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The Role of Social Network and Regional System in Maintaining Livelihood Security of Smallholder Farmers in Central Kenya

Matheaus K. Kauti[1*]

[1]Department of Environmental Science and Technology, School of Environment and Natural Resources Management, South Eastern Kenya University (SEKU), P.O.Box 170-90200, Kitui, Kenya.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Taking smallholder settlements constituting a relatively compact set of two newly settled villages adjacent Northeastern Slopes of Aberdare, Central Kenya as the main research field, the study: investigates the migration patterns, kinship relations and emerging associational life in the study sites; explores the social networks underpinning the exchange and sharing of information and knowledge by the smallholder farmers; and illuminates the functioning of the regional system driven by local-level area differences arising from ecological gradient of a mountain slope. It draws from both qualitative and quantitative data collected from field surveys between 2007 and 2009. Additional field work was conducted intermitted between 2010 and 2012. Findings reveal that lack of land and the ensuing process of migration led to geographical dispersal of household members and breakdown of common household residence formerly a basis for primary bonds and cohesiveness of the kinship system. Thus, kinship relations have weakened and in their place emerged new associational life at the destination areas for coping with and adapting to uncertainties in the new environment. These local-based associations in the new settlements have

**Corresponding author: E-mail: mkauti@seku.ac.ke;*

replaced the functions of kinship, market and the state in securing livelihoods for the smallholders. Findings on social networks using the case of seed sources information sharing attest to the fact that, farmers are less dependent on social relations in provision of crop varieties and livestock breeds and are highly dependent on market mechanism, an evidence of farmer's exposure to variable market forces. However, they are continuously engaged in social learning process. The functioning of the regional system revealed a complementary relationship among the studied settlements especially during crisis times such as drought whereby upland farmers have economic, social, and ecological relationships with lowland farmers. Even though the study is limited to the local scope, it provides a basis for designing policies aimed at rural livelihood security improvement and informs and facilitates targeting of outside interventions such as food security programs which can be built on existing social networks and regional system.

Keywords: Livelihood security; social network; smallholders; seed; central Kenya.

1. INTRODUCTION

This article looks at the role of social network, information sharing and regional system in maintaining the livelihood security of smallholder farmers coping with and adapting to economic changes and agro-climatic events in Central Kenya. Achievement of livelihood security is indispensable if poverty is to be effectively alleviated in a smallholder farming system which relies on natural resources. Ellis [1] points out that livelihood diversification are a clue to risk spreading and poverty alleviation. It has increasingly been difficult to maintain livelihood security, the way in which people cope with and adapt to threats and risks placed on their livelihood. The situation has been aggravated by the double exposure of smallholders to economic liberalization and agro-climatic events such as drought which are global macro-level processes intrinsically and fundamentally linked in shaping local level vulnerability as manifested particularly in rural agricultural areas of developing countries such as in sub-Saharan Africa. Thus, the overriding question to the farmers is how to maintain livelihood security through increase in agricultural production under these variable and adverse conditions. Smallholder farmers crop variety and livestock breed selection directly relates to broader conceptual notion of livelihood dynamism which is addressed in the wider literature but is rarely substantiated with empirical evidence especially in sub-Saharan Africa setting. Compared to other agricultural inputs, seed has the greatest potential to increase on-farm productivity and enhance food security needs for smallholder farmers. This has become especially true of late as a result of global economic trends and associated market downturns, tariffs limiting market access, coupled with climatic variability.

The argument advanced in this article is motivated by one of the key principles for sustainable adaptation i.e. integrating local knowledge into adaptation process [2]. The importance of existing local knowledge and capacity in maintaining livelihood security for the smallholder farmers in Central Kenya is particularly well illustrated by the case of seed sources information sharing networks. The central function of social network in linking economic change and agro-climatic effects to the households at the local level by obtaining and providing access to other resources has been a neglected area in aiding understanding of livelihood security. This view allows for the consideration of social learning processes relevant in coping with the variability and uncertainty prevalent in human-environment interaction.

In order to illustrate the mediating role of social network as a social learning process in maintaining livelihood security, there is need to understand the concept of social network within the context of present study. Social network has been recognized in various approaches as being an important element of social capital. For example, Lyon [3] points that the most common themes that run through the definition of social capital are networks, norms and trust that facilitate co-operation and co-ordination. Adger [4] concurs that at its core, social capital describes relations of trust, reciprocity, and exchange; the evolution of common rules; and the role of networks.

However, this conceptual emphasis has not been matched by the use of social network as a method to explore the effects of social context and its measurement has been accorded little attention [5]. Social networks are often measured in an oversimplified way such as the

quantification of the density of membership in voluntary associations [6]. But simply grossing up the membership status indicates little about the strength of social network. It must be at least accompanied by information on what people do as members. Though group membership is one useful way to measure social network, there is need to expand into other measures [7].

The focus of present study is on uncovering the social context of people's lives with respect to coping and adaptive capacity to adversity and includes the relationships that may be relied on. Some of these may be people known through participation in a specific group, but often it is family, friends, and neighbors etc., that are known from everyday experience. Therefore, the concept of social network is used to refer to social relations encompassing kinship ties and relations, friendship and/or neighbor in sharing of information on seed sources and agricultural production technologies.

The success or failure of agriculture in a household economy hinges on initial planting which is determined by farmers' ability to select crop varieties suitable to their own agro-ecological and socio-economic conditions. The selection is based on experiences and observations in the field formed over a long period of time using anecdotal evidence from the local agro-ecological localities. This form of local agro-ecological knowledge/experience is, acquired, shared, and handed down from generation to generation through the process of social learning. According to Crona and Bodin, [8] it is well known that many communities of resource users possess intricate knowledge of their local resource base. Thus, exchange of information and knowledge among users provide an avenue for successful maintenance of household livelihoods especially in the face of adversity.

There exists rich and broad literature of social science research on the adoption of new agricultural technologies [9,10]. To Conley and Udry [11] there is a natural way of thinking about this process of 'social learning' that has motivated much of the existing work on the topic. 'Consider the village (or other appropriate group) as a unit of learning engaged in a process of collective experimentation. Each farmer in the village observes the farming activities of each of the other farmers, including of course those who are experimenting with the new technology. Each farmer then updates his or her own opinion regarding the technology using this information, makes decisions regarding cultivation for the next season, and the learning process continues'.

The adoption of new agricultural technologies is an important route out of poverty for many in the developing world. Yet agricultural innovations are often adopted slowly and some aspects of the adoption process remain poorly understood. Empirical evidence shows that farmers learn how to cultivate a new crop from the choices of others also cultivating the same crop [9-12], and therefore, underscores the importance of social learning after a new technology has been adopted.

However, in the recent past, this established system of farming which draws from local (traditional) agro-ecological knowledge has witnessed a transformation by being double-exposed to external driving forces of economic changes and agro-climatic events which trigger disturbances at the local level farming systems. An important component of this transformation is the adoption of new agricultural technologies such as use of chemical fertilizers and modern varieties of seeds that were not used in the previous farming system.

According to Kiptot et al. [13], 'in the past, public sector agricultural extension and research services in developing countries played a very important role in promoting technological innovation in agriculture.' However, over the last two decades the situation has changed. First and foremost, because of the structural adjustment programs imposed by the IMF, many government extension officers have been retrenched, leaving a skeleton staff to carry out extension. In Kenya for example, the agricultural liberalization has been difficult and unsteady, but has led to a liberalization of the seed and fertilizer sectors [14]. These evolutions have led to an increase in number of participants, particularly from the private sector, but also to a decrease in institutional support, in particular for research, extension, credit, and marketing [15].

In order to address these challenges, Kiptot et al. [13] points that new approaches based on community participation have come to the fore as a means of scaling up and reaching out to a wider audience. These approaches work on the

assumption that if one farmer adopts a technology successfully, other farmers may learn the innovation from him/her, and share with others thereby developing a multiplier effect. Using a similar group approach in a development project to disseminate improved goat breeds, De Haan [16] observes that 'groups are able to provide channels for distributing information that are not regulated or initiated by outside interventions. These channels are often more useful because people trust them more and because farmers, among themselves, will formulate the message so that they will be able to understand the message better.

