

## **Local Institutions in Climate Change Adaptation by Smallholder Farmers: A farm level study in Homabay County, Kenya.**

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### **Abstract**

The purpose of this study was to investigate the role of local institutions in climate change adaptation by smallholder farmers in Homabay County, Kenya. The study employed cross-sectional survey design in which data was collected from smallholder farmers in one survey round. Quantitative data was collected from 398 smallholder farmers, while 48 key informant interviews and 12 focus group discussions were used to collect qualitative data to buttress information from farmers. Data was analysed using frequencies, percentages, cross-tabulations and chi-square at 0.05 significance level. The study established that local institutions and social networks had a positive influence on climate change adaptation by smallholder farmers. Local institutions and social groups enable smallholder farmers to deploy specific climate change adaptation practices. Local institutions pursue adoption of effective adaptation strategies relevant to local needs of the smallholder farmers. They also provide information on climate change adaptation options and give some external support to enable farmers cope with climate change. The study recommended the need to promote institutional partnership to enhance climate change adaptation at local level. Partnerships among local institutions are associated with area specific adaptation practices and communal pooling. The study also recommended the need to enhance the capacity of local institutions as the impacts of climate change are likely to intensify with time. Support in the form of new information and technology aimed at improving effective coping mechanisms and financial support will be necessary.

**Key Terms:** Local institutions, climate change adaptation, smallholder farmers, Homabay County.

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## Introduction

Sub-Saharan Africa (SSA) has been identified as one of the regions that are most vulnerable to the impacts of climate change (Bryan, et al., 2013; IPCC, 2014). Climate change is seen as one of the major factors limiting Africa's efforts to achieve food security because of the continent's dependency on rain-fed agriculture and the low capacity of smallholder farmers to adapt to climate change (IPCC, 2014; Phirri, et al., 2016). It is projected that SSA will witness increases in temperature, changes in rainfall intensity and distribution and a rise in incidences of extreme weather events (e.g. droughts and floods), pests, weeds and disease epidemics (FAO, 2015; Connolly-Boutin, & Smit, 2015).

Agricultural production in Kenya contributes about 25.4 per cent of the country's Gross Domestic Product (GDP) directly and another 27 per cent indirectly through its links with agro-based industries and the service sector (FAO, 2015). While Kenya already experiences an increase in rainfall variability, 75% of the agricultural output remains dependent on rain-fed small-scale agriculture (Herrero, et al., 2010). The majority of the population lives in rural areas, with smallholder rain-fed agriculture as the main economic activity (Bryan, et al., 2013; Barasa, et al., 2015b). It is projected that about 11 per cent of arable land could be affected by climate change, including a reduction of cereal production, which is about 16 per cent of agricultural GDP (FAO, 2005). Averting the challenge of climate change requires that farmers adapt by making changes in farming and land management decisions that reduce the negative consequences associated with the changing climate (Jarvis, et al., 2011).

## LITERATURE REVIEW

The impact of climate change has been localized and is severely affecting the livelihoods of households which predominantly rely on natural resources for their livelihoods. Among these are the smallholder agricultural

households who depend mostly on rain-fed agriculture. This calls for the need to address climate change impacts at the local levels. There is a growing realization that local institutions have an important role to play in planning and implementation of adaptation activities at the local level (Agrawal, & Perrin 2009; Agrawal, et al., 2009; Amaru, & Chhetri, 2013; Rodima-Taylor, et al., 2011). But a review of the National Adaptation Programme of Action (NAPA) of 45 countries shows that the role of local institutions has received little attention (Agrawal, & Perrin 2009).

Local institutions may be effective at aiding knowledge generation that may be important for adaptive capacity (Pelling, et al., 2008) and in the diffusion of information and technologies (Isaac, 2012). This is especially possible where local based financial institutions sometimes provide access to financial assistance in form of short term credit and information that may help individuals to pursue costly adaptation strategies. Natural resources have often been managed collectively (Meinzen-Dick, et al., 2002) especially on the context of environmental change, thus creating an important role for participation in local groups for adaptation at super-individual level (Adger, 2003 and Agarwal, 2010). These institutions participate in building resilience of smallholder farmers and reducing vulnerability to climate change through provision of physical infrastructure and services, disaster response planning, regulation of property rights and information dissemination (Agarwal, et al., 2009).

