Gender Differences in Smallholder Maize Plot Management and Production: Empirical Evidence from Two Villages in Western Kenya.

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Abstract

Gender differences in farm management among smallholders is receiving attention from researchers and policy makers. This paper investigated gender differences in five maize plot management practices *viz* plot sizes and their location relative to the homestead; sources of inputs and usage, labor usage; weeding frequency and green maize harvesting. Fifty five male- and 115 female-managed maize plots operated by 95 households in two villages were examined. Chi squared and t- tests were used to examine the significance of gender differences.

We found that female plot managers used less inorganic fertilizer.While no significant gender difference in the use of improved seeds was detected, the sourcing of seeds differed. Gender of the plot manager did not significantly influence the use of hired, family or voluntary labor.The study found no significant difference in the frequency of weeding. This implies that programs to bridge the gender gap in agricultural management are yielding fruits.

Keywords: Agricultural management, Gender differences, Smallholder farmers, Female and Male managed plots.

1. Introduction

Issues of gender, agricultural productivity, access to agricultural resources and asset ownership have received relatively adequate attention from researchers in the recent past. Such studies include *inter alia*: Doss, Meinzen-Dick, Quisumbing and Theis (2018) on some four gender myths; Lopez and Lopez (2014) on the relationship between gender differences in agricultural labor productivity and market imperfections; SOFA Team and Doss (2011) on the areas and the extent to which women participate in agriculture; Ahearn (2010) on why gender-specific data are important to measuring household well-being; Ali, Bowen, Deininger and Duponchel, Marguerite (2018) on women and agricultural labor force; FAO (2011) on the roles of women in agriculture; Doss (2015) on men's and women's relative productivity in agriculture; World Bank (2015) on the cost of the gender gap in agricultural productivity; Peterman, Quisumbing, Behrman and Nkonya (2010) on gender differences in agricultural productivity; Koirala, Mishra, and Mohanty, (2015) on the role of gender in rice production; FAO (2011) report on women access to agricultural resources and opportunities; Sraboni, Malapit, Quisumbing and Ahmed (2014) on women's empowerment in agriculture; Diiro, Seymour& Berresaw, Muricho and Muriithi (2018) on relationship between maize productivity and women's empowerment in agriculture; Djurfeldt, Dzanku,and Isinika (2018) on gender dynamics of land access; Djurfeldt (2018) on women land ownership and empowerment; Korul and Holden (2008) on gender influences on maize productivity; Okonya and Kroschel (2014) on male and female sweet potato farmers' access to agricultural information, credit and extension; Croppenstedt, Goldstein and Rosas (2013) on gender productivity differences and access to resources; Drafor (2014) on gender and small-farmer commercialization; Djurfeldt (2018) on assets, gender, and rural livelihoods; Djurfeldt (2018) on gender,

agricultural commercialization, Peterman, Behrman and Quisumbing (2010) who have reviewed empirical evidence on gender differences in non-land agricultural inputs, technology and services in developing countries, Doss (2015), who has presented evidence on women and agricultural productivity, Ragassa et al (2012) on gender differences in access to extension services and agricultural productivity, Kilic et al (2013) on gender differences in Malawian agriculture, SOFA team (2011) on gender differences in assets , Quisumbing (1995) on gender differences in agricultural productivity, Quisumbing and Behrman (2010) on understanding gender differences in agricultural productivity in Uganda and Nigeria, Villabon (2012) on gender differences in agricultural productivity in Peru, Palacios-Lopez and Lopez (2014) on the role of market imperfections on gender differences in agricultural productivity, Nzioki and Kandiwa (2015) on gender analysis of maize post-harvest management, Oseni et al., (2013, Gender Dimensions in Nigerian Agriculture) on gender differences in agricultural production in Nigeria, Okonya and Kroschel (2014) on gender differences in access and use of selected productive resources among sweet potato farmers in Uganda and Wambugu, Karugia and Kosura (2018) on gender and agricultural technology use.

However, a critical review of the above studies reveal that there are some aspects that require further empirical investigations in order for us to gain further insights into issues of gender, farm management and agricultural productivity. Such aspects include plot sizes, plot history and their location relative to the homestead, use and source of technological inputs, labor usage and its source and harvesting of green maize. Research work that have come close to examining issues of farm management and productivity such as Wambugu, Karugia and Kosura (2018) which examined some aspects on gender and agricultural technology use only zeroed in on use of hybrid maize, chemical fertilizer, pesticides, hoe and plough ignoring the above mentioned aspects. Ragassa et.al (2012) looked at plot managers and how they got extension services, but did not consider other plot management issues that are central to agricultural productivity. The work by Palacios-Lopez and Lopez (2014) which considered the implications of credit and labor market imperfections on gender differences in agricultural productivity also did not address the plot management aspects. Okonya and Kroschel (2014) considered both agricultural information and credit only. Quisumbing (1995) assessed the efficiency of both male and female farm managers and zeroed in on inputs and human capital. Peterman, Behrman and Quisumbing (2010) considered input measures only. Villabon (2012) has also just considered several inputs that male and female households use in their agricultural production.

