Mapping Poverty, Vulnerability and Resource Rights in Kilindi District, Tanzania

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Abstract

The main objective of the study was to map poverty at sub-village and village levels in Kilindi District in Tanga region, Tanzania. Disaggregated poverty maps like these are very useful in showing the spatial distribution of poverty at micro level which can lead to effective poverty reduction intervention measures. A sample of 391 households was collected from five villages located along the road and off-road of Handeni-Songe road. The poverty mapping results indicated that the study villages had better food security because of adopting new varieties of crops especially beans followed by asset and income poverty indicators. Medium poverty was observed in energy and transport. However, the villages had very high poverty in health and sanitation and so require more intervention measures from the Government and Civil Society Organizations. The overall poverty mapping indicators showed that Mafisa Village was better off when compared to other villages in terms of poverty. The level of poverty was very high in Kibirashi and Balang'a villages which had a high proportion of Maasai pastoralists.

Introduction

Aggregate national level indicators of development often hide important differentials between regions or areas which make the analysis of poverty, its determinants and poverty reduction interventions to be a little bit difficult. It is this intrinsic problem which has necessitated the use of poverty information which is further geographically disaggregated to ward or village level (World Bank 2007; Mbonile 2008)). On the other hand, poverty maps are spatial representations of poverty assessments and this information usually comes from a variety of indicators of poverty such as GDP per capita, means of livelihood, life expectancy, child mortality and literacy rates. Moreover, disaggregated poverty maps can be used to plan sectoral investments by showing where needs are high and so that policy makers can focus where there are scarce resources (Kristjanson et. al. 2006; Mathew et al. 2014).

Besides this poverty maps allow easy comparison of indicators of poverty or well being such as access to infrastructure, services, availability of natural resources, and distribution of transport and communications facilities. They, also, provide information on the spatial distribution of poverty where targeting of intervention or development projects can be done. In addition GIS based poverty analysis makes easier the integration of poverty data from various sources and Geo-referenced information sets free the analysis from restrictions caused by fixed geographical boundaries (Kristjanson et. al. 2006, United States Census 2015).

Meanwhile poverty is deprivation of common necessities that determine the quality of life like food, clothing, shelter and safe drinking water. It may, also, include the deprivation of opportunities to learn, to obtain better employment to escape poverty (World Bank 2007, Orshansky, 2005). Moreover poverty can be measured in terms of absolute or relative poverty. Absolute poverty refers to a set standard which is consistent over time and between regions of the same country (World Bank 1996).

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Vulnerability to Poverty

Vulnerability to poverty is usually defined in economics as having a high probability of being poor and it is largely determined by the ability of households and individuals to manage the risks they face (Dercon 2001). Despite the fact that vulnerability is a dynamic process in that it is concerned with the potential future welfare status of individual and households. Also, it gives useful insights in accounting for why households and individuals are predominantly poor or not poor at a particular time (Alwang et. al. 2001, Benson et. al 2006).

To what extent households or individuals are exposed to shocks or risk is an important consideration in assessing their vulnerability to poverty. These risks may be events that affect the population broadly or those that affect individuals or households randomly. Multiple risks that affect specific areas or spatially defined segments of the population are the easiest to bring into a spatial analysis. Shocks like epidemics, drought and flood can be mapped to show the most risky areas (Benson et. al. 2006).

The Methods of Poverty Mapping and Data Collection

As observed by Davis (2003) a variety of methods for spatial location of the poor have been put forward in practice. These include the small-area estimation which is a statistical technique that combines survey and census/survey data to estimate welfare or other indicators for disaggregated geographical units such as districts or municipalities or rural communities. The other method is by measuring the household or community status by using income measures or consumption expenditure. The outcome variable in this analysis is the household well-being or livelihood. Hence various asset variables can be considered in the calculation of wealth index such as building quality (roofing, wall, floor and extra house), consumable durables (iron sheet, wooden bed, spongy mattresses and watch/wall clock) and communication means (radios, bicycles). The asset takes the value of one if it is owned and zero if otherwise in this procedure.

The result of principal component is an asset index and it is for each household (Aj_0 based on the formula:

$$A\,j = f1\ (fji\text{-}a1) / (S1) + \ldots.. fN\ (ajN\text{-}ajn)/(SN)$$

Where

Aj = index for each household

f = is the scoring factor for the first asset as determined by the procedure.

Aj1= the jth household value of the fist variable (one or zero)

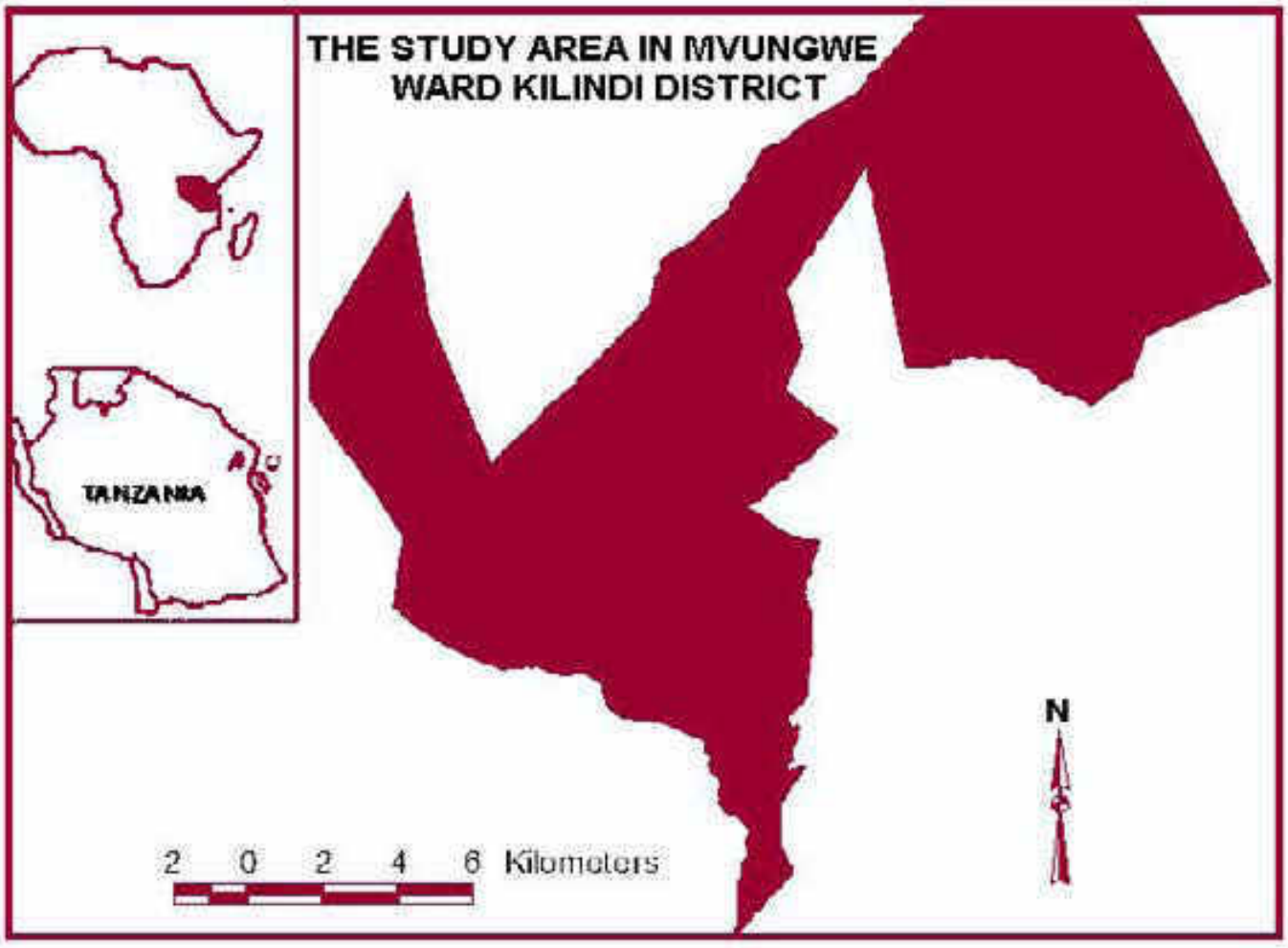
a1 and **S1** are the mean and standard deviation respectively of the value on the asset variable over all households.

N is the number of households in the study area.

After close monitoring of variables for more than five years in this study the calculation of socio-economic indicators were based on the frequencies which were regressed in the formula item by item and later for easy readability and interpretation it was classified from 0 when there was no poverty to 100 when somebody or village is extremely very poor. In order to compare the level of poverty from one sub-village to another and from a village to another village, the 0 to 100 poverty index units were divided into five classes of poverty: very low poverty to very high poverty (Map1-17). Similar class range was used for easy across indicator comparison. An indicator with poverty index value ranging from 20 to 40 shows that, with respect to that indicator, the population is relative less poor at that location compared to an indicator with poverty index value ranging from 60 to 80. In addition to across category comparison the within category was performed using a compound poverty index that indicate the overall poverty

per village by individual indicator range and level. The within poverty comparison was divided into four classes, ranking from low to very high poverty . While the within category classes of low or high poverty cannot be comparable to across category classes but the values are comparable and allows an easy ranking of poverty (Table 4)

Figure 1: The study location in Tanzania



This study was conducted in Mvungwe ward Kilindi District in North Eastern Tanzania. (Figure 1). Poverty was mapped at village level and t village level poverty mapping exercise required the consideration of two scenarios. First, the construction of maps that would enable a comparison of poverty levels between villages. This was achieved by selecting villages within ward(s) that were contiguous. Secondly, to capture within a village variations in poverty levels, village maps with sub-villages (*Kitongoji*) were required. Mvungwe ward was selected out of 15 wards for mapping village level poverty. The selection of villages in this ward considered their contiguity and varying accessibility. The four villages were Kibirashi and Mafisa located on the Handeni – Songe road, and Gombelo and Balang'a located off the main road. The sub-village (*Kitongoji*) was the lowest unit for mapping poverty. The selection of the sub-villages considered representation of the socio-economic features of a village such as crop and livestock keeping communities (Table 1).

Table 1: Number of Sub-villages and Selected Sub-villages

Village	Number of Sub-villages	Selected Sub-villages
Balang'a	11	Mnadani Kijiweni Jungu Kitinge Lekitinge
Gombelo	6	Madukani Kwediteli Mtego Kiwanja cha Ndege Komhigo
Kibirashi	11	Chanika Hoza Elerai Loriparaku Mkondoa
Mafisa	5	Madukani Siki Lamba

Household Sampling

In each sub-village a sample of households for administering the questionnaire were selected. The sample size was guided by taking 20% of the number of households in a sub-village. The individual households were drawn using a systematic random sampling. A list of households was obtained from the chairperson of the sub-village (*Mwenyekiti wa Kitongoji*). The first household was selected randomly and the others were drawn systematically at an appropriate interval (See Table 2).