Many scholars in climate adaptation have underscored the significant role of local institutions in climate change adaptation. In particular, adaptation does not occur in an institutional vacuum; institutional and social factors play a key role in shaping the extent to which rural households and communities become vulnerable to different environmental risks and respond to such risks (Agrawal, et al. 2009; Amaru, & Chhetri 2013). Institutions are defined as the formal and informal rules through which social

structures share decision making and take collective action (Agrawal, et al., 2009). Agrawal and Perrin (2009) argue that institutions are leverage points to determine the direction and magnitude of flow of resources to different social groups.

O’Riordan and Jordan (1999) describe the role of institutions as a means for holding society together, giving it sense and purpose and enabling it to adapt. In general, countries with well-developed social institutions are considered to have greater adaptive capacity than those with less effective institutional arrangements, commonly developing nations and those in transition (Smith, & Lenhart, 1996). The role of inadequate institutional support is frequently cited in the literature as a hindrance to adaptation. Kelly and Adger (1999) show how institutional constraints limit entitlements and access to resources for communities in coastal Vietnam and thereby increase vulnerability. Huq et al. (1999) demonstrate that Bangladesh is particularly vulnerable to climate change especially in the areas of food production, settlements, and human life, reflecting serious constraints on adaptive capacity in the existing institutional arrangements, which is not conducive to ease the hardship of the people.

Institutions have influenced the livelihoods and adaptation of rural communities in the past. They structure risk and sensitivity to climate hazards, and thereby facilitate or impede individual and collective responses, ultimately shaping the outcomes of such responses (Agrawal, 2008; 2010). Rural local institutions contribute to sustainable livelihoods in diverse ways and are important for addressing and mitigating various aspects of insecurity and vulnerability (Uphoff, & Buck, 2006). Such local institutions, which acquire and store knowledge and experience, as well as create flexibility in problem solving, can increase people’s adaptability and resilience (Tompkins, & Adger, 2004; Walker, et al., 2006). In addition, local institutions mediate external interventions that can reinforce or

undermine adaptation practices (Agrawal, 2008). Planning for climate change adaptation, therefore, needs to promote the capacity of local institutions and improve the relationships between local and national-level adaptation planning (Agrawal, et al. 2012).

Despite the recognition of the role of local institutions in facilitating adaptation to climate change, little systematic analysis has been done to identify the factors that strengthen climate resilience, the roles of different local institutions in climate adaptation, features of institutions that are important for successful adaptation and external support they require to enhance their role in facilitating adaptation (Agrawal, et al., 2009). It is also worth noting that most of the smallholder farmers probably due to some hidden constraints find it hard to actively participate in these institutions. These institutions include local government, service organizations, private businesses, local cooperative societies and local financial institutions. It is therefore important to understand why some of the smallholder farmers find it hard to participate in these institutions and how these institutions influence climate change adaptation by smallholder farmers.

## RESULTS AND DISCUSSION

Local institutions can play an important role in enhancing climate change adaptation at household level through provision of training on farming techniques, farm inputs and soft loans run small-scale businesses to supplement household incomes. This means that farmers who are members of these organizations are able to apply new farming technologies and are able to access farm inputs, which will enable them to adapt effectively to the effects of climate change.

This hypothesis was tested by analysing farmers’ membership to local institutions and the extent to which the institutions had assisted them in climate change adaptation. It was also tested by analysing the presence of

other external organisations supporting climate change adaptation.

On membership to local institutions, 60.55% (241) of the respondents reported that they belonged to at least one social organisation. The results also indicate that 39.45% of the households are not members of any social organisation

and could miss on the benefits of social organisations, hampering ability to adapt to climate variability and change. Seitz et al. (2011) reported that institutional barriers at household levels could influence mainstreaming of adaptation strategies. The results are presented in figure 1.

