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Agricultural Economics Research, Policy and Practice in Southern Africa



ISSN: 0303-1853 (Print) 2078-0400 (Online) Journal homepage: www.tandfonline.com/journals/ragr20

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To cite this article: Esther Leah Achandi, Asmerom Kidane, Aloyce Hepelwa & Gaudiose Mujawamariya (2019) Women's empowerment: the case of smallholder rice farmers in Kilombero District, Tanzania, *Agrekon*, 58:3, 324-339, DOI: [10.1080/03031853.2019.1587484](https://doi.org/10.1080/03031853.2019.1587484)

To link to this article: <https://doi.org/10.1080/03031853.2019.1587484>



Published online: 15 May 2019.



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Women's empowerment: the case of smallholder rice farmers in Kilombero District, Tanzania

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ABSTRACT

This study examines women's empowerment and its determinants for smallholder rice farming households in Kilombero, Tanzania. The Women Empowerment in Agriculture Index (WEAI) is adopted and for the study site, the overall WEAI was 0.54 with a 5 Domains Empowerment sub-index value of 0.50 and the Gender Parity sub-index of 0.86. Key domains contributing to women's disempowerment are workload, resource ownership and restricted inputs to productive decision making. To assess determinants of women's empowerment the ordinal logit analysis is used and for the female-headed households, age of the household head, education level, group membership, condition of dwelling and distance from the nearest major town have a positive association with women's empowerment, while monthly income has a negative association with it. For the male-headed households, the association is significant for age of the man.

ARTICLE HISTORY

Received 28 June 2018
Accepted 18 February 2019

KEYWORDS

women empowerment;
attainment; determinants;
Tanzania

JEL CLASSIFICATION

J16, Q12, R20

1. Introduction

By definition, women empowerment is a process by which women become able to organise themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources which will assist in challenging and eliminating their own subordination (Malhotra & Schuler, 2005). Tanzania joined the international community in acknowledging the importance of women empowerment and has ratified a number of international and regional human rights instruments relating to the rights of women such as the International Covenant on Economic, Social and Cultural Rights (UN Economic and Social Council, 2009); the African Charter on Human and Peoples' Rights (OAU, 1981), among several others. Domestically, Tanzania has adopted a strong formal legal framework protecting women's rights to property within its existing legislation as noted by Duncan (2014). Additionally government incorporated within its National Development Vision 2025 a goal of attaining gender equality and the empowerment of women in all socio-economic, political relations and culture by the year 2025 (URT, 1999).

The Tanzanian economy is largely agrarian, thus land is a key productive resource. The Land Act No. 2 of 2002 established Land Tribunals whose composition required not less than 43 per cent women (URT, 2002) and the Land Act No. 4 of 1999 was amended in 2004, to make land economically valuable and allow for mortgaging in order to access financial resources for investment (URT, 2004); this was noted as a gender aware reform (Knight, 2010). Agriculture's contribution to GDP was highlighted at 29.8 per cent for the period 2012 to 2016 (NBS, 2016), the sector employs 69.9 per cent of

female and 64 percent of the male population (NBS, 2017). Fox (2016) notes that women are over-represented in the agricultural sector compared with men. Their productivity within the sector, however, remains very low and there exists a gender gap¹ between men and women (UN Women *et al.*, 2015); women have limited access to extension services (Mbo'o-Tchouawou & Colverson, 2014) and complementary agricultural inputs (Mukasa & Salami, 2015). They are marginalised and have very limited decision-making power (Lyimo-Macha & Ntengua, 2002), are less likely to hire male labour for their agricultural plots, yet Mukasa and Salami (2015) in a study on Nigeria, Uganda and Tanzania argue that family members working on a farm and hired male workers are more productive than other types of labour inputs. Lack of control over key productive resources such as land and credit has been previously noted to reduce the productivity of women (Ishengoma, 2004). In spite of the legal machinery in place, co-existence of customary law alongside national legislation poses a challenge for execution of provisions of the law in a way that would grant women full access and control over land to the same extent as that enjoyed by men (Pedersen & Haule, 2013). Leavens (2011) observes that 80 per cent of Tanzania's communities are patrilineal, the customary land tenure common in these communities favouring male heirs. Additionally, most women have usufruct rights to land and face challenges in enforcing property rights in Tanzania (Moyo, 2017), thus limiting development of their agricultural activities. Where women are able to inherit land they are still unable to dispose of it, such as in the case of Ephraim Bernado vs Holaria Pastory (1990) highlighted in Pedersen and Haule (2013); this limits their ability to make full use of such resources. Moreover, this system is dominant across the country since women are mainly employed in the rural agricultural sector, yet Moyo (2017) notes that rural agricultural areas are predominantly under customary land tenureship.

Within the policy framework specific to the nation's agricultural sector, rice has been identified as a strategic crop due to its characteristics among crops within the sector; rice is the second most important cereal after maize (Ronald *et al.*, 2014), is among the three crops prioritised under Big Results Now (BRN) to ensure food availability, reduce poverty and facilitate a gradually shift to commercialised and modernised production system (URT, 2013). The rice subsector has received a boost with Tanzania benefiting from membership to the Coalition for African Rice Development (CARD) (JICA/AGRA, 2008) and Tanzania serves as a host for the regional rice centre of excellence in East Africa under the East African Agricultural Productivity Programme (EAAPP) initiative (World Bank, 2009). Moreover in terms of production, Tanzania is the second largest rice producer in Eastern Africa after Madagascar (Kolleh *et al.*, 2017).