Table 2: Sub-villages and Number of Sampled Villages

Village	Sub-villages	No. of HHs	Sample size
Balang'a	Mnadani	65	14
	Kijiweni	76	14
	Jungu	256	32
	Kitinge	81	16
	Lekitinge	110	22
Gombelo	Madukani	155	31
	Kwediteli	140	28
	Mtego	55	11
	Kiwanja cha Ndege	139	28
	Komhingo	136	27
Kibirashi	Chanika	115	33
	Hoza	60	11
	Elerei	115	19
	Loriparaku	117	7
	Mkondoa	65	13
Mafisa	Madukani	262	30
	Siki	352	37
	Lamba	196	18
TOTAL		2,496	391

Focus group discussions were held at district and village levels in order to explain the objectives of the study and collect views, perceptions and vulnerability to poverty. At village level the discussion groups were composed of members of the village government, experts (teachers, agricultural extension workers, health officers and development officers), elders, and youth and women representatives. The discussions at village level focused on the identification of indicators of poverty, causes of poverty and coping strategies. Also, it involved discussions with key informants such as agricultural extension officers, head teachers, village executive officers and elders who provided valuable information on poverty indicators, causes and coping strategies. Key informants, also, participated in guiding researchers in the identification of land marks, units for mapping. The village executive officer provided village level data on poverty indicators.

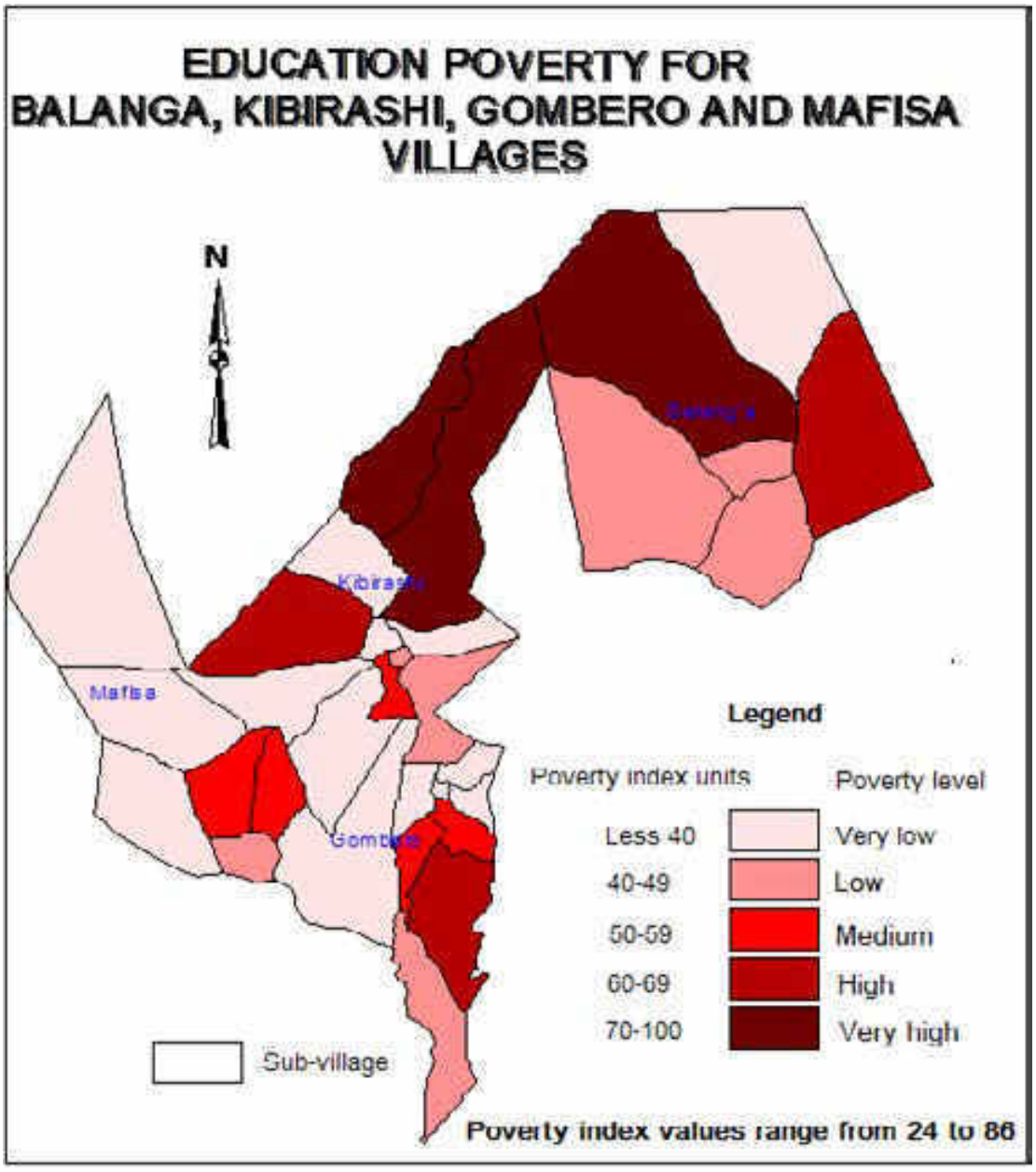
Household interviews were undertaken and a total of 391 questionnaires were administered. The data collection tools included a questionnaire, checklists for key informants; a GPS for recording locations for mapping. The data from the questionnaire was coded and processed by using SPSS for quantitative analysis. Frequencies and cross-tabulation were used to establish variation by village and sub-villages poverty indicators. The index for mapping were computed and used to portray variations in poverty levels. GPS data records were used to demarcate boundaries and establish mapping units (village and sub-village village levels).

Mapping Poverty and Vulnerability by Village

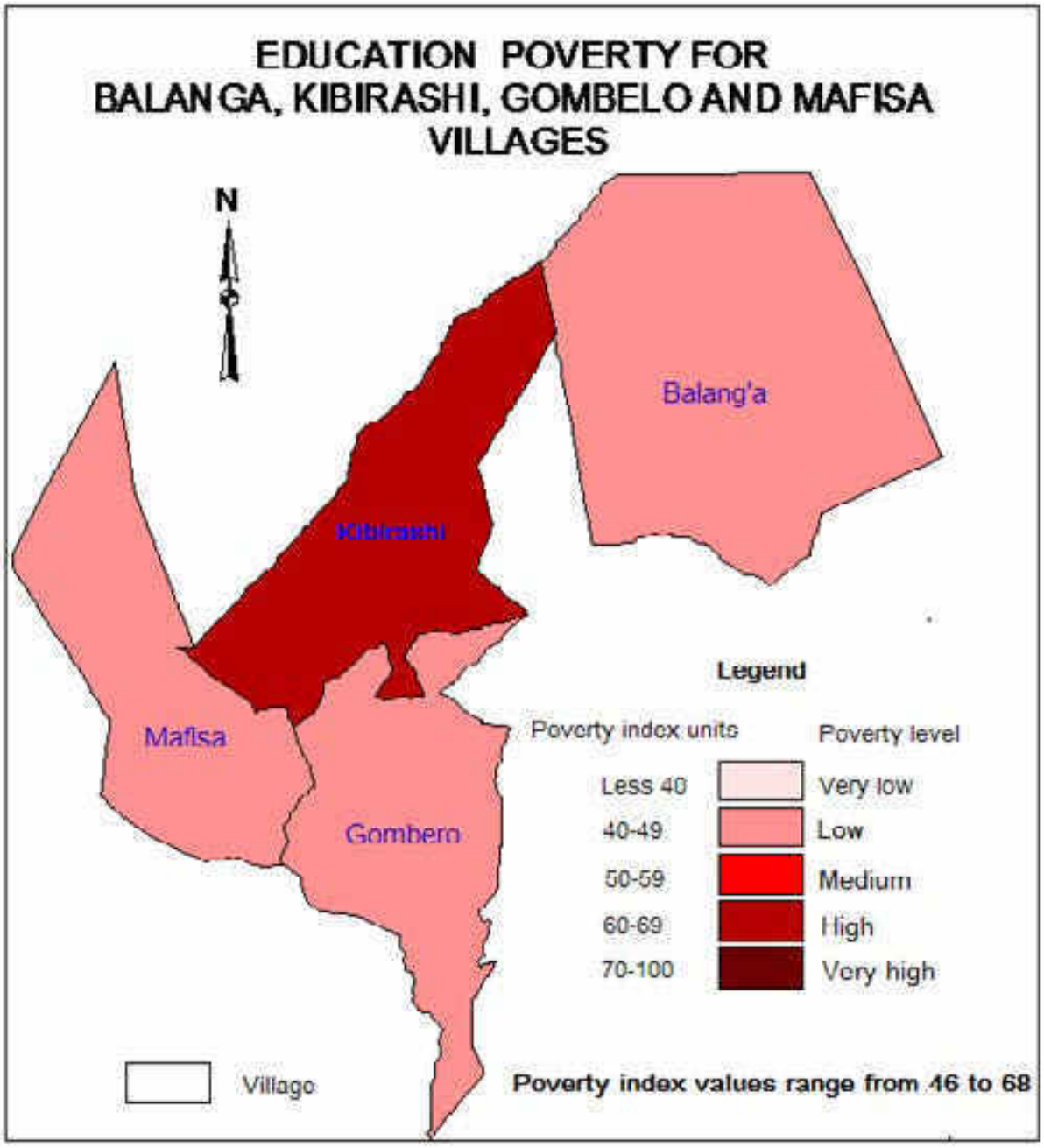
Education Poverty Indicators

Agenda 21 Millennium Development Goals and Tanzania Vision 2025 have identified education as an essential tool for achieving sustainable development (UN 1992, 2000; URT 2000). The study of education poverty indices (number schools and educational attainment in primary and secondary education) indicates that educational poverty very high in Jungu and Lekitinge sub-villages in Balang'a Village and Hoza, Elerei, Loriparaku and Mkondoa sub-villages in Kibirashi Village. Meanwhile in Gombelo Village Kwediteli, Kiwanja cha Ndege and Komhingo sub-villages had high educational poverty. In Mafisa Village Siki and Lamba sub-villages had high educational poverty. Overall the educational indicators showed that educational poverty was very high in sub-villages where the pastoralists population of Maasai is very predominant when compared to sedentary population sub-villages (See Maps 1). Nonetheless, when the educational poverty indexes were disaggregated at village level Kibirashi village with more pastoralists' population emerged very clearly that it had very high educational poverty followed by Gombelo and Mafisa Villages with medium educational poverty while the lowest educational poverty was experienced in Balang'a Village (See Map 2).

