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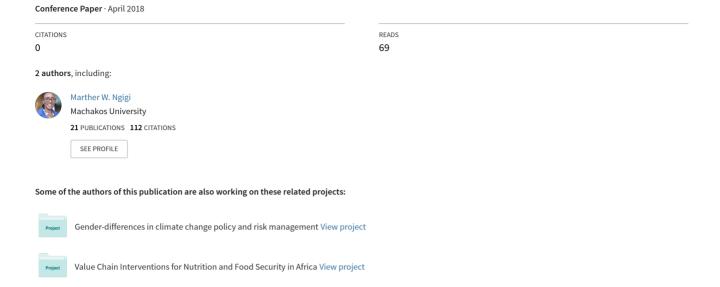
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Beyond participation: Welfare effects of gender-differentiated group-based approaches under climate change in Kenya

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Abstract

A gender-differentiated data collection approach is an essential step toward understanding gendered perspectives in climate change research. Innovative institutions like group-based approaches provide opportunities to improve socio-economic, political or environmental situations with positive outcomes in the midst of climate change. However, little is known on the potential of gender-differentiated group-based approaches in the context of improving men's and women's welfare outcomes under climate risk. The study shows that husbands and wives associate in different groups, hence acquire different gendered benefits. Econometric analysis shows that participation in group-based approaches is influenced by both gender-specific factors such as level of education, perception of climate change and institutional factors, which in turn influence welfare outcomes of participating in social groups. In the wake of climate change, innovative institutions present important pathways to strengthen the ability of men and women to manage risks and improve their welfare. Hence, there is a need for enabling policies that nurture social capital and group-based approaches at the local level.

Keywords: gender-differentiated group-based approaches, intra-household analysis, welfare outcomes, climate change, Kenya

1. Introduction

Climate change is a global challenge that threatens livelihoods and undermines efforts for overcoming hunger, poverty reduction, gender equality, and environmental sustainability. Sub-Saharan Africa (SSA) is extremely susceptible to adverse impacts from climate change and variability, attributable to low adaptive capacity, low investment in infrastructure, low levels of physical and human capital, high rates of poverty, over-reliance on rain-fed agriculture and lack of a coherent climate policy (IPCC 2014; African Union 2014). The Global Risks Report 2017 emphasizes that environmental-related risks, especially extreme weather events, remain to be prominent creating a global crisis and that these risks are interrelated with other risks, namely, conflict, economic threats, and migration (World Economic Forum 2017). However, climate change may also present an economic opportunity for Africa that can be exploited through institutional and technological innovations. In this paper, we argue that in the wake of climate change, social capital created through group-based approaches (GBA) and community-based organizations present important pathways to strengthen the ability of men and women to manage risks under climate change. Ngigi (2017) shows that social groups often divert from their main mandate to address challenges of climate change and risks through sharing of adaptation information and options and facilitating non-traditional livelihoods that build assets and abilities especially for women.

An institutional innovation is a process of changing norms or generating social change in order to improve a challenging situation like climate change with a positive welfare outcome. Group-based approaches consist of participation in social and political groups that create risk awareness and offer risk managing strategies. Institutions influence how climate risks and impacts are experienced and distributed across various groups and govern access to and control over resources crucial for adaptation. Group-based approaches imply a forum for people or communities to participate in decision-making processes in a collective ruling for solutions to difficulties, risks, and shocks facing them (Ngigi 2017). Social capital created through group-based approaches is an essential coping tool for the asset poor and female-headed households as well as helping households to become resilient against shocks. Recent studies suggest that borrowing through group-based approaches is crucial for tackling shocks such as health shocks and market shocks and enhancing food security for the households (Ngigi et al. 2015; Bonfrer & Gustafsson-Wright 2016; Woodson et al. 2016). Social capital is also a valuable post-shock recovery tool that empowers households to rebuild assets (Mawejje & Holden 2014; Woodson et al. 2016) and builds resilience of rural communities or individuals against extreme events (Bernier & Meinzen-Dick 2014; Woodson et al. 2016; IFAD 2016). Social capital also helps households to adapt to climate change (Nganga et al. 2013; Chen et al. 2014; Ngigi, Mueller and Birner 2017). Hence, social capital promotes economic development, poverty reduction and rural transformation[13] even in the face of accelerating climate change.

