Telling the full story: Using mixed methods to better understand women's empowerment and its correlates in central Kenya

by Julyann Mutuku, Monica Fisher, Holger Kirscht, Patrick Irungu, and Chrysantus M. Tanga

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Introduction

Women's empowerment in agriculture is a process that increases women's ability to make strategic decisions regarding agriculture and their access to the physical and social capital required to implement these decisions (Alkire et al. 2013). Empowerment is widely recognized as an important indicator of progress towards achieving gender equity objectives as well as having the potential to achieve broader welfare outcomes, such as improved food and nutrition security and reduced poverty (Malapit and Quisumbing 2015). However, there remains a need for additional research before strong conclusions can be reached on the instrumental value of women's empowerment (Santoso et al. 2019). Given the intrinsic and potentially instrumental value of women's empowerment, understanding its empirical drivers is important for guiding development policy and practice to enhance it.

Several studies have empirically investigated the correlates and determinants of women's empowerment in the developing world (for a recent review, see Trommlerova et al. 2015; O'Hara and Clement 2018; Sell and Minot 2018; Sraboni et al. 2014). Studies in this literature have tended to measure women's empowerment using their own indicators rather than a standardized measure that would allow for meaningful comparison across countries or regions. For instance, Allendorf (2007) developed two measures of women's empowerment in Nepal based on four survey questions regarding who in the household has the final say in decisions on own health care, large household purchases, daily household purchases, and mobility. On the

other hand, Mahmud et al. (2012) focused on four dimensions of women's empowerment in Bangladesh, namely self-esteem, role in decision-making, freedom of mobility, and control over resources. Striking is what Santoso et al.'s (2019) review of 62 studies of the relationship between women's empowerment and child nutrition outcomes revealed: the use of 200 unique indicators of women's empowerment.

In terms of the correlates of empowerment, studies are generally consistent in the finding of a positive association between empowerment and age, being married, educational attainment, working off-farm, having personal earnings, and media access (Gupta and Yesudian 2006; Trommlerova et al. 2015; O'Hara and Clement 2018). For several other variables, research findings have been less consistent. For example, household wealth has alternately been found to have a positive association (Allendorf 2007), negative association (Mahmud et al. 2012), or no association (Arestoff and Djemai 2016) with women's empowerment, which likely partly reflects different approaches to measuring wealth. It is also expected that context matters considerably in terms of the main factors that influence women's empowerment.

This paper uses new data from a peri-urban setting in central Kenya to assess the main correlates of women's empowerment among a sample of female smallholder farmers ($n = 263$) engaged in poultry and pig production. We build on existing literature and contribute in three main ways. First, the study uses a mixed-methods (MM) approach, which "combines elements of qualitative and quantitative research approaches with the broad purposes of breadth and depth of understanding and corroboration" (Johnson et al. 2007, p. 123). We contribute to both MM research and the literature on gender in agricultural development through an illustrative example of the utility of a MM approach for enhancing credibility and completeness of results and identifying critical areas of future inquiry for research on women's empowerment in developing

countries. Ngulube (2010) draws attention to the scarcity of MM research in the social sciences for the case of developing regions, particularly sub-Saharan Africa (SSA). Alatinga and Williams (2019) and Teye (2012) present useful case studies, demonstrating the value of a MM approach for informing health and forest policy in Ghana, but more developing-country case studies of MM research are needed.

Scholars on gender in agricultural development have called for the use of MM research due to the complexity and context specificity of gender relations in agriculture (Behrman et al. 2014, Akter et al. 2017), but research in this area has been slow to adopt a MM approach. Research on women's empowerment has relied heavily on quantitative analysis (e.g., Gupta and Yesudian 2006; Allendorf 2012; Arestoff and Djemai 2016) with a few exceptions like Akter et al. (2017) who used a qualitative approach to assess women's empowerment in Southeast Asia. Yet, to our knowledge, only O'Hara and Clement (2018) have used a MM approach to explore the factors associated with women's empowerment, and their study revealed important advantages for using this approach. Their qualitative analysis provided a more nuanced interpretation of their quantitative results. For instance, focus group discussions (FGDs) revealed that local people attach very distinct meanings and values to power held by women vs. men. The qualitative data also provided a highly plausible explanation for why some key variables expected to associate to women's empowerment were found non-significant in the regression analysis: the measure of women's empowerment used did not include measures of critical consciousness, such as attitudes toward domestic violence.

A second key contribution is our use of a new tool to measure women's empowerment called the Project Level Women's Empowerment in Agriculture Index (Pro-WEAI). This tool focuses on agency as a domain of power in the Kabeer (1999) framework of empowerment,

which defines agency as one's ability to set goals and take actions toward fulfilling them. In the Pro-WEAI, agency includes the three domains of intrinsic, instrumental, and collective agency, each of which consists of several indicators for a total of 12 Pro-WEAI indicators. The Pro-WEAI tool has at least three important advantages. First, it is built from, and therefore includes, all indicators of the Abbreviated WEAI (A-WEAI) tool, which is a representative tool allowing for meaningful comparisons across countries and regions (Malapit et al. 2017; Malapit et al. 2019). Second, the Pro-WEAI can be tailored to specific agricultural projects, depending on their area of focus, with the use of add-on modules for health and nutrition, livestock production, and market inclusion. Third, by adding project-specific questions on domains of empowerment that are likely to change faster, a project's impact on women's empowerment can be assessed at the end of its implementation period. Identifying specific domains of women's disempowerment at project start allows for modification of activities, targeting domains of high disempowerment to support improved outcomes for all beneficiaries.

