Factors influencing gendered intra-household allocation of land and capital assets in banana (*Musa* spp.) production: The case of Meru County, Kenya

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Unequal access to agricultural resources such as land, labour and capital has driven women to less rewarding roles along the banana value chain while allowing men to take up the (dominant) management roles. This study seeks to determine factors that influence gendered intra-household resource allocation in banana production in Meru County in Kenya. Currently, intra-household distribution of land and capital assets for banana production in the study area is skewed towards married men. A systematic random sampling technique was used to select 160 household respondents in March 2017. A fractional logit model was used to determine the effects of independent variables on the proportions of land and capital assets allocated jointly or to husbands or to wives. The value of livestock owned by the household emerged as one of the key factors that favoured 'joint' allocation of land ($p < 10\%$) while the variable 'age of the wife' reduced the likelihood of a 'husband' ($p < 5\%$) being allocated land in banana production. The results also show that the key driver for 'wife' allocation with both land and capital assets is education of wives (significant at $p < 5\%$ in both cases), a factor associated with the enhancement of the human capital of women, and thus their empowerment. For both land and capital assets, group membership reduced the likelihood of 'joint' allocation (significant at $p < 5\%$ in both cases). Thus, investments in social capital may not address the problem of unequal intra-household distribution of productive agricultural resources. To increase equity in intra-household distribution of land and capital assets in banana production in the study area, policy interventions needed include diversification of banana production into livestock keeping, and investment in the formal education of girls.

Keywords: Banana, capital assets, gender, land, intra-household allocation, Kenya, Meru County

The part played by traditions and social norms in defining the different roles of both men and women in Kenya's key agricultural value chains is of paramount importance and should be understood for the efficient structuring of interventions to increase farm incomes. A gendered value chain analysis is one of the tools that can be used to determine the different roles of men and women in value chain development. For decades now, gender bias has pushed women to the periphery of the value chain and in turn reduced their overall effectiveness as chain actors and even more so in high-value, horticultural value chains (Mason and King 2001). Particularly in sub-Saharan Africa, women are excluded from high-income ventures because of their limited access to productive resources compared to their male counterparts.

Over the years, traditional cash crops in Kenya, such as tea and coffee have provided farmers with less and less income. This has led to a shift in focus from cash crops to other crops such as banana, passion fruit, and papaya fruit. The profitability of bananas has been growing because of increased urbanization and increasing consumer demand for the produce in urban markets.

Banana production is carried out both as sources of food and income for low-income and resource-poor households in Kenya. During the precolonial period, the crop was characterized as semi-subsistence and its production involved women only. However, due to urbanization and population growth, there has been an increase in the demand for bananas in urban areas and this has resulted in commercialization of the enterprise (Wambugu and Kiome 2001). Commercialization has redefined the gender roles along the value chain and increased income-generation opportunities for both men and women while creating challenges at the same time. In particular, over the last decade there has been

a drastic change of resource allocation in terms of labour and land in sub-Saharan Africa (Mason and King 2001). Gender differences in accessing and using agricultural resources needs to be recognized to facilitate successful agricultural development, particularly in sub-Saharan African countries.

The gender roles of men and women in traditional African society play a critical role in determining how intra-household resource allocation takes place. Despite women constituting 80% of smallholder farmers in Africa, their agricultural productivity is hampered by little access to and control over agricultural resources (Ferguson 2010). Thirty years ago, Virji and Meghji (1989) argued that low access to capital by women had hindered their ability to accumulate assets – assets that are mandatory as collateral for obtaining credit.

Evidence documenting gender disparities in development initiatives in developing countries is ample. According to the FAO (2010), women are less likely to own land and to have access to rented land, and if they have access to land, it is often of poorer quality and smaller in size than that of men. Also, disparities in accessing financial services and capital assets have far-reaching implications on investment in agriculture. Studies have shown that improving women's direct access to financial resources leads to higher investments in human capital in the form of children's health, nutrition, and education (Vargas-Lundius 2009). There are also clear differences in terms of accessing both formal and informal sources of credit between men and women. However, these differences in access to capital are not a result of non-availability, but because men have fewer time constraints, are more able to work outside the home, possess greater social networks, and have more control over household income than women.

Social and economic factors, including gendered norms and practices, often hinder women from participating on par with men in agricultural activities and initiatives. For instance, in most African societies, gender division of labour results in women undertaking a disproportionate share of non-productive work in conditions of drudgery, which in turn leads to time wastage, limited mobility, and relegation to the private sphere (Spilsbury et al. 2002). Unequal access to agricultural resources such as land, labour, and capital has driven women to less rewarding roles along agricultural value chains while allowing men to take up the (dominant) management roles.