Taking cognizance of the importance of producing evidence-based policies, this paper uses empirical data from Kenya to update the current knowledge on gender differences in farm management through an analysis of maize production in Kenya. The paper contributes to the growing literature on gender differences in farm management and agricultural productivity.

2. Research Questions and Objectives

In this paper we explored some aspects on gender and agricultural productivity which have yielded conflicting results in previous studies, yet have not been adequately investigated. The current study is part of a larger research project (yield gaps: a research consortium made up of several universities including Lund, Nairobi, Chuka and Ghana) whose overall objective was to, 1) develop a comprehensive understanding of the causes of the large variations in yield gaps which is typical for much of SSA, and 2) integrate geophysical and socio-economic explanations for these. This paper aims at highlighting gender differences that have not been adequately investigated in maize production.

This study was guided by the following objectives; determining the maize plot sizes and their location from the homestead disaggregated by gender of the plot manager, investigating the sources of inputs and their use by gender of the plot manager, establishing the sources of farm labor by gender and finding out the extent of green maize harvesting disaggregated by gender and its impact on household food security

This study attempted to provide answers to the following questions:

1) Where are the maize plots in relation to the homestead? Who cultivates more plots?
2) Where are the inputs sourced from and who uses more inputs?
3) What are the sources of labor and which labor is widely used?
4) Who harvests more green maize and why? How does green maize harvesting impact household food security?
5) Who realizes more maize yields?

3. Hypotheses

With regard to male managed maize plots (MMMPs) and female managed maize plots (FMMPs) this study hypothesizes that that there are no significant differences in plot sizes, distance of the plots from the household, use of inputs, labor usage, weeding frequency, green maize harvesting and maize yields.

4. Conceptual Framework

A number of factors interplay to explain gender differences in agricultural productivity. Inequalities in access to land and other productive resources have often been cited as important factors that contribute to gender differences in farm management and agricultural productivity. Access to land and how that land is managed is an important resource in agricultural yields. Common Knowledge of agriculture shows that the location and quality of farmland/plots have a significant effect on the level of output. Additionally, access and use of improved seed varieties, fertilizer (both organic and inorganic), irrigation water, pesticides, credit, extension services, labor, frequency of weeding and membership to farming and other social groups strongly affect agricultural output (Wambugu, Karugia and Kosura, 2018). To really understand the interrelationship among access and quality of land, access and use of technology, use of labor, access and use of agricultural information, group membership, gender and farm management on agricultural output, these factors require further empirical analysis. Where necessary interventions have not been instituted to bridge the gender gap, these factors act like a vicious cycle perpetuating and intensifying gender differences in farm management and agricultural productivity. Figure 1 is a simplified conceptual model that tries to depict the interrelationship among these factors.

Insert fig 1 here

5. Methods

This study uses data from a larger study, Yield Gaps (YG) study. As alluded to earlier the YG study sought to investigate the huge yield gaps typical of SSA using Ghana and Kenya as case studies. However, for purposes of this study a diagnostic and descriptive survey was conducted in two villages in western Kenya to get a wide coverage of maize production among MMMPs and FMMPs in relation to production resources. A hand held GPS was used to get the coordinates of the maize plots. Prior to the YG study the study villages had earlier been selected as part of Africa intensification (Afrint) studies. Afrint studies have been collecting panel data sets to capture agricultural dynamism in the villages since the year 2000. However, to further empirically examine whether gender differences really exist in agricultural yields, this paper not only used maize plot yield data collected in the YG study, but also analyzed maize yield data collected during Afrint studies.

A total of 55 and 115 male- and female- managed maize plots respectively were examined. The interviews and observations covered households' characteristics, farmers maize production techniques, plot sizes and their location, sources and use of fertilizer and certified seed, sources and use of agricultural labor and extent of green maize harvesting among other aspects. The data were disaggregated to show trends in the two different farm managed plot categories. Descriptive analyses (frequencies, percentages, and means) were computed using the statistical package for social scientists (SPSS) version 21 (SPSS V.21 for windows). The chi squared test (X^2) and t-test were used to examine whether the observed data and their differences were significant, or whether variables were related to each other. The significance level was set at $p \leq .05$. The results were then presented in tables and charts separately for male- and female- managed farms, from which conclusions were drawn.

Insert Fig 2 here

6. Results and Discussion

In this section the sample overview and results on distances of maize plots from the household, sources and usage of fertilizer, improved maize seed, labor, credit, agricultural information and group membership are presented and discussed. Also presented and discussed are results on frequencies of weeding and the extent of green maize harvesting. The section finally presents maize yield data examining whether there are any gender differences.

6.1 Sample Overview

The sample for this study consisted of 95 maize farmers (28 males and 67 females). These farmers operated varying numbers of maize plots hence the number of plots were 170. The plots characteristics varied from one plot to the next and for purposes of this study each plot was treated as a different case even where the plot operator was the same. Therefore, the sample for this study was 170 (55 male and 115 female maize plots managers). Of the households represented by this sample, 76.50% were headed by males and 23.50% were headed by females.