A few studies have been undertaken in Tanzania to examine women's empowerment in the agricultural sector with such examples such as Masamha *et al.* (2018) and Seymour *et al.* (2016). Such studies specific to the rice subsector remain scarce in spite of rice being identified as a priority crop. This study thus seeks to estimate the level of intra-household women empowerment and identify its determinants for smallholder rice farmers in Kilombero.

2. Models and estimation procedure

2.1 Estimating the Women Empowerment in Agriculture Index (WEAI)

A number of indices that have been developed to examine women empowerment such as the Gender-related Development Index, the Gender Empowerment Measure (Bardhan & Klasen, 1999), the Gender Equity Index (GEI) (Social Watch, 2007). These, however, do not have sufficient coverage of the micro sector such as the agricultural sector. Additionally, the multi-dimensional nature of empowerment makes it difficult to measure (Aker, 2017). This study adopts the Women Empowerment in Agriculture Index (WEAI) developed by Alkire *et al.* (2012) due to its ability to measure empowerment, agency, and inclusion of women in the agricultural sector. It is a self-assessment-based index examining women empowerment using two sub-indices; the five domains of empowerment in agriculture (5DE) and the gender parity (GPI) in empowerment between the primary male

and female within the household. Self-assessment is due to the notion that empowerment has its roots in feminist theory and popular education, stressing personal and inner dimensions of power as highlighted by scholars such as Luttrell *et al.* (2009). Moreover, in addressing biases that could arise from use of self-assessment, objective indicators such as membership to groups are also included amongst the indicators and Alkire *et al.* (2012) indeed reiterates that since empowerment is an individually located concept, not using self-assessment would undermine the entire measurement process. The WEAI is computed using the five domains, key indicators for each domain and weights for indicators in computation of the index as shown in Table 1:

2.1.1 Computing the Women's Empowerment in Agriculture Index

The following definitions of key components in estimation of the WEAI from Alkire *et al.* (2012) are adopted.

With H_p the disempowerment head count ratio, $H_p = \frac{q}{n}$ where q is the number of disempowered individuals and n is total population and, intensity of disempowerment A_p . Inadequacy score of disempowered individuals is

$$A_p = \frac{\sum_{i=1}^q c_i(k)}{q}$$

where $c_i(k)$ is the censored inadequacy score of individual i and q is the number of disempowered individuals.

The five domains of disempowerment measured as M_0 are

$$M_0 = H_p \times A_p \quad (1)$$

From the above disempowerment index, the 5DE can be obtained as

$$5DE = 1 - M_0 \quad (2)$$

Therefore, the $5DE = H_e + (H_p \times A_e)$ where H_e is the empowered head count ratio same as $(1 - H_p)$ and, A_e is the average adequacy score of disempowered individuals also equal to $(1 - A_p)$.

The 5DE is based on the disempowerment index M_0 , it can also be calculated as

$$5DE = H_e + H_p(A_e) \quad (3)$$

The Gender Parity Index is constructed using two components

$$H_{GPI} = \frac{h}{m}$$

where h is the number of inadequate households in gender parity and m is the total number of dual adult (male-headed households) in the sample.

Table 1 Five domains of empowerment in the WEAI.

Domain	Indicator	Weight	Weight*
Production	Input in productive decisions	1/10	1/5
	Autonomy in production	1/10	
Resources	Ownership of assets	1/15	2/15
	Purchase, sale, or transfer of assets	1/15	
	Access to and decisions about credit	1/15	
Income	Control over use of income	1/5	1/5
Leadership	Group member	1/10	1/5
	Speaking in public	1/10	
Time	Work load	1/10	1/5
	Leisure	1/10	

Note: *Weight means the indicator weights used in this study.

Source: Alkire *et al.*, 2012.

Table 2. Summary statistics for socio-economic characteristics of study site.

Variable	Mean (std dev.) [n = 188]
Type of household* (1 = female headed)	0.52 (0.50)
Age of household head (both male and female household heads)	48.10 (13.19)
Age of the women (female household heads and wives in male-headed households)	44.07 (13.57)
Education of the household head (1 = primary)	0.69 (0.46)
Education of the woman (female household heads and wives in male-headed households) (1 = at least completed primary)	0.70 (0.46)
Primary occupation household head as a farmer (woman) (1 = non-farm)	0.23 (0.42)
Distance to major town (km)	63.67 (9.43)
Household size (individuals)	4.29 (1.92)
Male : female ratio	1.04 (1.06)

Note: *Refers to whether it is a female-headed household or male-headed household with a primary male and female. Between parentheses are standard deviation.

The second component of the GPI is the average empowerment gap, and is the average percentage gap between the censored inadequacy scores of the women and men living in households that lack gender parity (I_{GPI}).

$$I_{GPI} = \frac{1}{h} \sum_{j=1}^h \frac{c'_j(k)^W - c'_j(k)^M}{1 - c'_j(k)^M}$$

Where $c'_j(k)^W$ and $c'_j(k)^M$ are the censored inadequacy scores of the primary woman and man respectively (in this case they are the spouse and the primary respondent) living in j household and h is the number of households that are inadequate in gender parity.