Resource allocation and benefit sharing are contentious issues especially in high-income enterprises such as banana. According to Vargas-Lundius (2009), women are frequently excluded from high profit markets, and access to and control over productive resources. Quisumbing (2001) and IFAD (2002), among others, have widely documented the impact of women's access to productive resources and their engagement in profitable markets on the outcome of improved household welfare. However, there is little literature about intra-household division of labour, access to and control over land, and access to capital assets in high-value, horticultural value chains such as banana. Moreover, factors that affect intra-household allocation of these resources in value chain activities have not been well documented either.

The objective of our study was to identify factors that influence gendered allocation of land and capital assets within banana-producing households in Meru County, Kenya. Specifically, the study identified the drivers of the allocation of land and capital assets to husbands, to wives, and jointly to husband and wife pairs. Results from this study will provide information on conditions that can favour impactful intra-household allocation of productive agricultural resources in the banana value chain. This information can form the basis of science-based decisions by policy makers and other stakeholders when promoting interventions geared towards

increasing productivity within the value chain and increasing women's incomes. Such interventions include the enhanced freshness formulation (EFF) technologies that have already been piloted in the study area and found useful for enhancing fruit quality, and therefore, increasing farm incomes (Yumbya et al. 2017).

Theoretical background

A household is both a producer and a consumer, and thus decision making on production, labour allocation, and consumption are intertwined with and dependent on each other. The production behavior of smallholder farmers across sub-Saharan Africa and Asia and the impact of this behavior on their economies can be comprehensively explained using agricultural household models. For a household it is assumed that utility maximization from the available agricultural resources is the goal. The agricultural household model is consistent with utility maximization. The model also helps in describing the relation of explanatory variables to the outcome of a choice or intervention by households. The household model suggests that household members have different preferences and these affect how production and consumption decisions are made and the outcome of such decisions.

Researchers have widely documented two household models that can be used to conceptualize intra-household resource allocation: the unitary model and the collective model (Quisumbing and Maluccio 2003). The unitary model depicts the household as a single unit of decision-making for which there is always consensus on production and consumption issues. There are a number of arguments against the use of the unitary model for household modelling. Alderman et al. (1995) have pointed out a key failure of the unitary model – its inability to capture and take into account individual preferences, intra-household inequalities and conflicts, and different levels of bargaining power between members of different sex, age, and gender within the household. Since the household is assumed to maximize utility from the available resources as a unit (Doss 1996), the unitary model does not help in understanding the dynamics of intra-household decision-making.

Alternatively, the collective model views intra-household resource allocation as an outcome of bargaining processes among the household members. It therefore recognizes individual preferences and utility functions that exist within a household. With respect to agriculture, collective models of the household recognize that there are differences in ownership, use, and control of production resources between men and women in a household (Browning and Chiappori 1998). A collective model allows assessment of how resources held and controlled by either men or women are utilized to enhance agricultural productivity and welfare outcomes. This model is thusly applied in our study.

The collective model suggests that exogenous factors that affect maximization of utility have an impact on how individuals are involved in decision-making within the household and their level of bargaining power. These factors include an individual's income, access to land, and other resources. For instance, Doss and Morris (2001) have argued that access to, and the ability of a person to effectively use the available technologies, dictate the amount of income obtained by the individual.

Ideally suited for the type of analysis we desired in our study is Osmani's (1998) bargaining model because it helps to explain the outcome of gender conflicts and the negotiation process within the household. Bargaining power within the household plays an important role in access to and control over resources as women with higher education levels, more assets, and who are older are favoured (Agarwal 2011). This premise is tested in the current study.

Materials and methods

Study area

This research was conducted in Meru County in eastern Kenya. The study focused on rural households in South Imenti sub-county that produce bananas for both household consumption and sale. Meru County was selected because of its recent commercialization of banana production as a result of the introduction of tissue culture technology by non-governmental organizations (NGO) initiatives (e.g., TechnoServe) and government interventions. It is also the area where the EFF project has already been piloted (Yumbya et al. 2017). The area has an altitude ranging from 300 m to 5,199 m above sea level and therefore has a variety of agro-ecological zones. The average annual rainfall is 1,250 mm. Temperatures as low as 8°C during the rainy periods, and as high as 32°C during the dry season, are typical.

Data collection procedure

Data were collected in March 2017. Key informant interviews and focus groups were conducted to better understand the banana sub-sector within the region. These were followed by household surveys (sample size = 160); respondents were interviewed using semi-structured questionnaires. To generate a sampling frame of potential study households, a list of farmers from banana groups and cooperatives was generated. The farmers to be interviewed were randomly selected in a systematic manner using an interval of 10 on the list. The household interviews were only conducted with the household head or the spouse. For households where heads or spouses were absent, substitution was systematically done using the household list.