Majority (76.50%) of the household heads were males while a good proportion (67.60%) of maize plot managers were females. This information is shown in Figure 3

Insert Fig 3 here

As far as the household headship is concerned more males (76.50%) than females (23.50%) were household heads. This reflects the patriarchal system where in most communities males are the household heads. However, more females (67.60%) acted as maize plot managers as compared to males (.32.40%). This reflects the feminization of agriculture where more females than males are involved in agricultural activities.

6.2 Land Acquisition, Size of Maize Plots and their Location Relative to the Household

The question of how land ownership is acquired is an important one in agricultural productivity for it has implications on employment, wealth creation and poverty reduction. Results of this study show that land used for maize farming was either inherited bought or rented. Majority of the plot managers reported that they acquired their plots through inheritance (58.20% and 69.60% of male and female plot managers respectively). Thirty eight point two per cent (38.20%) of male and 27.00% of female plot managers have bought land while the rest had rented in the plots (Fig.4)

Insert Fig 4 here

Fig. 4: Methods of Acquiring Land

Access to land has traditionally been a major focus of studies on gender and agriculture (see for example Anaglo, Boateng & Boateng, 2014; Croppenstedt, Goldstein & Rosas, 2013; Enwelu, Morah, Dimelu & Ike, 2014; Ericsson, 1999; FAO, 2010; Odeny, 2013). This attention is justified on account of the importance of land as a productive resource and its potential role in employment, wealth creation and poverty reduction.

The size and number of maize plots disaggregated by the gender of the plot manager are issues that have not been adequately investigated. Results (Table1) indicate that male plot managers had slightly higher mean plot sizes and higher mean number of plots than female plot managers. The distribution of plots by gender of the plot manager is depicted in Table 2. The table shows that though majority of the farmers owned one maize plot, some owned up to six plots.

Insert table 1 here

Insert table 2 here

However, as shown in Table 1, there was no significant relationship (t = .87, p = .384) between gender of the plot manager and the mean maize plots sizes. Similarly, no significant relationship (t = .87, p = .393) was found between gender and the number of plots owned. These results may be a pointing to the fact that females are gaining better access to land resources than hitherto. In Kenya various affirmative actions and the Kenya constitution 2010 that allow females (married or otherwise) to own and inherit land could be contributory factors. Also changing cultural and religious beliefs might explain this finding.

As alluded to earlier, the question of who (males or females) cultivates plots that are closer to the homestead is an issue that has also not received enough empirical investigation. This study found out that FMMPs were nearer to the homestead as compared to those managed by the males. The mean distances are depicted in Table 3. This finding can be explained by the fact that females who are involved in other household chores need to access the plots faster and work on them. The scenario can also be explained by the fact that females need to easily access the plots when they engage in piecemeal harvesting of green maize for household food security. However, the study found no significant relationship *(t* = 0.74 P = 0.459) between gender and the mean distances from the maize plots to the household. This means that gender is not a very important factor in determining who cultivates plots near the household.

Insert Table 3 here

6.3 Non-Land Inputs Sources and Extent of Use

This study investigated some selected maize production inputs to see whether there are significant gender differences in their access and usage. The inputs considered for this analysis include fertilizer (organic and inorganic), improved seed, labor (family, hired and voluntary) and credit for plot management. Other aspects considered include sources of agricultural information and group membership.

6.3.1 Use of Fertilizer

A substantial amount of research and literature on gender differences and agricultural productivity have focused on inorganic fertilizer. This is justified perhaps due to the perceived important role fertilizers continue to play in agricultural productivity and poverty reduction.

As depicted in Table 4 use of inorganic fertilizer was very high (83.6% and 95.7% for MMMPs and FMMPs) respectively. There was a significant relationship (X^2 =7.18, P = 0.008) between gender of the plot manager and use of inorganic fertilizer. However, compared to inorganic fertilizer, use of organic fertilizer was not as high (34.5% and 52.2% for MMMPs and FMMPs respectively). The higher usage of inorganic fertilizer can be explained by farmers' inability to keep enough livestock, lack of vegetation and other materials to make organic fertilizer. This compels them to resort to buying inorganic fertilizer. This study found a significant relationship (X^2 =

4.648, P= 0.031) between gender of the plot manager and use of organic fertilizer. This result though contradicting initial expectations and some earlier studies (e.g. Freeman and Omiti (2003), Bourdillon et al (2002),Chirwa (2005), and Horrell and Krishnan (2007) who found no significant relationship between gender and adoption and intensity of use of inorganic fertilizer is in agreement with other studies such as FAO, 2011; Conley and Udry 2010; Duflo, Kremer, and Robinson 2008; Peterman et al. 2011; Doss and Morris 2000; Gilbert, Sakala, and Benson 2002 and Thapa 2008. The results from this study tend to indicate that gender is an important determinant of fertilizer use in maize.