The GPI is thus constructed as

$$GPI = 1 - H_{GPI}(I_{GPI}) \tag{4}$$

The GPI score can improve by increasing the percentage of women who attain gender parity H_{GPI} or, for those less empowered than the men, by reducing the empowerment gap between the male and female from the same household (equivalent to reducing I_{GPI}).

From the above sub-components, the Women empowerment in Agricultural Index is estimated as:

$$WEAI = 0.9(SDE) + 0.1(GPI) \tag{5}$$

The weights of the 5DE and GPI sub-indices are 90 per cent and 10 per cent, respectively. The total WEAI score is the weighted sum of the overall sample size. Achievement in these scores is set at a threshold for achievement empowerment at 80 per cent of weighted indices. Alkire *et al.* (2013) suggest this threshold, having explored sensitivity of the empowerment classification for different cut-offs, and considered an individual as disempowered if his or her inadequacy score is greater than 20 per cent.

To compute disempowerment by each index Alkire *et al.* (2013) suggest the following formulation for decomposition of each indicator to disempowerment.

$$M_{0population} = w_1CH_1 + w_2CH_2 + \dots + w_{10}CH_{10} \tag{6}$$

where w_1 is the weight of indicator 1, CH_1 is the censored² head count ratio of indicator 1 and the similar definition for the rest of the weights and their indicators such that $\sum_{d=1}^D w_d = 1$.

The following is used in this study since there are six indicators for the five domains.

$$M_{0population} = w_iCH_1 + w_2CH_2 + \dots + w_6CH_6 \text{ and still } \sum_{d=1}^D w_d = 1 \tag{7}$$

The percentage contribution of each indicator d to disempowerment;

$$M_0 = \frac{w_d CH_d}{M_{0population}} \tag{8}$$

From the above, the contribution of each indicator to disempowerment of men or women in the sample can be obtained.

2.2 Determinants of women empowerment: The Ordinal Logistic Model

Women empowerment can be examined as either a continuous, binary or ordinal variable; this study adopts the definition of empowerment as a process (Malhotra & Schuler, 2005) and thus progressive in nature. Ordinal scales have been noted to use numbers to indicate rank ordering on a single attribute (Long, 2014). The ordinal logit is thus suitable in assessing the determinants of women empowerment because it bears the characteristic that it can use choice of numbers to represent the progressively more severe categories, it therefore conveniently preserves the “greater than” or “less than” quality of the underlying attribute defining the categories themselves as argued by O’Connell (2006). In this study ordering in the achievement of higher levels of empowerment is considered, thus the ordinal logit model is adopted. The model for the ordinal regression model is derived from a regression on an unobserved, continuous variable y^* .

$$y_i^* = \beta_i x_i + \varepsilon_i \tag{9}$$

Where ε_i is logistic with a mean 0 and variance $\frac{\pi^2}{3}$.

The continuous y^* is divided into observed, ordinal categories using the Thresholds τ_0 through τ_j .

$$y_i = j \text{ if } \tau_{j-1} \leq y_i^* < \tau_j \text{ for } j = 1 \text{ to } J \tag{10}$$

where $\tau_0 = -\infty$ and $\tau_j = \infty$.

Structure of the model can be looked at using cumulative probabilities of being less than or equal to category j .

$$\Pr(y \leq j/x) = \Pr(y^* < \tau_j/x) \tag{11}$$

$\Pr(y \leq j/x) = \Pr(\varepsilon < \tau_j - [\beta_j x_i]/x)$ for $j = 1, J - 1$ when we substitute for y^* .

The Cumulative Density Function for the logistic is

$$\Pr(y \leq j/x) = \Lambda(\tau_j - x' \beta) \text{ for } j = 1, J - 1 \tag{12}$$

The probability of an individual category j is the probability that $y \leq j$ minus the probability that $y \leq j - 1$.

$$\Pr(y = j/x) = \Lambda(\tau_j - x' \beta) - \Lambda(\tau_{j-1} - x' \beta) \text{ for } j = 1, J \tag{13}$$

For identification, the value of either one threshold or intercept has been fixed and thus the model

$$\Pr(y \leq j/x) = \Lambda(\tau_j - x' \beta) \text{ for } j = 1, J - 1 \tag{14}$$

For each j , the above is a binary logit on an outcome dividing categories between lower and higher values. For the $J - 1$ ways of dividing the ordinal categories, the resulting binary logits have different intercepts but identical slopes. This is the parallel regression assumption.

Because of the identical slopes adjacent categories of the outcome can be combined to attain estimates of the β 's.

The odds of being less than or equal to j is;

$$\Omega_j(x) = \frac{\Pr(y \leq j/x)}{1 - \Pr(y \leq j/x)} = \frac{\Lambda(\tau_j - x' \beta)}{1 - \Lambda(\tau_j - x' \beta)} \text{ for } j = 1, J \tag{15}$$

But $\Lambda(\tau_j - x'\beta) = \exp(\tau_j - x'\beta)$ thus we get $\Omega_j(x) = \exp(\tau_j - x'\beta)$ for $j = 1, J$ which can be interpreted as:

For a unit increase in x_k , the odds of being in a category less than or equal to j , changes by $\exp(-\beta_k)$, holding other variables constant.

For the study, a survey was conducted in five villages sampled from Kilombero district which is one of the major rice producing districts in Tanzania. Villages sampled were Mkula, Mang'ula A, Msolwa Ujamaa, Mbingu and Njage, all located within the rice sector hub³ as defined by AfricaRice under whose supervision and funding the research was conducted. Initially 40 households were targeted within each village but given resource limitations, the survey covered 256 households during the period 8 August 2016 to 12 August 2016.