The semi-structured questionnaire was used to gather information on household demographic characteristics, as well as physical, institutional, and socio-economic attributes related to gendered banana production and resource allocation within households. Information on the type of resources available in a household were also collected taking into account issues such as who owns a certain resource, the quantity owned, and the current value in Kenyan shillings. Also, data on kinds of services (e.g., extension, credit) sought from the governments and other value chain supporters were collected. Data on gender issues, and on access to productive resources as well as credit were gathered and documented too. Names and measurements used to describe the dependent and explanatory (or independent) variables used in the land allocation and capital assets regression analyses are shown in Table 1.

Enumerators who could speak the local language administered the questionnaire. Data entry was done using SPSS (Version 22) while analyses were done with STATA (Version 14). While the former statistical package is easy to use for data entry and manipulation, the latter gives more robust econometric results.

Statistical analyses

Descriptive statistics were calculated for all independent variables. The two kinds of dependent variables—land allocation and capital assets allocation—in the regression analyses of independent variables possibly influencing intra-household allocation of productive resources in banana production were each denoted as 'husband,' 'wife,' and 'joint' allocations; this resulted in a total of six dependent variables (e.g., land allocation under 'husband'). The dependent variables were calculated as the proportion of the resources allocated to the husband, wife, and jointly, out of the total resources available in the household. Given the nature of the data, a fractional response model (FRM) was used to estimate the six regressions. The FRM is the most suitable econometric model and it was selected since it is capable of modelling empirically-bounded dependent variables that exhibit piling-up at one of the two corners (Papke and Wooldridge 1996).

Table 1: Names and measurements used to describe the explanatory (or independent) and dependent variables used in the land allocation and capital assets regression analyses of banana production in March 2017 in Meru County, Kenya

Explanatory variables	**Measurement**
Sex of the household head	Dummy (1 = male, 0 = female)
Age of husband	Years
Age of wife	Years
Household size	Total number of people in the household in the last 12 months
Level of education of husband	Years of formal schooling
Level of education of wife	Years of formal schooling
Farming experience	Number of years the household has been practicing farming
Group membership	Dummy (1 = yes, 0 = no)
Total income	Amount of money in KES[a] generated per year from all activities
Access to extension	Dummy (1 = yes, 0 = no)
Livestock value	Current value in KES of livestock owned
Off-farm income	Amount of money earned in KES from off-farm activities per year
Access to credit	Dummy (1 = yes, 0 = no)
Non-agricultural assets value	Current total value in KES of all non-agricultural household assets
Total land	Farm land owned in acres
Total cost of inputs	Total cost of inputs used in production of bananas in KES
Dependent variables	**Measurement**
Land allocation under 'husband'	Proportion of land used by husband for banana production
Land allocation under 'wife'	Proportion of land used by wife for banana production
Land under 'joint' allocation	Proportion of land jointly used by husband and wife for banana production
Capital assets allocation under 'husband'	Proportion of value of capital assets used directly in banana production by the husband
Capital assets allocation under 'wife'	Proportion of value of capital assets used directly in banana production by the wife
Capital assets under 'joint' allocation	Proportion of value of capital assets used directly in banana production jointly by husband and wife

[a]KES = Kenyan shillings

With allocation ratios ranging from 0 to 1 for land and capital assets, six estimations of factors that influence 'husband allocation', 'wife allocation,' and 'joint allocation' were conducted. The data for land and capital assets allocations were collected directly from farmers practicing banana production. The explanatory variables of age, years of education, off-farm income, as well as the other socio-economic variables were regressed on the six dependent variables to capture their effect on intra-household resource allocation

by gender. Age and years of education are human capital variables and according to Quisumbing (2001), they are likely to have a positive influence on agricultural activities. The influence of off-farm income on land and capital asset was hypothesized to be neutral. This is because off-farm income the total household income needed for investment in agriculture. However, higher off-farm income could act as motivation for investment in non-agriculture ventures due to higher returns generated. The results were assessed for significance at three levels ($p < 0.10$, $p < 0.05$, and $p < 0.01$) and presented in tabular form.

The dependent variables land and capital asset allocation were generated as a proportion allocated to each gender (husband, wife or joint) from the total resources owned by the household. The general estimation of the regression is:

$$y_{xi} = \beta_0 + \beta_i x_i + \varepsilon_i$$

where y_{xi} is the proportion of resource *x* (land or capital assets) allocated to individual *i* (husband, wife, or joint) within the household, β_0 is the constant, $\beta_i x_i$ is the independent variable, and ε_i is the error term which is expected to be normally independent and distributed with a zero mean and constant variance. In our study the outcome variables were truncated and could only take on values between 0 and 1.

Maximum likelihood estimation was used to eliminate the errors of biased and inconsistent estimates that manifest in the use of ordinary least squares regression estimators. The explanatory variables that exhibited a dispersed distribution, such as current value of livestock, total household income, off-farm income, total production cost, value of non-agricultural assets, and value of inputs used in production were converted into natural logs (base 10).