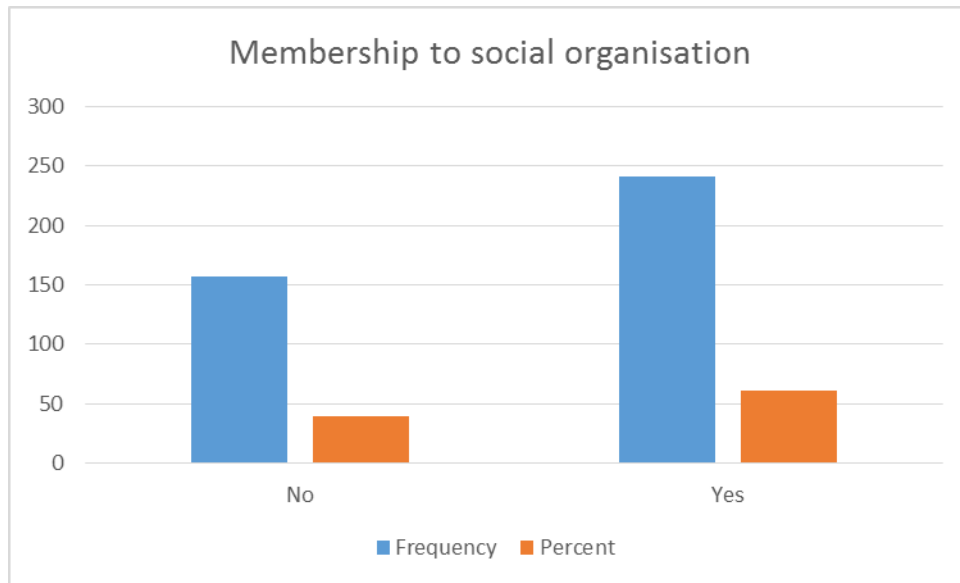


Figure 1: Membership to Local institutions  
Source: Field survey data, 2018

These institutions, both formal and informal play an important role in building resilience through community pooling and reducing vulnerability to climate variability and change. Although households have historically adapted to climate variability through many different strategies, their capacity to adapt depends significantly on the way the organizations regulate and structure their interactions, both amongst themselves and with external actors (Agrawal et al., 2009). Group participation allows farmers to pool together labour (Teklewold, et al., 2013) especially on labour intensive adaptation strategies such as soil conservation practices.

On the extent to which these organisations have assisted farmers in their operations in order to adapt to effects of climate change, 51.87% of the respondents who belonged to local institutions reported that these institutions had assisted them to a great extent, while 3.32% were not very sure of the assistance they had received from these organisations. The results are presented in table 1.

Table 1: Extent to which Local Institutions had Assisted Farmers

	Frequency	Percentage
Little extent	46	19.09

Undecided	8	3.32
Great extent	125	51.87
Very great extent	62	25.73

Source: Field survey data, 2018

To determine the relationship between membership to local institutions and climate change adaptation by smallholder farmers in the study area, chi-square test was done as shown in table 2.

*Table 2: Chi-Square Test Results on the Relationship between Membership to Local Institutions and Climate Change Adaptation*

	Value	df	Pr > ChiSq
Pearson Chi-Square	118.32	3	<0.05

The test statistic,  $\chi^2(df = 3, N = 398) = 218.08, p < 0.05$  indicate that participation in local institutions significantly influences climate change adaptation. This implies that farmers who belong to these organisations are able to access assistance in the form of agricultural training or financial from these organisations which enable them to adapt to effects of climate change. Participation in social organisations enables households to choose specific adaptation practices especially those that may need external support. Members of farmers groups can share experiences and exchange information about new technologies when they meet (Kassie, et al., 2013). Group membership can enhance social learning and knowledge spill over (Bandiera, & Rasul, 2006) about climate change adaptation.