Insert Table 4 here

6.3.2 Use and Source of Improved Seed

Many studies that analyze fertilizer use also examine whether there are gender differences in use of improved seed (Peterman, Behrman and Quisumbing, 2010). This study found that more FMMPs used hybrid seed (81.7%) compared to 78.2% of the MMMPs (Table 5). Other varieties of seed used include local and other unspecified varieties.

Insert Table 5 here

As shown in Table 6 there was no significant relationship (X^2 = 0.301, P = 0.583) between gender and use of improved seed. This result implies that use of improved seed is not affected/driven by gender.

Insert table 6 here

The sources of maize seed are reported in Table 7. Plot managers reported that they acquired maize seed from various sources. The least popular source was from Government where none of the farmers reported sourcing seed from it. This was followed by neighbors and relatives with no MMMP owner and only 1.7% of FMMP owners reporting to have used seeds from this source. Agro dealers were popular among MMMPs (49.10%) while shops were popular among FMMPs (39.10%). Generally, majority of the plot managers sourced their seeds from agro dealers and shops.

Insert Table 7 here

Further analysis revealed a significant relationship between gender and agro-dealer and between gender and shop as sources of maize seed, (X^2 = 12.16, p =.000 and X^2 = 6.16, p = .013 respectively) as shown in Table 8. However, no significant relationship was found between gender and other sources of maize seed. This implies that gender does not significantly influence the source of maize seed.

Insert Table 8 here

6.3.3 Source of Labor

Labor is an important input in agricultural productivity. However, the issue of source and use of labor disaggregated by gender of the plot manager has not received enough empirical investigation. As shown in Table 9 a higher percentage of FMMPs used labor from the three categories of labor analyzed in this study. However, the study found no significant relationship between gender and source of labor. This result implies that gender does not affect source and use of labor in maize production.

Insert Table 9 here

6.3.4 Use of Credit for Plot Management

Access to credit is important in agricultural productivity for it avails resources for carrying out various activities in the farm. In this study a higher percentage, 25.50%, of MMMPs reported to have used credit for plot management as compared to 22.60% of FMMPs. This result is in agreement with other studies (Anaglo, Boateng & Boateng, 2014; Fletschner & Kenney, 2011; Panos, 2015) which have reported that males have better access to credit than their female counterparts. However, as shown in Table 10, there was no significant relationship (X^2 = 0.167, P = 0.682) between gender and use of credit. This implies that gender does not influence access and use of credit in maize plot management.

Insert Table 10 here

6.3.5 Sources of Agricultural Information

Access and use of agricultural information is an important service to farmers and has far reaching implications on agricultural productivity. This study sought to collect information on sources of agricultural information by the maize farmers. The maize plot

managers reported that they got agricultural information from a variety of sources as shown in Table 11. Radio, extension services, neighbors and relatives, research institutions, donor organizations, and seminars and workshops were the most popular sources. A significant relationship (X^2 = 17.259, p = 0.00) between gender and extension service, neighbours/relatives, agricultural shows and internet as sources of agricultural information was noted (Table 11). However, looking at all the other sources investigated, no significant relationship between gender and sources of agricultural information was noted. A critical look at the results in table 11 one can generally say that for some sources gender does influence the source of agricultural information.

Insert table 11 here

6.3.6 Group Membership

Social support systems are important aspects in agricultural productivity. However, a critical review of literature shows a dearth of information on the relationship between social support systems and agricultural productivity. This study considered group membership and whether there is a significant relationship between it and gender. Forty nine point one percent of the MPM and 49.6% of the FPM reported to be members of at least one social group. This study considered different groups and their popularity between MPMs and FPMs compared. Results are reported in Table 12.

Further analysis revealed no significant association between general group membership and gender (X^2 = .003, p =.954). However, memberships to certain groups were significantly related to gender. Membership to a farming group (X^2 = 6.870, p =.009); to a women group, (X^2=13.621, p =.001); men group (X^2= 6.831, p =.033); and to a welfare group (X^2= 9.947, p=.007)) were significantly related to gender. These results clearly demonstrate the importance of social support systems in society and possibly by extension to agricultural productivity.

Insert Table 12 here

6.3.7 Frequency of Weed Control in the Maize Plots

Weeding and the frequency of weeding are important aspects in plot management. As alluded to earlier the question of gender differences in the frequency of weeding is an issue that has also not received adequate empirical investigation. Results from this study (Tables 13 and 14) show that FMMPs were weeded more times and therefore had a higher mean frequency of weed control as compared to MMMPs. However, further analysis showed no significant relationship (t = -.56, P = 0.574) between gender and the frequency of weeding. This implies that gender does not drive the number of times weed are controlled in maize plots.

Insert table 13 here

Insert Table 14 here

6.4 Harvesting of Green Maize

The issue of green maize harvesting and its impact on household food security is another aspect that has not been given enough attention by researchers and policy makers. In Kenya demand for green maize is rising. Also the question of who harvests more green maize between males and females is an aspect that requires further empirical investigation. As depicted in Table 15 more FPMs (43.00%) than MPMs (34.50%) reported harvesting green maize from their plots. The higher percentage of females harvesting green maize underscores the role of women in ensuring household food security. However, further analysis revealed no significant association (X^2 = 1.098, P = 0.295) between gender and frequency of harvesting of the green maize. This implies that gender does not drive frequency of green maize harvesting. While females may harvest green maize for household food security, both females and males may harvest it for commercial purposes given the changing recipes being made from green maize and the changing dietary patterns in Kenya. The proceeds from the sale of green maize may also be used to meet other household needs.