Results and discussion

Socio-economic characteristics of the sampled farmers

Descriptive statistics for household characteristics are shown in Table 2. In our sample, 86% of the households were headed by men. This is an indication of the social setting of African households in which men are always considered to be the household heads even if they are working far away from home. The mean land holding size in the study area was 2.11 acres and this is consistent with small-scale farmers' land size in Meru County (Miriti et al. 2014). The average household size was 4.0 members with the household head having an average age of 58.0 years. The household mean level of education (of adults) was 9.0 years of formal schooling. This means that, on average, most of the householders in the area have not acquired secondary school education.

Only 36% of the study households had access to extension services that provide information on the production and marketing of bananas. This finding concurs with Miriti et al. (2014) who found that 64% of the farmers in the region lacked regular access to extension services despite the region being a major banana producer. The current survey results also reveal that of the 36% of households that had access to extension services, only 27.1% were headed by women. The gender parity in agricultural extension that we saw could be attributed to the fact that male extension providers tend to pay more attention to male farmers, and the assumption is that the spillover effects of extension will eventually reach women farmers (Mason and King 2001). However, we did not study the gender aspects of extension service in the area and so the assumption of spillover effects may require further investigations.

Table 2: Mean or proportion (standard deviation) of the independent and dependent variables in of a sample of households (n = 160) involved in banana production in March 2017 in Meru County, Kenya

Independent variables	**Mean (standard deviation at 95% confidence level)**
Household size	4.00 (1.45)
Sex of the household head (proportion)	0.86 (0.35)
Age of the husband in years	57.52 (14.51)
Age of the wife in years	49.84 (13.85)
Years of schooling of the husband	9.39 (4.44)
Years of schooling of the wife	8.89 (4.60)
Total land size in acres	2.11 (1.66)
Access to credit (proportion)	0.15 (0.39)
Group membership (proportion)	0.51 (0.50)
Access to extension (proportion)	0.36 (0.48)
Total cost (KES)[a]	36213.35 (51873.40)
Total income (KES)	250157.6 (332616.10)
Livestock value (KES)	165130.8 (143001.40)
Non-agricultural assets value (KES)	667080.50 (1012110.00)
Total costs of inputs (KES)	50779.16 (151182.50)
Off-farm income (KES)	83121.26 (247597.70)
Dependent variables (all proportions)	
Land allocation under wife	0.22 (0.41)
Land allocation under husband	0.33 (0.46)
Land under joint allocation	0.45 (0.49)
Capital assets under joint allocation	0.23 (0.40)
Capital assets under wife allocation	0.13 (0.3177)
Capital assets under husband allocation	0.63 (0.46)

[a]KES = Kenyan shillings

Our study found that 37% of the respondents sourced their extension services from government officers while 25% of the extension services were received from farmer groups. The NGOs provided 15% of the extension services. Banana is a perishable crop and the quality attributes after harvesting dictate the price it fetches in the market. Most of the information sought from extension officers was on product handling (71.7%). Post-harvest handling, in light of banana's perishability, is one of the major constraints facing the banana value chain actors. Other kinds of information and services sought from the extension officers were on chemical handling (11.3%), soil and water management (9.4%), and pest management (7.6%).

Credit access and financial capital plays an important role in agricultural production in the African agriculture setting. Credit access in our study was found to be at 15% which is consistent with Miriti et al. (2014) who found that of all the respondents interviewed in South Imenti, only 10% had access to credit. The low access to credit could be attributed to the requirement for collateral by financial institutions before securing credit. Focus group discussions and key informant interviews attributed this to lack of collateral and guarantors by banks and microfinance

institutions. Farmer groups such as banana cooperatives were the leading lender to farmers (29.2%) in our study. These survey findings are consistent with our focus group discussions and key informant interviews wherein the participants stated their preferences for farmer group loans where no collateral security is required. The other relatively minor sources of credit were commercial banks (20.8%) and the Agricultural Finance Cooperation (12.5%). Gender disaggregation analysis showed that 13.3% of those who had access to credit were women. The existing literature on gender and credit access however show mixed results. For instance, Meinzen-Dick et al. (2010) argue that the difference between men and women when it comes to credit access is small and insignificant, and in some instances, men have low credit access compared to their counterparts who are favoured by the credit institutions.

Our results demonstrate that 51% of the households surveyed participated in groups, whether formally or informally. About 29% of the respondents cited ease of market access as one of the major reasons of joining groups. Respondents reported that the banana cooperatives in the region have been used as marketing channels because they are secure and efficient compared to roadside markets. Other reasons for participating in groups included access to production information as well as access to credit.