Third, to our knowledge, this is the first study of women's empowerment in agriculture to focus on a peri-urban setting in sub-Saharan Africa (SSA). Extant literature (Trommlerova et al. 2015; O'Hara and Clement 2018; Sell and Minot 2018) has concerned rural localities. And only a few previous studies of women's empowerment correlates have occurred in SSA (e.g., Trommlerova et al. 2015; Sell and Minot 2018). Urban and peri-urban agriculture, where households raise crops and livestock or engage in fish farming in cities and towns, is an economic activity essential to the lives of millions of people globally (FAO 2011a). It differs from rural agriculture, as actors have better access to input and output markets and greater opportunities for off-farm employment. Africans are growing in numbers and becoming more urbanized and wealthier, and accompanying these changes is a rapid increase in the demand for

food, especially white meat (FAO 2011b). To help meet this demand, peri-urban agriculture will become increasingly important in years to come, and there is need for research to understand decision-making in peri-urban agriculture, including women's roles in such decisions.

The remainder of the paper is organized as follows: The next section provides details on the study area, data collection, and the MM research design. We then turn to the empirical results, where we integrate the quantitative and qualitative findings for purposes of triangulation and complementarity. Finally, the conclusion summarizes key study findings, discusses some caveats of the study approach and findings, and highlights the main implications for research, policy, and development interventions.

Materials and methods

Study area

Data for the study come from baseline household and individual surveys and focus group discussions (FGDs) in Kiambu County, central Kenya, as part of the Insect-for-Feed project (described below). Kiambu County is a peri-urban area adjacent to the City of Nairobi, covering an area of 2,539 km^2 and having a population density of 952 people/km^2 (Kenya National Bureau of Statistics 2019). The county has four broad topographical zones (Upper Highland, Lower Highland, Upper Midland, and Lower Midland Zone), and a bi-modal type of rainfall. Average annual rainfall is approximately 966 mm per year, with long rains typically occurring from mid-March to May and short rains from October to December (Second Kiambu County Integrated Development Plan 2018-2022). Temperatures range from as low as 8°C during the cold season to as high as 32°C during the hot season.

The pre-dominant economic activity in the county is mixed crop-livestock agriculture, involving over 80% of the population. Agriculture is the leading sector in terms of employment, food security, and income generation. The major crops grown in the county are tea, coffee, maize, beans, pineapples, sweet potatoes, and Irish potatoes, and major livestock raised are cattle, sheep, goats, pigs, poultry, and donkeys (County Integrated Development Plan 2017; Kenya Population and Housing Census 2009). The average farm size under small-scale farming is 0.36 hectares and 69.5 hectares under large-scale cash crop farming (County Government of Kiambu 2018).

Methods and data

This study used a mixed-methods (MM) approach to elucidate the key factors associated with women's empowerment and was implemented in a sequential manner. In the first research phase, a quantitative survey of 441 farmers (263 women) was conducted and the data were analyzed with multiple regression analysis to reveal the main correlates of women's empowerment in the study area. This was followed by focus group discussions (FGDs) in 8 of the 12 sub-counties covered by the baseline survey to validate and seek clarification on the findings of the quantitative study. In the final step, we synthesized the findings across the different components of research, identifying complementarities and contradictions in the various research findings and the overarching stories they convey. The study thus followed a merging process and a contiguous approach (Alatinga and Williams, 2019), where quotes from qualitative data analysis were used to interrogate and add richness to the regression results.

Among the five broad purposes of MM research, the main reasons we chose to combine qualitative and quantitative data and analysis were for triangulation, initiation, and complementarity (Bryman 2006; Greene et al. 1989). In terms of triangulation, cross-checking of

the quantitative and qualitative results allowed for an assessment of the validity and credibility of the study findings. Where important differences were found to exist, we explored further to gain an understanding of the sources of inconsistencies, and this initiated new research questions. Complementarity was achieved by allowing the voices of FGD participants to bring deeper insights beyond what the quantitative modelling provided, for example, shedding some light on causal relationships. Below we describe the quantitative and qualitative data collection methods and analysis.

Quantitative data collection

Sampling of households for the baseline survey began with purposive sampling of 24 wards, two in each of Kiambu County's 12 sub-counties. In selecting wards for inclusion, we aimed for good geographic coverage, but this had to be balanced with proximity of wards to roads for ease of access and the need for timely data collection at reasonable cost. The Ministry of Agriculture, Livestock, and Fisheries provided lists of women and men poultry, pig, and fish farmers in the sampled wards from which we randomly sampled 370 households across the wards. Agricultural extension officers contacted the sampled households to ask for their participation. The final sample of households is 364 due to some households not being available for interview at the time of the survey, and our decision to drop six fish farming households to focus on poultry and pig farmers. At each household, we interviewed the household head using a pre-tested structured questionnaire. In addition, both the household head and spouse were interviewed using an individual survey questionnaire. The individual interviews were conducted in private and, where possible, we matched the gender of the respondent and the enumerator. It was often not possible to interview more than a single adult in the sampled households, with male household heads most frequently being unavailable. Thus, the final number of individuals

interviewed is 272 women and 192 men (464 total). Most of the interviews were carried out in Kiswahili the lingua franca in Kenya; but some interviews were conducted in Kikuyu due to a few respondents being more comfortable conversing in this local language widely spoken in Kiambu County.