For the conduct of the survey, a team of 10 enumerators (three male and seven female) were engaged in data collection and the extension officer was contacted prior to the survey to inform selected farmers of our impending visit. Moreover, during interviews each male enumerator interviewed only the male respondents while the female interviewed the female respondents to minimise possible bias that can be induced by the gender of the interviewer. (Zaller and Feldman (1992) suggest that researchers should take into account potential gender-of-interviewer effects where they might be reasonably expected.) Farmers were informed that the information sought was on rice farming activities and decision making within the household in order to guard against explicitly asking about women empowerment which is a contentious issue across rural communities.

Questions asked were drawn from the IFPRI WEAI website⁴ adapted for rice farming activities as specific to the Tanzanian context. In this way, respondents' answers were recorded and empowerment was later computed from these responses using the WEAI resources on the IFPRI website.

3. Results and interpretation of results

3.1 Descriptive results for the sampled area

From the five villages selected, a complete sample for which the women empowerment index could be computed was 188 households with 291 individuals. Below is a description of the sample.

The study looks at two types of male-headed households with both the primary male and the primary female (in this case, the husband and the wife) and female-headed households. Fifty-two per cent of the samples were from female-headed households. The average age of the household head is 48 years. For the women in the sample, their average age was 44 years. Sixty nine per cent of the household heads had attained at least a primary seven education and for the women in the sample, at least 70 per cent had attained primary education. Twenty three per cent of the women held primary occupation outside farming from the sample. Generally, the households had an average size of 4.29 individuals with a male to female ratio of 1.04. In terms of distance from the nearest town, the villages selected were located at an average of 63.67 km away from the nearest towns.

3.2 Women Empowerment in Agriculture Index: Computed results

Table 3 indicates the sub-indices and the overall WEAI scores for the study site with a break down on achievement of the men and women;

The overall WEAI for the study area is 0.54 and is a weighted average of the 5DE sub-index value of 0.50 and the GPI sub index of 0.86.

3.2.1 Overall 5 Domains Empowerment

The 5DE shows that at 80 per cent achievement threshold, 6.5 per cent of the women are empowered and the not-yet-empowered women have an average inadequate achievement in 50 per cent of domains. The women's disempowerment index (M0) is 0.50 and 5DE is 0.50. For the men in the

Table 3. Women empowerment in agriculture index: Scores for the study site.

Indicator	Women	Men	Difference
5DE (1–M0)	0.50	0.49	0.01
Disempowerment score (1–5DE)	0.50	0.51	–0.01
<i>N</i> (number of observations)	188	91	
Percentage achieving empowerment (1–H)	6.5	4.5	2.0
Percentage <i>not</i> achieving empowerment (H)	93.5	95.5	–2.0
Mean 5DE score for not yet empowered women (1–A)	0.50	0.49	0.01
Mean disempowerment score (1–5DE) for not yet empowered women (A)	0.50	0.51	–0.01
GPI score (1–H _{GPI} *I _{GPI})	0.86		
<i>N</i> (number of male-headed households)	91		
Percentage of women achieving gender parity (1–H _{GPI})	62.07		
Percentage of women <i>not</i> achieving gender parity (H _{GPI})	37.93		
Average empowerment gap (I _{GPI})	0.38		
WEAI Score (0.9*5DE + 0.1*I _{GPI})	0.54		

Source: Author's own calculations using adapted STATA do-files by Ana Vaz and Sabina Alkire.

Available at <https://www.ifpri.org/weai-training-materials>.

sample group, 95.5 per cent are not-yet-empowered, the average inadequacy score among these men is 51 per cent. So, the men's disempowerment index (M0) is 51 per cent and their 5DE is 0.49. The observation of 6.5 per cent of the women in rice farming household as empowered highlights evidence of low levels of empowerment; a related agricultural study by Masamha *et al.* (2018) in the cassava value chain in Tanzania also reports a low level of women empowerment at 5 per cent.

Women's disempowerment looks at how women have been subordinated, but with this result the question arises: Who is disempowering both the men and the women? Sen *et al.* (2006) highlights existence of other power centres within the household that could result in the disempowerment observed when both the men and women within the same households report disempowerment; this can be attributed to the presence of extended family within the same household in the developing world. Moreover, the study also highlights the importance of multi-generational structure of the household in affecting women empowerment thus, apart from cross-gender disempowerment, there is a possibility of cross-generational empowerment. Moreover, since the sample is from smallholder farmers with low incomes and in an area with high prevalence of poverty (Lokina *et al.* (2011) observe that poverty levels are highest among rural populace and among those mainly dependent on agriculture), reporting disempowerment is likely to be interpreted by farmers, as stated by Narayan *et al.* (2000), that poor people agree to spend time with researchers in the hope that their voices will be carried to those who have the power to affect decisions that affect their lives. Therefore, rather than exclusively looking at empowerment as a cross-gender, cross-generational issue, they also look at it as a cross-class issue in their self-assessment of the five domains. Indeed Kabeer (2012) argues that gender inequalities intersect with other forms of socio-economic inequality, including class, caste, race, ethnicity, location and so on, thus exacerbating injustices associated with them. A self-assessment based index as the one hereby used can thus result in both men and women within the same household reporting a comparable state of disempowerment.