Due to the increased pressure on farmers in an increasingly globalized world, there is a dire need for a better understanding of how smallholder farmers negotiate the transition into a global society. According to Kiptot et al. [13], though there is increasing emphasis on farmer-led extension in rural development, there is little knowledge regarding the specific social processes involved. An important and pragmatic question is on the extent to which this transition is mediated by the reciprocal and face to face connection through social networks, and the extent to which individual smallholders are linked to more universal institutions including market transactions when they maintain their livelihood. It is believed that social networks facilitate access to resources in situations where markets do not function efficiently [17]. This aspect becomes very important one in farming systems that are undergoing transition in trying to integrate changes triggered from outside by exogenous shocks such as economic changes and agro-climatic events.

The current research seeks to contribute on this body of literature by explicitly considering the processes by which coping and adaptation takes place in particular by unraveling the mediating role of social relations in exchange and sharing of information and knowledge vital for coping and adapting with agro-climatic and economic threats. The objective is to investigate the social network and associational life present in the community that became apparent especially after economic liberalization and agro-climatic events. This article, therefore, illustrates the centrality of social network in maintaining households' livelihood security using insights from a study on determinants of smallholder farmers' crop variety and livestock breed selection [12] within the notion of local ecological knowledge.

2. METHODOLOGY

2.1 Conceptual and / or Analytical Framework and Research Design

Taking smallholder settlements adjacent Northeastern Slopes of Aberdare Forest Reserve, Central Kenya as the main research field, this study: investigates the migration patterns, kinship relations and emerging community associational life in the study site. The intention is to get a basic grasp of the associational life in the research sites that is useful for coping and adapting with the new environment for the immigrants and especially in the face of economic changes and agro-climatic events. The study also, explores the social networks underpinning the exchange and sharing of information and knowledge about seed sources by the smallholder farmers. The focus is on uncovering the social context of people's lives with respect to coping and adaptive capacity to adversity. Finally, an attempt is made to understand the functioning of the local-level geographical (regional) system in terms of flow of goods as a result of local-level area differences arising from ecological gradient of a mountain slope. The supporting role of market mechanism in this system is also investigated with regards to marketing of agricultural produce.

The research work draws from a comparative case study material of a mountain slope constituting a relatively compact set of two newly settled sites. The ecological gradients defined by the mountain slope such as between the study sites display characteristics that give rise to livelihood system interactions across settlements. The approach pursued enhances understanding of the functioning of the local-level geographical system within which the two sites are located.

The study utilizes both qualitative and quantitative data collected from field surveys. The survey on social networks of the exchange and sharing of information and knowledge about seed sources collected a data set on farmer's access and/or sources of seeds during the initial year of crop introduction into farm field. The fieldwork survey was carried out in two settlement villages between 2007 and 2009. The data set on household migration history and geographical extension of household members is supplemented by additional oral interviews conducted in 2011 and 2012 with key informants on broad topics about the history and settlement patterns into the two sites. A census survey for

the two sites was not possible practically and therefore, a selection of 20 households from each study site was done based on land register map of the area and questionnaire surveys administered (N=40). The land register map indicates subdivision of land and size of land by households. Purposive judgment was employed in determining which households to interview. These were a cluster of mutually neighboring households adjacent to forest reserves in the two sites. From each site a geographical section was selected having households with both large and small landholdings in order to facilitate valid comparative analysis approach. The household-level questionnaire was designed to provide information on the mediating role of social network and community associational life in exchanging and sharing of information and knowledge on seed varieties by the smallholder farmers, as well as history and migration process of the households. In addition to the questionnaire survey, a variety of key informant interviews were conducted with village leaders, older people, traders/brokers, and Government staff as part of information gathering on general issues such as migration and settlement history and process, agro-climatic events, and marketing of agricultural produce among others.

2.2 The study Sites

The study site is located in the former Nyeri District[1], Central Province, which comprises the most western part of the moist windward side of Mt. Kenya (5199 m), the drier western leeward side of this extinct volcano, the borders of the semi-arid Laikipia Plateau (in the rain shadow area), and the moist windward eastern slope of the Aberdare range (4000 m). The inhabited areas in the District consist of two distinct blocks conforming to the newly created Districts, the traditionally Kikuyu south (Mathira, Mukurweini, Othaya, Tetu Divisions, and Nyeri Municipality) and the north formerly in the scheduled areas (Kieni East and Kieni West Divisions). The southern half is former African reserves, densely populated and fertile, with homesteads of Kikuyu, while the northern half is part of the former scheduled areas for white settlers which have been subdivided to African smallholders under settlement schemes[2] in the 1960s [18]. The new frontier areas attracted the migrating land poor Kikuyus from the traditional birthplaces in the south. In these new frontier areas, Sottas [19] researching under the auspices of Laikipia Research Programme, observed that unfavorable ecological and economic conditions create contradictions and many households undergo a considerable risk to fall into marginality. Yet, these areas remain largely un-researched.

Within former Nyeri North District, Northeastern Slopes of Aberdare Ranges was chosen as study area on several accounts. Based on the historical mosaic bequeathed from the colonial and post colonial period, the area was an open frontier for African settlement with both government settlement scheme known as Watuka and private land-buying company, Gatarakwa, being key players in land subdivision and allocation. Consequently, the area witnessed an influx of migrants from the densely populated high-potential areas of Central Kenya. The study focused on two contrasting research sites in the micro study area, Kamariki Sub-location[3] (Table 1 and Figure 1). The area is broadly a mix representative of the conditions found in the wetter and drier parts of Nyeri North District. The case study sites are representative of the diverse range of ecological conditions, topographical settings, vegetation associations and soil types prevalent in the district. The two sites were: Kabendera located at lower to intermediate zones of Northeastern slopes of Aberdare Ranges adjacent to South Laikipia Forest Reserve and the wetter Kiambogo on the higher elevations of Aberdare Ranges next to Aberdare Forest Reserve. Located in a continuous slope, the two sites were chosen for detailed survey to facilitate comparative case study approach owing to their location in different agro-ecological zones within the study area as well as different settlement history. Such an approach was deemed necessary to enhance understanding of the functioning of the regional system within which the two sites are located. An ingredient of such an approach is local level area differences arising from ecological gradients, such as found on mountain slopes, which provide examples of a variety of farming and economic systems in a small area, and often are characterized by interactions between the slope zones [20-22].

1 The study site lies under the former Nyeri North District which was hived off the larger former Nyeri District in 2007 and later in 2010 became Nyeri County.

2 For example, Gatarakwa, Mugunda, Watuka, and Ng'ari Ng'iro settlement schemes among others in Central Province.

3 The area is located in Gatarakwa Location, Kieni West Division, Nyeri North District. It is worthy noting that Kenya is divided into five hierarchical tiers of administration; Province, District, Division, Location and Sub-location.

Table 1. Households and household size, area in Sq Kms and density by administrative levels[1]