For the household survey, data were collected on the following topics: socio-demographics; livestock holdings; costs and revenues for poultry and pig enterprises; farm size and agricultural production; and access to markets, credit, and agricultural extension. The individual survey included modules on women's empowerment (using the Pro-WEAI survey tool), awareness of the use of insects as animal feed, and dietary diversity.

The Pro-WEAI modules covered 12 indicators within three domains (intrinsic, instrumental, and collective) of agency. Intrinsic agency was measured as autonomy in income, self-efficacy, attitudes about domestic violence, and respect among household members. Collective agency was captured with a module on group membership and membership in influential groups. Instrumental agency included the following indicators: ownership of land and other assets, input in productive decisions, control over use of income, mobility, work balance, and access to and decision-making on financial services (Malapit et al. 2019).

Focus group discussions

Eight FGDs were carried out, one in each of eight of Kiambu's 12 sub-counties. Sub-counties were selected to represent low, average, and high women's empowerment based on results of the baseline survey. Because of our aim to correlate the findings of the quantitative analysis about women's empowerment with women's perceptions, we focused on women-only focus groups. Each focus group had five to nine participants purposely identified from the baseline survey sample to represent a spectrum of empowerment levels and individual and

household characteristics. The selection criteria were based on the following characteristics identified from regression analysis to be positively correlated with women's empowerment: age, education level, and livestock count.

A FGD checklist was used to facilitate discussions. Topics discussed included local definitions of women's empowerment (capturing various dimensions of empowerment not limited to agency), factors that may increase or decrease women's empowerment, and specific indicators (self-efficacy, work balance, asset ownership, and mobility) that either displayed gender-based differences or had counterintuitive quantitative findings.

Quantitative analysis – empirical model and study hypotheses

To examine the main factors associated with women's empowerment, we estimated a regression model of the following form:

$$W_i = \beta_0 + \boldsymbol{\beta_1 X_{1i}} + \boldsymbol{\beta_2 X_{2i}} + \boldsymbol{\beta_3 X_{3i}} + \varepsilon_i$$

In this equation, W_i is the women's empowerment score ranging from 0 to 1 (described in detail below), $\boldsymbol{X_{1i}}$ is a vector of individual i's characteristics (age, education level, a binary variable for whether the sampled woman is a household head, and binary variables indicating whether the person's main occupation is self-employment or wage work), $\boldsymbol{X_{2i}}$ is a set of household-level characteristics (family size, number of children of different ages, a binary variable for whether the woman has a son, and tropical livestock units (TLU)), $\boldsymbol{X_{3i}}$ are sub-county fixed effects, and ε_i is an error term assumed to be uncorrelated with the explanatory variables. Table 1 presents descriptive statistics for the explanatory variables for the sub-samples of women household heads and wives in men-headed households.

[Insert Table 1 here]

The explanatory variables were identified through a review of previous empirical studies on factors influencing women's empowerment (Trommlerova et al. 2015; O'Hara and Clement 2018; Sell and Minot 2018). Age and age-squared were included as explanatory variables to determine how a woman's empowerment changes as she ages. In the literature, age has often been found to have a curvilinear relationship with women's empowerment (Trommlerova et al. 2015; Arestof and Djemai 2016; Sell and Minot 2018). These studies show that a woman's empowerment level initially increases as she gains experience and confidence in her work and household decision-making abilities, and as she expands her social networks. However, as an elderly woman, her involvement in decision-making, mobility, group membership, and overall empowerment tend to decline.

Education has generally been found to have a positive association with women's empowerment (Mahmud et al. 2012; Trommlerova et al. 2015; Samarakoon and Parinduri 2015). Education increases women's knowledge, skills, and confidence, making them better placed to take advantage of wage employment and business opportunities (Gupta and Yesudian 2006; Hanmer and Klugman 2016). Sell and Minot (2018) found that it is not the level of a woman's education per se that matters to her empowerment but rather her education level relative to the husband. We were unable to test that hypothesis with our dataset, however, since for many of our sampled spousal-couple households we were only able to interview the husband or the wife, not both.

We hypothesized that married women have less decision-making power, compared with women household heads, because in the local context wives generally must consult their husbands on most decisions. In Bangladesh, Mahmud et al. (2012) found that married women were generally secondary decision-makers in their household after their husbands, regardless of

the decision made, and thus had a lower level of empowerment compared to their husbands and female household heads. Trommlerova et al. (2015), reinforces this for the Gambia, where they found that polygamous men reported having a higher ability to influence changes in their community compared to their wives.

