-value
	Low	Average	High			
Being young or older						
Young (20–35 years)	9.1	10.9	1.8	5.573 ^a	2	0.062
Old (36–80 years)	40	14.5	23.6			
Woman’s ability to read and Write lumasaba and English						
Yes	21.8	18.2	20	5.496 ^a	2	0.064
No	27.3	7.3	5.5			
Does the husband and wife have separate coffee gardens						
Yes	5.5	1.8	0	1.688 ^a	2	0.43
No	43.6	23.6	25.5			
Individual’s ability to comply with farmer group goals						
Yes	31.3	22.9	25	8.337 ^a	2	0.015
No	18.8	2.1	0			
Ability to meet the group membership criteria/rules						
Yes	31.5	20.4	22.2	2.157 ^a	2	0.34
No	16.7	5.6	3.7			
Having access to credit for coffee production						
Yes	34	25.5	25.5	8.586 ^a	2	0.014
No	14.9	0	0			
Being married or not married						
Yes	34.5	20	20	0.487 ^a	2	0.784
No	14.5	5.5	5.5			

(Continued)

Table 1. (Continued)

Variable	Group participation rank proportions			χ^2	df	p-value
	Low	Average	High			
Having the ability to move to the group meeting site during stipulated meeting days						
Yes	25.9	16.7	25.9	9.912 ^a	2	0.007
No	24.1	7.4	0			
Woman's involvement in off farm income activities						
Yes	23.6	20	18.2	4.350 ^a	2	0.114
No	25.5	5.5	7.3			
Yes	25.9	16.7	25.9	9.912 ^a	2	0.007
No	24.1	7.4	0			
Having a leadership position in the group						
Yes	9.1	1.8	7.3	2.165 ^a	2	0.339
No	40	23.6	18.2			
Having access to agricultural inputs for coffee management						
Yes	36.4	23.6	25.5	5.814 ^a	2	0.055
No	12.7	1.8	0			
Access to extension services						
Yes	36.4	23.6	25.5	5.814 ^a	2	0.055
No	12.7	1.8	0			
Sought coffee production information						
Yes	31.3	22.9	25	8.337 ^a	2	0.015
No	18.8	2	0			
Having a final say/control over inputs needed for coffee management						
Yes	44.2	15.4	21.2	10.298 ^a	2	0.036
No	7.7	7.7	3.8			
Having access to coffee benefits-farm income						
Yes	44.9	14.3	18.4	9.084 ^a	2	0.059
No	10.2	8.2	4.1			

4.3.6. Marital status

Results in Table 1 indicated that, their marital status was not directly significantly correlated to participation in Coffee IPM group processes but indirectly responsible for restrictions to participation. Women's ability to more move to the group meeting site during stipulated meeting days influenced participation at $p < 0.05$. Marital status was one of the reasons for such restrictions as women were pre-occupied by reproductive roles. Further survey results to established places women moved to frequently and a proxy to mobility, findings show that, women could only move freely to water points (mean of 29.2) and trading centers (10.3) to either sell or purchase items for home consumption. The lowest number could move freely to the trainings venues (3 times), attend meetings (3.2) which are major points for IPM information dissemination. The plausible explanation could be attributed to restrictions associated with mobility and other household gender associated obligations. For example, in Mozambique, married women may not participate in groups without the permission

of their husbands (Gotschi et al., 2009). According, Ochago, Mangheni, and Miir (2017), men’s negative perceptions about their wives re-enforced their dis-empowered position in the household and consequently limited participation in groups.

4.3.7. Access to and control over coffee stem borer management inputs

Access to and control over coffee management inputs influenced participation in group activities. The inputs include; labor, land, wheel barrow, water, pesticides, spray pump, pangas, dry banana fibers, polythene bags, hand bow saw and pruning scissors. These variables had a significant correlation with women's participation in groups at $p < 0.05$ as indicated in Table 1 and have details discussed below.

Results from a sample of both men and women show that, both family and hired labor (about 34 men, 33% women) is used though perceived to be limited (about 40%) in terms of adequacy (about 40%) especially women who needed it most at production, drying and sorting coffee. Access to labor is often more constrained in both female headed households and for women in male headed households (Baluku, Mayoux, & Reemer, 2009; FAO, 2011; IFAD, 2010) due to less access to resources for hiring non-family labor. The time burden due to domestic tasks is also a major constraint for women’s labor (Quisumbing & Pandolfelli, 2009). This labor is often mediated by their relationships with men through marriage and kinship, and they are further constrained in hiring labor by their relatively low incomes (Rubin et al., 2009a). Decisions on labor deployment further perpetuated the inequality in that, decisions on coffee labor deployment were significant different at $p < 0.001$ and who to purchase CSB control inputs at $p < 0.05$ meaning though women participated in making of such decisions, men dominated. This implies that, for any CSB strategy introduction through groups, men must be talked into accepting such ideas otherwise it will be waste of time and resources.