Insert Table 15

6.5 Gender and Maize Yields

In the preceding sections this paper has discussed aspects of gender differences in maize plots management. Closely tied to the question of gender differences in plot management is the question of gender differences in yields. In this section the question whether there are gender differences in maize yields is investigated using both Afrint studies and yield gaps data. The investigation is premised on the conflicting and sometimes inconclusive results from previous studies that do not agree whether or not gender differences really exist in agricultural productivity. Using the more recent YG data, results (Table 16) show no significant relationship between gender and the yields of green and dry maize (t = 1.12, p= .264) and (t= 1.45, p= .149) respectively.. Similarly and using the Afrint data sets, results show no significant relationship between gender and maize yields for all the seasons examined save for Afrint III two seasons

ago where a significant relationship (t= 2.19, p= .029) was found. These results imply that the affirmative actions, strategies and programmes implemented to bridge the gender differences in agricultural yields are bearing fruits.

Insert Table 16 here

Insert Table 17 here

Conclusions and Policy Implications

In this paper, we have examined some aspects on maize plots management that we thought have not been given adequate empirical investigation giving them a gender dimension. The paper first concludes that there is no significant relationship between gender and the mean distances from the maize plots to the household. Second, the study found a significant relationship between gender of the plot manager and use of both organic and inorganic fertilizer. Third, the study found no significant relationship between gender and use of improved seed, some sources of maize seed, source of labor, use of credit, some sources of agricultural information, membership to some groups, frequency of weeding and green maize harvesting. However, a significant relationship was found between gender and some sources of maize seed, some sources of agricultural information and membership to certain groups. The study finally concludes that there are no significant differences in maize yields between males and females.

Our findings reveal that government programmes and interventions meant to bridge the gender gap are yielding the desired fruits and therefore we recommend that these should be continued and strengthened. Further, given the significant relationship between gender and use of fertilizer, some sources of agricultural information and membership to certain agricultural support groups, these segments should be targeted and strategies devised that will level the playing field, reduce the gender gap and thereby improve agricultural productivity and general welfare for all.

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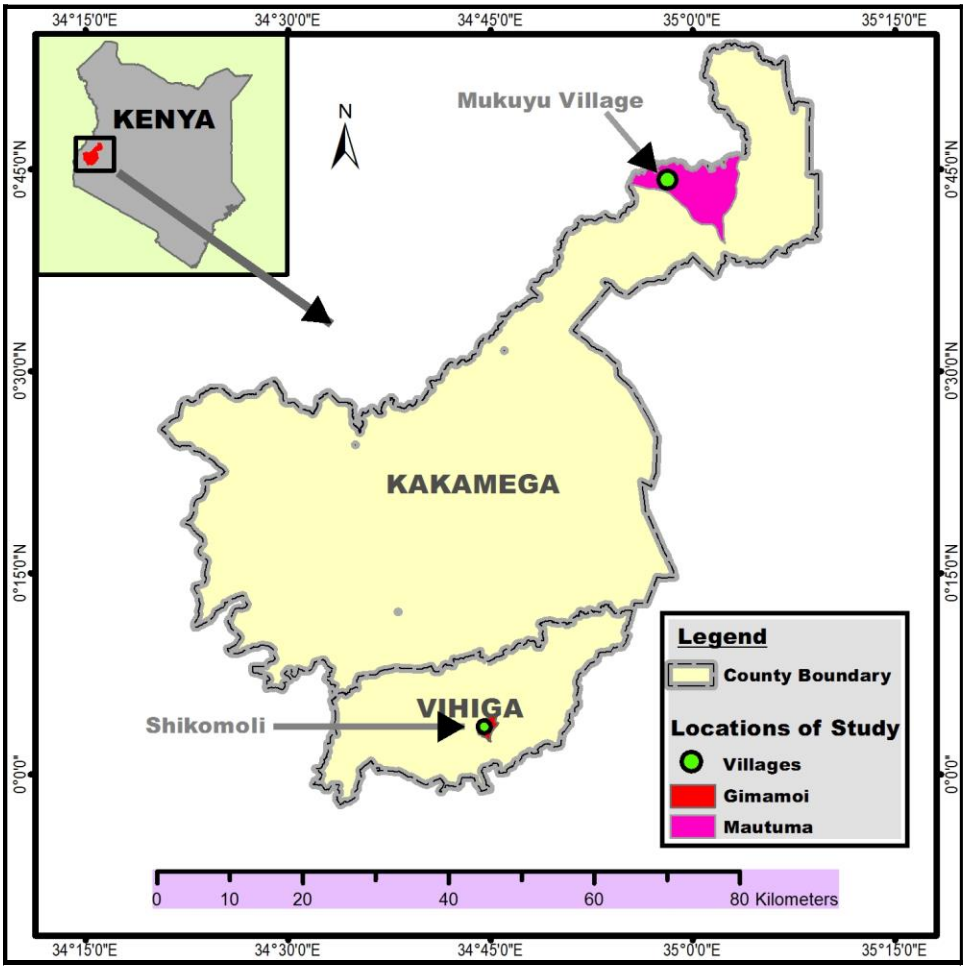