Map 1: Education Poverty Index by Sub-village



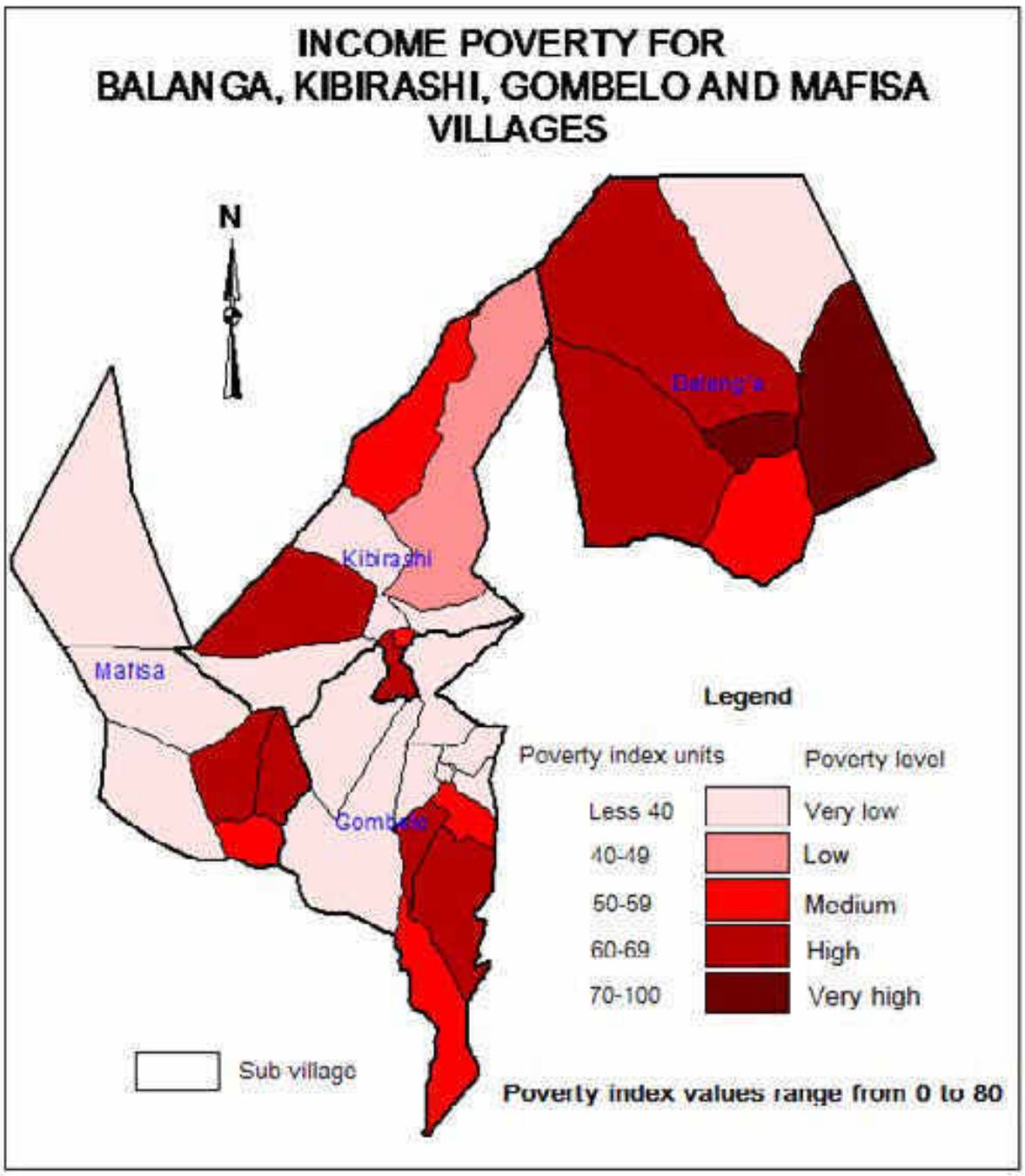
Map 2: Education Poverty Index by Village



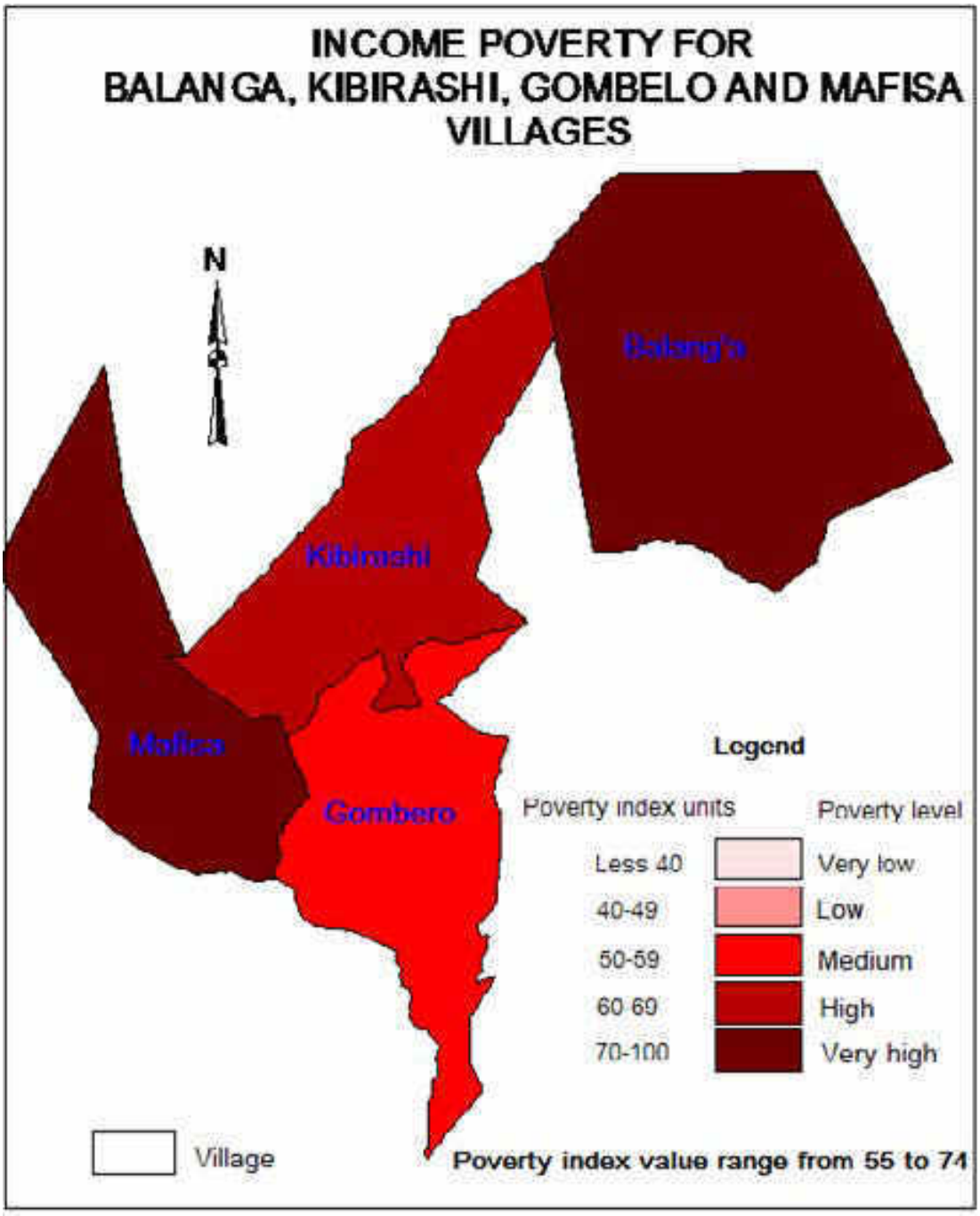
Income Poverty Indicators

Households and individuals can be aggregated poor or not poor at a particular point in time by using a few selected socio-economic indicators. In terms of income poverty indicators were very high in all the sub-villages in Balang'a, Kibirashi, Gombelo and MafisaVillages indicating that most households are poor were living at subsistence level (See Map 3). As a whole when the same poverty indicators were further disaggregated at village level income poverty was very high in Balang'a and Mafisa Villages while in Kibirashi village it was medium. Meanwhile Gombelo village had a low income poverty level (See Map 4).