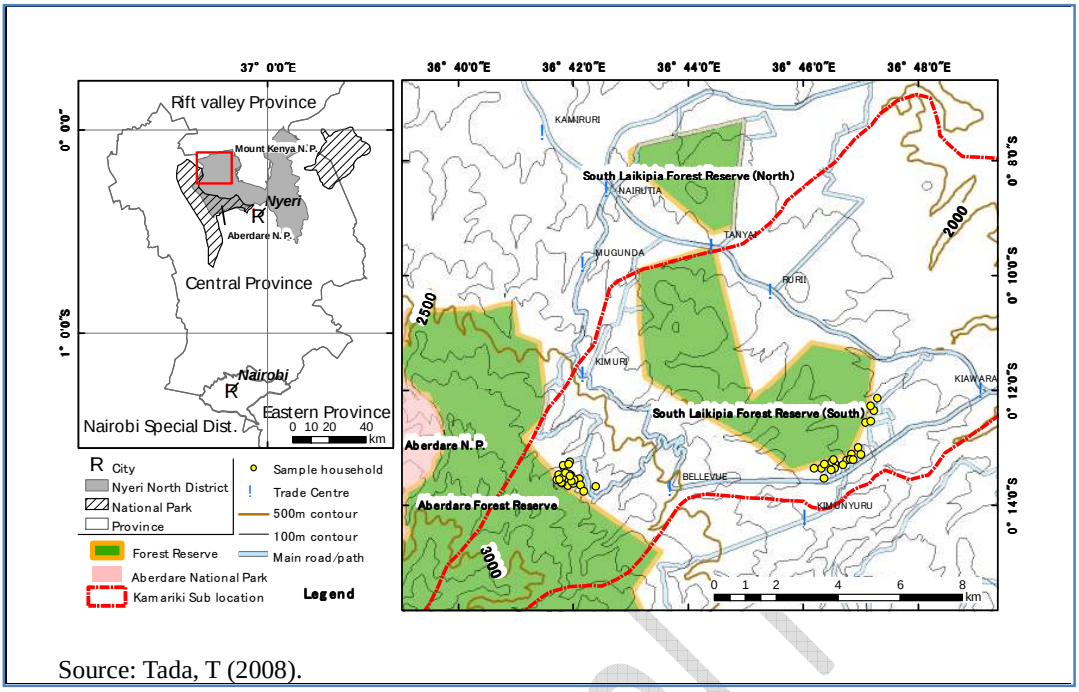
District	Division	Location	Sub-lcn/Village	Households	Population	Area (Km²)	Density
Nyeri district				168,786	661,156	3,356	197
7 Divisions	**Kieni west division**			16,699	68,461	626	109
	5 Locations	**Gataragwa location**		3,809	16,310	213	77
		4 Sub-locations	**Kamariki Sub-lo**	1,647	6,740	89	59
			Githura A	121	510		
			Kandigiri	61	261		
			Githura B	109	481		
			Kiambogo	166	734		
			Kiboya	89	344		
			Bellevue B	217	780		
			Bellevue A	175	528		
Kieni West	Gataragwa	Kamariki	Kabendera[2]	32	101	**Information**	
Kieni East	Mwiyogo	Watuka	Wamucuni[2]	82	319	**not available**	
Mathira	Mweiga	Lamuria	Kaheho A	114	450		
Mukurwe-ini	Endarasha	Embaringo	Kaheho B	116	506		
Othaya	Mugunda		Gacuma	118	519		
Tetu			Birisha	90	377		
Municipality			Secondary Line	157	830		

Source: Adopted from Kenya, Republic of, [23]

Notes: 1. There have been changes in boundaries due to creation of new districts, divisions, locations and sub-locations since 1999.

2. The term 'Village' is used to refer to Central Bureau of Statistics' Enumerated Area (EA) – a statistical unit of enumeration which according to 1999 census was expected to contain 100 households.

3. The boundary of an EA was delineated using identifiable features like roads, rivers, footpaths etc. From the above definition, of a Village and/or EA, the boundaries of the two study sites are not clear cut and can be said to lie in Kiambogo, Kabendera and Wamucuni villages



Source: Tada, T (2008).

Figure 1. Study area: Kamariki sub-location, northeastern slopes of Aberdare

3. RESULTS AND DISCUSSION

This section illustrates how the research sites have gone through migration and settlement process as a prelude to examination of associational life present in the two study sites that became apparent after in-migration and especially as a result of economic liberalization and agro-climatic events. The issue of role of social networks in exchange and sharing of information and knowledge of seed sources is also reported and discussed. Finally, the functioning of the regional system and the supporting role of markets in this system is presented.

3.1 Migration Patterns, Kinship Relations and Community Associational Life

3.1.1 Migration patterns, kinship relations and geographical extension of household

An attempt was made to trace the migration paths of the households. Both quantitative (questionnaire) and qualitative (oral interviews) surveys were undertaken at the research sites on the migration and settlement process of the household heads and resultant geographical dispersal of their kinship members and/or spatial extension. The field survey results indicate that most of the interviewed household heads originated from original traditional homesteads (birth places) in southern part of former Nyeri District in high potential areas of Central Kenya (Figure 2).

The two research sites lie in Gatarakwa Location and the reason why it is shown as a place of birth in some cases is because their household heads were born in the study sites. The field survey data shows that the migration paths of most household heads are traced from their place of birth in high potential areas of Tetu, Aguthi and Iria-ini locations in Tetu and Othaya divisions, southern part of former Nyeri District. It is obvious that the place of residence for the household head/spouse is Nyeri District (Table 2), but it should be remembered that at a lower administrative level and geographical scale, the place of residence is different from that of the parents since as the previous section illustrated, most of the households heads bought their own land and settled independently from their parents land. According to Otieno [24], this fact does not conform to traditional residential ideology of the Kikuyu customs and norms whereby after marriage, the couple is expected to stay in the natal home of the man (patrilocal). This also explains the differences in place of

residence of parents and grandparents of the household head. It can therefore, be argued that migration process led to breakdown of common household residence which was a basis for primary bonds and cohesiveness of the kinship system. This is a further confirmation and feature of the changing Kikuyu kinship system.

The geographical dispersal of members of a household and/or spatial extension in a wide area is made clear by the field data on head of households' siblings as well as uncles and aunts. Other districts in former Central Province such as Murang'a, Nyandarua, Thika, Maragua and Kiambu, as well as districts outside Central Province, were mentioned as places of residence for next of kin. Whether this reflects a state after migration where families are geographically dispersed with resultant weakening of kinship relations from original birth places and emerging of new associational life in the newly settled area will be discussed in the next section.

A further breakdown analysis of the data on place of residence within former Nyeri District (Table 3) reveals two trends. First, Kieni West Division, and Gatarakwa Location especially, are shown to be leading place of residence for household head siblings. This is attributed to the manner in which they acquired the land. For instance, some households have kin relations within the study sites especially those who acquired the land from their fathers (initial settlers) a period which occurred between 1970s and 1980s. In addition, the first immigrants acted as source of information on availability of land in the new areas, information which they shared with their relatives who remained in the birth places. It should be noted that not everyone who acquired land from the government settlement scheme or land buying companies settled in the land a situation which led to selling of land by individuals. There are also cases of initial settlers who have sold portions of their landholdings. The other unique cases were when close kin joined the same land-buying company and were coincidentally allocated land close to each other through the balloting process of land allocation exercised by the land buying companies or the extraordinary case where the Company officials acquired more land owing to their positions and economic status and in turn sold or shared it to their relatives. These facts were evidenced by the closeness and/or adjacency of landholdings by some relatives but could not be further investigated due to the sensitivity of the land issue.

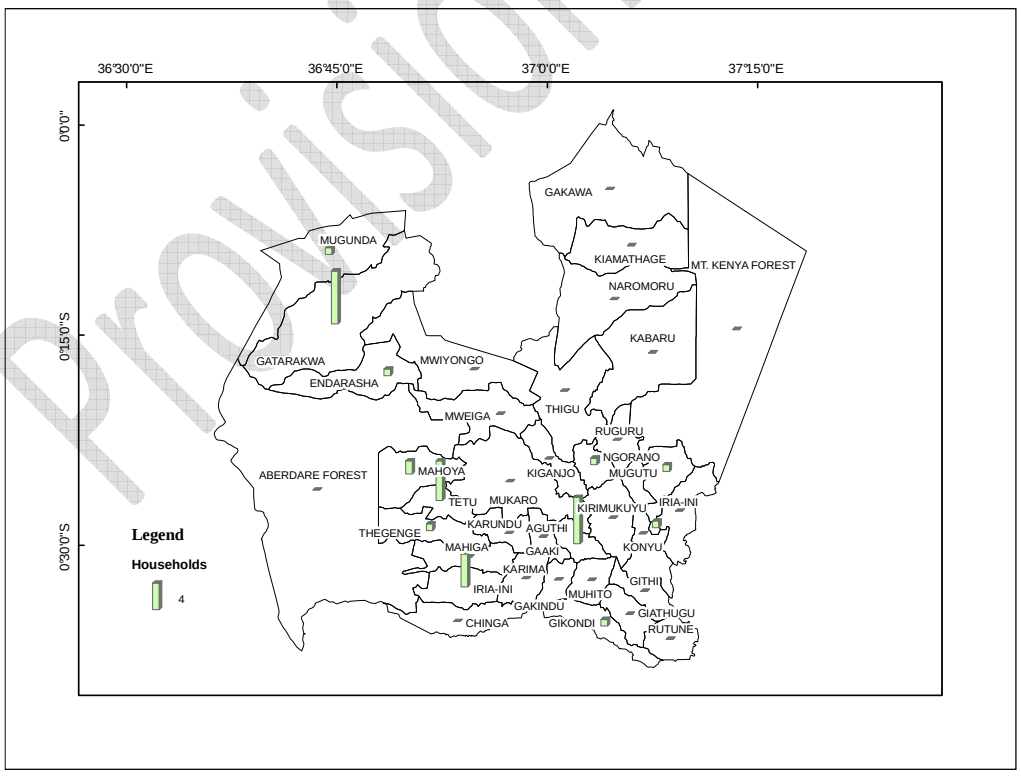


Figure 2. Place of birth of household head and population by location, Nyeri District