3.2.2 Gender Parity Index

For the study site, 62.07 per cent of the women are achieving gender parity with the primary male in their households. Of the remaining 37.93 per cent not achieving gender parity, average empowerment gap is 38 per cent. The GPI for the study site is 0.86 indicating that within a larger percentage of households, men and women are enjoying relative gender parity. This result concurs with findings by Achandi *et al.* (2018) estimating a simple women empowerment index adapted for rice farming systems who found that in Tanzania, women enjoyed relative parity in decision making with their spouses within the households.

3.2.3 Decomposition of disempowering factors for women and men within the study area

The disempowerment measures (M_0) for women and men decomposed by domain and indicator are presented in Table 4.

From Table 4, the domains contributing most to women's disempowerment are workload (38.2%), ownership of assets (20.2%) and input in agricultural productive decisions (18.9%). For the men the domains contributing to their disempowerment are workload (39.96%) and input in productive agricultural decisions (28.0%). Workload defined as allocation of time between productive and domestic tasks; ownership of assets, defined as sole or joint ownership of major household assets and, input in productive decisions defined as sole or joint decision making over food and cash crop farming, live-stock (Alkire *et al.*, 2012) have been cited as key in contributing to disempowerment of women. Both men and women report a comparable contribution of workload to their disempowerment although the contribution of workload for men is reported slightly higher than that of women. Higher workload contributes to women's disempowerment although it has also been argued that with development interventions, sometimes women's workload increases a situation interpreted as favourable for the women; Kabeer (1998) in a study in Bangladesh found that women were happy with the extra burden because of the respect, personal satisfaction, and improved standard of living as a result of their income-generating activities resulting from increased workload.

Men and women reporting workload as contributing to their disempowerment is an expected result; the study targeted rice farmers and rice farming in Tanzania is labour-intensive (Mdemu & Francis, 2013) with low levels of labour saving technologies (Kangile & Mpenda, 2016). Even with labour saving technologies, such as rotary weeders, remaining weeds are still removed by hand and such technologies are not yet widely available to farmers (Achandi *et al.*, 2018).

The lack of decision making around agricultural production contributes much more to men's disempowerment than to women's (28% compared with 18.9%). This is possible since the initial bargaining position of men under patriarchy was that they were sole decision-making agents within the households (Sultana, 2012), but with the continued efforts at women empowerment some studies have reported an increase in consensus between spouses in intra household decision making. Doe (2014) argues that albeit traditional norms, married women and men emphasised that husbands and wives must show mutual respect and both must have a say in household decision making. This result echoes findings by Alkire *et al.* (2013) in Uganda where both men and women reported disempowerment in decision making around agricultural production (22% vs 9% respectively).

Ownership of assets still ranks high as a limiting factor to women empowerment and contributes more to women's disempowerment as compared with men's, a result also noted in a WEAI pilot in

Table 4. SDE decomposed by dimension and indicator for the study site.

Statistics	Production	Resources		Income Control	Leadership Grp membership	Time Workload
	Input in productive decision	Ownership of assets	Access to and decision on credit			
Indicator weight	0.20	0.13	0.07	0.20	0.2	0.2
Women						
Censored headcount	58.5%	52.5%	74.5%	4.0%	24.0%	83.5%
Percentage contribution (was problematic)	18.89%	20.18%	12.39%	1.62%	8.73%	38.19%
Contribution	0.12	0.07	0.05	0.01	0.05	0.17
Percentage contribution by dimension	18.89%	20.18%	12.39%	1.62%	8.73%	38.19%
Men						
Censored headcount	71.4%	49.5%	93.4%	1.1%	15.4%	90.1%
Percentage contribution	28.00%	12.87%	14.23%	0.29%	4.70%	39.96%
Contribution	0.14	0.06	0.07	0.00	0.03	0.18
Percentage contribution by headcount	28.00%	12.87%	14.23%	0.29%	4.70%	39.96%

Source: Author's own calculations using STATA do-files by Ana Vaz and Sabina Alkire.
Available at <https://www.ifpri.org/weai-training-materials>

Uganda (Alkire *et al.*, 2013). Similarly, Ali *et al.* (2014) in Tanzania observed that men are by default treated as the sole legal owners of household land. Doss *et al.* (2015) observe that in Tanzania women constitute 27 per cent of land owners, yet land is a key resource that supports agricultural production (Odhiambo, 2006).

3.3 Estimating the determinants of women empowerment: An Ordinal Logit Analysis

Women empowerment is estimated as a dependent variable achieved on an ordinal scale with three distinct groups defining achievement in the weighted domains; i.e, those attaining <40 percent, 40 to <60 per cent and lastly those above 60 per cent. In this case the dependent variable has more than two categories and the values of each category have a meaningful sequential order where a value is indeed 'higher' than the previous one (Torres-Reyna, 2012).

In an attempt to address possible endogeneity problems between the explanatory variables and women empowerment, an initial attempt to use proportion of sons out of number of children yields unsatisfactory results. The analysis using women empowerment itself is therefore done and results interpreted as correlations rather than causal relationships as recommended by Malapit *et al.* (2015).