Factors influencing intra-household land allocation

A number of factors were found to influence gendered land allocation in banana production within the households. As shown in Table 3, factors that favoured 'joint' allocation of land for banana production include total costs of inputs of production ($p<10\%$), value of livestock ($p<10\%$), household size ($p<5\%$), access to credit ($p<1\%$), and sex of the household head ($p< 1\%$). Factors that hindered 'joint' allocation were years of education of the wife ($p< 5\%$), participation in groups ($p< 5\%$), and age of the wife ($p< 5\%$) (see also Table 5-7 for detailed results). Allocation to 'husband' was favoured by education of the wife ($p < 1\%$) and participation in groups ($p<10\%$) while it was inhibited by size of the household ($p < 5\%$) and access to credit ($p<5\%$). Allocation to 'wife' was driven up by education of the wife ($p<5\%$) and possession of non-agricultural assets ($p <1\%$) while it was driven down by sex of the household head ($p<5\%$), access to credit ($p<5\%$), total costs of inputs of production ($p< 10\%$), and value of livestock owned by the household ($p< 5\%$).

Turning to the effect of each factor across 'joint,' 'husband,' and 'wife' land allocation categories or dependent variables, it was found that current value of livestock in the household had a positive influence (at $p < 10\%$) on 'joint' land allocation while it had a negative effect (at $p < 5\%$) on 'wife' land allocation (Table 3, bottom). This can be explained by the fact that livestock ownership in African society is mainly accorded to the husband. Women are only allowed to own small stocks such as chicken and goats. In some cases, they are also allowed to have control over livestock products such as milk (Zimmerman 1982). Thus, as the number of livestock increases within the household, less land is likely to be allocated to wives as much of it is needed for grazing and fodder production.

Table 3: Marginal effects (standard error) and significance levels of variables influencing intra-household land allocation in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	Joint	Husband	Wife
Sex of household head	3.1462*** (0.2676)	0.1550 (0.2034)	-0.3848** (0.1448)
Household size	0.3167** (0.1191)	-0.2619** (0.1039)	0.0274 (0.0881)
Age of the wife	-0.2995** (0.1458)	0.0842 (0.1431)	0.1015 (0.1333)
Access to extension	0.0518 (0.0325)	-0.0285 (0.0297)	-0.0113 (0.0198)
Log total cost of inputs	0.4578* (0.2404)	-0.2119 (0.1732)	-0.1977* (0.1185)
Education of wife	-0.3959** (0.0715)	0.2414*** (0.0923)	0.1713** (0.0759)
Group membership	-0.0927** (0.0421)	0.0872* (0.0471)	0.0032 (0.0273)
Access to credit	0.0320*** (0.0093)	-0.0194** (0.0095)	-0.0158** (0.0057)
Log non-agricultural assets	-0.1216 (0.2413)	-0.2934 (0.2236)	1.1577*** (0.3523)
Log value of livestock	0.8199* (0.4742)	0.1407 (0.2545)	-0.6880** (0.2663)
Log Off-farm income	0.0390 (0.0416)	-0.0362 (0.0366)	0.0024 (0.0403)

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 4: Marginal effects (standard error) and significance levels of variables influencing intra-household allocation of capital assets in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	Joint	Husband	Wife
Sex of household head		0.1893(0.1606)	-0.0042(0.0596)
Household size			-0.0724(0.1522)
Education of wife	-0.1487**(0.0721)	0.0374(0.0893)	0.1014**(0.0500)
Age of the wife	0.1503(0.1272)	-0.4026***(0.1487)	0.2572*(0.1522)
Group membership	-0.0635**(0.0301)		0.0183(0.0294)
Access to extension		0.0466*(0.0275)	-0.0244***(0.0062)
Log nonagricultural assets	-0.0982(0.2239)	0.2677(0.2426)	-0.1897*(0.1020)
Log livestock value	0.5777(0.3702)		-0.2211*(0.1259)
Log Off-farm income			-0.0414**(0.0184)
Log total income	1.1245**(0.4604)	-0.7165**(0.3464)	
Log of total land	0.0524(0.0573)	-0.0090(0.0560)	-0.0416**(0.0189)

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 5: Marginal effects (standard error) and significance levels of variables influencing intra-household joint land allocation in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Std. Error	P>z	95% Confidence interval
Sex of the household head	3.1462	0.2676	0.000	2.6216-3.6707
Household size	0.3167	0.1191	0.008	0.0206-0.1404
Age of wife	-0.2995	0.1458	0.038	-0.0114- -00003
Education of wife	-0.3959	0.0715	0.000	-0.0589- -0.0291
Group membership	-0.0927	0.0421	0.024	-0.3414- -0.0235
Access to credit	0.0320	0.0093	0.020	0.0411-0.4899
Extension contact	0.0518	0.0325	0.122	-0.0354-0.3009
Log total cost of inputs	0.4578	0.2404	0.049	0.0005-0.2184
Log nonagricultural assets	-0.1216	0.2413	0.613	-0.1095-0.0645
Log value of livestock	0.8199	0.4742	0.081	-0.0198-0.3460
Log off-farm income	0.0390	0.0416	0.354	-0.0167-0.0469