Table 2. Place of residence for household heads' kinship in Kenya

Province	District	Household head/ Spouse	Parents	Grand parent	Brothers	Sisters	Uncle	Aunt	Total
	Nyeri	37	34	29	116	91	55	18	380
	Muranga	0	2	2	6	8	3	0	21
	Nyandarua	0	0	0	3	5	0	1	9
	Thika	0	0	1	0	0	1	2	4
	Maragua	0	0	0	0	1	0	1	2
	Kiambu	0	0	0	0	1	0	0	1
Central		**37**	**36**	**32**	**125**	**106**	**59**	**22**	**417**
	Machakos	0	0	0	0	1	0	0	1
	Meru	0	0	0	0	3	0	1	4
Eastern	Not known	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**5**
Nairobi	Not known	**0**	**0**	**0**	**1**	**2**	**0**	**2**	**5**
	Kericho	0	0	0	1	0	0	0	1
	Laikipia	0	1	0	9	16	6	2	34
	Nakuru	0	0	0	2	2	2	2	8
Rift valley	Not known	**0**	**1**	**0**	**12**	**18**	**8**	**4**	**43**
No Response*		0	3	8	24	42	24	30	131
Deceased		1	NA**	NA	NA	NA	NA	NA	1
Single		2	NA	NA	NA	NA	NA	NA	2
Grand Total		40	40	40	162	172	91	59	604

Notes: *The interview was administered to household head/spouse and the place of residence referred to patrilocal (husband's) kinship according to Kikuyu cultural system except for one household whose head was female and kin relations referred to her father and not husband. *: Information about place of residence was not availed/known **: The question about whether deceased/alive or marital status was not asked to the respondents*

Table 3. Place of residence for household heads' kinship in Nyeri District, Central Kenya

Division	Location	Household head/Spouse	Parents	Grand parent	Brothers	Sisters	Uncle	Aunt	Total
Kieni West	Gatarakwa	35	10	3	79	41	8	0	176
	Mugunda	0	1	0	5	10	1	2	19
	Endarasha	0	1	0	0	1	0	0	2
	Mweiga	0	0	0	1	0	0	0	1
	Mwiyogo	0	0	0	0	0	0	2	2
	No sure	0	1	0	2	1	1	0	5
Total		**35**	**13**	**3**	**87**	**53**	**10**	**4**	**205**
Tetu	Tetu	0	5	6	4	0	17	5	37
	Aguthi	0	4	7	5	4	8	1	29
	Kahigaini	0	1	1	4	4	2	0	12
	Mahoya	0	0	4	0	1	3	0	8
	Mahoyas	0	3	0	0	0	0	0	3
	Thegege	0	1	0	0	0	0	0	1
	Karundu	0	0	1	0	0	0	0	1
	No sure	0	0	0	0	2	0	0	2
Total		**0**	**14**	**19**	**13**	**11**	**30**	**6**	**93**
Kieni East	Kabaru	0	0	0	1	0	3	0	4
	Naromoru	0	0	0	0	0	3	3	6
Total		**0**	**0**	**0**	**1**	**0**	**6**	**3**	**10**
Mathira	Karatina	0	0	0	2	9	0	0	11
	No sure	0	2	1	5	3	3	0	14
Total		**0**	**2**	**1**	**7**	**12**	**3**	**0**	**25**
Mukurweini	Not sure	**0**	**1**	**1**	**2**	**2**	**1**	**0**	**7**
Municipality	Kiganjo	0	0	0	0	1	0	0	1
	Mukaro	0	0	0	1	0	0	0	1
Total		**0**	**0**	**0**	**1**	**1**	**0**	**0**	**2**
Othaya	No sure	1	4	5	4	9	5	5	33
No sure		1	0	0	1	3	0	0	5
		37	**34**	**29**	**116**	**91**	**55**	**18**	**380**

Notes: Not sure: The respondents were not able to name the place

Secondly the data supports the earlier observation that the place of residence for most household heads is different from their parents at a lower administrative and geographical scale. In this case, apart from Kieni West Division, Tetu and Othaya divisions in former Nyeri District are among the leading divisions mentioned as the place of residence of parents and grandparents.

From the foregoing analysis it is evident that the traditional system of property (land) ownership has gradually transformed into individual property ownership whereby the functions of the traditional systems such as *mbari* have disappeared. The findings have shown that lack of land in the high agricultural potential areas of southern part of the former Nyeri District and availability of land in the low agricultural potential areas such as the study sites and the ensuing process of migration led to a breakdown of common household residence which was a basis for primary bonds and cohesiveness of the kinship system.

3.1.2 Emerging community associational life

In the newly settled areas, immigrants operate in a harsh environment characterized by vagaries of health, weather, crop pests and diseases and a need to survive in order to make ends meet. The situation is made worse by minimal support received from kinship system for some households and limited or lack of access to formal financial markets. This has led to more dependence on voluntary organizations in securing livelihoods for the smallholders although these are mostly restricted to welfare matters and also existed in the original birth places.

The following analysis starts with a basic quantitative investigation of formal types of association's existent in the two sites. The quantitative analysis is done alongside with qualitative analysis which draws from informal interviews conducted with key informants and experiences gained from not only working, but eating and sleeping in the study sites during the entire period of field work. The main aim is to give a general overview of the associational life present in the community that is geared towards livelihood security improvement. Such background information is essential in understanding information networks.

At the community level an attempt was made to get a basic grasp of the community associational life by grossing up the 40 households' group membership in the study sites. At first, the household head/spouse was asked to name all the groups in the settlement which he/she or a member of the household belongs to. The respondents were asked about the group membership in an open-ended question, which permitted them to provide multiple answers since it is possible to be a member of more than one group. Since the procedure considered the household as the unit of analysis and not the individual, it did not allow the examination of the role of gender in group belongingness, but rather the household as a whole. However, the procedure, allowed a compilation of an inventory list of names for all the groups present in the area. Secondly, informal interviews were carried out with key informants to establish the type and functions of the groups.

The survey identified 63 groups broadly categorized into 14 types (Figure 3). It is evident from the data that women form a very important part of the associational life in the study sites and they are more active than men. This is confirmed by the number of households who are members of Women groups (merry-go round) (43). Women in Kabendera and Kiambogo respectively cooperate among each other in almost every aspect of their daily lives ranging from joint firewood collection trips to more formalized activities undertaken through Women groups. During such cooperation, they insure themselves and their households against future events that may befall them such as sickness, death of family members, payment of school fees, and wedding of their sons/daughters among others. And, although it may not be an objective in group formation, during their meetings information about crop varieties, markets, farming practices is exchanged/or shared.

The other type of association present in the study sites is based on community groups such as the Water distribution project (42). Motivation to become a member of community groups is driven by the benefits accrued such as water user rights for the Water project. Failure to join or participate in community groups/work is considered bad in the eyes of villagers and leads to denial of water use and may lead to lack of support from the community in case where one is befallen by a calamity such as death.

The data show that religious groups (39) are an important aspect of their lives. It is because of the importance they attach to religion that the research could not be conducted on a Sunday, a

day reserved for the religious gatherings. It can also be argued that transfer of information essential in their livelihoods such as agricultural techniques takes place during such gatherings.

Welfare associations such as funeral/burial-based groups are an important insurance to the costly occasion when death strikes. These groups are guided by rules and regulations about premium contributions, procedure of election of office bearers, meetings, among others. It is therefore an important indigenous insurance institution.