We hypothesize from existing literature that the factors affecting empowerment are; household characteristics such as type of household, age of the household head, gender of household head and age of the woman, number of male children, household size, location of the household from a town or nearest road, number of bedrooms in the dwelling house; human capital investment with variables such as education level of household head, education level of the woman; social capital acquired through group membership by household head being a proxy for this; factors that capture the woman's opportunities for productive resources such as primary occupation, condition of the dwelling house (women usually run home-based small business activities) and monthly income. A number of studies have used similar variables in studying women empowerment some of which are highlighted in Table 5.

Table 5. Determinants of women empowerment and expected sign of effect from literature.

Covariates	Description	Expected sign	Studies
Continuous variables			
Distance to the nearest town	Distance from the village to the nearest town	Negative	Nayak <i>et al.</i> (2009)
Age of the man	Age of the husband in male headed households	Negative	Wiklander (2010)
Age of the woman	Age of the wife or female in-charge in female headed household	Positive/ Negative	Wiklander (2010)
Household size	Number of people in the household	Negative	Upadhyay <i>et al.</i> (2014)
Male children per household	Number of male children in the household	Positive	Wiklander (2010)
Number of people under care	Number of elderly and the children (dependants)	Negative	Sebhatu, K. T. (2012)
Number of bedrooms	Number of bedrooms in the dwelling house (women run informal businesses from their homes and often need extra space)	Positive	Akarro <i>et al.</i> (2013)
Distance to the nearest road	Distance from the dwelling house to the nearest main road	Negative	Diirro <i>et al.</i> (2018)
Monthly income	Total household income per month	Positive	
Categorical variables			
Group membership	Membership to any farmer group in the village such as a rice farmer group	Positive	Represents collective action (Evans and Nambiar, 2013; Baden, 2013)
Education	Level of education	Positive	Fox (2016)
Primary occupation of the woman	Primary occupation of the primary female respondent (1 = non-farm)	Positive	Newman and Canagarajah (1999).
Condition of the house	Own assessment of the conditions of dwelling house (1 = good housing)	Positive	Aggarwal (2008)

The variables highlighted in Table 5 are described for the study area using the mean and standard deviation. Table 6 gives a description with mean and standard deviation of the covariates, and also a description of the covariates as used in each model and for the combined model.

For the female-headed households, distance from the nearest major town was 64 km while that of male headed households was 62 km. Also female household heads were on average 48 years old compared with their counterparts in male-headed households who were on average 39 years of age. Additionally, female-headed households had smaller household sizes, fewer people under their care, lower household income per month and were located closer to the main roads compared with male-headed households. Male-headed households had on average a higher number of household members and a higher monthly income.

From our analysis of given covariates Table 7 shows the results for determinants of women empowerment for female-headed households, male-headed households and a combination of both household types.

Three models are estimated: a model for female-headed households, for male-headed households and the joint model for both household types. There have been arguments indicating that effects on the level of empowerment filter through differently to women as household heads compared with women as spouses (Meemken *et al.*, 2017). Moreover, women as household heads generally report different attainments in terms of empowerment when compared with women within male-headed households. This is informative because the WEAI is a self-assessment-based index.

3.3.1 Female-headed households

For the female-headed households, distance from the nearest town is significant at 10 per cent, education of the woman, condition of dwelling house and monthly income are significant at 5 per cent

Table 6. Descriptive statistics of determinants of women empowerment for the study site.

Variable		Mean (standard deviation)		
		Female-headed households	Male-headed households	Combined
Continuous variables	Description			
Distance to the nearest town	Distance from the village to the nearest town (km)	64 (8.8617)	62.311 (0.889)	63.66 (9.429)
Age difference	Age difference between couples (in years)		7.958 (5.0599)	
Age of the man	Age of the husband in male-headed households		47.77 (12.346)	48.09 (13.19)
Age of the woman	Age of the wife or female household head	48 (13)	39.15 (10.927)	44.07 (13.57)
Household size	Number of people in the household	3.756 (1.82)	4.875 (1.836)	4.29 (1.92)
Male children per household	Number of male children in the household	2 (1)	1.491 (1.305)	1.44 (1.29)
Number of people under care	Number of elderly and the children (dependants)	2 (1)	2.35 (3.274)	2.05 (2.52)
Number of bedrooms	Number of bedrooms in the dwelling house	2.672 (1.274)	2.433 (1.850)	2.57 (1.61)
Distance to the nearest road	Distance from the dwelling house to the nearest main road (km)	0.914 (1)	1.313 (2.059)	1.109 (1.686)
Monthly income	Total household income per month ('000)	44.332	107.708 (138.364)	80.15 (118.23)
Categorical variables				
Group membership	Membership to any farmer group in the village such as a rice farmer group in the village (1 = member)	0.25 (0.43)	0.525 (0.501)	0.38 (0.48)
Education of the woman	Level of education (1 = some formal education)	0.578 (0.496)	0.525 (0.501)	0.69 (0.46)
Primary occupation of the woman	Primary occupation of the primary female respondent (1 = non-farm)	0.195 (0.397)	0.733 (0.444)	0.23 (0.42)
Condition of the house	Own assessment of the conditions of dwelling house (1 = good state)	0.227 (0.420)	0.217 (0.414)	0.22 (0.42)
Marital status of the woman	Whether the woman is a household head or a wife in the household (1 = married)			0.47 (0.50)

Table 7. Results for the determinants of women empowerment.