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Wald chi2(11)=356.9
Prob > chi2=0.0000
Pseudo R2=0.2496
Log pseudo likelihood = -63.458585

The value of non-agricultural assets owned by the household had a positive influence (at p<1%) on 'wife' land allocation and no significant effect on the other two types of allocation. This implies that as the non-agricultural assets increase in a household, individual bargaining power of wives increases and in the process they gain control of land. Thus, as the household gets wealthier, the probability of a wife being allocated land increases. These study results concur with past findings that indicate that ownership of assets increases the woman's bargaining power within the household, which results in more resource allocation (Quisumbing and Pandofelli 2009).

Credit access by the household increased the probability of 'joint' land allocation (at p<1%) but at the same time reduced chances of 'husband' (p<5%) and 'wife' allocation (p<5%). This may be because most of the credit accessed by households is secured by having land as collateral and both wife and husband have to participate in land cultivation to ensure regular repayment. As expected, access to credit does not favour 'wife' land allocation. In fact a number of studies have found that even in situations where households have access to credit services, women's control over productive resources remains limited (White 1991).

'Joint' land allocation was negatively affected by participation in groups (p<5%). However, the same variable had a positive influence on 'husband' land allocation (p<10%). Group participation was mainly by men who seek the benefits of market access and higher profits associated with the selling of bananas in kilograms as opposed to bunches. It is likely that due to these incentives husbands hold onto the land and do not allow joint ownership or transfer of the property rights to their wives.

Education of wives had a negative effect on 'joint' land allocation (p<5%) while it

exhibited a positive influence on both 'husband' ($p < 1\%$) and 'wife' allocations ($p<5\%$). Thus, education as an investment in human capital plays a critical role in according married women a higher bargaining power in negotiations on ownership of resources like land. The results further indicate that as the education of the wife increases, households are not likely to have joint allocation of land but would rather favour husband allocation. Considering that the right to allocate land in the study area is mainly assigned to husbands, this result implies that married men retain control over land even if their wives are highly educated. This result concurs with the assertion of Kimani (2008) that no matter how hard women in Africa fight over access to and control over land, men will always have the decision-making power.

Total costs of inputs had a positive effect on 'joint' land allocation ($p<10\%$) and a negative effect on 'wife' allocation ($p<10\%$). This may be because using large amount of inputs in the production of bananas and other crops in the study area is associated with wealth which favours joint decision-making on the farms. Similarly, total costs of inputs reduced the likelihood of 'wife' land allocation since safeguarding wealth in the African set-up is associated with men (Soetan 2001).

The age of the wife negatively influenced 'joint' land allocation ($p<5\%$). This implies that joint allocation was not common in households with older women and this is perhaps due to cultural barriers. The size of the household, however, positively influenced 'joint' land allocation ($p<5\%$) but had a negative effect on 'husband' allocation ($p< 5\%$). With large families, it might be expected that husbands would be more motivated to transfer land rights to their wives and, to some extent, to mature children in order to encourage production of the much needed food and to achieve self-sufficiency. As expected, having male-headed households favoured 'joint' land allocation ($p<1\%$) but negatively influenced 'wife' allocation ($p<5\%$). This is likely because the right to land is mainly held by men who can allocate land to whomever they want. The result also implies that husbands in the study area do not have a problem with 'joint' land allocation.

Factors influencing intra-household capital assets allocation

Factors influencing intra-household capital assets allocation are somewhat different from the ones influencing land allocation except for value of livestock, group membership, and age of the wife (Table 4). For capital assets allocation, the value of livestock had a similar negative and significant influence on 'wife' allocation ($p<10\%$), and group membership had a similar negative influence on 'joint' allocation ($p<5\%$) (see also Tables 8-10 for detailed results). The results of the 'education of wife,' in the capital assets allocation model almost matched those of the land allocation. The variable showed a similar negative influence on 'joint' capital assets allocation ($p<5\%$) and a positive influence on 'wife' capital assets allocation ($p<5\%$).