Map 3: Income Poverty Index by Sub-village



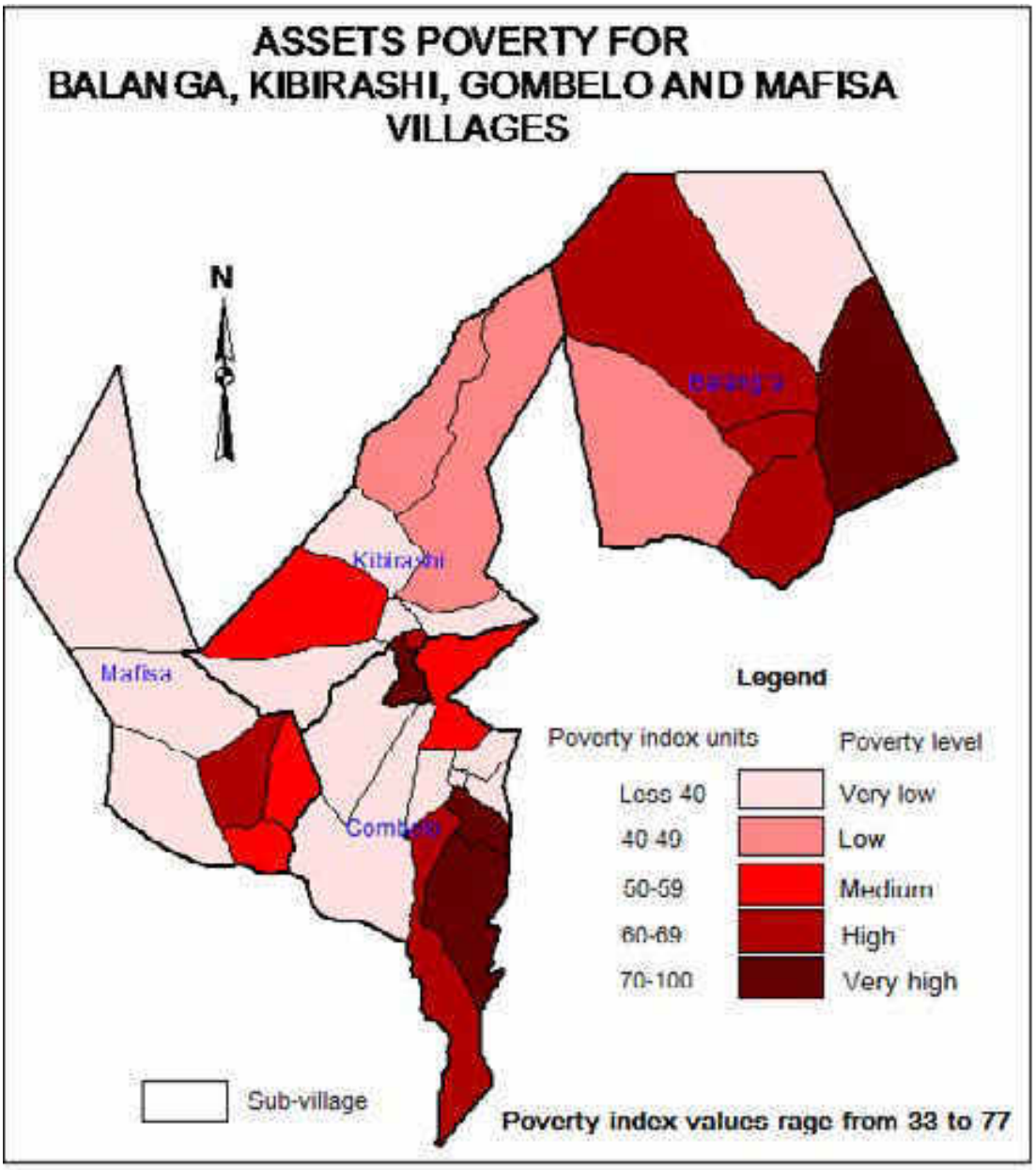
Map 4: Income Poverty Index by Village



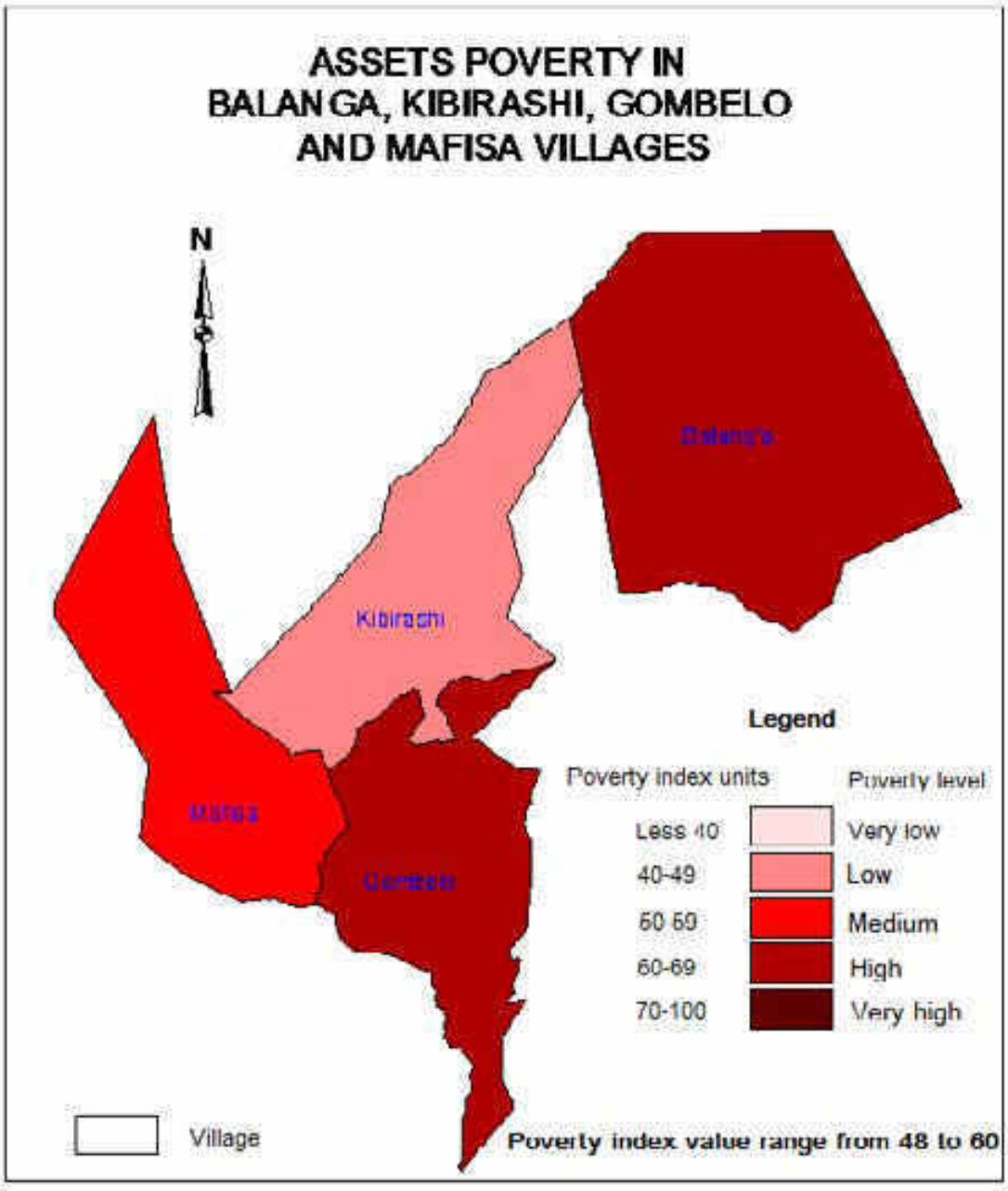
Asset Poverty Indicators

Asset ownership is one of the major indicators of poverty in the society. Usually rich households own property wealth of several billions of money while poor households own simple tools used to sustain their livelihoods (World Bank 2015). Asset poverty by using properties like hand hoes, radios, mobile phones and others indicated that pastoralists sub-village like Elerei, Loriparaku and Mkondoa in Kibirashi Village had low asset poverty because they manage to buy them when they sell their livestock in weekly markets (*magulio*). Almost the same situation appeared in sub-villages with trading centres like Mnadani (Balang'a Village), Mtego (Gombelo Village), Chanika (Kibirashi Village) and Mafisa Madukani (Mafisa Village) (See Map 5). Moreover, when the asset poverty indicators were disaggregated at village level the level was very high in Balang'a and Gombelo villages while it was medium in Mafisa and it was low in Kibirashi Village (See Maps 6)