Fig. 2: Location of the two Villages in Western Kenya

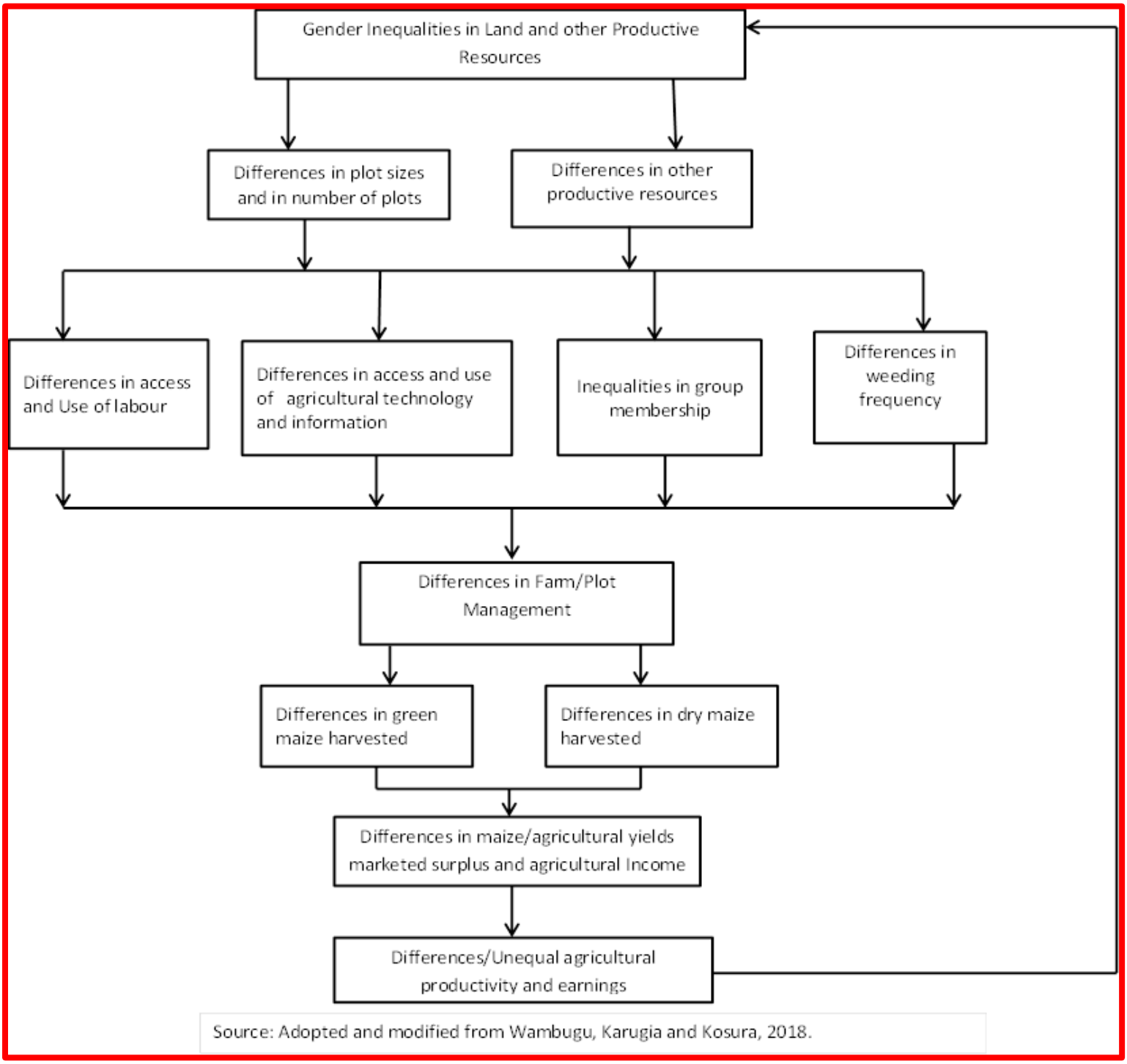

Fig. 2: Relationship among Access to Productive Resources, Farm Management, Agricultural Productivity and Gender