It was argued in the previous section that the relevance of kinship ties has diminished over time. However, it should be noted that, some aspects of kinship relations still exist between relatives especially those who are residents of the new settlements such as family get-together parties. Although they still maintain contacts with their relatives in birth place, the frequency of visits to attend marriage ceremonies, death, land disputes etc has reduced due to the increasing cost of transportation.

The discussion on the migration and settlement process of the 40 households interviewed from the original traditional homesteads (birth places) in high potential areas of southern part of the former Nyeri District in Central Kenya to the research sites has shown how reliance on kinship networks between origin and destination areas has diminished but is still relevant especially during crisis events such as death, land disputes which require the intervention of kinship support. It has also been argued that in order to cope with uncertainties in their new environment and broaden the range of coping strategies in the area of destination, the migrants participate in local-based associational groups. In the next section, attention shifts to the issue of smallholder farmers seed sources networks.

3.2 Social Networks in Exchange and Sharing of Information and Knowledge

In order to identify networks through which information dissemination takes place, questions were asked to identify different social networks within and outside the village, the focus being on seed sources. For all seeds sourced from farmers within the research sites, the name of the provider of seed and relationship to the respondent was obtained. This also applied to seed sources outside the research sites with addition of geographical location of the provider according to Kenya administrative units.

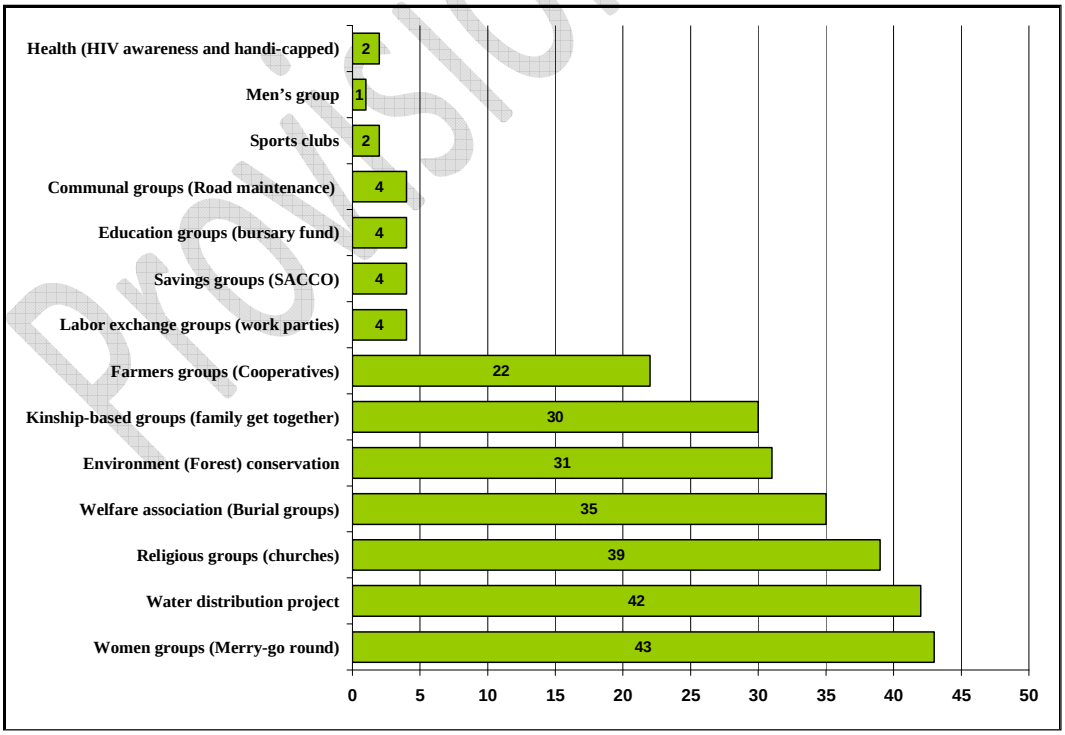


Figure 3. Community organizations and household membership in the research sites

The data collected do not deal with the issue of ways of obtaining the seed i.e. the different types of seed transactions, for instance whether purchased, borrowed, gifted, or exchanged. But rather, the main concern is the source of the seed. The data allow carrying out a comparison among different sources of seed by crops and an examination of the dynamics of social networks of seed source over the period of time corresponding with farmer's first introduction of the crop variety seed or livestock breed into their farm field. This stance allows contextualization of the dynamism of social networks within broader concepts such as economic changes and agro-climatic events at the centre of the study. In the following analysis an attempt is made to distinguish between two-level flows of seed sources as supported by the survey data. The first includes the intra-village flows of seeds while in the second flow are those seeds pulled from sources outside the village (Table 4).

The respondents mentioned a series of different types of networks through which seed flows. Overall, a vertical look of Table 4 shows that there are more flows of seeds into the village from outside (301) than the intra-village sources (147) an evidence of how the study sites are networked to other geographical areas in terms of seed sources. This is true for all the crops except potato, wheat, and sheep for livestock which by nature of their agronomic attributes are obtainable from farmers own previous harvest or for the case of sheep which is easily obtained within the village because of its fast reproduction.

A horizontal examination of Table 4 shows how the respondents are dependent on markets as sources of seed through Agro veterinary dealers (133) and market (seed vendors) (71) an evidence of being exposed to market forces and economic changes as illustrated elsewhere in this study. The role of social relations as sources of seeds both within the village (neighbor/friend and relative/kin) and outside the village (birth place and farmers elsewhere) cannot be overlooked but comparatively speaking, it is less than that of market mechanism. However, this should not be misconstrued to imply that social network is not a relevant component of their livelihood security as discussed in previous section on associational life. They are continuously engaged in social learning process whether through social interactions or through observations made while walking through others fields and so forth. Daily life conversations are characterized by topics revolving around agricultural activities such as weather patterns, new seed varieties, market trends etc.

The general statement about high reliance on market mechanism by the households for seed sources is explored further by taking a longitudinal perspective in observing changes in social networks of seed sources in order to be able to say that in the study sites, households are less dependent on social relations in provision of crop seed/varieties and livestock breeds and are highly dependent on market mechanism. But before doing that, a further analysis is conducted to reveal the geographical extent of sources of seed outside the village according to Kenya administrative units (Table 5).

The findings clearly demonstrate the functions of small markets and shops in Kieni West such as Kiawara and Bellevue trading centers in Kabendera and Kiambogo respectively (Figure 1). Agro veterinary dealers and seed vendors have located their business in these centers to tap on the business opportunity provided by the close proximity to the two study sites. The function of Nyeri Town (Municipality in Table 5) as a source of seed is also evident.

The data on geographical sources of seeds validate that on the place of birth of household heads with Tetu, Mathira, Othaya and Mathioya divisions being the geographical locations of seed sourced from birth place. The administrative locations shown in Figure 3 as birth places of household heads i.e. Tetu, Iria-ini and Aguthi are located in Tetu, Mathira and Othaya divisions respectively.

For meaningful analysis of the change in people's social network, a methodological approach which seeks historical depth of explanation is indispensable for one to be able to say previous social network was wider or narrow than present. Thus, in the ensuing analysis, emphasis is put on longitudinal as opposed to cross-sectional perspective in observing changes in social networks of seed sources over a period of time in tandem with the farmer's experiences of crop variety and livestock selection during the initial year of crop/livestock introduction. As noted before, this stance enables contextualization of the dynamism of social networks within broader concepts such as economic changes and agro-climatic events informing the current study.

In Figure 4, the various seeds planted in the two sites from 1981 to 2008 are plotted as per their sources on a five-year period time scale to illustrate the changing trend of information networks of seed sources. The findings show that there are four main sources of seeds having variable dependence levels over time by households in the research sites. These are markets, neighbor/friend, relative/kin, and a farmer from distant and/or remote place from the research site. The figure reveals that starting the period 1991-1995 to 2006-2008, there has been an increasing trend in reliance on the four sources except for the case of relative/kin source which drastically reduced after 2000 from 24 cases to 17 cases and further still to only two cases in the period 2006-2008. Market sources on the other hand appear to have consistently been relied upon with a tremendous increase in the period 2001-2005. The last period 2006-2008, displays a fictitious decline in reliance for all sources of seeds because the period under consideration is less (three years) unlike the five-year period span for the other periods.