Map 5: Asset Poverty Index by Sub-villages



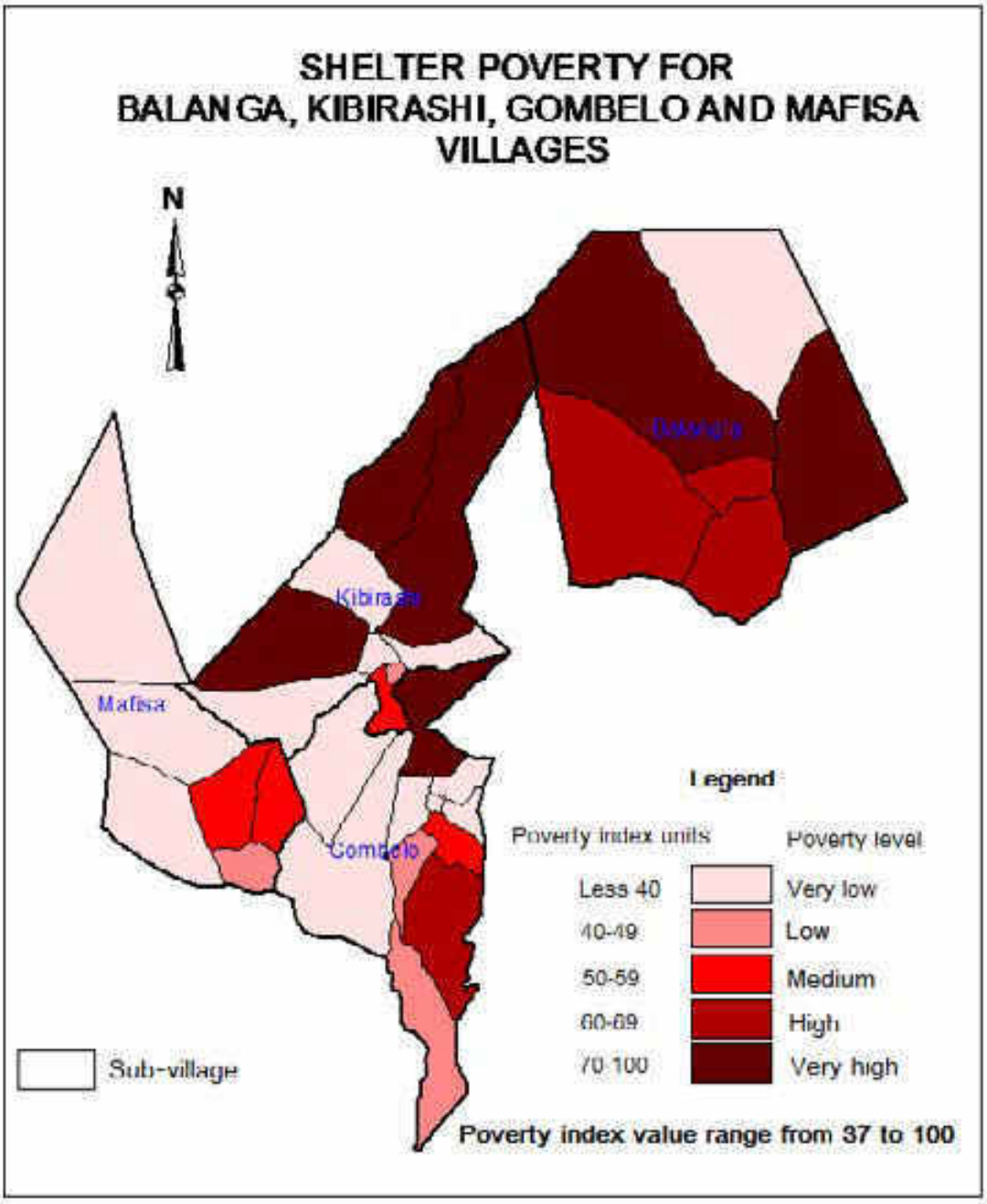
Map 6: Asset Poverty Index by Village



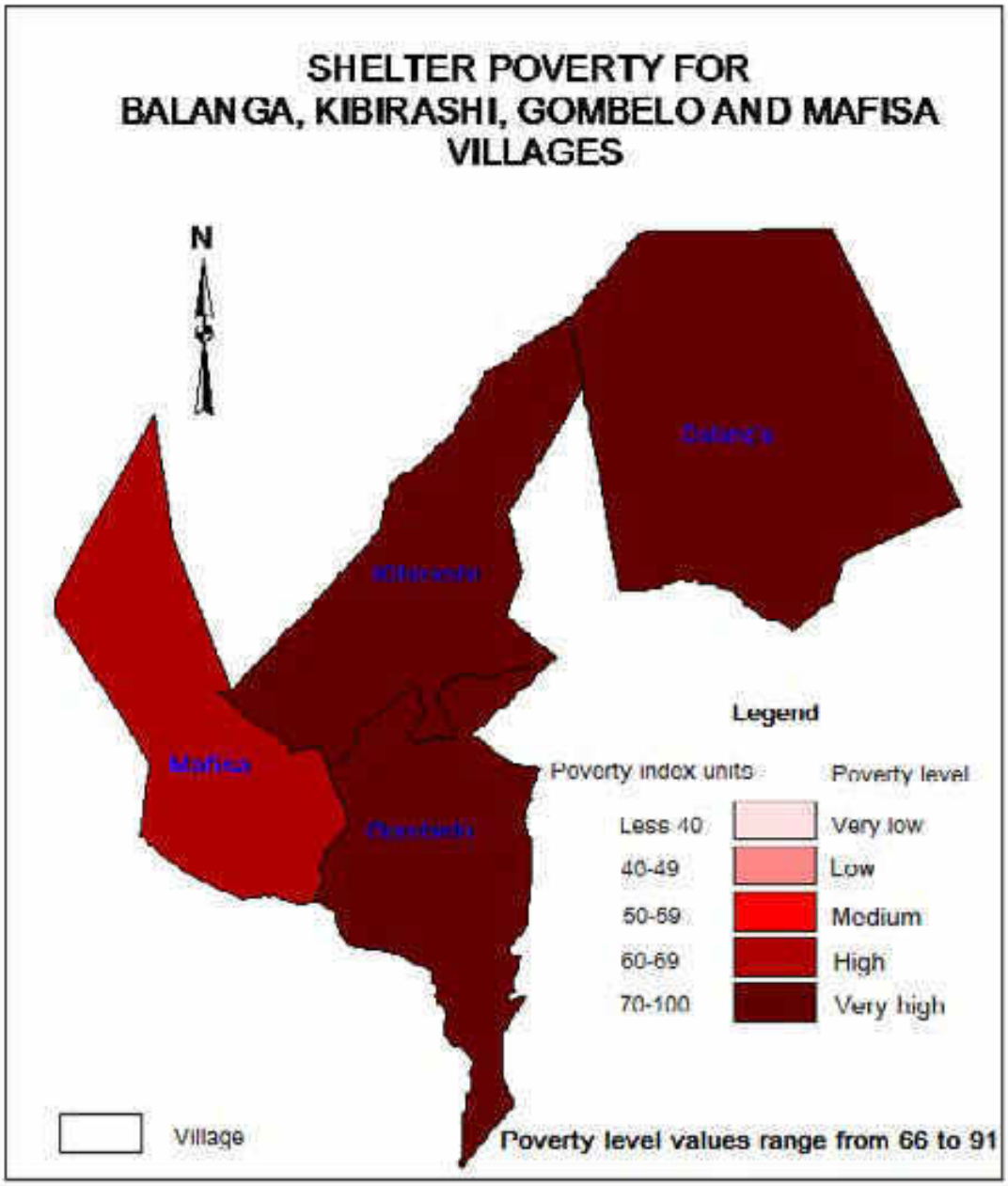
Shelter Poverty Indicators

One of the major Millennium Development Goals (MDGs) on shelter conditions is the improvement of rural housing from the present situation of using poles and mud to houses constructed by concrete/baked bricks for residential housing (UN 2000) The shelter poverty indicators such as the use of cement, burnt bricks and iron sheets is extremely low in nearly all sub-villages except in few sub-villages with trading centres such as Gombelo Madukani (Gombelo Village and Chanika (Kibirashi Village) (See Map 7). At very level the shelter poverty was very high in Balang'a village, medium in Kibirashi Village and low in Gombelo and Mafisa Villages (See Map 8)).

Map 7: Shelter Poverty Index by Sub-Village



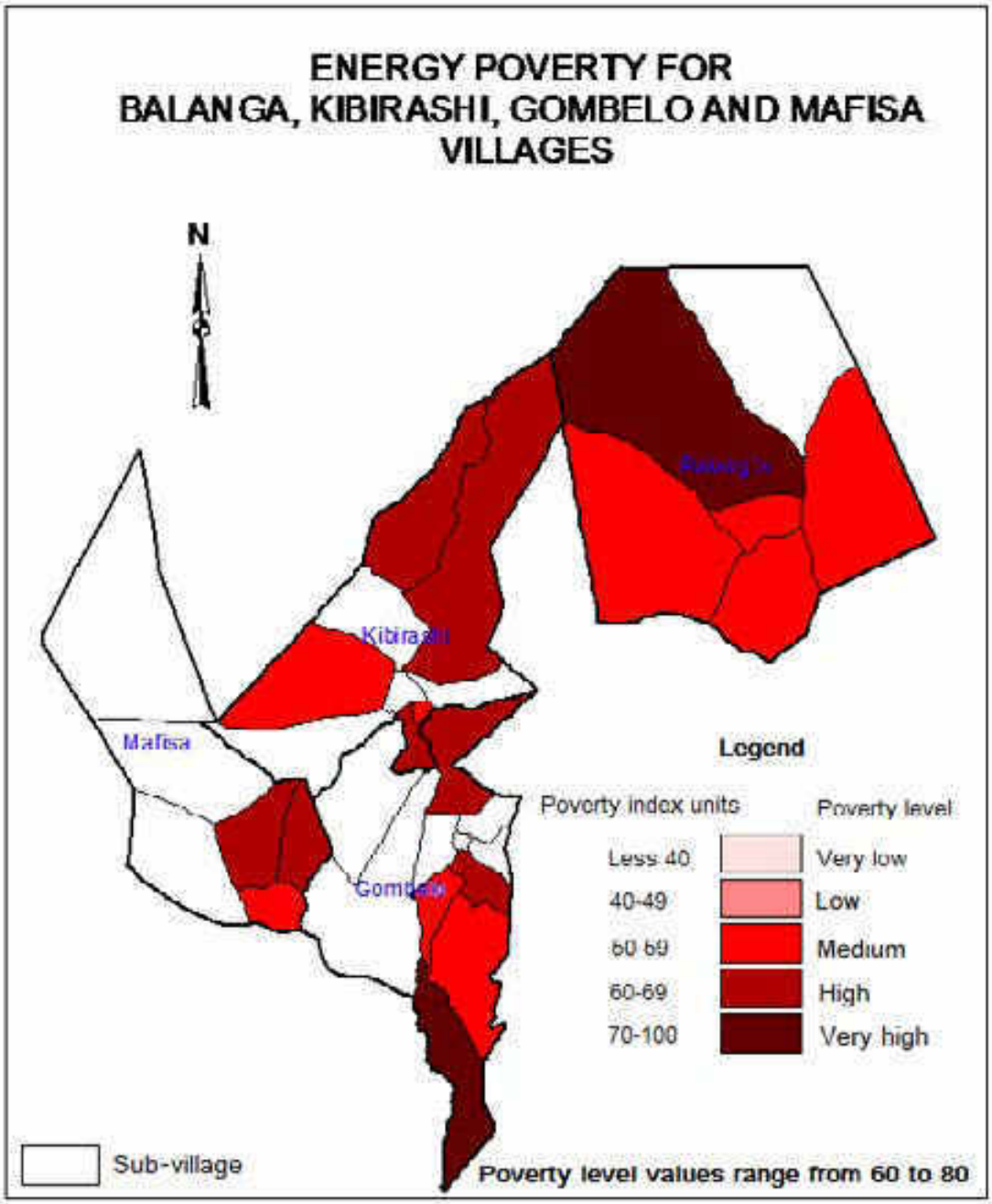
Map 8: Shelter Poverty Index by Village



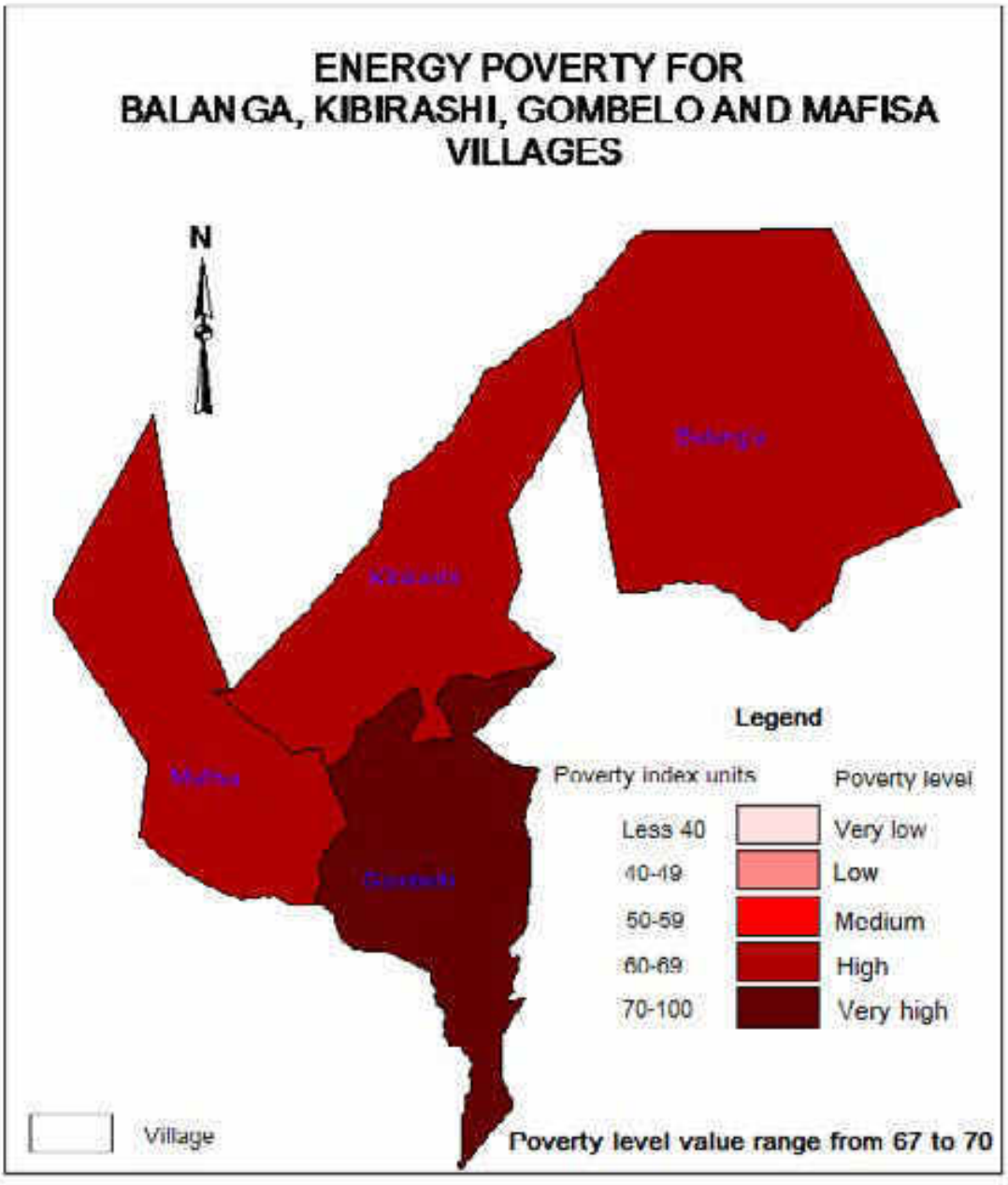
Energy Poverty Indicators

The main objective of any power supply policy is to reduce the over-dependency of households on traditional natural power supply resources like firewood which have proved to be detrimental to the environment (URT 2003). The energy poverty indexes were measured by sources of energy such as firewood, kerosene and biogas. The indexes showed that due to heavy dependency on firewood as the main source of energy poverty levels were very high in all the sub-villages like Siki in Mafisa Village, Gombelo Madukani in Gombelo Village (See Map 9). When these indexes were disaggregated at village level the energy poverty level was very high in Gombelo Village, medium in Kibirashi Village and low in Mafisa and Balang'a Villages (See Maps 10).