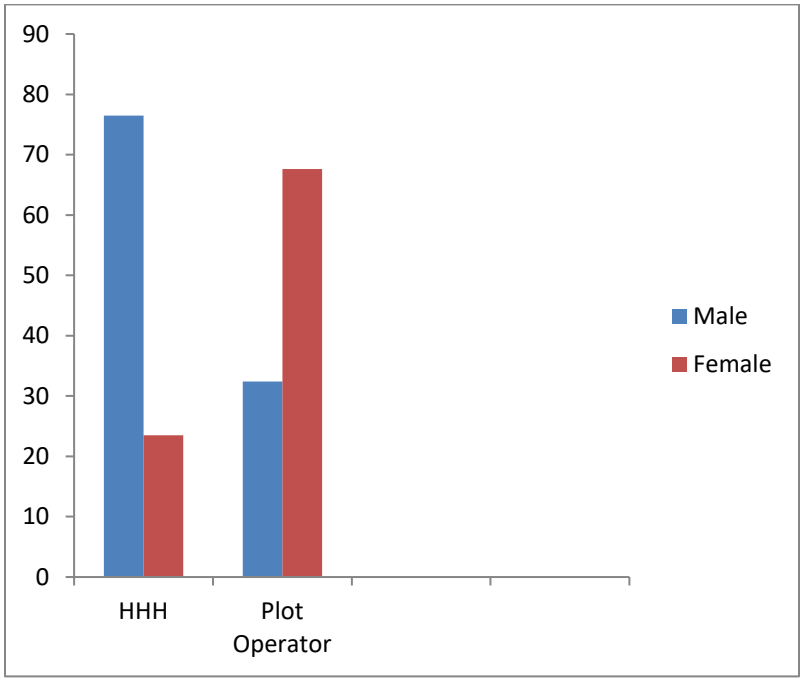

Fig. 3 Comparison between plot manager and household head

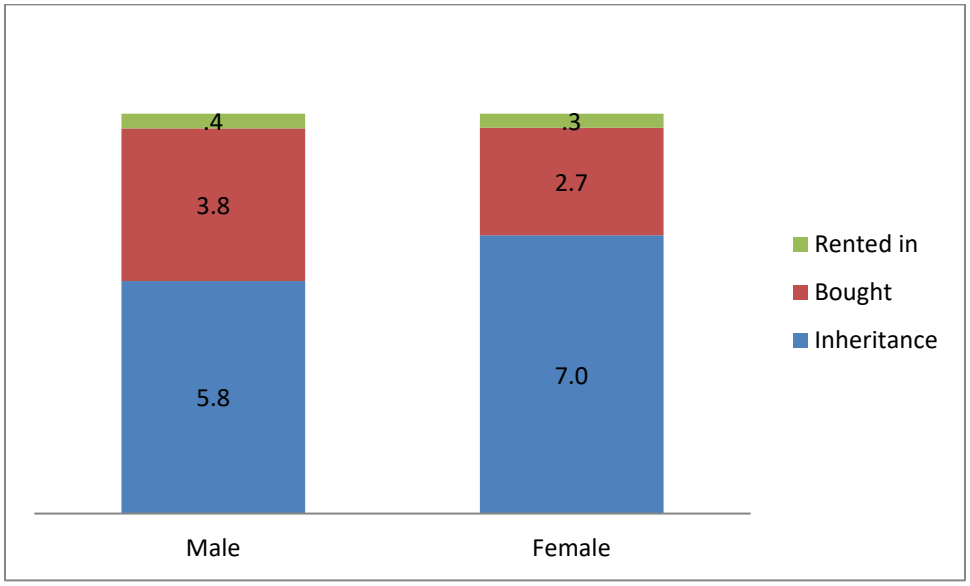

Fig 4;Land Acquisition, Size of Maize Plots and their Location Relative to the Household

Table 1: **Plot Sizes and Number of Plots**

	Male		**Female**		**t**	***p***
	Mean	SD	Mean	SD		
Mean Plot Size (Acres)	.47	.56	.40	.48	.87	.384
Number of Plots	1.96	1.40	1.72	.90	.87	.393

Table 2: Number of Plots Owned by the Farmers

		Number of plots					Total
		1.00	2.00	3.00	4.00	6.00	
Gender	male	17	2	4	4	1	28
	female	37	14	14	2	0	67
Total		54	16	18	6	1	95

Table 3: Mean Distances (in Metres) from the Maize Plots to the Household by Gender

Gender	Mean	SD	t	*p*
Male	211.05	444.62	.74	.459
Female	164.42	339.97		

Table 4: Use of Fertilizer

Input	Male		Female		X^2	df	*p*
	Yes (%)	No (%)	Yes (%)	No (%)			
Inorganic Fertilizer	83.6	16.4	95.7	4.3	7.108	1	.008
Organic Fertilizer	34.5	65.5	52.2	47.8	4.648	1	.031

Table 5: Maize Varieties Planted

Maize Variety	Male (%)	Female (%)
Local	16.4	17.4
Hybrid	78.2	81.7
Other	5.5	.9

Table 6: Gender and use of Improved Seed Maize

Input	Male		Female		X^2	df	*p*
	Yes (%)	No (%)	Yes (%)	No (%)			
Improved Seed	78.2	21.8	81.7	18.3	.301	1	.583

Table 7: Source of Maize Seed (% reporting)