In spite of vast literature on social capital, there has been little attention to gender-differentiated roles regarding group-based approaches in the context of improving men's and women's welfare outcomes even in the wake of challenges like climate change. Gender perspectives are essential because households rarely operate as a single economic unit with identical production and consumptions preferences (Alderman et al. 1995; Njuki & Sanginga

2013). There is inadequate quantitative and qualitative information about the actual benefits individuals derived from gender-differentiated groups and about the determinants of such benefits. There is even less information about how group participation or even how social capital is accumulated and how the derived benefits differ across gender. A research gap exists on the potential of gender-differentiated group-based approaches in protecting and accumulating welfare or empowering men and women in the face of fast-track climate change. Men and women are likely to accumulate different forms of social capital that would apparently have different impacts on adaptation to climate change and their well-being. To bridge this knowledge gap, the study examines determinants for formulation of gender-differentiated group-based approaches and how they in turn influence adaptation and welfare outcomes for husbands and wives. The study contributes to the existing literature on the role of social capital in risk management by applying a gender-disaggregated data set that allows for a more nuanced gender analysis in order to shed light on intra-household decision-making on participation in group-based approaches. This paper hence represents a valuable contribution to the debate concerning strategies for coping and adapting with and benefiting economically from climate change.

2. Data and sampling procedure

Data for this study was collected from three agro-ecological zones (AEZs) of rural Kenya. These include semi-arid regions (Mbeere South and Nakuru districts), sub-humid regions (Gem and Siaya districts) and humid regions (Mukurweini and Othaya districts). The study included 75 villages. Hence, the data captured a wider range of climatic, agro-ecological, socioeconomic and cultural conditions, policy and institutional arrangements as well as susceptibility to climate change of individuals and households. A mix of qualitative and quantitative data collection techniques was used. The survey involved individual- and intra-household level data through interviewing husbands and wives separately. Intra-household interviews were carried out on parallel time, whereby couples were not allowed to consult or communicate with each other. Overall, a random sample of 156 pairs of spouses was interviewed, resulting in 312 respondents in total. Qualitative research involving gender-disaggregated focus group discussion (FGD) was carried out in all study sites to complement the household survey. Seven women focus groups and eight men focus groups were conducted, resulting in 15 focus group discussions in total. Narratives from qualitative data were used to supplement quantitative information as well as to interpret and discuss selected results of the quantitative analysis.

3. Descriptive results of intra-household analysis

Intersection of gender and group-based approaches

Table 1 presents summary statistics of husbands and wives differentiated by group membership. The cross-tabulation analysis of gender and membership in social groups shows that husbands and wives who belong to different kinds of social groups have more access to extension services, farmer field schools, early warning information, credit facilities and bargaining power than non-group members. This is achievable through use demand-driven extension delivery approaches whereby farmers in social groups organize themselves and invite

the extension officers to be trained and advised on appropriate adaptation options and other agricultural development opportunities.

Table 1: Relations between gender, group membership and key variables (mean)