Map 9: Energy Poverty Index by Sub-village



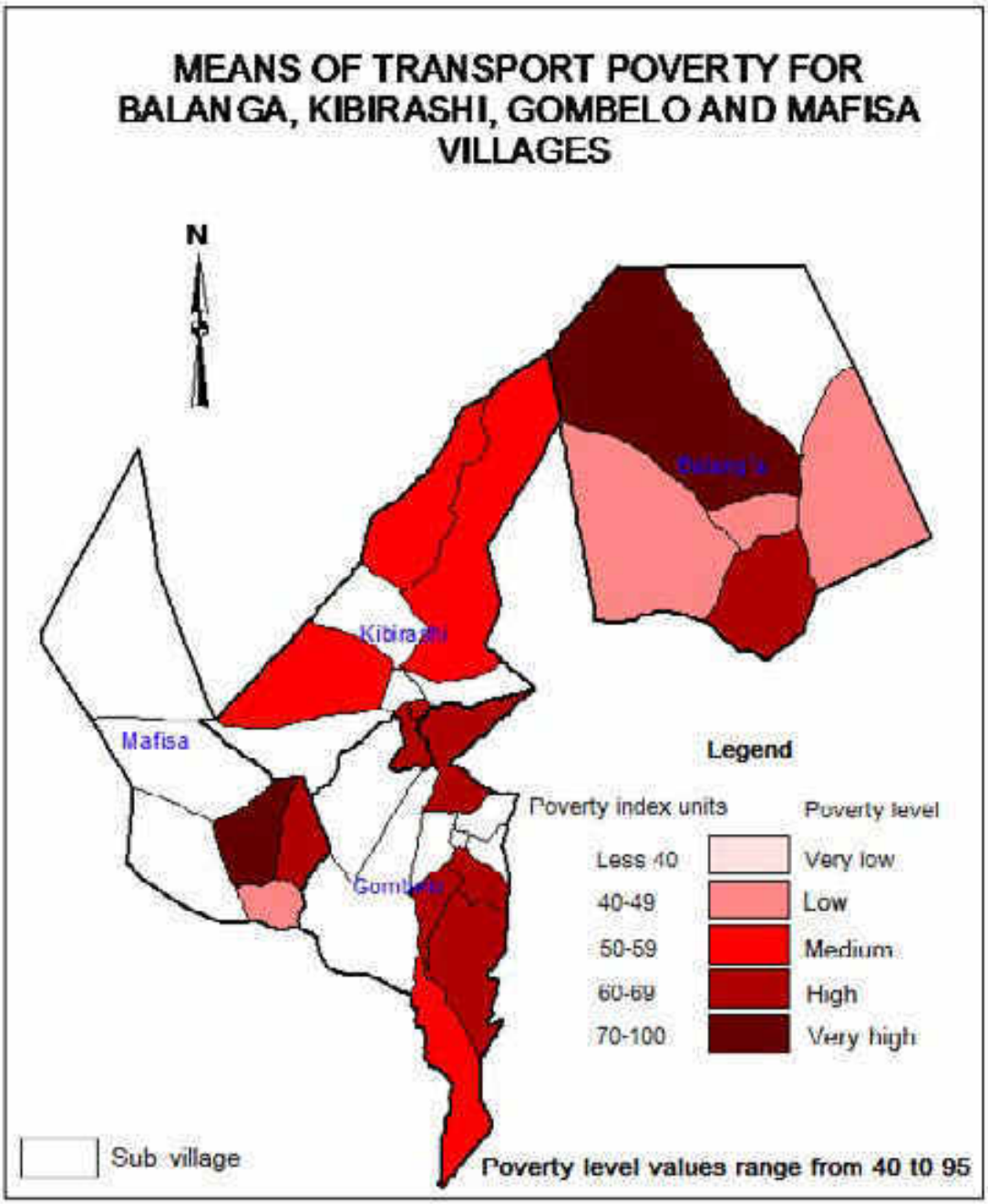
Map 10: Energy Poverty Index by Village



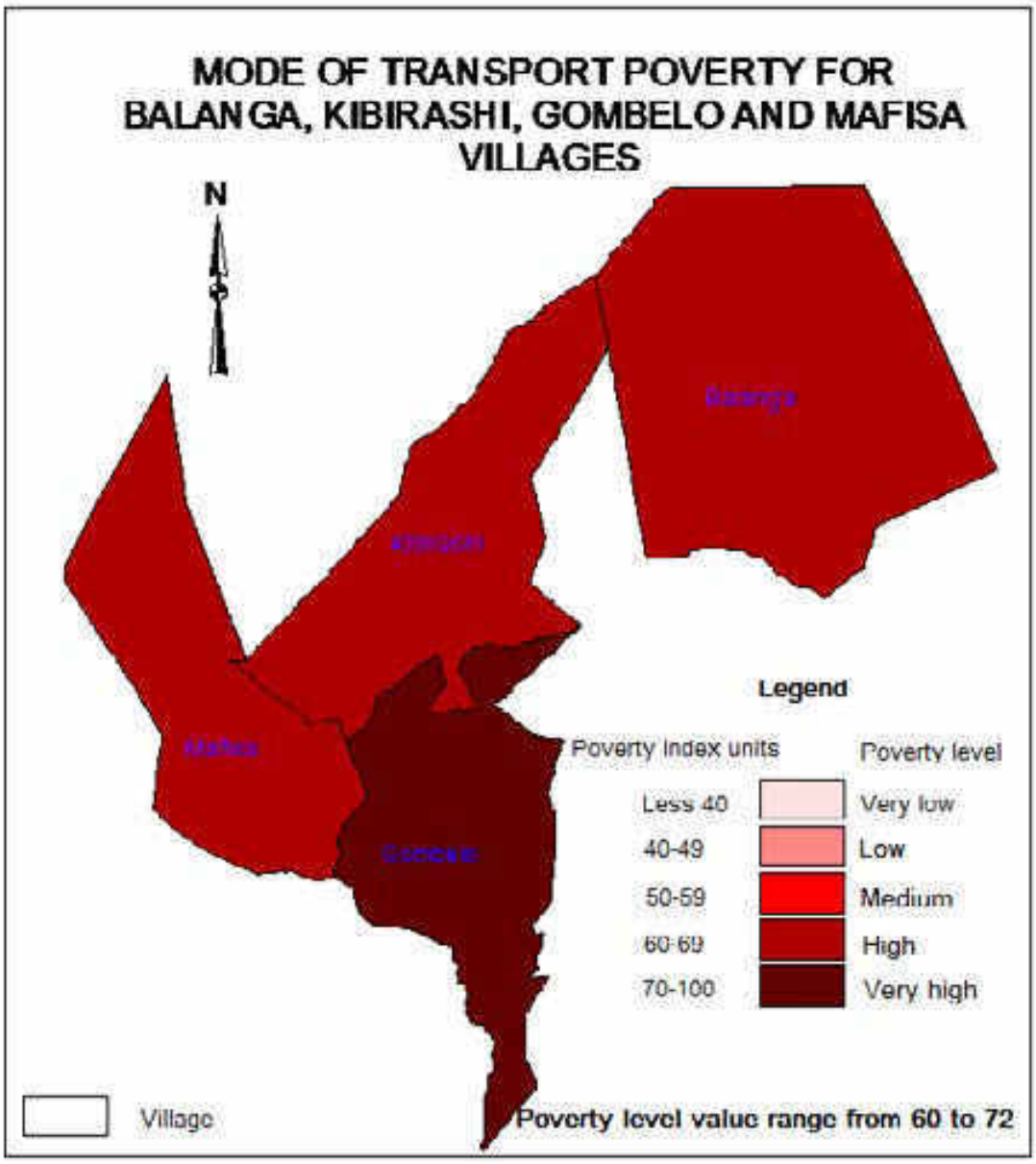
Transport Poverty Indicators

One of the major tools of development is transport which links rural areas with urban areas or links households with the market (Bart, et.al. 2006; REPOA, 2005). There was a vivid effort in most villages to use a bicycle as a quick means of transport especially in sub-villages with trading centres like Chanika in Kibirashi where some young people have also bought motorcycles for ferrying people from one place to another, the transport poverty level is medium and low in several remaining sub-villages (See Map 11). The disaggregation of transport poverty indicators at village level showed a very high poverty level in off-road villages like Gombelo, high in Mafisa Village, medium in Kibirashi Village and low in Balang'a village (See Map 12).