Results in Table 2 show men having more access to and control over coffee CSB control inputs except water, dry banana leaves which were obtained freely. Polythene bags (about 17%), pesticides (about 17%) and spray pumps (about 14%) were the furthest in terms of distance. No significant differences in the distance to input source between males and females. Meaning encouraging the use of non-host habiting material such banana fibers that are locally available and any other such material would greatly boost CSB IPM use among coffee farmers. Men specifically had more access to hand bow saws (73%) for stumping because according to women men were more energetic to carry out such work. Pesticide access (65%) and control (62%) came second among those dominated by men. This confirmed the role division labor emphasizing that men were responsible for coffee spraying work.

Table 2. Access to and control over CSB IPM inputs

Inputs	Access to CSB inputs (%)			Control over CSB inputs (%)			Input obtaining status (%)		Distance to the input sources
	OM	BMWE	OW	OM	BMWE	OM	OFC	P	
Dry banana fibers	16.4	69.6	14	24.5	61.3	14.2	96.2	3.8	1
Water	6.9	74.1	19	19.5	58.4	22.1	97.4	2.6	1.5
Land	31.4	62	6.6	51.7	39.8	8.5	48	52	1.9
Pangas	38.5	54.9	6.6	36.8	53.8	9.4	18	82	14.4
Polythene bags	38.8	55.4	5.8	45.5	45.6	8.9	25	75	17.1
Pesticides	64.6	29.7	5.7	62.3	29.8	7.9	10	90	16.6
Spray pump	63.6	30.9	5.5	70.5	22.8	6.7	6	94	16
Wheel barrow	54.8	38.7	6.5	57.3	34.8	7.9	12	88	17
Hand bow saw	72.7	21.2	6.1	67.4	24.2	8.4	9	91	15.5
Pruning scissors	67	26.8	6.2	65.6	25.8	8.6	7	93	15.7

Notes: OM = only men; BMWE = both men and women equally; OW = only women; OFC = Obtained free of charge and P = Purchased.

Land is a very crucial coffee stem borer control resource because it is a growth media for coffee. Land in the study site was in small parcels which was accessed majorly accessed (about 31% men) and controlled by men (52%) than women. This input was both inherited and purchased. Women accessed land by virtue of the relationship with men through marriage or any other form of relationship. This is not surprising since many studies including Baluku et al. (2009), Ofuoku, Egho, and Enujeke (2008) confirm this. There is evidence that, women as compared to men have less control over land, use fewer agro-inputs and have less access to extension services (FAO, 2011). This limited access to productive assets may decrease women's bargaining power in and outside the household consequently, limiting their ability to join producer organizations that require ownership such as land (Agarwal, 2001; Pandofelli et al., 2007; Wiig, 2013).

Another useful input in the control of CSB is a wheel barrow. Wheel barrows are used for carrying dry banana fiber to the sites, fertilizers, chemicals, water spray pumps and so on. Fertilizers act as soil amendments to increase the growth vigor of coffee plants so that they can withstand attack from pests and diseases. Wheel barrows were accessed (about 55%) and controlled (57%) by men. This input was also purchased (88%) and not easily accessible to many especially women.

Pangas, hand bow saws and pruning scissors were another set of inputs used in the control of CSB. These are sanitation gargets for coffee plantations. Cutting off dry/dead branches, trim off excess branches, completely cut down very old/nonproductive and infected coffee plants was the common use. These inputs were purchased though in few cases could be obtained from neighbors or projects. They were accessed and controlled by men.

Water, spray pump and pesticides are non-IPM inputs used to control coffee stem borer. Water was accessed (19%) and controlled (about 22%) by women than men as opposed to spray pumps and pesticides. Pesticides were obtained from the nearby trading centers and Mbale town for Sironko and Manafwa for Bupoto and Bumbo sub counties.