Variable	Female-headed households (n = 93)	Male-headed households (n = 90)	Both household types (n = 122)
Distance to the nearest town	0.0507 (0.0285)*	0.0017 (0.0224)	0.0177 (0.0203)
Age difference between couple	–	0.0040 (0.0630)	–
Age of the man	–	0.3811 (0.1501)**	–
Age squared of the man	–	–0.0039 (0.0017)**	–
Age of the woman	0.1555 (0.1103)	–0.1597 (0.1642)	0.1539 (0.0676)**
Age squared of the woman	–0.0010 (0.0011)	0.0025 (0.0023)	–0.0012 (0.0007)*
Education of the woman	1.1333 (0.5489)**	–	0.4742 (0.4758)
Group membership of the woman	2.0510 (0.6390)***	–0.5788 (0.4565)	–
Group membership household head	–	–	1.0445 (0.4131)**
Household size	–0.0690 (0.2222)	–0.0899 (0.1880)	–0.3738 (0.1658)**
Male children per hh	0.1570 (0.2364)	–0.2764 (0.2331)	–
Primary occupation woman	–0.6854 (0.6172)	0.1075 (0.5348)	–0.1896 (0.4596)
Number of people under care	–0.2173 (0.2797)	0.1940 (0.1831)	0.3363 (0.2215)
Condition of the house (C3)	1.1611 (0.5673)**	0.6688 (0.5579)	0.5475 (0.4365)
C6 (number of bedrooms)	–0.0173 (0.1668)	–	0.0557 (0.1245)
C15 (distance from nearest road)	–0.0112 (0.1460)	0.2307 (0.2024)	0.1209 (0.1132)
C14 (monthly income)	–0.0170(0.0070)**	–	–0.0018 (0.0021)
Marital status of the woman	–	–	0.8425 (0.4560)*
Brant, test result ($p > \chi^2$) ^{NS}	0.961	1.000	0.990

Notes: */**/** significant at 10%/5%/1%. ^{NS} = A significant test statistic provides evidence that the parallel regression assumption has been violated.

while group membership of the woman is significant at 1 per cent. This implies that moving from non-membership to membership of a group is associated with a 2.05 increase in the log odds of being in a higher level of empowerment; moving from a poor to a good dwelling place, is associated with a 1.16 increase in the log odds of being in a higher level of empowerment; the log odds of being in a higher level of empowerment increases with education. Education of the women has a high association with the level of empowerment. Warner *et al.* (2012) argue that education is essential for preparing adolescent girls for healthy, safe and productive transitions to adulthood, while Duflo (2012) argues that education can increase women's bargaining power within their households, since it endows them with knowledge, skills and resources to make life choices that improve their welfare. Indeed our results concur with these arguments and similar findings have been made by Jeckoniah *et al.* (2013) who looked at the importance of education attainment on women empowerment and found that empowerment increased with education attainment. Our results, however, are contrary to those of Losindilo *et al.* (2010) in a review of factors affecting women's participation in social, political and economic activities in mainland Tanzania, who found that the effect was not significant. Moreover, education alone may not be sufficient. Meena (1996) cautions that education can be a two-edged sword, that on the negative side perpetuates the gender stereotypes within the greater society and may therefore play a very vital role in the social construction of women and men in Tanzanian society through allocating gender-specific packages which reinforce the oppressive gender relations.

Group membership improves the position of the respondents in the patriarchal family systems through increased knowledge of legal system and enabling the members to engage in family decision making and members also develop leadership qualities (Chitagubbi *et al.*, 2012). It also provides members with a forum to voice their opinions, challenge cultural prejudices and misconceptions, and participate in decision making (Ross *et al.*, 2015). Nonetheless, group membership is not an automatic ticket to women empowerment. For example, in Tanzania wealthier women were more likely than poor women to join SHGs and thus the groups served to reinforce the idea that wealthier women have more access to financial services, social capital and community respect than poorer women (Mercer, 2002).

Distance to the nearest town has an unexpected sign since the results show that a unit increase in distance is associated with log odds of attaining a higher level of women empowerment. This could be due to the fact that empowerment, as used in this study, entails a self-assessment and as such

possibly the women that are closer to town are more aware of their disempowerment (due to availability of information through media, cross-cultural interactions and general public awareness), while those further away are not aware of their disempowerment. Eldred (2013) notes that in the rural areas traditional customs usually persist and women themselves sometimes perpetuate patriarchal ideologies to the younger generations. This finding is contrary to arguments by Nayak *et al.* (2009) who found that urban married women are more empowered than rural women.

Household income also has a negative association with the level of empowerment attained by the women. Gilabert *et al.* (2016) caution that increasing levels of wealth alone might not necessarily translate into higher levels of empowerment for women in agriculture, as household wealth poorly captures intra-household allocation of resources. Moreover, Kantor (2003) examining home-based garment production found that women producers are more likely to lose control over their income when their earnings are high, because of the easier monitoring and access to benefits by other household members. Agarwal (1997) raises arguments about the possibility of women generally being more altruistic within their households as compared to men. Contrary findings about the effect of income on women empowerment has been reported by Carlsson *et al.* (2009) who indicated that men overall have larger influence on joint decisions than women, but that women have a larger influence in households in which women have higher income. However, given that these are female-headed households, we would have expected a positive effect of the household income on the level of empowerment of the women.