Binary variables indicating that the woman's main occupation is self-employment or wage work (reference category is farming) were included based on our expectation that running a business or working for wages confers economic independence and with that comes higher empowerment. In agreement with this hypothesis, Trommlerova et al. (2015) found that economically inactive people were less likely to rely on themselves and hence were less empowered. Another explanation for a positive association between women's empowerment and their earned income is that husbands consider income-generating activities more valuable than domestic work (Allendorf 2007; Anderson and Eswaran 2009). Furthermore, earning income not only increases a woman's bargaining power in the household, but travelling to work or markets gives them an opportunity to interact with and gain information from others, which can in turn increase empowerment (Arestoff and Djemai 2016).

Three household composition variables were included in the regression: household size, number of young children, and a binary variable for whether the woman has a son. The direction of association between household size and women's empowerment is indeterminate ex ante. Two studies reviewed, included household size but found it to be non-significant (Patalgsa et al. 2015; Sell and Minot 2018). The presence of young children (below five years) in the household generally means a higher workload for women. Thus, women with young children have less time available to devote to other activities such as income-generating activities and decision-making on various household domains and, therefore, have lower empowerment (Sell and Minot 2018).

Where cultural norms attach a high value to being able to bear sons, women without a son may be less empowered (O'Hara and Clement 2018).

We hypothesized that household wealth is positively correlated with women's empowerment and measured wealth with two proxies: farm size and (TLU). O'Hara and Clement (2018) proxy wealth through a household asset inventory of consumer durables and livestock, which was found to be positively associated with empowerment. Allendorf (2007) measured women's empowerment in relation to land rights and livestock ownership and found that women possessing these assets were more likely to be empowered. Finally, we included sub-county fixed effects to account for differences observed in women's empowerment across locations.

The dependent variable, the women's empowerment score, is the proportion of the Pro-WEAI indicators for which an individual achieved adequacy, according to cut-offs proposed by those who developed the Pro-WEAI (Malapit et al. 2019). As mentioned, there are 12 Pro-WEAI indicators. For two of these indicators (respect among household members and autonomy in income), we did not have reliable data due to some challenges collecting these indicators in our survey. Thus, the empowerment score was calculated based on 10 rather than 12 indicators. It should also be mentioned that the Pro-WEAI survey tool can be used to calculate a Pro-WEAI index composed of two sub-indices: Three Domains of Empowerment Index (3DE) and Gender Parity Index (GPI). In computing the pro-WEAI, 3DE contributes a weight of 90% from the 12 mentioned indicators and includes both female household heads and wives. It mainly identifies the rate of individual disempowerment by indicator. On the other hand, GPI contributes a weight of 10% and compares the empowerment scores between husband and wife in a dual adult household. It shows the extent of gender inequality in a household; hence, a household is said to achieve gender parity if a woman is empowered or, if she is disempowered, her inadequacy score

is equal to or less than the husband's inadequacy score. Our dataset, however, did not allow for construction of this index due to the large number of spousal-couple households in which only one spouse could be interviewed.

Qualitative analysis

Upon completion of the FGDs, detailed English transcripts were generated based on translation of the Kiswahili tape recordings and field notes compiled during the discussions. These transcripts were then typed in Microsoft Word and categories to analyze the qualitative findings were developed. Structured codes were used on the scripts to identify and report common themes. A three-class coding approach was used, with coding representing general/global themes in the first class and more specific themes in the second and third classes. For example, one first-class coding theme was work that women perform in the study area. The secondary and tertiary codes for this theme were casual work and contract farm labor respectively.

All the transcripts were coded using the same themes that arose in the discussions and were identified during coding. Although we developed the coding structure according to the themes raised in the FGDs, the present paper reports only on those themes that correlate to findings from the quantitative results. Relevant quotes from the FGDs were also identified that either support or contradict the quantitative results and summarize local interpretations of findings from the quantitative survey. In the final step, all the identified themes were collated in an Excel sheet to show theme frequencies and facilitate identification of patterns.

Empirical Results

What does empowerment mean?

The quantitative and qualitative survey tools enable us to compare local definitions of empowerment with Kabeer's (1999) definition and the Pro-WEAI indicators. The manner in which FGD participants defined empowerment somewhat resonates with but is narrower than Kabeer's definition, who conceptualizes women's empowerment in three dimensions. First, having access to resources which are the enabling factors to make particular decisions. Second is agency, which is the ability to make planned decisions with sound judgement and act upon them. With increased agency, one will experience achievements, the third dimension, which includes outcomes such as enhanced welfare, higher mobility, and increased leisure time enabling membership in influential groups. The focus groups emphasized more of the financial aspects of empowerment. For example, Martha, a 33-year-old female household head, said that women's groups seek to acquire financial assistance from organizations to start businesses like livestock keeping, to enable them to do things previously not possible in their lives. Further Ann, a 53-year-old poultry farmer defined empowerment as,

"To be given power and enabled to do something; for example, being given money to start a business or to come together with another person for a joint activity." (FGD participant, Gatundu South Sub-County, 28 January 2020)

Turning to indicators of empowerment, in discussions on the local definitions of women's empowerment, all women's groups expressed the importance of financial freedom and social capital as essential factors. Specifically, women defined the state of being empowered as having the financial capital for having a business, finding employment, having income generating ideas and opportunities, and being a member of a group where they could access loans jointly or

individually and obtain useful information. Other common, local empowerment dimensions elucidated in the FGDs are having high self-esteem and the respect of one's husband. Some respondents also mentioned the ability to make joint decisions with their husband and being married as conferring empowerment. The mention by women in the FGDs of access to financial capital, decision-making power, group membership, self-esteem, and respect resonate with some of the Pro-WEAI indicators and Kabeer's (1999) empowerment framework. However, Kabeer cautions that choice in agency may be determined by cultural norms and beliefs, which may not automatically indicate empowerment. Having a husband, for instance, may not automatically empower women, although many women in our FGDs viewed marriage as a key source of empowerment.