Source of maize seed	Male		Female	
	Yes	No	Yes	No
Saved seed	1.8	98.2	5.2	94.8
Neighbour or relative	.0	100	1.7	98.3
Local market	.0	100	4.3	95.7
Agro-dealer	49.1	50.9	22.6	77.4
Shop	20.0	80.0	39.1	60.9
Research institution	5.5	94.5	13.0	87.0
Government	.0	100	.0	100
Other	3.6	96.4	.9	99.1

Table 8: Gender and Source of Maize Seed

Source of maize seed	X^2	df	*p*
Saved seed	1.09	1	.297
Neighbour or relative	.97	1	.325
Local market	2.46	1	.116
Agro-dealer	12.16	1	.000
Shop	6.16	1	.013
Research institution	2.26	1	.132
Government	-	-	-

Other	1.64	1	.200

Table 9: Source of Labor

Input	Male		Female		X^2	df	p
	Yes (%)	No (%)	Yes (%)	No (%)			
Family Labor	92.7	7.3	98.3	1.7	3.346	1	.067
Hired Labor	78.2	21.8	81.7	18.3	.301	1	.583
Voluntary labor	60.0	40	70.4	29.6	1.834	1	.176

Table 10: Use of Credit for Plot Management

Input	Male		Female		X^2	df	p
	Yes (%)	No (%)	Yes (%)	No (%)			
Loan for Plot management	25.5	74.5	22.6	77.4	.167	1	.682

Table 11: Relationship between Gender and sources of Agricultural information

	Male		Female		X^2	df	p
	Yes	No	Yes	No			
Radio	25.50	74.5	36.5	63.5	2.063	1	.151
TV	1.80	98.2	2.6	97.4	.101	1	.750
Newspaper	7.30	92.7	3.5	96.5	1.195	1	.274
Extension Services	40.00	60.00	12.2	87.8	17.259	1	.000
Neighbours/Relatives	27.3	72.7	44.3	55.7	4.567	1	.033
Lead farmer	7.3	92.7	3.5	96.5	1.195	1	.274
Agricultural shows	5.5	94.5	0	100	6.385	1	.012
Research Institution	20.00	80.00	10.40	89.60	2.910	1	.088
Demonstration Center	1.8	98.2	1.7	98.3	.001	1	.971
Agro Dealers	0	100	.90	91.9	.481	1	.488
Donor organization	18.2	81.8	14.8	85.2	.322	1	.571
Mobile phone	9.1	90.9	4.3	95.7	1.512	1	.219
Seminars and workshops	32.7	67.3	30.4	69.6	.091	1	.763
Ancient Knowledge	3.6	96.4	6.1	93.9	.446	1	.504
Internet	5.5	94.5	0	100	6.385	1	.012
Others	5.5	94.5	0	100	6.385	1	.012

Table 12: Relationship between Gender and Group Membership

Group membership	Male		Female		X^2	df	p
	Yes	No	Yes	No			
Membership to at least one	49.1	50.9	49.6	50.4	.003	1	.954
Farming group	30.9	69.1	13.9	86.1	6.870	1	.009
Women group	00	94.5	6.1	69.6	13.621	2	.001
Men group	00	94.5	.90	99.1	6.831	2	.033
Welfare group	00	83.6	2.6	93.9	9.947	2	.007
Credit and savings group	1.8	90.9	00	92.2	2.112	2	.348
Others	00	92.7	.90	97.4	3.791	2	.150

Table 13: Number of Times weed control is practiced by Gender

	Times weed control practiced				Total
	Zero	Once	Twice	Three times	
Male	0	12	41	2	55

Female	1	18	92	4	115
Total	1	30	133	6	170

Table 14: Mean Frequency of weed control by gender

Gender	Mean	SD	*t*	*p*
Male	1.82	.475	-.56	.574
Female	1.86	.457		

Table 15: Gender and frequency of Green Maize Harvesting

Yield	**Male**		**Female**		***X²***	**df**	***p***
	Yes %	No %	Yes %	No %			
Green	34.5	65.5	43.0	57.0	1.098	1	.295

Table 16: Yields (kg) at plot level by gender (YG data)

	Male		**Female**		**t**	***p***
	Mean	SD	Mean	SD		
Green	38.69	71.15	23.64	54.61	1.12	.264
Matured	489.50	631.15	343.55	574.52	1.45	.149

Table 17: Maize Yields by Gender (Afrint data)

Panel	**Season**	**Male**		**Female**		**t**	***p***
		Mean	SD	Mean	SD		
Afrint I	Recent	716.42	1289.19	663.40	1545.49	.32	.747
	Previous	792.48	1510.21	727.89	1726.94	.34	.731
	Two seasons before	1304.14	2577.93	1285.07	3202.37	.06	.955
Afrint II	Recent	672.64	1098.06	485.66	751.33	1.73	.083
	Previous	782.44	1313.35	622.98	1265.00	1.01	.312
	Two seasons before	903.57	1593.59	720.91	1442.98	.98	.330
Afrint III	Recent	732.63	1206.06	605.51	749.94	1.12	.262
	Previous	661.18	1178.41	554.64	781.89	.84	.403
	Two seasons before	853.64	1680.83	537.39	815.95	2.19	.029