Social organisations also provide a channel through which external interventions reinforce or undermine the existing adaptation practices. Social organisations play a crucial role in enhancing the capacity of local communities to cope with climate variability and providing mechanisms that help to shape the social and individual interactions within the society (Burch, 2010; Seitz, et al., 2011). Participation in

social organisations encourages the farmers to engage in a united strategies orientation; farmers involved in these organizations share knowledge and innovation ideas, discuss problems and challenges with others, and engage in collaborative decision making (Uddin, et al., 2014). Participation in farmer-based organisations enhances social networking and increases social capital (Egyir, et al., 2015). This could positively influence climate change adaptation by smallholder farmers.

On the type local institutions that respondents belonged to, majority of the farmers interviewed (40.66%) indicated that they are members of self-help groups. 17.5% of the farmers belonged to women groups, followed by 12.5% representing those who were members of the youth groups. The results are presented in table 3. However all the respondents belonged to a family as a social institution. This institution is important in supplying cheap labour to supplement the hired labour in some households while other households use family labour exclusively to carry out farm operations. As reported earlier, 36.21% use family labour while 20.09% use both family and hired labour. Family labour increases social interaction and networking among family members, which increases adaptive capacity of households. More access to family labour enhances social capital of households (Eakin, et. al, 2011; Ibrahim, 2014).

The farmers reported that these groups were providing them with loans to pay school fees for their children and welfare services among other benefits. This could improve farmers' social status thereby influencing their ability adapt to climate variability and change. This is consonance with the work of Frank and Penrosa (2012) and Defiesta and Rapera (2014) who reported that farmers with access to credit are more economically able to adapt to climate change than those who are not able to access credit. Social organisations may also act as safety nets for their members by enhancing livelihood systems. Local organisations

improve livelihood security in arid areas with disengagement of governmental services and limited access to income generating activities (Washington-Ottobre, & Pijanowski, 2013).

*Table 3: Type of Social Organisation*

	Frequency	Percent
SILK GROUP	23	9.58
Women group	42	17.50
Youth group	30	12.50
Sacco	22	9.17
Farmers union	10	4.17
Self-help group	98	40.66
Kenya Women Finance Trust	9	3.75
Ndhiwa community bank	6	2.50

Source: Field survey, 2018

Farmers were further asked whether there were organisations in the study area that were assisting them in adapting to climate change. 36.43 percent of the respondents reported that there were some organisations supporting them to adapt to climate change while 63.57% reported that they had not accessed any assistance from any organisation to help them adapt to climate change. These organisations can play a vital role in reducing farmers' vulnerability to effects of climate change through provision of financial capital and/or agricultural and environmental training. They can help in building up community awareness of climate change and its likely impact on their livelihoods and habitats. They can help communities to build up their capacities to undertake the needed adaptive actions to reduce vulnerability, mitigate risks and build resilience. These organisations shape the livelihoods impacts of climate hazards through a range of indispensable functions they perform in rural contexts including information gathering and dissemination, resource mobilization and allocation, skills development and capacity building, providing leadership, and networking with other decision

makers and institutions (Agrawal, et. al., 2009). It is however noted that with a large percentage of the households in the study area not able to access any support from these organisations, climate change adaptation may be influenced negatively. In order for the communities to properly realize the support of these organisations in climate change adaptation, there may be a need in changing the strategy of how this support is to be channelled by involving the communities at the grass root level. The results of the study are presented in table 4.

*Table 4: Presence of Organisations to Support Climate Change Adaptation*

	Frequency	Percent
No	253	63.57
Yes	145	36.43

Source: Field survey data, 2018

When asked to report on the level of support given by these organisations towards climate change adaptation, 49.66% of the respondents who reported the presence of organisations in the study area to support climate change adaptation indicated that the level of assistance was high compared with 8.28% who indicated that there was very low level of assistance. The results indicate that these organisations had significant impacts on the livelihoods of the households that accessed their assistance. The results are presented in table 5.

*Table 1: Level of Assistance Provided to Farmers*

	Frequency	Percent
Very low	12	8.28
Low	14	9.66
Not sure	6	4.14
High	72	49.66
Very high	41	28.28

Source: Field survey data, 2018

Chi-square test was run to determine the relationship between the level of support provided and climate change adaptation. The test statistic  $\chi^2(df = 3, N = 145) = 104.69, p < 0.05$  indicate that the assistance provided by the various organisations positively influenced climate change adaptation.