How do the empowerment levels of men and women compare?

Table 2 shows mean values for empowerment, empowerment scores, and the 10 indicators for the full sample (i.e., including men household heads).

[Insert Table 2 here]

The average empowerment score of sampled men household heads, wives, and women household heads were 0.75, 0.71, and 0.78, respectively; these numerical differences are not statistically significant. Looking at gender-based differences for specific indicators, only two (self-efficacy and work balance) are statistically significant. These findings are somewhat surprising, but not unprecedented. For example, Sell and Minot (2018) found female household heads were more empowered than male household heads in Uganda. O'Hara and Clement (2018) found for their Nepalese sample that 60% of women interviewed were as empowered as their spouse. An open question is whether women in peri-urban areas of Kenya have greater gender

parity in empowerment compared with rural Kenyan women? Below we add richness to the quantitative findings for two indicators by referring to our qualitative results.

Asset ownership

Table 2 shows no statistically significant difference in the asset ownership indicator across the three groups. In the ownership of land and other assets, the results show that 99% of husbands and 97% of wives had sole or joint ownership, respectively, while 100% of female household heads reported sole asset ownership. The qualitative findings, however, give a very different picture of women's and men's empowerment in this indicator, as described below.

In the FGDs, respondents reported that men have sole ownership over inherited land in the study area, and if women claim ownership of land, they will be cursed. Even in cases where women reported they had jointly purchased land with their husband, 50% said the land is the husband's property. When asked whether women had ownership claim to inherited land, the following remark was made by 42-year-old Esther:

"No, a woman who claims it will get a curse to even ask for that land. That land belongs to the children." (FGD participant, Juja Sub-County, 27 January 2020)

The FGD participants also shared that in the local context, men generally have sole ownership of cattle and in only a few cases is there joint ownership for other livestock, such as pigs and goats. Women in men-headed households reportedly are sole owners of poultry only when the enterprise is non-commercial. Christine, a 53-year-old poultry farmer remarked,

"There is a saying in our culture that says that blood animals like livestock and land belong to the man. Even if he has given you a calf and you want to sell it, you must consult him."

(FGD participant, Githunguri Sub-County, 29 January 2020)

This inconsistency between the qualitative and quantitative results leads us to question whether respondents to the Pro-WEAI correctly understood the concept of ownership and highlights the importance of using local definitions of this term, such as asking about the inclusion of women on the land ownership title deed in the case of land ownership. Galiè et al. (2015) acknowledge the lack of a country-specific definition of asset ownership and urges researchers to first understand a community's definition rather than assuming their definition is ideal. With that in mind, Galiè et al. (2015) further break down ownership into a flexible arrangement in terms of use, decision-making, management, benefits accrued from livestock products such as money from sale of milk, source of livestock, and being knowledgeable about a resource.

Work balance

Table 2 indicates that among the sample, on average, wives had the least adequacy (54%) in the work balance indicator, while 85% of women heads and 74% of men heads reported work balance adequacy. Work balance adequacy in the Pro-WEAI is achieved if working on-farm, at business activities, for wages, and on domestic activities adds up to less than 10.5 hours in the last 24 hours. We asked focus group participants if these findings resonate with their experiences. To some extent, the qualitative findings support the quantitative results. Women FGD participants reported that husbands add to a woman's workload and are in the habit of policing their wives. Wives must set aside their chores for later when their husbands demand their time. According to local socio-cultural norms, household chores are the domain of women. A man would be perceived as weak if he were to help in household chores, and women in most cases would not approve of it anyway. Women household heads were said to have the freedom to

conduct their work when and how it suited them best, thus their higher work balance adequacy (vs. wives).

When asked about why wives have a higher workload than their husbands, Mineh, a 65-year-old dairy farmer stated,

"What can we say? It is just laziness. Because they do not want to do hard work and they say that this hard work is for women. They leave the work burden to the wife. When they do not have money is when they help out in the house, but as they get older and have more money, they acquire more wives and stop helping out." (FGD participant, Githunguri Sub-County said, 29 January 2020)

In Lari Sub-County, which has the highest percentage of female-headed households in our sample, some FGD respondents expressed disagreement with our quantitative findings of women heads having a higher work balance adequacy. For instance, Martha, a 33-year-old female head said,

"I disagree because, a married woman can get ample resting time, but a single mother will have to look for extra part-time work to get income to cater for all her household needs. You are the only one who fends for your family so with limited income, you have to work a lot." (FGD participant, Lari Sub-County, 30 January 2020)

What are the main correlates of women's empowerment?

A two-limit Tobit model was used in the regression analysis due to the continuous nature of the dependent variable (empowerment score) with left (0) and right (1) censoring. Tobit model results are reported in Table 3.