Key variables	Wives			Husbands			Households		
	Non-group members	Group members	Diff. in mean (t-test)	Non-group member	Group members	Diff. in mean (t-test)	Non-group members	Group members	Diff. in mean (t-test)
Adaptation crop[†]	0.71	0.83	-0.12*	0.53	0.76	-0.23**	0.59	0.80	-0.21**
Adaptation livestock[†]	0.57	0.51	0.06	0.43	0.56	-0.13	0.48	0.54	-0.06
Adaptation decision[†]	0.71	0.86	-0.15*	0.63	0.79	-0.16*	0.66	0.83	-0.17**
Intensity of adaptation	2.57	2.42	0.15*	1.43	2.48	-1.04**	1.80	2.45	-0.65*
Perception of climate change[†]	0.64	0.56	0.08	0.63	0.60	0.04	0.64	0.58	0.06
Age	63.50	53.59	9.91**	63.37	62.56	0.80	63.41	57.81	5.59*
Year of schooling	4.14	6.39	-2.25*	6.57	8.30	-1.74*	5.80	7.29	-1.49*
Farming experience	41.29	30.91	10.38**	30.40	32.09	-1.69	33.86	31.46	2.40
Entrepreneurial experience	0.43	3.16	-2.73*	3.97	2.38	1.59	2.84	2.79	0.05
Credit access[†]	0.21	0.49	-0.27*	0.30	0.56	-0.26**	0.27	0.52	-0.25**
Information sources	1.36	1.90	-0.54*	1.60	1.98	-0.38*	1.52	1.94	-0.42*
Information trust index	0.76	0.70	0.06	0.60	0.66	-0.06*	0.65	0.68	-0.03
Extension services[†]	0.14	0.41	-0.27*	0.33	0.57	0.24*	0.27	0.49	0.21**
FFS[†]	0.29	0.44	-0.15*	0.23	0.21	0.03	0.25	0.33	-0.08
Early warning[†]	0.07	0.28	-0.21*	0.23	0.42	-0.19*	0.18	0.35	-0.17*
Weather forecast[†]	0.71	0.63	0.09	0.60	0.41	0.19*	0.64	0.53	0.11
TLU	3.01	4.61	-1.59	5.91	4.45	1.46*	4.99	4.53	0.45
Consumer durable assets	0.22	0.29	-0.08*	0.28	0.32	-0.04	0.26	0.30	-0.05*
Agricultural durable assets	0.47	0.51	-0.04	0.58	0.52	0.06	0.54	0.52	0.03
Bargaining power[†]	0.29	0.35	-0.06	0.10	0.26	-0.16*	0.16	0.31	-0.15*
N	14	142		30	126		44	268	

Note: Superscripts [†] present variables in binary format. ***p<0.01, **p<0.05, *p<0.1

Wives belonging to social groups have more access to consumer durable assets and higher entrepreneurial experience than non-group members. Results further show that social groups improve wives' access to consumer durable asset through collective purchase of household appliances, cooking stoves and pots that augment their asset portfolios. Husbands and wives belonging to social groups are more likely to adjust crop production system as well as to make a decision to adopt several strategies to climate change influenced by their roles and responsibilities, social norms, risk perceptions and access to resources as elaborated in Ngigi et al. (2017). Intensity of adoption was considered as the number of adopted practices/strategies aggregated at the household level, where groups influence intensity of adoption of these strategies.

Formulation and accumulation of group-based approaches by husbands and wives

Table 2 shows how husbands and wives form and accrue their social capital by being involved in various group-based activities. The study applied Principal Component Analysis (PCA) to compute a group-based approaches index that consisted of variables on trust, reciprocity, group participation and social support. Husbands have a higher social capital index (0.71) as compared to the wives (0.68), a difference that is statistically significant at 10% (t-test P value<0.10). However, a higher percentage of wives (91%) belong to social groups than husbands (81%). This could be explained by the fact that husbands are more willing to participate in community activities, mostly belong to community-based organizations (CBOs) hence having wider networks and political capital than wives. In contrary, wives are more active in women's groups and micro finance groups.

