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Tanzania  
Forest  
Conservation  
Group

# Landscape Tracking Tool Usambara

## Preliminary Baseline Results

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## 1. Introduction into landscape tracking tool

Within the context of conservation there are often two contrasting factors, the biodiversity of a region and the local people who live in close proximity to the protected areas. Often times in an attempt to conserve a piece of land the local communities are marginalized, thus threatening their livelihoods. As a result, many villages surrounding protected areas view conservation as a negative action that only intensifies their struggle to survive. Furthermore, these communities predominately believe that the only stakeholder to benefit is the government. NGO's like WWF (World Wide Fund) are attempting to draw these two factors closer together so that local communities can benefit from conservation, thus encouraging villages to support the conservation movement (Tougher, 2006).

Many field interventions in developing countries now operate at large spatial scales and deal with complex land cover mosaics. They frequently aspire both to improve local livelihoods and conserve the environment. However, there is little empirical evidence about the effectiveness of these approaches. Monitoring and evaluation methods typically emphasize either the state of species (or ecosystems), or simply project deliverables and outputs. The approaches used often have limited ability to address the issue of where the balance between conservation and development (improvement of livelihoods) should lie. Methods are needed to make the tradeoffs between conservation and development explicit, and to provide platforms for negotiation about the tradeoffs (Sayer et al., 2005).

In order to develop an understanding of the relationship that local communities have with protected lands, and the best option for introducing conservation that benefits the local community, it is necessary to establish a *landscape tracking tool*, which "is aimed at the identification and application of a small representative set of locally appropriate indicators grouped under a framework of common key landscape values - Biodiversity, Livelihoods and Environmental Services" (Aldrich et al. 2006).

The landscape tracking tool focuses on five "capital assets"; natural, human, physical (build), social and financial each asset having a widespread application in both the private sector and the rural livelihoods contexts. Additionally a set of biodiversity indicators is proposed which captures the often non-local values that conservation agencies are focused on. In the context of conservation and development projects, the assumption is that the long term well-being of people will be determined by the benefits that flow from these assets (Aldrich et. al ). Therefore, this tracking tool can contribute in the development process of conservation and development activities within rural areas.

A landscape-tracking tool can assist in creating a positive relationship between local communities and conservation efforts because it establishes a clear understanding of what the goals are of a specific region. Currently, most conservation organizations have made unwarranted assumptions about what is desired by, or good for local people. As a result, the conservation movement sometimes negatively affects local communities, because conservation agencies know little about the specific region. So in order to develop a general understanding of regions surrounding conservation areas it is essential that a landscape-tracking tool is administered so that conservation agencies can establish a baseline of information focused on a specific region (Sayer et al., 2005).

WWF believes that a tracking tool “can also be applied not only to track “outcomes” but also to set baseline values for landscape “condition” ahead of any intervention. It can also be used to assess the (potential) impact of the private sector and infrastructure development on broader landscape function” (Aldrich et. al ). Furthermore, by establishing a baseline of information of the region, it is possible to provide a simple relatively low cost method of tracking key elements of a region, which in the future might trigger more detailed evaluations and management schemes. It also provides a learning opportunity for the local people which encourages local participation in the on going assessment process. Lastly, the landscape-tracking tool allows for the identification of key values or functions of the landscape and discussions among stakeholder on the outcomes that are really desired.

### **Objectives**

- 1) Contact and involve most important stakeholders that are directly influencing or influenced by the targeted landscape and develop ways of ensuring that their interests and views are reflected in the “Indicators framework”.
- 2) To develop a set of indicators on the basis of stakeholder and expert views so future changes in the landscape (restoration) can be best measured.
- 3) Collect a data set of these indicators that will give a representative idea of the current situation and can be easily re-assessed in future years.

### **Considerations**

- 1) Stakeholders will be requested to contribute their own and most essential monitoring information to the tracking tool. Indicator information from all different stakeholders together will increase knowledge and understanding about the landscapes in which they operate.
- 2) This document only presents the preliminary results. Further analysis on correlations among indicators will be in a final document which is expected by the end of 2006.
- 3) The results of this baseline study will form the basis for discussions among stakeholders (Government, NGO, Community and private sector) on desired outcomes of the landscape. Outcomes: = Actual changes in the Natural Resource System, both those that are caused by project activities and those that result from changes outside the control of the project

### **Research Questions**

- 1) Which set of indicators for the assets framework will measure changes in landscape functionality in a way that is practical enough to enable data to be gathered in a regular interval?
- 2) How can one ensure that the wishes of the different stakeholder are realistically incorporated into the outcome assessment process and thus into the activities of the projects?