[Insert Table 3 here]

To account for possible heteroscedasticity, a common problem in cross-sectional data, the 95% confidence intervals reported in Table 3 are based on heteroscedasticity-robust standard errors (White 1980). To assess multicollinearity problems, variance inflation factors (VIFs) were computed for all independent variables. There was no evidence of multicollinearity problems; VIFs for all variables were below 2.5.

The Tobit model results reveal three variables are statistically significant at standard test levels ($p < 0.05$,): age, education, and livestock wealth. We expected empowerment level would be different for wives vs. women householders, but the female headship binary was weakly significant, which might be explained by the small number of female household heads in the sample ($n = 47$). The descriptive statistics (Table 2) similarly found numerical but not statistically significant differences in most of the empowerment indicators.

A woman's age and her empowerment level

The results of the Tobit model indicate that as a woman ages, her empowerment initially increases but declines thereafter, which is consistent with previous studies (e.g., Trommlerova et al. 2015; Arestof and Djemai 2016; Sell and Minot 2018). It is also partly in line with Kabeer's (1999) theoretical approach, which views age (as well as education, wealth, household position, etc.) as an important resource that can be used to bring about change in one's own life and in the community. The qualitative findings are in accord with the finding of a positive association between a woman's age and her empowerment level. Women in the focus groups remarked that as a woman ages she is considered to have more ideas and experience relevant for household decision-making. Furthermore, husbands in the study areas reportedly also listen more to their wives after many years of marriage. As remarked by Mary, a 63-year-old poultry farmer,

"An older person is more experienced, has gone through a lot of things in life which are like education and is able to advise others on how to do things." (FGD participant, Lari Sub-County, 30 January 2020)

A common sentiment across the focus groups was that as a woman ages, her physical strength dwindles and she may not be as active in carrying out physical tasks, but she can give instructions to younger people or employees to carry out these tasks. As stated by Ann, a 53-year-old dairy farmer,

"The older I get, the harder it gets doing things in the house because I have less energy. But if you're empowered and get old, you will still run your household smoothly, you can even employ someone to help you around with income-generating activities." (FGD participant, Gatundu South, 28 January 2020)

A woman's educational attainment and her empowerment level

Our quantitative findings suggest that women become more empowered with an increase in their level of education (Table 3). This common finding in the literature has been explained as follows: through education, women become more skilled and productive, better able to access critical information, and can take advantage of income generating opportunities, which gives them greater leverage in household decision-making (Samarakoon and Parinduri 2014).

In the focus groups, women agreed that education confers advantages in terms of business skills and income generation. For instance, Sarah, a 37-year-old poultry farmer remarked,

"If you studied business in college, you can look for markets for your poultry and your customer skills are better than one who has not. Your business will expand fast." (FGD participant, Kiambu Sub-County, 29 January 2020)

When asked if education affects a woman's empowerment, Catherine a 37-year-old poultry farmer stated,

"We agree, because an educated person seeks knowledge and information and reacts in a fast way to solve a particular problem. However, in the case where a woman is more educated than the husband this can pose issues as some may fear you. Or look down upon themselves and call you a 'know it all'". (FGD participant, Githunguri Sub-County, 29 January 2020)

Wealth and a woman's empowerment level

As proxies for household wealth, we included farm size and livestock wealth, the latter measured by constructing the TLU index. We found that women from households with high TLU values are more empowered than women from households with low values. This finding is in line with O'Hara and Clement (2018), who developed a household wealth index that included livestock holdings. Other studies have measured household wealth in terms of household building materials and access to utilities and found a negative association with women's empowerment (Mahmud et al. 2012) or an absence of statistical significance (Allendorf 2012; Arestof and Djemai 2016). Like Galiè et al. (2015), we argue that TLU is a better measure of wealth, as women are directly involved in pro-creation of this kind of wealth, either as owners, co-owners or caretakers of livestock, or as users of livestock products.

Focus group participants mentioned livestock endowment as a key measure of wealth in the area, with dairy cows being rated as the most important livestock and indigenous chicken being ranked the lowest in terms of economic importance, justifying our use of the TLU to proxy wealth. In Githunguri Sub-County where dairy farming is the main economic activity, the women viewed themselves as more empowered than women from other sub-counties. Women

from other sub-counties confirmed this statement and considered Githunguri women as relatively more empowered.

Ann, a 40-year-old dairy farmer noted,

"Well, in Githunguri, it is a bit different compared to other sub-counties. Women here are more empowered. A Githunguri woman wakes up at around 4am, prepares water for milking then goes to milk, takes the milk to the dairy, comes back home, prepares breakfast and wakes the family up. All households have at least two dairy cows making it the main economic activity." (FGD participant, Githunguri Sub-County, 29 January 2020)

Ann a 57-year-old farmer, when asked about the empowerment levels of women in other areas commented, *"Githunguri women are more empowered. There, women are more knowledgeable in dairy farming than us. They have more cows."* (FGD participant, Gatundu South, 28 January 2020)

Discussion

This study examined the correlates of women's empowerment in a relatively wealthy peri-urban area of central Kenya using a mixed-methods (MM) approach. Instead of using a single method, i.e., quantitative or qualitative, which is the standard practice in the women's empowerment literature, we opted for a MM approach which offered the opportunity to cross-check results across methods (i.e., triangulation) and obtain a richer understanding of who is empowered and why (i.e., complementarity) (Greene et al. 1989). The MM approach also initiated new research questions (Hesse-Biber 2010). For instance, even when using a standardized tool like the Pro-WEAI, the qualitative interviews highlighted the importance of framing interview questions regarding empowerment in a context-specific manner considering the culture-specific complexity of concepts of empowerment, such as land ownership.