Table 4. Sources of seed and livestock within and outside the research sites

Type	Source	Maize	Potato	Beans	Onion	Cabbage	Carrot	Wheat	Cow	Sheep	Total
Inside	Neighbor/Friend	4	47	13	6			10	7	7	94
	Relative/Kin (Locally)	1	23	9	1				4		38
	Farmers Cooperative								8		8
	Government relief	3									3
	White settler		1	1					1		2
	Church										1
	Natural Birth									1	1
	Total	**8**	**71**	**23**	**7**	**0**	**0**	**10**	**20**	**8**	**147**
Outside	Agro vet dealer	76	1		44	6	5	1			133
	Market (seed vendors)	7	7	55	2						71
	Farmer elsewhere	2	14		3			4	25		48
	Birth place	3	11	12	1			1	6	4	38
	Kenya farmers Assn.	6	2					1			9
	Relative/Kin (Distant)	1	1								2
	Total	**95**	**36**	**67**	**50**	**6**	**5**	**7**	**31**	**4**	**301**
Grand Total		**103**	**107**	**90**	**57**	**6**	**5**	**17**	**51**	**12**	**448**

Note: The respondents were asked about sources of seeds during the initial year of crop introduction into their farm fields

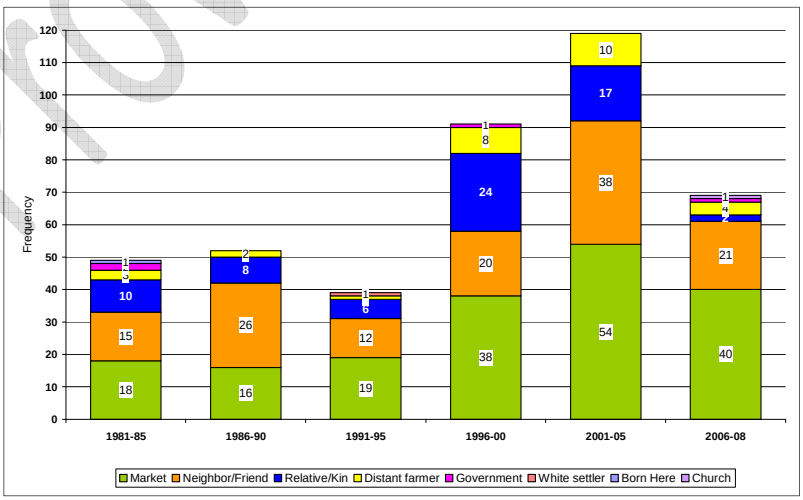


Figure 4. Sources of crop seed and livestock breed over time in research sites

Table 5. Geographical sources of crop seed and livestock outside the research sites

Province	Central											Rift valley		Total
District	Nyeri						Muranga		Nyandarua			Laikipia	Nakuru	
Division	Kieni West	Municipality	Mathira	Tetu	Othaya	Kieni East	Kiharu	Mathioya	Ndaragwa	Ol joro orok	Nairobi	Nyahururu	Nakuru	
Agro vet	64	64									3	1	1	133
Market (seed vendors)	43	25							1			1	1	71
Farmer elsewhere	45					3								48
Birth place	9		8	12	4		1	4						38
Kenya farmers Assn.		5	3									1		9
Relative/Kin (Distant)									1	1				2
Total	161	94	11	12	4	3	1	4	2	1	3	3	2	301

Although Figure 4 is an oversimplification of complex differences among different crops, the findings are useful in two respects. First, it illustrates the influence of wider economic changes and especially sector specific reforms in agriculture which occurred in the period starting 1990s. Secondly, the high dependence on market sources of seeds as necessitated by the economic reforms and less dependence on social relations such as kinship, neighbors and friends is confirmed by the data. However, further analysis is necessary to reflect on the differences among crops.

An examination of the data by crops and livestock reveals differences arising from agronomic attributes of crops and livestock and thus differences of seed sources within the village and outside the villages (Figure 5). For instance, the fact that potato is readily available within the village is evident from the data. This is attributed to its agronomic attribute of being able to be re-planted from seedlings of previous harvest unlike the cereal based seeds for crops such as maize, or onion which are sourced through the market channels. As such, only a few cases of maize and onion are indicated to be sourced from the village via neighbor/friend network.

It is clear from the data that in the case of potato, the two sources i.e. neighbor/friend and relative/kin are very relied upon. The trend has been stable until the period 2001-2005 when there was sudden increase of the number of potato seeds from the two sources and suddenly decreasing in the following period especially the case of relative/kin sources. Even though only few cases, maize source is indicative of the two nation-wide droughts in 1984 and 2000 when government provided free seeds as indicated in the period 1981-1985 and 1996-2000. Similarly, farmer's cooperative was a source of livestock (cow) in form of Artificial Insemination (AI) services in the period 1981-1985 and 2001-2005.

A comparison of intra-village and outside the village sources of seeds over time is required to understand the dynamics of seed sources networks. Figure 6 shows outside the village sources of seeds and livestock over time. The findings further confirm the role of agronomic attributes in determining source of seed. In this case maize is shown to be sourced through market channels and the trend has been upward from 1981 to 2008. The case of onion portrays similar trends especially the exceptional increase in the number of seeds sourced from the market after 2006. The other notable case is that of cow which has been sourced from farmers from other places but the trend is not consistent.

The results from the foregoing analysis on information networks of seed sources have shown that seed flow is a complex process, influenced by a variety of agro-climatologic, economic and agronomical factors. The findings also suggest high dependence on market sources of seeds as necessitated by the economic reforms and less dependence on social relations such as kinship, neighbors and friends. High dependence on market mechanism is an evidence of farmer's exposure to variable market forces brought about by wider economic changes. The intra-village source of seed analysis has shown how agronomic attribute is important determinant of sources of seeds such as potato.

3.3 The Role of Regional System and Markets in Northeastern Slope of Aberdare

The social network component used in understanding coping and adaptation processes by smallholder farmers in Kabendera and Kiambogo in the context of economic changes and agro-climatic events is mediated by the geographical/regional system. The role of markets in this system has been shown as important to the farmers in selection of crop variety and livestock breed.

3.3.1 Geographical system and ecological gradient of interrelationship

In order to understand the geographical and/or regional system in which the rural livelihoods of smallholders in the two study sites take place, this section attempts a comparative examination of the ecological gradient of interrelationship defined by the Northeastern Slope of Aberdare. As mentioned earlier, both the study sites and the region as a whole display characteristic that gives rise to livelihood system interactions across the zones. This is the case especially during crisis times such as drought whereby upland and lowland farmers have economic, social, and ecological uni-directional relationships.

The approach used in this section aims to enhance understanding of the functioning of the regional system within which the two sites are located. Previous studies such as Ueda [25] contend that geography is an important

mediating factor of the impact of economic and natural conditions on local livelihoods. The current study takes the same view in arguing that areal differentiation within a wider regional system is an indispensable condition for intra-regional transfers of people, food, and goods which are generated, channeled and mediated through reciprocal social network and market mechanism.

A quantitative investigation into the nature and form of the flows existing in the study area is not possible due to lack of such data; however, in the following a qualitative analysis of interdependence across the zones of the slope is explored using information obtained from key informant interviews with commercial people such as shopkeepers, middle-men (brokers) in marketing of agricultural produce as well as observations made during the field survey.

The agro-ecological gradient differences between the two sites have led to complementary relationship among the studied settlements thereby connecting them and their surrounding areas in terms of agricultural produce, labor exchanges for food during drought, casual labor (paid), firewood, timber, trading commodities among others. Figure 7 shows the direction of flow using the arrow.