Table 2: Formulation of group-based approaches for husbands and wives

Proxy of Group-based approaches	Wives (% Yes)	Husbands (% Yes)	Difference in % point	Significance x^2 (P-value)	Agreement (%)	Kappa	Significant Kappa (P-value)
Group-based approaches index (mean)	0.68	0.71	-0.03	†0.060*			
Belong to any social group	91.17	80.81	10.36	0.018**			
At least one group is a mixed-gender group	48.08	75.64	-27.56	0.000***			
Duration of group membership in years (mean)	10.12	11.91	-1.79	†0.285			
Number of groups belonging to (mean)	1.26	1.15	0.11	†0.087*			
Willing to participate in disaster management	91.67	98.08	-6.41	0.010**	91.03	0.10	0.056*
Willing to contribute labor	89.10	97.43	-8.33	0.003***	89.10	0.16	0.005*
Willing to contribute funds for community work	78.85	93.59	-14.74	0.000***	75.00	-0.01	0.536
Involvement in group activities	90.38	83.33	7.05	0.065*	80.13	0.14	0.034*
Work with others in community work	35.90	67.31	-31.41	0.000***	49.36	0.08	0.119
Witnessed sanction	64.10	66.03	-1.93	0.722	62.18	0.17	0.017*
Support from relatives	37.18	36.54	0.64	0.907	53.21	-0.01	0.526
Support from neighbors	36.54	35.90	0.64	0.906	53.21	-0.01	0.563
Support from friends	29.49	17.31	12.18	0.011**	59.62	-0.10	0.915
Trust neighbors with your kids	74.36	78.21	-3.85	0.525	64.10	0.01	0.450
Most people in the community are trustworthy	46.15	50.00	-3.85	0.497	56.41	0.13	0.054*
N	156	156					

Notes: Superscript * presents significance at the 10% level, ** at the 5 % level, ***at the 1% level. † indicates t-test estimates of population-level mean comparisons.

Husbands and wives affirm that they are willing to participate in disaster management activities, contribute both time and labor in group activities as well as are willing to participate in other group activities. Besides, a higher percentage of wives than husbands are willing to participate in group-based activities and have received support from members of social groups in the occurrence of extreme events (Pearson x^2 <0.001). Further, husbands and wives slightly agree that most people in the community are trustworthy (56% in agreement) (Kappa P-value

<0.05)[1] and they affirm to have witnessed sanctions to those community members who are not willing to participate in group-based approaches and community activities (62% in agreement) (Kappa P-value <0.05). The findings suggest that, compared to wives, husbands are more willing to cooperate in community activities (67% and 36%, respectively) (Pearson x^2 <0.05).

Gendered benefits of group-based approaches under climate change

Gender-differentiated group-based approaches benefit husbands and wives in different ways as shown in Table 3. Husbands mainly acquire climate information, adaptation ideas, and access to farm inputs through social groups. For example, farmers belonging to social groups are more likely to change crop variety and types, supported by group-based seed acquisition.

Table 3: Gender-differentiated linkages of group-based approaches to risks under climate change

Benefits acquired through group-based approaches	Wives (% Yes)	Husbands (% Yes)	Difference in % point	Significance x^2 (P-value)
Access to climate information	22.44	38.46	-16.03	0.002***
Advice on adaptation options	32.05	46.79	-14.74	0.008***
Access to agricultural inputs	32.05	49.36	-17.31	0.002***
Diversify sources of livelihood	73.72	64.74	8.97	0.086*
Manage risks	80.77	68.59	12.18	0.013**
N	156	156		

Notes: Superscript * presents significance at the 10%, ** at the 5 %, and ***at the 1% level.

On the other hand, women's groups often assist women to diversify their sources of livelihood and managing climate (as well as non-climate) risks. These benefits are often not the main mandate of groups but diversified to address various challenges arising from climate change. Women's groups often help them diversify livelihoods through innovative pathways such as group-based savings, micro-credit and income generating activities. Groups also help women build their welfare and assets and manage sudden events such as illness. Women collectively hire land, use it for production thus increasing income and food security for the household. They also pull resources and buy food in bulk and sub-divide among themselves hence reducing cost of food and promote food and nutritional security. These findings suggest that climate change presents an opportunity for growth and strengthening of innovative institutions such as group-based approaches that promote non-tradition livelihoods and foster ability of men and women to manage risks.