The main findings on correlates are that women's empowerment increases with age, education, and household livestock wealth, with the qualitative and quantitative results generally supporting each other, enhancing the credibility of these findings (Hesse-Biber 2010). In terms of empowerment levels, men and women at the study sites were found to have similar levels of overall empowerment and for most of the detailed empowerment indicators. Exceptions to this general result are for work balance adequacy (wives were found to be relatively disempowered by having a low work-leisure balance) and self-efficacy (men were found to be relatively empowered). The general finding of gender parity in empowerment may reflect that our study concerned a peri-urban setting, and gender gaps may be wider in rural localities. The complementarity advantage of a MM approach was revealed across these findings, with the quotes of FGD participants adding considerable richness to the quantitative results.

For the case of asset ownership, where there were discrepancies between quantitative and qualitative findings, a maintained hypothesis is that respondents did not fully understand the concept of ownership or the survey team did not adequately explain ownership concepts according to the local context. Participants of the FGDs put a strong emphasis on the cultural norm that men have to make the final decision if it comes to the use of assets, although it became clear from the discussions that many daily decisions are jointly or solely made by the usual handler of the resources. Respondents could have referred to informal joint ownership agreements between the husband and wife in the survey, while formally it was the men who owned land and large livestock as highlighted in the FGDs and as observed in the findings of Galiè et al. (2015). In understanding the local meanings and sources of asset ownership as defined by Ribot and Peluso (2003), joint ownership is defined as shared labor in the Ethiopian context, and in Nicaragua, as the household head having legal rights and other members of the

household having informal rights. Thus, the need to have a clear understanding of asset ownership when measuring women's empowerment emerged as a key area to be considered by future researchers, demonstrating the initiation strength of MM research (Greene 1989; Hesse-Biber 2010).

A limitation of our study is that it was not possible to calculate the Pro-WEAI index and the gender parity index as a component to measure the gender gap within a household. Due to geographic mobility and the common engagement in off-farm employment in the peri-urban or urban areas of Nairobi, many male household heads were absent during the daytime and could not be interviewed. A second limitation is the data are cross-sectional and observational, which in the absence of valid identifying instruments, precluded a causal analysis.

A key objective of collecting gender-disaggregated data and of measuring women's empowerment as part of a project baseline study is to support the application of a gender lens in the design, implementation, and monitoring of research-for-development projects (Njuki et al. 2013). Understanding the drivers of empowerment, and domains of disempowerment of men and women can be useful to inform project implementation mechanisms. Evidence-based knowledge on empowerment can be used to specifically design implementation mechanisms according to specific domains and levels of empowerment and to avoid traps which hinder women's involvement in project activities.

Results from the present study have and will continue to inform the roll out of the Insect-for-Feed project (described earlier). For instance, the selection of farmers for training in insect rearing and as recipients of insect farming starter kits was partly determined by the level of empowerment of the surveyed women. We selected as beneficiaries some women farmers with relatively high empowerment, especially in the domain of agricultural group membership,

because we expect these women to be important multipliers of knowledge and better able to contribute to widespread dissemination of the technology to other women. The overall high level of empowerment in the domain of mobility made it possible for women with low levels of overall empowerment (generally, younger, less-educated, and poorer women) to attend project training on insect rearing. Their participation confirmed high interest to participate in insect-for-feed enterprises. Project staff recognize that women with low empowerment levels are most in need of new, profitable enterprises but require greater support to begin and succeed at insect farming.

Insect farming offers a new source of income and a low-cost substitute for animal feed. If insect-feed enterprises deliver on their promise to increase women's personal income and financial independence, this should reduce the gender gap in agriculture and, in turn, increase women's empowerment in central Kenya; these are important objectives of the Insect-for-Feed project. Progress towards women's participation and success in insect production and women's empowerment will be tracked during the project's life. These impacts will be assessed at project end with an endline survey, using the same or improved survey tools, with panel data being available for causal analysis of the determinants of and changes in key outcomes of interest (i.e., women's income and empowerment). Findings of studies using a design like ours that include a MM gender analysis occurring at a baseline and endline can assist development agencies in designing and implementing gender-sensitive development strategies to empower women and youth in agriculture.

Table 1. Descriptive statistics for regression model explanatory variables, by sex and household position of the respondent