On the type of organisations providing support to the community, 40.88% of the respondents reported that they had got support from Non-governmental Organisations (NGOs), government ministry (18.98%), farmers union (21.9%), individuals (16.89%), and Community Based Organisations (CBOs) (1.46%). The most commonly mentioned NGO in the study area was Vi Agroforestry which was promoting climate resilient projects including grafted fruit production and agroforestry. The results are presented in table 6.

**Table 6: Type of Organisation Offering Assistance**

Type of organization	Frequency	Percent
Non-governmental organizations	56	40.88
An individual	23	16.89
Government Ministry	26	18.98
Farmers Union	41	21.9
CBOs	6	1.46

Source: Field survey data, 2018

The results of cross tabulation between the type of assistance received by farmers and measures to adapt to climate change in the study area revealed a significant relationship ( $\chi^2(12) = 27.3, P < 0.05$ ). This indicate that the support provided by these organisations significantly influences climate change adaptation by smallholder farmers in the study area. This corroborates another research in Kenya which demonstrated that local institutions reduce local vulnerabilities and increase livelihood security in areas experiencing climate variability (Washington-Ottombre, & Pijanowski, 2013).

During focus group discussions, respondents classified these institutions into credit and savings facilities, Non-governmental organisations, and government departments. They gave specific roles of these institutions as giving loans, provision of training on financial management, education on tree planting, provision of tree seeds and seedlings, training on modern agricultural practices, training on water harvesting, construction of wells, spring protection and management and protection of water catchment zones. The results of cross-tabulation are presented in table 7.

**Table 7: Type of Assistance Received by Measures to Cope with Climate Change**

Type of assistance received	Measures to cope with climate change					
	Changing planting date	Planting short season crops	Planting drought resistant crop varieties	Planting trees	Water harvesting	Total
Loans	12	8	6	22	7	55
	4.90%	3.27%	2.45%	8.98%	2.86%	22.44%
Environmental information	15	2	5	28	7	57
	6.12%	0.82%	2.04%	11.43%	2.86%	23.26%
Agricultural	16	9	16	29	3	73

information	6.53%	3.67%	6.53%	11.84%	1.22%	29.79%
Provision of farm inputs	14	13	15	18	-	60
	5.71%	5.31%	6.12%	7.35%	0	24.48%
Total	57	32	42	97	17	245
	23.27%	13.06%	17.14%	39.59%	6.94%	100%

Source: Field survey data, 2018

## CONCLUSION AND RECOMMENDATION

**Conclusion:** Local institutions were found to be influencing climate change adaptation by smallholder farmers. Local institutions and social groups enable smallholder farmers to deploy specific climate change adaptation practices. Local institutions pursue adoption of effective adaptation strategies relevant to local needs of the smallholder farmers. They also provide information on climate change adaptation options and give some external support to enable farmers cope with climate change. Farmers who belong to these organisations are able to access assistance in the form of agricultural training or financial, which enables them to adapt to effects of climate change. In order to improve agricultural productivity and enhance household food security in the study area, the institutional support from government and private sector will be necessary. This will enable smallholder farmers to move from short-term coping mechanisms in response to climate shocks and to invest in long-term strategies that enhance resilience to climate change through livelihood

diversification and adoption of more expensive but efficient agricultural technologies. The development of smallholder agricultural production therefore will need to factor in the socio-economic and cultural factors constraining climate change adaptation for improved household food security.

**Recommendations:** There is need to promote institutional partnership to enhance climate change adaptation at local level. Partnerships among local institutions are associated with area specific adaptation practices and communal pooling. There is also need to enhance the capacity of local institutions as the impacts of climate change are likely to intensify with time. Support in the form of new information and technology aimed at improving effective coping mechanisms and financial support will be necessary. This will call for collaboration between national and county governments to build the capacity of local institutions to enhance climate change adaptation by smallholder farmers.

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