4. Econometric Results
Empirical strategy
The study aims to examine contributing factors to gender-differentiated group-based approaches index for the households and individually for husbands and wives. Past studies

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[1] The Kappa statistics are often used to examine the significance in inter-rater agreement of two or more groups

assess factors influencing association or membership to groups using binary estimation procedure (Rakib 2015). This study goes beyond membership and considers several factors that contribute to group-based approaches besides group membership. Hence, the study applied ordinary least squares (OLS) to assess factors that influence formation of group-based approaches as follows

$$GBA_i = X_i\beta + \varepsilon_i \qquad (1)$$

Where GBA_i presents GBA index for household i, husband i, and for wife i, and X_i is a vector of explanatory variables, including household and individual characteristics, socioeconomics, climate variables and institutional factors, where beta represents the coefficients to be estimated. The regression ε_i refers to unobservable errors.

The study goes beyond participation to examine welfare effects of group-based approaches towards assets accumulation for households and individually for husbands and their spouses. GBA index is likely to be endogenous because participation in social groups faces self-selection or is not likely to be a random participation (Adepoju & Oni 2012; Ngigi et al. 2017). As such the study adopts a control function approach where first OLS residue of GBA and inverse Mill's ratio (Heckman 1979; Wooldridge 2010) are used in the OLS model of welfare effects of group-based approaches such as

$$A_i = \beta_1 GBA_i + X_i\beta_2 + \lambda_i + \rho\hat{\varepsilon}_i \qquad (2)$$

Where A_i presents asset or asset indices for household i, husband i, and for wife i, GBA_i is the index for group-based approaches, X_i is a vector of explanatory variables, where betas represent the coefficients. The regression λ_i corrects for selection bias in the model and $\hat{\varepsilon}_i$ yields consistent estimates. We applied assets as a measure of wellbeing because different kinds of assets are built up over time and provide a better proxy for welfare than income or expenditure measures (Johnston and Abreu 2016).

Factors affecting formulation of group-based approaches
The findings show that variables associated with a spouse are likely to influence an individual decision to participate in group-based approaches. Participation of a wife in a social group is likely to influence the husband's participation in group-based approaches and vice versa. Years of schooling of wives positively influence formulation of GBA index, while this is not the case for formulation of GBA index for the husbands or for the households. This suggests that wives with higher education levels are more knowledgeable on benefits of group-based approaches that boosts their social capital and social engagement. Access to farm visits and farmer field schools (FFS) as a mode of extension service influence the GBA index of husbands. A notable finding is the influence of trust in information acquired from various sources on formation of GBA for wives and for the households, which implies that reliable information can strengthen group-based approaches. Access to credit influences positively the GBA index of husbands and their spouses as well as of that of household levels. Interestingly, perception of climate change - especially worry about the impacts of climate change - influences positively husband's participation in GBA. The findings also show that assets held by the households are likely to influence the GBA index. Household's tropical livestock units (TLU) and consumer durables

are likely to influence wives' GBA index, while land size influences the GBA index for wives and that of the households.

Table 4: Results of Ordinary Least Squares on determinants of formulation of group-based approaches