Variable	FHH (*n* = 46)			Wives (*n* = 216)			MHH (*n* = 170)		
	Mean	**95% CI**		**Mean**	**95% CI**		**Mean**	**95% CI**	
Age (years)	56.587	52.679	60.496	47.870	46.227	49.514	54.789	52.692	56.887
Female household head (0/1)	1	0		0			0		
Household size	3.717	3.132	4.302	4.227	4.011	4.442	4.029	3.788	4.271
No. of children aged 18 and lower	0.087	0.004	0.170	0.194	0.141	0.247	0.152	0.098	0.206
Has a son (0/1)	0.413	0.269	0.557	0.579	0.513	0.645	0.515	0.439	0.590
Wage work (0/1)	0.065	-0.007	0.138	0.065	0.032	0.098	0.152	0.098	0.206
Self-employment (0/1)	0.043	-0.016	0.103	0.065	0.032	0.098	0.129	0.078	0.179
Secondary school or higher (0/1)	0.435	0.290	0.580	0.542	0.475	0.608	0.678	0.608	0.749
Farm size (acres)	1.380	0.562	2.198	1.630	1.331	1.930	1.931	1.537	2.325
Tropical Livestock Units	5.382	3.168	7.597	14.316	10.493	18.138	15.984	10.849	21.118
Githunguri (0/1)	0.087	0.004	0.170	0.093	0.054	0.131	0.112	0.069	0.165
Kiambaa (0/1)	0.109	0.017	0.200	0.093	0.054	0.131	0.082	0.041	0.124
Kabete (0/1)	0.043	-0.016	0.103	0.088	0.050	0.126	0.070	0.032	0.109
Limuru (0/1)	0.043	-0.016	0.103	0.106	0.065	0.148	0.100	0.055	0.145
Lari (0/1)	0.239	0.114	0.364	0.037	0.012	0.062	0.041	0.011	0.071
Gatundu North (0/1)	0.109	0.017	0.200	0.083	0.046	0.120	0.094	0.050	0.138
Gatundu South (0/1)	0.022	-0.021	0.064	0.093	0.054	0.131	0.112	0.064	0.159
Ruiru (0/1)	0.130	0.032	0.229	0.074	0.039	0.109	0.065	0.028	0.103
Kikuyu (0/1)	0.065	-0.007	0.138	-0.093	0.054	0.131	0.088	0.045	0.131
Juja (0/1)	0.065	-0.007	0.138	0.065	0.032	0.098	0.065	0.028	0.102
Thika town (0/1)	0.043	-0.016	0.103	0.079	0.043	0.115	0.059	0.023	0.094
Kiambu (0/1)	0.043	-0.016	0.103	0.097	0.058	0.137	0.112	0.064	0.159

Table 2. Overall empowerment and adequacy in empowerment indicators, by sex and household position of the respondent

Adequacy indicator	FHH (n = 41)			Wives (n = 196)			MHH (n = 131)		
	Mean	95% CI		Mean	95% CI		Mean	95% CI	
Empowered (0/1)	0.600	0.446	0.754	0.410	0.341	0.480	0.563	0.476	0.649
Empowerment score	0.775	0.732	0.818	0.710	0.689	0.732	0.751	0.725	0.777
Input in productive decisions (0/1)	0.825	0.705	0.945	0.754	0.693	0.815	0.672	0.590	0.754
Attitude about domestic violence (0/1)	0.900	0.806	0.994	0.759	0.699	0.819	0.883	0.827	0.939
Ownership of land and other assets (0/1)	1			0.974	0.952	0.997	0.992	0.977	1.008
Access to and decisions on credit (0/1)	0.900	0.806	0.994	0.903	0.861	0.944	0.923	0.875	0.967
Control over use of income (0/1)	0.325	0.178	0.472	0.241	0.181	0.301	0.242	0.167	0.317
Visiting important locations (0/1)	0.625	0.473	0.777	0.697	0.633	0.763	0.672	0.590	0.754
Group membership (0/1)	0.975	0.926	1.024	0.969	0.945	0.994	0.883	0.827	0.939
Membership in influential groups (0/1)	0.750	0.614	0.886	0.703	0.638	0.767	0.680	0.598	0.761
Self-efficacy (0/1)	0.600	0.446	0.754	0.559	0.489	0.629	0.820	0.753	0.887
Work balance (0/1)	0.850	0.738	0.962	0.544	0.473	0.614	0.742	0.666	0.819

Table 3: Tobit regression results of determinants of women empowerment in Kiambu County

Empowerment score	Coefficient	95% Conf. Interval	
Constant	0.318	-0.016	0.651
Age (years)	0.013*	0.000	0.025
Age squared	-0.010	-0.000	0.000
Female household heads (0/1)	0.016	-0.037	0.068
Household size	-0.004	-0.017	0.008
No. of children aged 18 and lower	0.016	-0.050	0.082
Has a son (0/1)	-0.001	-0.044	0.041
Wage work (0/1)	0.027	-0.051	0.105
Self-employment (0/1)	-0.046	-0.126	0.034
Secondary education and higher (0/1)	0.051*	0.009	0.094
Farm size (acres)	-0.003	-0.011	0.005
Tropical Livestock Units	0.001**	0.000	0.001
Kiambaa (0/1)	0.030	-0.056	0.118
Kabete (0/1)	0.017	-0.072	0.105
Limuru (0/1)	-0.013	-0.111	0.086
Lari (0/1)	0.032	-0.072	0.136
Gatundu North (0/1)	0.010	-0.083	0.103
Gatundu South (0/1)	-0.028	-0.109	0.054
Ruiru (0/1)	0.024	-0.081	0.129
Kikuyu (0/1)	-0.006	-0.099	0.088
Juja (0/1)	-0.021	-0.133	0.091
Thika town (0/1)	-0.01	-0.094	0.075
Kiambu (0/1)	-0.052	-0.152	0.047

legend: * p<.05; ** p<.01; *** p<.001