Table 6: Marginal effects (standard error) and significance levels of variables influencing intra-household husband land allocation in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Std. error	P>z	95%confidence interval
Sex of household head	0.1550	0.2034	0.438	-0.2454-0.5669
Household size	-0.2619	0.1039)	0.016	-0.1291--0.0132
Age of the wife	0.0842	0.1431	0.552	-0.0038-0.0071
Access to extension	-0.0285	0.0297	0.371	-0.2369-0.0884
Log total cost of inputs	-0.2119	0.1732	0.223	-0.1348-0.0314
Education of wife	0.2414	0.0923	0.005	0.0079-0.0443
Group membership	0.0872	0.0471	0.040	0.0069-0.3103
Access to credit	-0.0194	0.0095	0.014	-0.3625-0.0546
Log non-agricultural assets	-0.2934	0.2236	0.188	-0.1341-0.0263
Log value of livestock	0.1407	0.2545	0.578	-0.0705-0.1265
Log Off-farm income	-0.0362	0.0366	0.346	-0.0466-0.016

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Wald chi2(11)=26.38

Prob > chi2=0.0057

Pseudo R2=0.3523

Log pseudo likelihood = -39.396314

Table 7: Marginal effects (standard error) and significance levels of variables influencing intra-household wife land allocation in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Standard error	P>z	95% confidence interval
Sex of household head	-0.3848	0.01448	0.004	-0.6822- -0.1317
Household size	0.0274	0.0881	0.753	-0.0352- 0.0487
Age of the wife	0.1015	0.1333	0.435	-0.0030-0.0070
Access to extension	-0.0113	0.0198	0.594	-0.1454-0.0832
Log total cost of inputs	-0.1977	0.1185	0.060	-0.1099-0.0108
Education of wife	0.1713	0.0759	0.014	0.0033-0.0298
Group membership	0.0032	0.0273	0.904	-0.0967-0.1095
Access to credit	-0.0158	0.0057	0.004	-0.3967-0.0575
Log non-agricultural assets	1.1577	0.3523	0.001	0.0833-0.3198
Log value of livestock	-0.6880	0.2663	0.010	-0.2454- -0.0326
Log Off-farm income	0.0024	0.0403	0.952	-0.0248-0.0264

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Wald chi2(11)=26.38

Prob > chi2=0.0057

Pseudo R2=0.3523

Log pseudo likelihood = -39.396314

Table 8: Marginal effects (standard error) and significance levels of variables influencing intra-household joint allocation of capital assets in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Std. error	P>z	95% confidence interval
Education of wife	-0.1487	0.0721	0.037	-0.0347-0.0001
Age of wife	0.1503	0.1272	0.222	-0.0018-0.0079
Group membership	-0.0635	0.0301	0.018	-0.2752-0.0079
Log nonagricultural assets	-0.0982	0.2239	0.656	-0.1005-0.0632
Log livestock value	0.5777	0.3702	0.118	-0.0285-0.2531
Log total income	1.1245	0.4604	0.018	0.0162-0.1692
Log total land	0.0524	0.0573	0.380	-0.0249-0.0655

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Wald chi2(7)=14.82
Prob > chi2=0.0383
Pseudo R2=0.1008
Log pseudo likelihood = -63.957321

Table 9: Marginal effects (standard error) and significance levels of variables influencing intra-household husband allocation of capital assets in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Std. error	P>z	95% confidence interval
Sex of the household head	0.1893	0.1606	0.470	-0.2068-0.4480
Education of wife	0.0374	0.0893	0.314	-0.0094-0.0295
Age of wife	0.0374	0.1487	0.001	-0.0126- -0.0016
Extension contact	0.0466	0.0275	0.010	-0.0650-0.2799
Log of nonagricultural assets	0.2677	0.2426	0.305	-0.0443-0.1419
Log total income	-0.7165	0.3464	0.017	-0.1468-0.0266
Log total land	-0.0090	0.0560	0.480	-0.06597-0.0310

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Wald chi2(7)=13.21
Prob > chi2=0.0671
Pseudo R2=0.0764
Log pseudo likelihood = -67.313945

Table 10: Marginal effects (standard error) and significance levels of variables influencing intra-household wife allocation of capital assets in banana-producing households (n = 160) in March 2017 in Meru County, Kenya

Variable	dy/dx	Std. error	P>z	95% confidence interval
Sex of household head	-0.0042	0.0596	0.309	-0.2306-0.0729
Household size	-0.0724	0.1522	0.108	-0.1407- -0.0057
Education of wife	0.1014	0.0500	0.020	0.0041-0.0271
Age of the wife	0.2572	0.1522	0.084	-0.0034-0.0026
Group membership	0.0183	0.0294	0.737	-0.0916-0.0648
Access to extension	-0.0244	0.0062	0.001	-0.1801-0.0508
Log nonagricultural assets	-0.1897	0.1020	0.057	-0.1235- -0.0087
Log livestock value	-0.2211	0.1259	0.065	-0.0129-0.1141
Log Off-farm income	-0.0414	0.0184	0.021	-0.0302- -0.0009
Log of total land	-0.0416	0.0189	0.019	-0.0364-0.0047

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$
Wald chi2(10)=65.8
Prob > chi2=0.000
Pseudo R2=0.3471
Log pseudo likelihood = -8.2262506