Map 11: Transport Poverty Index by Sub-village



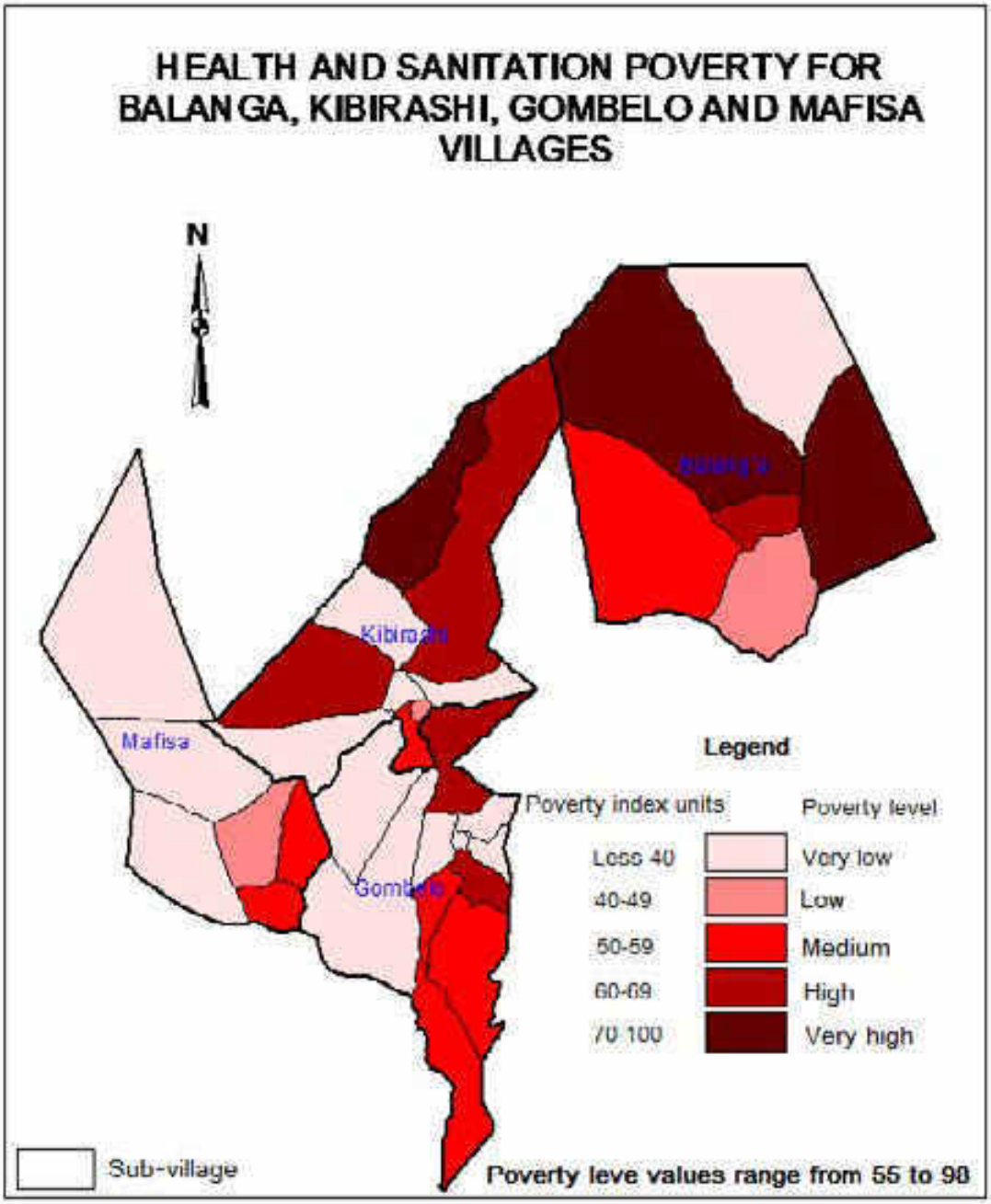
Map 12: Transport Poverty Index by village



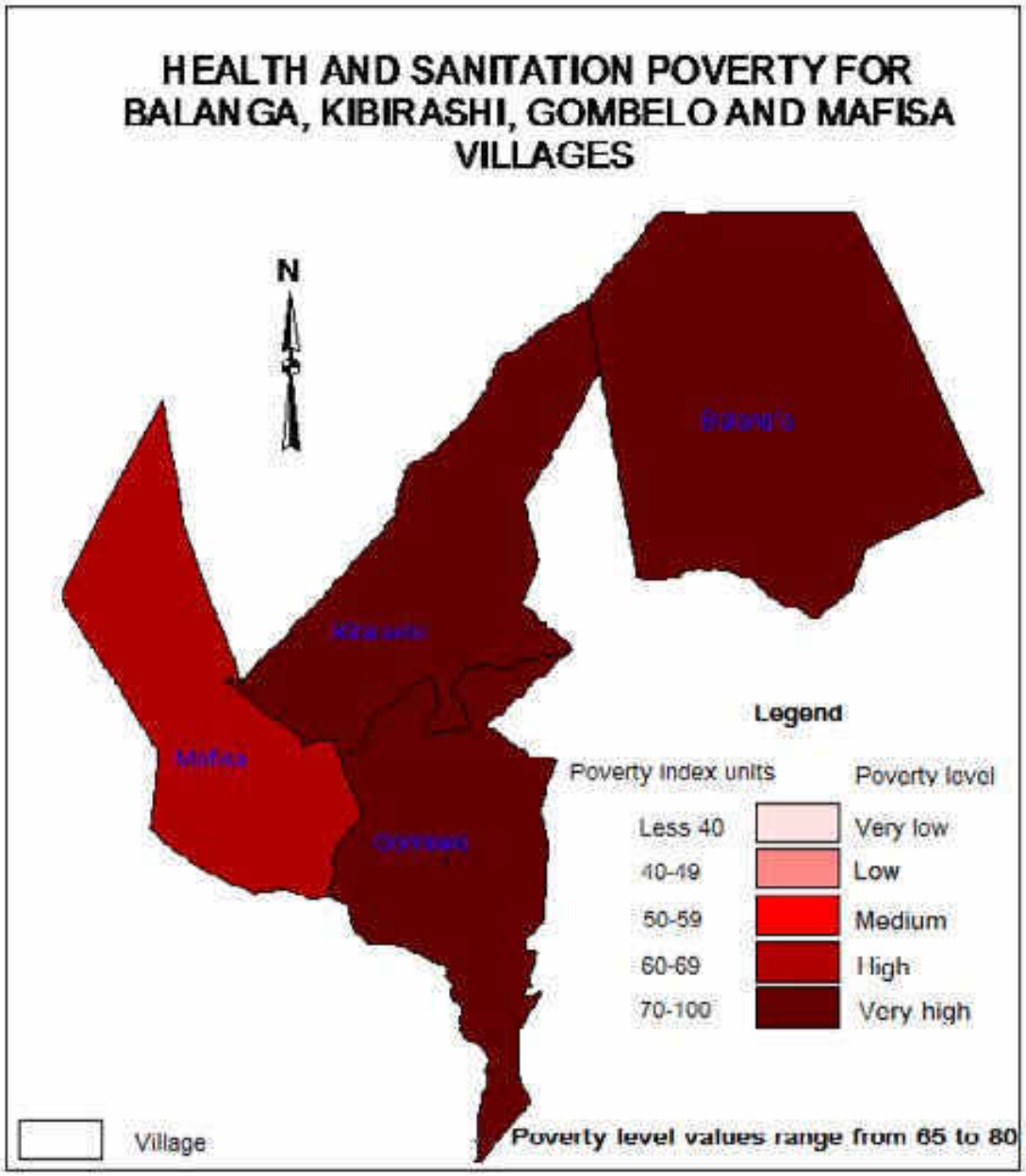
Health and Sanitation Poverty Indicators

The sanitation and health conditions of any human settlement have a direct impact on the livelihood of the people (Mbonile & Kivelia 2008). The sanitation and health poverty indicators (use of toilets and vulnerability to malaria) showed that health and sanitation poverty indexes were very high in sub-villages like Kijiweni in Balang'a Village, Kiwanja cha Ndege in Gombelo Village where the sub-villages were vulnerable to infectious diseases like typhoid and dysentery because of high level of using the bush as a toilet (See Map 13). At village level the health and sanitation poverty level was very high in Balang'a Village, high in Kibirashi Village, medium in Gombelo Village and low in Mafisa Village (See Map 14).

Map 13: Health and Sanitation Poverty Index by Village



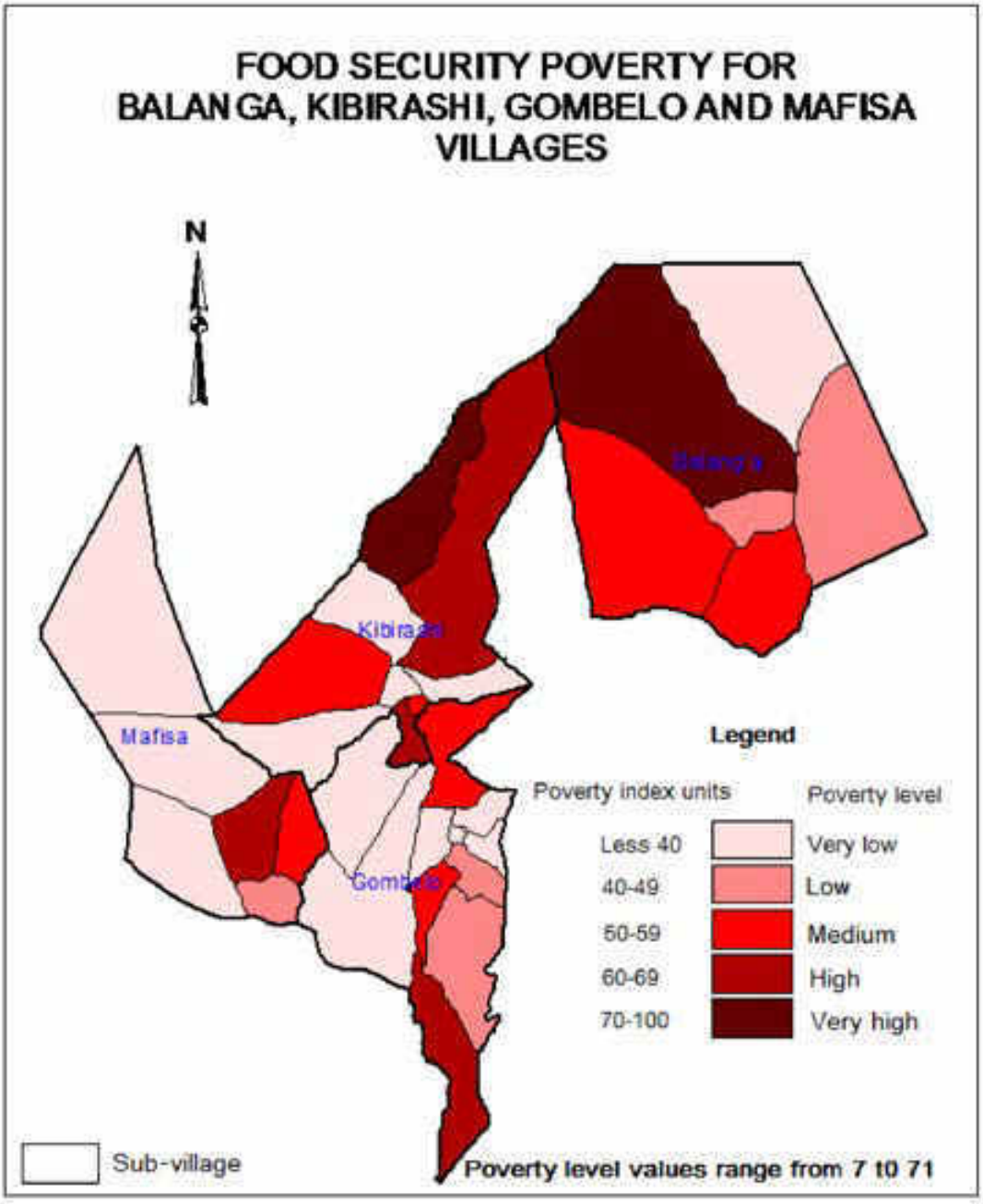
Map 14: Health and Sanitation Poverty Index by Village