	Determinants of individual GBA		Determinants of household GBA	
	Wives	*Husbands*	*Wives*	*Husbands*
GBA of wives		0.161** (0.064)		1.161*** (0.644)
GBA of husbands	0.171* (0.091)		1.171*** (0.084)	
Years of schooling of husbands	-	0.003 (0.003)	-	0.002 (0.005)
Years of schooling of wives	0.041* (0.005)	-	0.004 (0.004)	-
Number of information sources of husbands	-	0.021** (0.011)	-	0.022* (0.022)
Number of information sources of wives	0.014* (0.015)	-	0.032* (0.020)	-
Trust index- information of husbands	-	0.058 (0.057)	-	0.123 (0.011)
Trust index- information of wives	0.074 (0.071)	-	0.055** (0.073)	-
Worried about Climate change of husbands	-	0.047* (0.025)	-	0.054** (0.024)
Worried about Climate change of wives	0.05 (0.032)	-	-0.040 (0.048)	-
Farm visits of husbands	-	0.042** (0.024)	-	0.042** (0.024)
Farm visits of wives	0.025 (0.036)		0.047 (0.051)	
FFS of husbands	-	0.059** (0.027)	-	0.142** (0.025)
FFS of wives	-0.005 (0.037)	-	-0.008 (0.050)	-
Access to credit of husbands	-	0.050** (0.025)		0.103** (0.025)
Access to credit of wives	0.047* (0.029)	-	0.032* (0.045)	-
Household's decision on land use	0.039 (0.030)	0.049** (0.029)	0.058* (0.045)	0.042* (0.027)
Household land size (acres)	0.034** (0.001)	0.019 (0.016)	0.050*** (0.00)	0.004* (0.002)
Household's agricultural asset index	0.067* (0.037)	0.019* (0.035)	-0.132 (0.053)	-0.066 (0.060)
Household's consumer durable assets	0.023* (0.037)	-0.425 (0.032)	-0.008 (0.055)	0.049 (0.056)
Household's TLU	0.002 (0.002)	-0.009** (0.003)	0.013* (0.003)	-0.007 (0.006)
Household's rainfall*temperature	0.459* (0.310)	0.144 (0.328)	0.543 (0.485)	0.982** (0.05)
Households located in Sub-humid regions	-0.369* (0.188)	-0.044 (0.202)	-0.348* (0.191)	-0.646** (0.312)
Households located in semi-arid regions	-0.062 (0.0501)	0.052 (0.048)	-0.076 (0.076)	0.052 (0.048)
Constant	-3.960*	0.267	-3.960	0.267

	(3.043)	(3.268)	(3.063)	(3.268)
R-squared	0.257	0.314	0.680	0.761
Prob > F	0.006	0.000	0.000	0.000
Number of observations	156	156	156	156

Notes: Corrected and robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Humid region is used as a base variable for agro-ecological regions

Beyond participation: welfare effects of gender-differentiated group-based approaches

The findings show that group-based approaches are likely to influence accumulation of assets owned by wives and by the households. Group-based approaches are likely to increase consumer durables of wives, but this is not the case for the husbands. These findings are supported by cross-tabulation analysis, which shows that wives and households belonging to social groups are more likely to own more assets than non-group members. This implies that even under climate change households or individuals can protect their assets through participation in group-based activities especially dealing with risk management and diversification of non-traditional livelihoods. Other factors that affect welfare of households include access to credit, access to numerous sources of agricultural and climate information, livestock and land size. Level of education of wives, access to credit, land size, collective decision on use of land are likely to influence positively and significantly assets owned by wives. Further, perception of climate change, tropical livestock unit (TLU), access to extension services and land size positively influence assets owned by husbands.

Table 5: Two-step estimation of welfare effects of GBA under climate change

	Individual welfare effects		Household welfare effects	
	Wives	Husbands	Wives	Husbands
GBA index of husbands	-	0.142	-	0.192
		(0.178)		(0.278)
GBA index of wives	0.037*	-	0.023*	-
	(0.116)		(0.225)	
Residue (husbands/wives)	-0.115	-0.105	-0.464	-0.103
	(0.213)	(0.216)	(0.457)	(0.342)
Mills ratio (husbands/wives)	0.119	0.268	-0.037	0.279
	(0.159)	(0.218)	(0.279)	(0.326)
Constant	0.755	8.194	11.018*	7.281
	(3.327)	(3.792)	(5.495)	(6.486)
R-squared	0.331	0.322	0.312	0.329
Prof > F	0.000	0.000	0.000	0.000
Number of observations	156	156	156	156

Notes: Corrected and robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. We only present the variables that are of interest for the study.

5. Discussion

While most studies on participation in social groups tend to neglect gender aspects, this study applied a gender-differentiated analysis and examined factors that influence formulation of group-based approaches and how these in turn influence welfare outcomes of husbands and their spouses and of the households. Husbands and their spouses belong to different social groups and accrue different benefits. These findings could be explained on the basis of pre-existing gender and social norms determining women's roles in the household, including cooking and taking care of kids, which is limiting their mobility and discourages them from

joining inter-village social groups and CBOs. Similar studies in Sub Saharan Africa (SSA) show that men possess more social and political capital, hence having greater access to supporting interventions than women (see Katungi et al. 2008; Pérez et al. 2014; Ngigi et al. 2017).