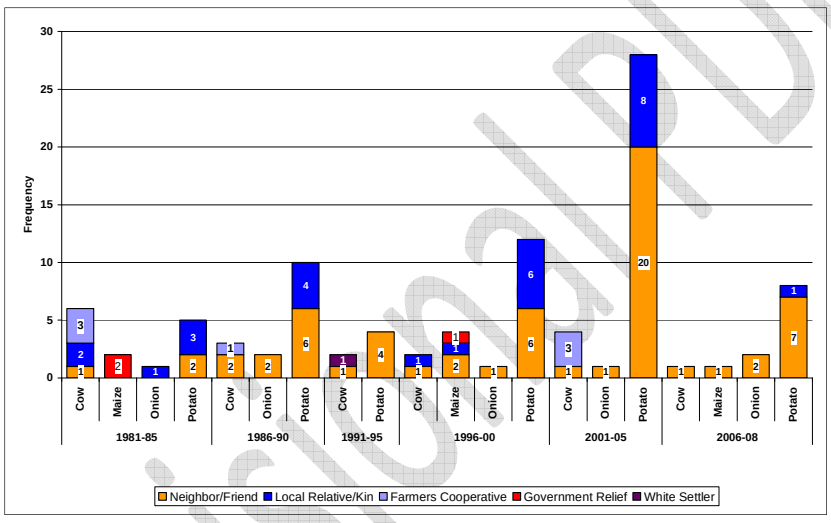


Figure 5. Intra-village sources of crop seed and livestock over time

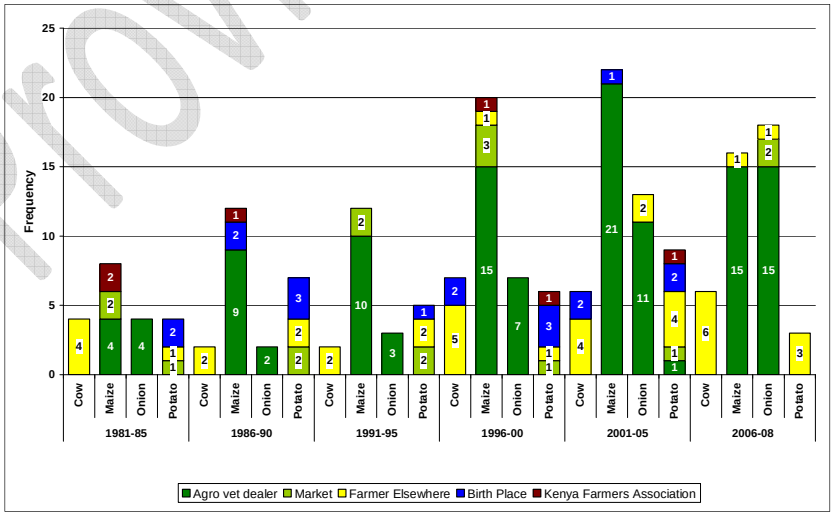


Figure 6. Outside the village sources of crop seed and livestock over time

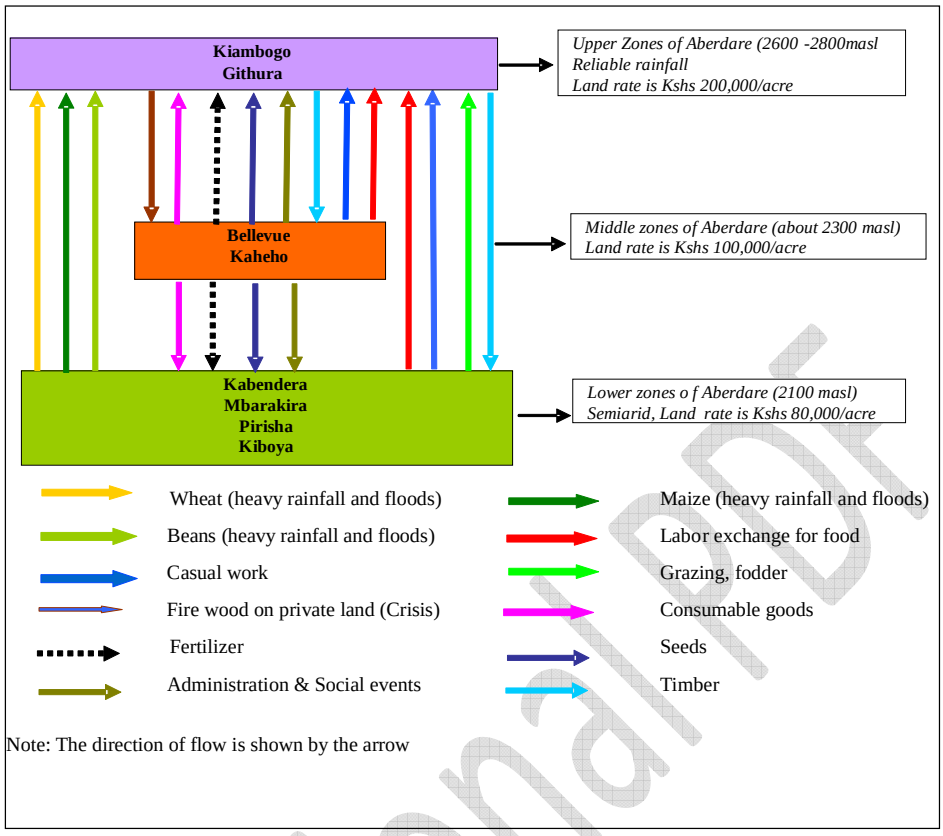


Figure 7. A Geographical system and ecological gradient of interrelationship between upper and lower zones of the Northeastern Slopes of Aberdare Range

Agricultural produce such as wheat, beans, and maize; flow from lower zones to upper zones of the slope especially during occasional heavy rains and coldest months of July and August leading to crop failure in Kiambogo. This is as a result of the agro-ecological suitability and adaptability of the crops. During drought events, labor in exchange of food, casual work and grazing (fodder) flows in the same direction from the lower to upper zone. In the reverse flow is timber for construction. As a local trading centre, Bellevue functions as provider of administrative, medical and social services to the surrounding areas. The administrative offices of Gataragwa Location and Kamaraki Sub-location are located in the centre hence the services of Chief and Assistant Chief respectively are available from the centre. A medical health facility, shops and local bars are found in Bellevue. As mentioned before, seed stockists such as Agro veterinary dealer shops and seed vendors locate their business in the area. The centre is therefore very important source of agricultural information to the farmers.

3.3.2 The market system in the northeastern slope of Aberdare

The economic reforms and particularly liberalization of commodity markets in the agricultural sector and the consequent withdrawal of the state from its traditional role of agricultural marketing, and stabilization of prices, protectionism and provision of basic services and agricultural inputs appears to have created two scenarios for the farmers in the research sites. On one hand, they are faced with agricultural input constraints and on the other, market reforms have led to profit-based farming which requires new strategies not only in improving agricultural production, but also in seeking new markets for their produce. As the crop and livestock selection experiences by the farmers have indicated, the emerging realities point to a shift from traditional subsistence-oriented farming to entrepreneurial or profit-driven farming which is dependent on market mechanism. An important feature of this dynamic nature of household livelihoods in the study sites is the

role commodity distribution channels play in sustaining the shift.

It is on this basis, that this section tries to shed some light on the aspect by focusing specifically on trading and marketing of agricultural/farm based produce. This is based on oral interviews and participant observation during the field survey. The purpose is to illustrate the role of middle-men as information sources for farmers with respect to crop and livestock selection. In order to achieve this aim it is better to first examine the commodity distribution channels through which the information flows.

3.3.2.1 The role of middle-men in marketing of agricultural produce

The value and existence of middle-men is appreciated when one looks at the risks they take and services they provide in the form of marketing functions they perform in moving the produce from farm to a wider market exposure. To get the agricultural produce to the end-user in the market is risk taking and requires expertise and resources which few farmer's have. In facilitating marketing of agricultural produce, middle-men play an equally important role of information channelling by bringing end-users and farmers together. Information about market forces of demand and supply is passed from market to the farm through the middle-men and ultimately influences farmers' decision in crop variety and livestock breed selection. In order to understand the functions of middle-men as conduits of information vital for crop selection, the study identifies three types of middle-men in the marketing channel which are described briefly using examples from the study sites, and thereafter an interpretation of their functions with respect to information on crop and livestock selection is attempted.

3.3.2.1.1 Type 1: Itinerant traders or wholesalers at the market place

These are business people in contact with either retail traders or end-users in various markets across the country. They have appointed brokers in different geographical areas who provide them with information about availability of agricultural produce in respective areas. As business people, they are risk takers and their sole aim is making profits. They are characterized by high investment in the business such as owning trucks for transportation among other investments required in performing their functions.