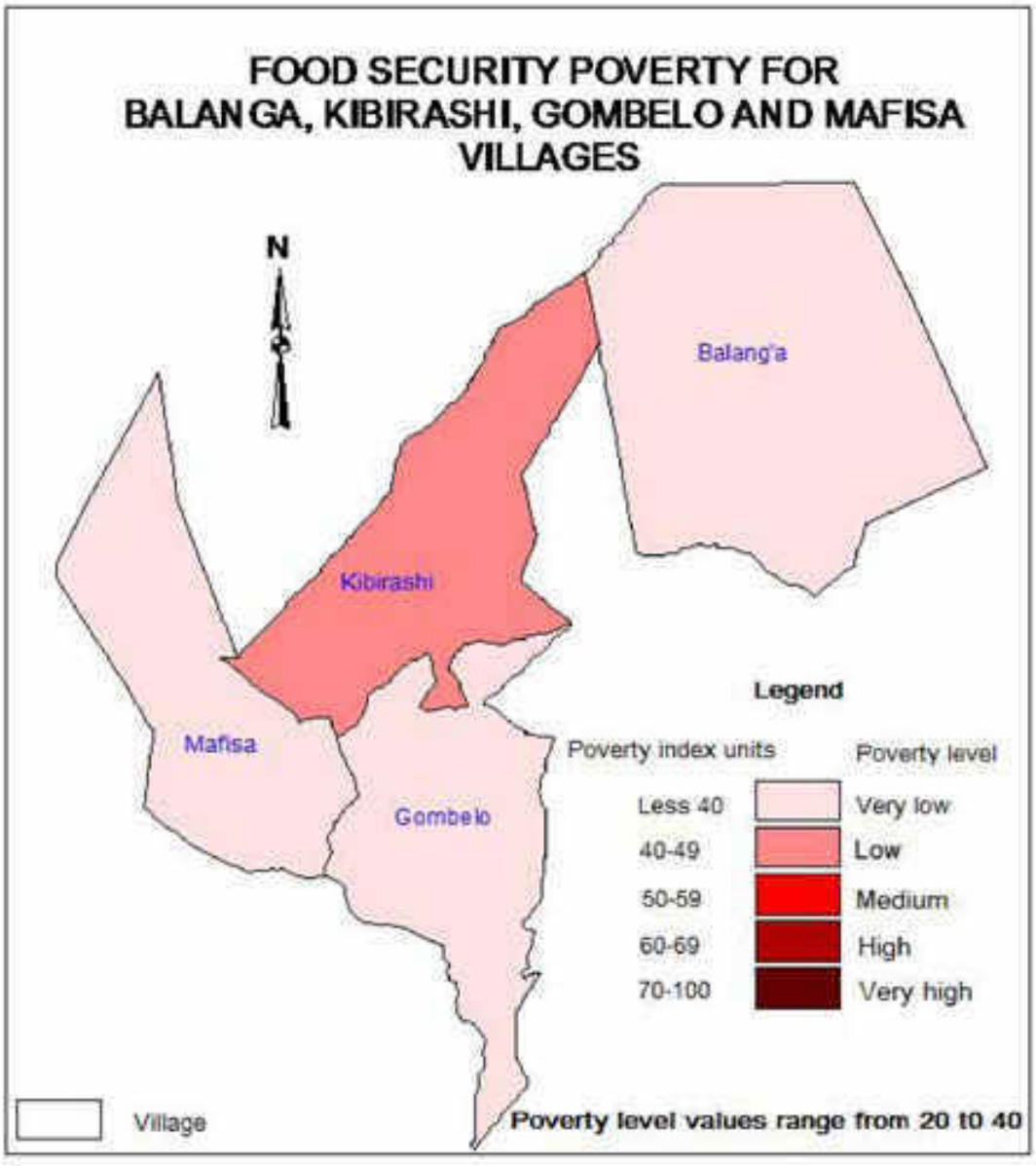
Food Security Poverty Indicators

Food security refers to the availability of food and one's access to it and a household is considered food secure when its household members do not live in hunger or fear of starvation(FAO, 2003). The food security poverty indexes showed that food insecurity was low in most of the sub-villages except for sub-villages such as Lekitinge in Balang'a Village and Loriparaku in Kibirashi Village which are largely habited by pastoralists (See Maps 15). A disaggregation by village indicated that the food security poverty level was very high Kibirashi Village largely habited by pastoralists, high in Balang'a Village, medium in Gombelo Village and low in Mafisa Village which is sedentary village along the road (See Map 16).

Map 15: Food Security Poverty Index by Sub-villages



Map 16: Food Security Poverty Index by Village



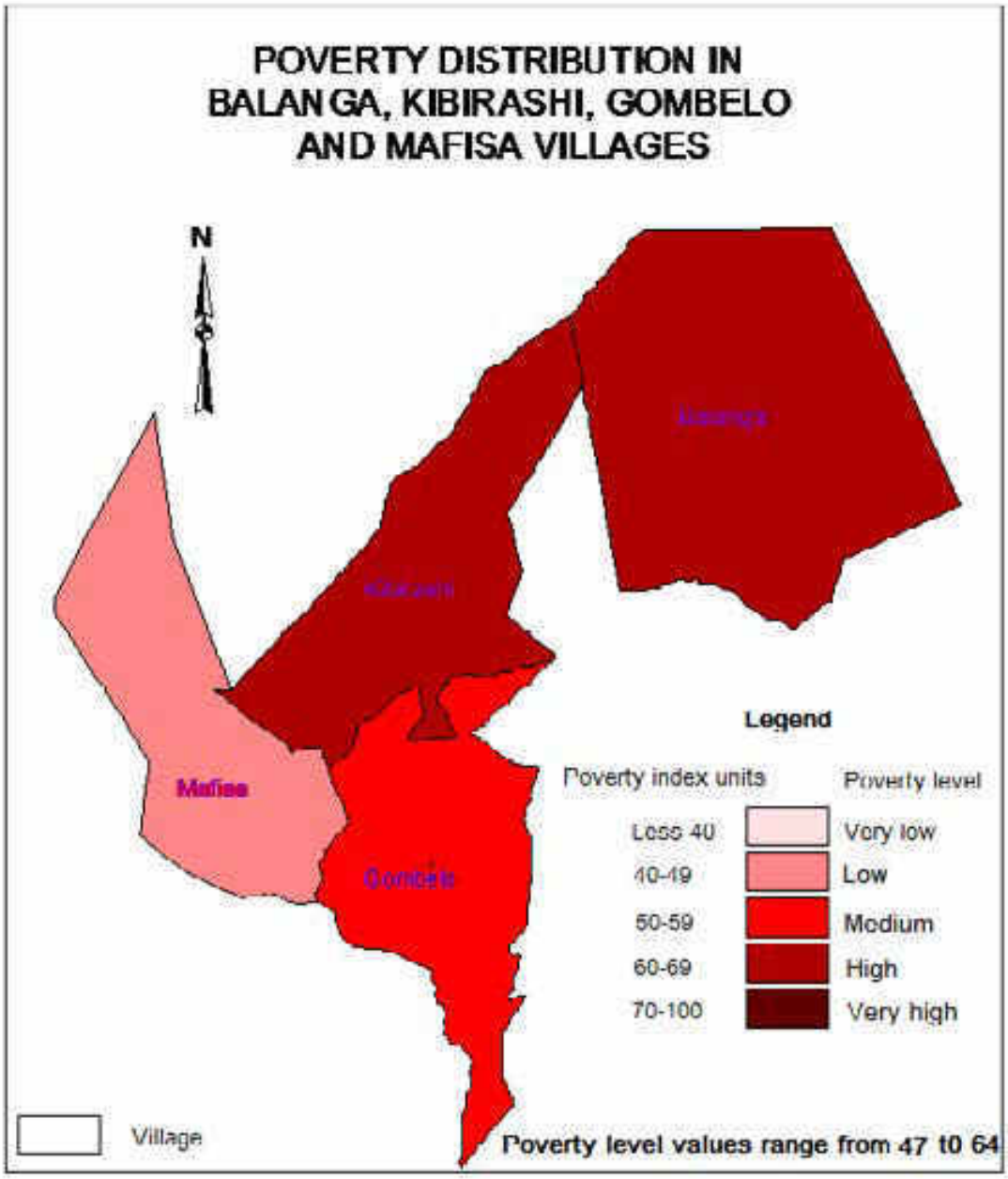
Overall Poverty Indicators and Policy Implications

In terms of policy implications and interventions the overall poverty indicators show the study villages were better of first in food security, followed by asset and income poverty indicators. These poverty indicators were followed by energy, education and transport indicators. The last two indicators which later require more interventions were shelter and health (Table 4). A combination of all these poverty indicators gave an overall level of poverty whereby Mafisa village had low poverty level when compared to Gombelo with medium poverty. On the other hand, the level of poverty was very high in Kibirashi and Balang'a Villages which as indicated above they have a large concentration of pastoralist communities (See Map 17) and they fairly poorly in many variables and the prominent one being shelter, health and sanitation. If comparing Kibarashi and Balang'a, Balang'a is a worst cases only featuring high in food security.

Table 4: Overall Poverty Indicators by Range, Level and Category Rank

Poverty Indicator	Range	Level of Poverty	Category Rank
Education	0-41	Low	5
	42-57	Medium	
	58-65	High	
	66-86	Very High	
Income	0-51	Low	**3**
	52-67	Medium	
	68-75	High	
	76-80	Very High	
Asset	0-38	Low	2
	39-47	Medium	
	48-65	High	
	66-79	Very High	
Shelter	***0-57***	Low	8
	58-75	Medium	
	79-90	High	
	91-100	Very High	
Energy	0-62	Low	4
	63-67	Medium	
	68-74	High	
	75-83	Very High	
Transport	0-51	Low	6
	52-67	Medium	
	68-78	High	
	79-95	Very High	
Health	0-59	Low	**7**
	60-74	Medium	
	75-87	High	
	88-98	Very High	
Food Security	0-15	Low	**1**
	16-29	Medium	
	30-42	High	
	43-71	Very High	

Map 17: Overall Poverty Indicators by Villages



Conclusion

Poverty at sub-village level in Kilindi District, Tanga region in Tanzania was measured by studying household social-economic and health indicators. The outcome variable in this analysis was the household well-being or the opposite of it that is poverty. Poverty indicators considered in estimating the material wealth were building quality (roofing, wall, floor and extra house), consumable durables (iron sheet, wooden bed, spongy mattresses and watch/wall clock), communication means (radios, bicycles) and type of energy used. Health and sanitation (diseases, toilet use) education access (primary, secondary school access and completion) and food security (meals, hunger, and land for food production) indicators were used to estimate the non-material wealth or lack of it that implies poverty. This information was disaggregated into maps that show the spatial distribution of poverty at micro level. Such maps proved effective in locating extent, degree and the nature of poverty in different places. Such information is valuable for effective poverty reduction interventions and can easily be communicated to a wide range of poverty stakeholders. It can also be employed in poverty reduction implementation strategies.

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