The econometric findings show that gender-specific factors influence the formulation of group-based approaches and social capital. Interestingly, participation of one spouse in a social group is likely to influence the other spouse's participation in group-based approaches. Years of schooling of wives boost their social engagement unlike men. Contrary, Rakib (2015) shows that the education of household heads, who are often men, influences participation in social groups in Bangladesh. Further, assets owned by individuals or households are likely to influence accumulation of social capital and participation in group-based approaches. Group-based approaches are likely to help individuals building and protecting their assets under climate change. Evidence shows that social groups are a crucial pathway particularly for women and asset poor to protect their assets and smoothen consumption in occurrence of climate and non-climate shocks [21]. Men mostly benefit from social groups by acquiring agricultural information, inputs and climate adaptation, while women diversify their non-traditional livelihoods and manage climate and non-climate risks as well as other shocks that they face. Further, social groups help households to enhance food security (Woodson et al. 2016), rebuild assets and deal with post-shock recovery (Mawejje & Holden 2014; Woodson et al. 2016) as well as build resilience against extreme events (IFAD 2016). This study contributes to the literature that gender-differentiated group-based approaches can build and protect assets for wives and of the households. Recent studies support our finding that social and political capital created by group-based approaches contribute to households' assets and consumption expenditure (See Aker 2005; Yusuf, 2008; Rakib 2015). However, while some literature shows that extreme events such as drought can weaken social capital and networks (Fuente 2008; Woodson et al. 2016; Ngigi 2017), a certain degree of shocks could strenghten association in social groups (Gebremedhin et al. 2010).

6. Conclusions and Recommendations

This study presents unique intra-household findings of the potential of gender-differentiated group-based approaches in enhancing welfare under climate change. It suggests that gender-differentiated social groups benefit men and women differently based on differential gender needs, opportunities, roles and responsibilities. The findings suggest that climate change presents an opportunity for growth and strengthening of innovative institutions such as group-based approaches that promote non-traditional livelihoods and foster ability of men and women to manage risks. The study found that gender-specific factors such as level of education, access to extension services, access to credit and trust in information influence the formulation and accumulation of group-based approaches, while household factors such as land size and decision-making influence wives' and husbands' social capital. This in turn influences accumulation of assets of husbands and wives and of the households. Gender-differentiated group-based approaches are essential for enhancing welfare outcomes through accumulating essential individual and household assets. They are also essential pathways towards protecting assets in occurrence of shocks through offering alternative risk managing tools and alternative consumption smoothing strategies under climate change. This suggests a need for policies that

nurture social capital and group-based approaches for men and women at both household and community levels. Possible pathways towards this goal include capacity building programs and training in basic entrepreneurship and in risk management skills as well as in effective measures for coping and adapting to climate risks for both men and women. Further research should focus on understanding dynamics of gendered innovative institutions through use of panel data and the opportunities they present in fostering resilience to climate and non-climate risks, while empowering men and women. It could be interesting to examine the economics of group formulation and participation in innovative institutions in terms of costs and benefits that are accrued by either men or women in attempts to foster their livelihood resilience.