State of housing has a positive association with the level of empowerment. Ndinda (2009) suggests that housing plays a key role in women empowerment. Jacobson *et al.* (2016) argue that housing plays a vital role in the informal economy, particularly for people working from home and especially those who work in the informal economy and rely on their homes as a physical asset to do their work. Indeed, the importance of housing to women's work has been emphasised by studies (Aggarwal, 2008; Jacobson *et al.*, 2016) given that most women that have alternative economic activities, for example, they may run a shop from their house in order to mind children at the same time, instead of taking on productive employment work from home (Duflo, 2012). Additionally, Aggarwal (2008) concludes that housing improvements increased the average number of working hours and consequently incomes.

3.3.2 Male-headed households

For male-headed households all other variables in the model are held constant. A unit increase in age of the man is associated with the log odds of attaining a higher level of women empowerment by 0.38. In terms of association of the age of the man and the level of women empowerment, the empowerment of the woman diminishes as the age of the man increases, thus there is a quadratic relationship. Initially as age of the man increases, the level of empowerment achieved by the woman increases then reaches a certain threshold and begins to fall. A possible explanation for effect of age of the man on women empowerment is that younger men are more exposed to the discourse on women empowerment thus make concessions to accommodate their wives in the decision-making process. Indeed, Wyrod (2008) reviewed gender in urban Uganda and argued that some aspects of women's rights are accommodated, while retaining previous notions of innate male authority. Older men are, however, more inclined towards the patriarchal cultural norms than subordinate women. Ali *et al.* (2011) observed that the younger generation were more positive regarding modernisation of gender roles than the elder generation.

3.3.3 Combined model of both female-headed and male-headed households

For the overall model, age of the woman and group membership of household head and household size are significant at 5 per cent, while marital status is significant at 10 per cent. A unit increase in the age of the woman is associated with a 0.15 increase in the log odds of attaining a higher level of empowerment for the woman in the household. For group membership of the household head, moving from non-membership to group membership is associated with a 1.04 increase in the log

odds of being in a higher level of empowerment. A unit increase in household size reduces the log likelihood of empowerment for the woman by 0.37. The relationship between women empowerment and the household size can be understood from the discussion on mobility which is noted to be inversely associated with the number of children (Balk, 1994). Moreover, Armendáriz and Roome (2008) suggested that the opportunity cost of women's time increases with micro-finance access and women are urged to reduce family size in order to increase education and health expenditure and to better manage the ability to repay. Smaller family sizes are therefore associated with higher levels of women empowerment.

Within this model, group membership of the household head (either female or male) has a positive association with the level of women empowerment. Penunia (2011) argues that farmer groups can be institutions of empowerment, provide training and a platform of knowledge exchange for farmers and help farmers access markets. However, Meinzen-Dick *et al.* (2005) cautions that collective action through group membership may have a negative effect on women's empowerment if collective action programmes are designed "gender-blind" or with false assumptions regarding women's motivations for joining a given group. Moreover, membership of the group may not necessarily guarantee participation. It has been observed that women lack time to participate due to multiple work demand (Prakash, 2003) and as such the traditional gender roles play out in the group arena, resulting in continued disempowerment of women, an observation also noted by Kabeer (2001).

4. Conclusions

For the study area the overall WEAI computed was 0.54 and is a weighted average of the 5DE sub-index value of 0.50 and the GPI sub-index of 0.86 indicating a low attainment in terms of the five domains although for a larger percentage of households men and women are enjoying relative gender parity. Using the same indicators for assessing women, men reported disempowerment, a result that can be attributed to the fact that men too are exposed to disempowering factors since empowerment has been observed to bear cross-class, cross-generational and cross-gender dimensions while intersecting with patriarchy and other social issues. For women, key domains contributing to disempowerment are workload, resource ownership and restricted inputs to productive decision making while the men also reported both workload and restricted input to productive decision making. The ordinal logit analysis is used to assess the determinants of women empowerment. For the female-headed households, age of the household head, education level, condition of dwelling, monthly income, group membership and distance from the nearest major town were all significant.

For the male-headed households, age of the man has a quadratic association with the level of empowerment attained by the woman.

Limitations

The study uses the WEAI to understand the level of women empowerment in rice farming households in Kilombero. In application of the WEAI, however, the study explores empowerment amongst only women that are household heads or spouses to the male household heads and thus leaves out the bulk of women that are not in this category. In this case generalisation of the results can only be undertaken with caution given that there are a number of other types of women within the household that were not considered and for whom empowerment dynamics will be different. Furthermore, the study does not address the potential endogeneity of determinants of women empowerment, which could be a source of bias, either due to causality or omitted unobserved characteristics (such as personal characteristics (Fernandez *et al.*, 2015)). There could also be omission of variables at the personal, household and community level which influence the level of women empowerment achieved especially since some factors affecting women empowerment at these levels are not easy to measure (Hossain, 2018). It is for this reason that we interpret our results as correlates rather than causes in relating them to women's empowerment (Trommlerová *et al.*, 2015).

Notes

1. Agricultural productivity is defined as the value of output per hectare. The difference in this measure between male and female farmers constitutes the unconditional gender gap (World Bank, 2015).
2. Called censored because the inadequacies of the women who are not disempowered are excluded so that focus is on the disempowered (Alkire et al., 2013)
3. Rice sector Development Hubs are areas where research outputs from research activities are implemented and involve large groups of rice farmers (1000–5000) and other value chain actors such as rice millers, input dealers and traders (Wopereis et al., 2013).
4. <https://www.ifpri.org/topic/weai-resource-center>

Disclosure Statement

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

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