The only significant factor with a different direction of influence was the value of non-agricultural assets (p<10%). This factor negatively influenced capital assets allocation of the 'wife.' It is most likely that households that already have higher values of non-agricultural assets are already regarded as well endowed with capital assets and therefore this factor is not a key driver for 'wife' allocation of assets needed for banana production. There are two other variables worth mentioning here: access to extension and age of wife. Access to extension did not have any significant influence in the land allocation model, however, it had a significant, positive influence on 'husband' allocation of capital assets (p < 10%) and a negative influence on 'wife' allocation of capital assets (p < 1%). These results are likely associated with the fact that extension services in the study area target mainly male members of the households as we have already explained in the descriptive statistics. In the capital assets modelling, the age of the wife had a significant, negative influence on 'husband' capital assets allocation (p < 1%) and this differs from what was seen in the land allocation modelling. This may be because capital assets in banana production are normally allocated to older children in the household as women (and men) age. Total land owned by a household had a negative influence on 'wife' capital assets allocation (p < 5%) (Table 4, bottom). This may be mainly because in the traditional African society, land ownership is a man's affair and a wife is not empowered to negotiate with her husband on land issues. In fact, findings from the focus group discussions and key informant interviews in the study area indicate that land is predominantly owned by the men and is rarely owned by women. This result is closely related to the results of the total household income variable. As expected, increased income positively drove 'joint' allocation (p < 5%) and reduced the likelihood of 'husband' allocation (p < 1%). However, increased off-

farm income had a different direction of influence, although it was tested only for 'wife' capital assets allocation due to model specification problems (i.e., multi-collinearity mainly). This factor was found to have a negative influence on 'wife' capital assets allocation ($p < 5\%$). This is mainly because husbands often spend off-farm income the way they want, including directly apportioning it to the farm activities. In most cases, there are no household discussions on the use of off-farm income earned by men. It is important to note that given the socio-cultural setting of traditional African society, it is easier for men to work outside the homestead compared to women who are burdened with household chores. Therefore, there is a high likelihood that a 'wife' does not access capital assets associated with banana production as off-farm income increases, since this kind of income solely belongs to men. For the same reasons, the values of livestock ($p < 10\%$) and non-agricultural assets ($p < 10\%$) negatively affected the 'wife' allocations to capital assets.

Access to agricultural extension had a positive effect on 'husband' capital assets allocation ($p < 10\%$) while it exhibited a negative effect on 'wife' capital assets allocation ($p < 1\%$). This may be because extension agents, as discussed above, mainly target husbands, who are also mainly the household heads, to deliver their messages to households. For example, a study undertaken by Miriti et al. (2014) in Kenya found that women have low access to extension services and even if they have high access, the benefits thereof are marginal and limited compared to those of their male counterparts.

Just like in land allocation analyses, group membership had a significant, negative influence on 'joint' allocation of capital ($p < 5\%$) for banana production. This implies that much of the capital assets remain with men who are also the main participants in group activities related to banana production.

The age of wife had a positive influence on 'wife' capital assets allocation ($p < 10\%$) and a negative influence on that of the 'husband' ($p < 1\%$). Similarly, years of formal education of the wife had a positive influence on 'wife' capital assets allocation in banana production ($p < 5\%$). These two factors are associated with human capital, and thus empowerment of the woman. Older wives and educated ones have a higher bargaining power and therefore have a higher likelihood of accessing household capital assets than younger wives and uneducated ones. This may also help explain why education of wife does not favour 'joint' allocation of capital assets.

Conclusion and policy recommendations

This paper investigated factors that influence intra-household resource (land and capital assets) allocations in Meru County, Kenya, a region that has experienced exclusion of women in the distribution of agricultural productive resources for many decades. From the study findings, we conclude that wealthier households, particularly through livestock ownership and high household income, have a higher probability of adopting 'joint' allocation compared to poorer households. Thus, diversification of banana production into livestock keeping and sustainable ways of increasing household incomes could increase intra-household equity in the sharing of land and the capital assets used for banana production in the study area.

The study showed that the age of the wife reduces the likelihood of 'husband' land and capital assets allocations. Thus, policy interventions geared towards ensuring equity in intra-household resource sharing should mainly target younger families and smaller households. Such targeting would be favoured by the fact that younger families are also small.

Since increasing years of education of the wife positively affects 'wife' land and capital assets allocations and since this is linked to human capital, it is important for female empowerment. Thus, if policy interventions

included investments in the education of girls in the study area, there might be more women eventually benefiting from the intra-household allocation of land and capital assets in banana production.

One of the factors hindering 'joint' intra-household allocation of land and capital assets was membership in groups. Group membership, a proxy for social capital, favours allocation of land to 'husband'. This implies that households with higher social capital do not value allocation of land and capital assets to married women. Although social capital has been identified in the literature as one of the drivers of rural economies, it may not be one of the solutions for achieving equitable intra-household distribution of land and capital assets in banana production in the study area.

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