References

1.   IPCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for Policymakers. *IPCC WGII AR5 Phase 1* 44 (2014).
2.   African-Union. Common Africa Position (CAP) on the Post- 2015 Development Agenda. in *22nd Ordinary Session of the Assembly of the Union on 31 January 2014* 21 (2014).
3.   World Economic Forum. *The Global Risks Report 2017 12th Edition*. (2017).
4.   Ngigi, M. W. *Managing risk under climate change in Kenya Multiple shocks, poverty, gender and potential for group-based approaches*. (University of Bonn, 2017).
5.   Rakib, M. *Gender- Differentiated Asset Dynamics in Bangladesh : Individual Adaptation and the Potential for Group Based Approaches in the Context of Climate Change. University of Bonn, Germany* (2015).
6.   Bonfrer, I. & Gustafsson-Wright, E. Health shocks, coping strategies and foregone healthcare among agricultural households in Kenya. *Glob. Public Health* 1–22 (2016).
7.   Mawejje, J. & Holden, S. T. Social capital, shocks and livestock investments: evidence from Masaka District, Uganda. *Int. J. Dev. Issues* **13,** 98–112 (2014).
8.   Woodson, L., Frankenberger, T., Smith, L., Langworthy, M. & Presnall, C. *The Effects of Social Capital on Resilience Capacity: Evidence from Ethiopia, Kenya, Uganda, Niger and Burkina Faso. Report prepared by the Technical Consortium, a project of the CGIAR. Technical Report Series No 2: Strengthening the Evidence Base for Res*. (2016).
9.   Bernier, Q. & Meinzen-Dick, R. Resilience and Social Capital. *2020 Conf. Build. Resil. Food Nutr. Secur.* **4,** (2014).
10.   Nganga, S. K., Bulte, E. H., Giller, K., Rufino, M. C. & Economists, A. Exploring use of livestock wealth and social capital by pastoral and agro-households in ASALs as insurance against climate change and variability risks: A case study of Samburu District in Kenya. in *4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013, Hammanet, Tunisia* 28 (2013).
11.   Chen, H., Wang, J. & Huang, J. Policy support, social capital, and farmers' adaptation to drought in China. *Glob. Environ. Chang.* **24,** 193–202 (2014).
12.   Ngigi, M. W., Mueller, U. & Birner, R. Gender Differences in Climate Change Adaptation Strategies and Participation in Group-based Approaches: An Intra-household Analysis From Rural Kenya. *Ecol. Econ.* **138,** 99–108 (2017).
13.   IFAD. *Rural Development Report 2016. Fostering inclusive rural transformation*.

(International Fund for Agricultural Development, 2016).

14. Njuki, J. & Sanginga, P. C. *Women Livestock Ownership and Markets. Bridging the gender in Eastern and Southern Africa.*. (Earthscan Routledge, 2013).

15. Alderman, H., Chiappori, P.-A., Haddad, L., Hoddinott, J. & Kanbur, R. Unitary versus Collective Models of the household: is it time to shift the burden of proof? *World Bank Res. Obs.* **10,** 1–19 (1995).

16. Heckman, J. Sample selection bias as a specification error. *Econometrica* **47,** 153–161 (1979).

17. Wooldridge, J. M. *Econometric Analysis of Cross Section and Panel Data*. (MIT Press, London, England, 2010).

18. Johnston, D. & Abreu, A. The Asset Debates: How (not) to use asset indices to measure well-being and the middle class in Africa. *Afr. Aff. (Lond).* **115,** 399–418 (2016).

19. Katungi, E., Edmeades, S. & Smale, M. Gender, social capital and information exchange in rural Uganda. *J. Int. Dev.* **20,** 35–52 (2008).

20. Pérez, C. *et al. How resilient are farming households, communities, men and women to a changing climate in Africa? CCAFS Working Paper* (2014).

21. Ngigi, M. W., Muller, U. & Birner, R. The role of livestock portfolios and group-based approaches for building resilience in the face of accelerating climate change : An asset-based panel data analysis from rural Kenya. *ZEF-Discussion Pap. Dev. Policy* 29 (2015).

22. Fuente, A. Climate Shocks and their Impact on Assets. *Hum. Dev. Rep. Off. Occas. Pap. Hum. Dev. Rep. 2007/2008* (2007).

23. Gebremedhin, L., Bezabih, M. & Gebreegziabher, Z. Local Social Networks, Shocks and Rainfall Patterns in the Highlands of Ethiopia. *EfD Ethiop. Work. Pap.* 28 (2010).

24. Viera, A. J. & Garrett, J. M. Understanding Interobserver Agreement: The Kappa Statistic. *Fam. Med. Res. Ser.* **37,** 360–363 (2005).