3.3.2.1.2 Type 2: Market brokers

Market brokers are the 'proper' middle-men and they have contacts with traders in markets spread over different geographical regions across the nation. Their function is to search for the produce on behalf of the traders in return for a commission. In the study sites they are found in trading centers such as Kiawara along the Nyeri-Nyahururu main tarmac road and Bellevue trading centre where they intercept the traders with trucks from larger markets in other areas (Map 1). Most of them have stores at the trading centres which act as collection points for agricultural produce after being gathered from nearby farm fields (Kiawara for Kabendera and Bellevue for Kiambogo) before being transported to the market. As discussed later in this section, they mediate and negotiate prices between farmers and traders. In the research sites, the name 'broker' connotes a negative image of being cunning. They are seen as idlers who gain from the sweat of farmer's labor.

3.3.2.1.3 Type 3: Farm gate broker or scout

The functions of farm gate broker or scout in the marketing system is important and they can be termed as scouts for the agricultural produce at the farm fields. They are usually residents in the locality and provide several services vital to the effective operation of the marketing system. Due to their familiarity with the locality, they know about which farmer has grown what type of crop and at what stage of maturity the crop is. The farm gate broker makes an important contribution to the marketing system by scouting/surveying for produce in the farm field, approaching the farmer to know the expected time of harvesting, collecting, grading and packaging the produce on behalf of market brokers from outside the locality; most of whom are not known by the farmers.

Having the basic information on functions of the middle-men, the attention now shifts to interpret the mundane issue of their role as information channels for crop and livestock selection. These are summarized in three features evident from the interviews carried out.

1. Areal differences in the geographical and/or regional system

   The marketing channels described above are sustained by areal differences in the geographical and/or regional system characterized by seasonality in producing

areas and specialization of markets. The interviews conducted with the middle-men revealed the geographical extent in terms of producing areas for instance; they mentioned that apart from Kieni West Division, the broad study area, other potato producing areas are Nyandarua, Molo, Nakuru, Mau, Timau among others. Similarly, the respondents talked about specialization of markets for instance in Central Province markets such as Nyeri Town, Kerugoya, Kirinyaga and Karatina were mentioned as being popular with white potato varieties. In Eastern Province, markets in Embu, Meru, Mwea, and Machakos were said to be destination for red potato varieties such as *Tigoni*. Such geographical extent and specialization of markets give rise to price differences for agricultural produce. As key players in the marketing system, the middle-men posses valuable information about demand and supply trends in the region and resultant price differences, when this information is shared with the farmers it influences not only their planning of agricultural calendar of activities but also decision on crop and livestock selection. Put differently, information on market opportunities for particular variety influences farmers' decision making of crop selection.

2. Price negotiation and profit assurance

Price negotiation and profit assurance is a complex and major part of the different stages of the marketing channel from the farm to the market. The interviews carried out revealed that advance payment (deposit), a form of commitment fee is paid to the farmer by the traders through the brokers. The rationality of this transaction was that it commits the trader to buy the produce even if the prices in market changes during the period of harvesting, this is especially the case for perishable crops such as onion and potato which are harvested once a trader is identified. The advance payment also enables the farmer to pay for casual labor involved in harvesting.

In the absence of standard units of measurement or weighing methods such as the case of potato and in an effort to assure profitability by the traders a sense of injustice and mixed emotions arise from the farmers. The brokers through their agents (scouts) seek to please their boss (traders) in order to be assured of future contacts. They use their services of grading and packaging to achieve this goal by rejecting poor quality produce and selecting the best such as grade 1 potato and onion in terms of size and quality or packaging the produce in excess. This does not augur well with the farmer who feels cheated and argues that by the sweat of his/her labor deserves to gain most from the marketing transactions of the produce. This was illustrated by one farmer' reference to the brokers and scouts as '*Hawa ni wezi wa viazi'* literally translated to mean 'these are potato thieves'. The complexity involved in marketing of some produce such as onion as described in the above example is an obstacle to some farmers who find it difficult to engage in the marketing transactions and hence influences the type of crop varieties they choose.

3. Role of technology

New technology such as mobile phone is useful in communicating information about prices in the market to the farm gate. This has reduced cost of transportation and time involved in physical movement and has improved on efficiency of information flow. The traders pass information about type of agricultural produce in demand and current prices in the market to brokers who in turn negotiate with farmers. Mobile phone banking popularly known as M-Pesa[4] is now being used by traders and farmers in payments and this has reduced the period of transaction and improved on level of trust between traders and farmers. The farmers can now confirm from their mobile handsets that the trader has deposited money in their account and then they commence the harvesting. This has facilitated quick access of cash by farmers. Although a new technology, it is becoming popular and relevant in determining variety choice especially for the market oriented crops as a result of the promptness of payment.

4 . M-Pesa is a mobile technology service that allows subscribers to make money transfers i.e. deposit and withdraw money from a network of agents that includes airtime resellers and retail outlets acting as banking agents and is available in rural areas such as the study sites.

4. CONCLUSION

This paper has discussed the role of social network, information sharing and regional system in maintaining the livelihood security in the two research sites. At first an attempt was made to understand migration patterns, kinship relations and emerging associational life for the interviewed households. Findings on the system of land management, ownership and inheritance show evidence that the traditional system of property (land) ownership has gradually transformed into individual property ownership whereby the functions of the traditional systems such as *mbari* have disappeared.

An examination of migration process and geographical dispersal of members of a household and/or spatial extension has shown that lack of land in the high agricultural potential areas of southern part of the former Nyeri District and availability of land in the low agricultural potential areas such as the study sites and the ensuing process of migration led to a breakdown of common household residence which was a basis for primary bonds and cohesiveness of the kinship system. As a result kinship relations have weakened and in their place emerged new associational life at the destination areas. Although the reliance on kinship networks has diminished over time some aspects of kinship relations still exist between relatives especially those who are residents of the new settlements such as through family get-together parties. Kinship ties are also relevant especially during crisis events such as death, land disputes which require intervention of kinship support. Although they still maintain contacts with their relatives in birth place, the frequency of visits to attend marriage ceremonies, death, land disputes etc has reduced due to the increasing demand for money and cost of transportation.

An attempt to understand the associational life of the immigrants in the two sites, in coping with and adapting to uncertainties in their new environment especially in the face of economic changes and agro-climatic events revealed the emergence of voluntary organizations whereby the migrants participate in local-based associational groups in the new settlements which have replaced the functions of kinship, market and the state in securing livelihoods for the smallholders although these are mostly restricted to welfare matters.

The other aspect investigated in this paper is networks of seed sources by the smallholder farmers. The findings attest to the fact that in the study sites, households are less dependent on social relations in provision of crop seed/varieties and livestock breeds and are highly dependent on market mechanism. However, as noted in the section on associational life this should not be misconstrued to imply that social network is not a relevant component of their livelihood security. They are continuously engaged in social learning process through social interactions or through observations made while walking through others fields and so forth. Daily life conversations are characterized by topics revolving around agricultural activities such as weather patterns, new seed varieties, market trends etc. The market mechanism has been shown to play an important role in seed provision an evidence of farmer's exposure to variable market forces brought about by wider economic changes. The results have shown that seed flow is a complex process, influenced by a variety of agro-climatologic, economic and agronomical factors. The findings also suggest high dependence on market sources of seeds as necessitated by the economic reforms and less dependence on social relations such as kinship, neighbors and friends. High dependence on market mechanism is an evidence of farmer's exposure to variable market forces brought about by wider economic changes.

Finally, the paper looked at the functioning of the regional system in terms of flow of goods as a result of local-level a real differences arising from the ecological gradient. A comparative examination of the agro-ecological gradient of interrelationship defined by the Northeastern slope of Aberdare such as in the two study sites revealed a complementary relationship among the studied settlements and their surrounding areas in terms of agricultural produce, labor exchanges for food during drought, casual labor (paid), firewood, timber, trading commodities among others. This is the case especially during crisis times such as drought whereby upland farmers have economic, social, and ecological relationships with lowland farmers.

The supporting role of market mechanism in this system was also investigated with regards to marketing of agricultural produce. Analysis of trading and marketing of agricultural/farm based produce identified three types of middle-men; traders, brokers and farm gate scouts, as information conduits for farmers with respect to crop and livestock selection. Information about market forces of demand and supply is passed

from market to farm through the middle-men and ultimately influences farmers' decision in crop variety and livestock breed selection.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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