Dry banana leaves. These are non-host habiting material obtained freely (96%) from farmers own gardens. They are used by coffee farmers for smoothening and wrapping stems during coffee stem borer control as an IPM package component. Banana fibers though highly a recommended, cheap, locally and easily available had a challenge of being eaten up by termites thus exposing the coffee plant to coffee stem borer. Continuous replacement of banana fibers becomes expensive in a long run. This input was almost equally accessed by both men (16%) and women (14%) equally. The control however varied, by men dominating (about 24%). In the absence of dry banana fibers, polythene bags were used for stem smoothening.

Information pertaining to coffee production was obtained from a number of sources including the Ministry of Agriculture staff (mainly sub-county agriculture/extension assistants), from friends, neighbors, and the media (radio). Other information sources included farmers' organizations, bulletins, newspapers, Makerere University researchers, posters and NGOs. There was a significant chi-square difference between men and women who sought coffee production information at $p < 0.05$. The major source of production (about 37% men, 30% women), pest (about 35% men, 31% women) was coffee group extension agents. Extension access (about 39% men, 38% women), Knowing the coffee demonstration site (about 48% men, 45% women), number of contacts with coffee IPM group extension (Table 2) workers had no significant differences as per chi-square tests except visiting the coffee IPM group site at $p < 0.05$. There was also a significant chi-square difference between men and women in general extension at $t(140) = 1.659, p > 0.05$ (Table 3). This meant that, much as women and as well as men had contacts with trainers, women had fewer trainings encounters evidenced by limited visit to the demonstration site (learning spot). For women alone, access to extension services influenced their participation $p < 0.05$ but this was specifically for those with coffee information seeking behavior. Extension access exposed benefits of group participation and thus a big motivant to participation.

Table 3. T-distribution of extension services among coffee farmers

Variable	Men		Women		t	p-value
	Mean	SD	Mean	SD		
Freq of extension contacts	2.1143	1.479575	1.6944	1.53493	1.659	0.099*
Freq of demo visits	3.2958	2.73284	3.9099	3.33206	-0.028	0.978(NS)

Note: NS = Not Significant.

* $p < 0.1$ (10% Significance level).

** $p < 0.05$ (5% Significance level).

*** $p < 0.01$ (1% Significance level).

Table 4. Coffee households income levels

Variable	Men		Women		t	p-value
	Mean	SD	Mean	SD		
Average monthly income	267,940	330,132	155,960	175,679	2.17	0.032**
Total coffee revenue	3.1347E6	3.61044E6	1.9161E6	2.57660E6	2.338	0.021**

Note: SD = Standard deviation.

* $p < 0.1$ (10% significance level).

** $p < 0.05$ (5% significance level).

*** $p < 0.01$ (1% significance level).

4.3.8. Access to and control over coffee benefits

The main benefit from coffee was income which was often accessed by men (about 47%) and women (about 48%) equally. Men (30%) however had control over the benefits than women (22%) which thus proved as a center of inequality within the households. This is evidenced (Table 4) by a significant difference in monthly income levels at $t(100) = 2.171, p < 0.05$ where men had 267,940 Uganda shillings as compared to only 155,960 of females per month. Access to coffee income was negatively significant to participation at $p < 0.05$ because men had overall control. Coffee income was followed the same pattern of men's domination at $t(142) = 2.338, p < 0.05$. Household expenses (about 58%), paying schools fees (about 17%) and purchase of other productive assets (about 6%) were among the three financed by coffee income. Women in male headed households could receive but were not responsible for allocation of such incomes.

5. Conclusion and recommendations

This study set out to determine barriers to women's participation in coffee IPM group processes. Results revealed that the level of men's participation in mixed sexed coffee IPM group processes was significantly higher than women's. A combination of demographic and institutional factors influenced women's participation in group activities. Demographic factors which positively influenced their participation included age and ability to read and write English and Lumasaba. Thought out other contexts, women's age and education have been found to influence women's participation in groups. This implies that interventions that improve older women's education have a potential to enhance their participation. On the contrary, strategies to deliberately target with the aim of empowering younger women with necessary basic knowledge and skills would improve their participation. Regarding institutional factors, the study found that a mismatch in group *visa v* individual married women's goals, unfavorable group membership requirement and rules, limited access to and control over coffee IPM management inputs and income are barriers to participation. The study concludes that women's lower position in the society compared to men gives them a lesser opportunity to attend group meetings, contribute ideas that are taken during such meetings. The study recommends that research and development approaches that utilize groups should systematically conduct gender analysis aimed at identifying and addressing women's strategic needs and barriers to participation and benefit from commercial enterprises such as coffee and group processes. The approaches should use inclusive methods suited to women, younger farmers and resource constrained and those that face mobility challenges.

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The authors declare no competing interest.

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