## 2. The tracking tool in Usambara

The landscape tracking tool was initiated in a two month period, by Alexander van Andel, a student from the Netherlands who is assigned by WWF-International. In the end of March two weeks were used to familiarize with some stakeholders in the East Usambara mountains and discuss the possibilities and constraints of a landscape-tracking tool in the East Usambara mountains. In the months April and May data for the landscape tracking tool was collected in Kwale district in Kenya. The experience in Kwale was valuable for the improvement of the questionnaire for the East Usambara.

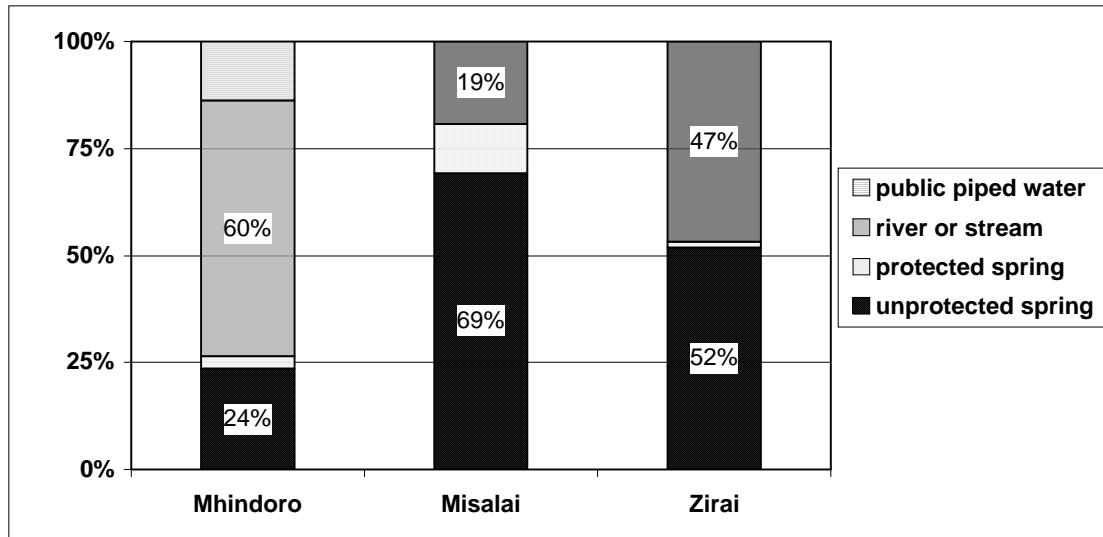
From the middle of May the questionnaires which were used to collect data was improved in Dar es Salaam. Additionally existing indicator information from the National Bureau of Statistics Tanzania was obtained. From the 1<sup>st</sup> until the 14<sup>th</sup> of July questionnaires on socio-economic and environmental issues were administered in 10 villages which were distributed over three administrative wards (Mhindoro n=103, Misalai n=78, Zirai n=77) of Muheza district. (see Appendix 1 for more info on wards, villages and sub-villages). The questionnaires were administered in cooperation with WWF, TFCG, Amani Nature reserve and students from Sokoini University of Agriculture. In total 258 households were interviewed on issues like education, agriculture, livestock, employment, housing, water, social organisation, health, forest resources and wildlife. In total 168 men and 80 women were interviewed. The preliminary results of this data collection exercise were presented on June 27<sup>th</sup> 2006 and can be found in this report..

**Table 2.1** Primary indicators from questionnaire field study presented in section 3.

Capital asset	Indicator
1. Physical	1.1 Main water source during the dry season 1.2 Type of roofing material used 1.3 Type of lighting used
2. Social	2.1 Households with a member in a social group 2.2 Perception on social services provided by the local government 2.3 Original birth area of household head
3. Human	3.1 Walking time to water source in dry season (one-way) 3.2 Walking time to nearest health facility 3.3 Education level of household head 3.4 Average household size
4. Financial	4.1 Households with an employed member 4.2 Households that hired labourers in the last year 4.3 Households that receive income from relatives
5. Natural	5.1 Average number of acres own by household that are cultivated and fallow 5.2 Crops produced by household over last two seasons 5.3 Impression of crop production over last 5 years 5.4 Household that own a certain tree species 5.5 Average number of chicken and goats owned
6. Biodiversity	6.1 Animals species sighted by households 6.2 Problems from the forest experienced by households

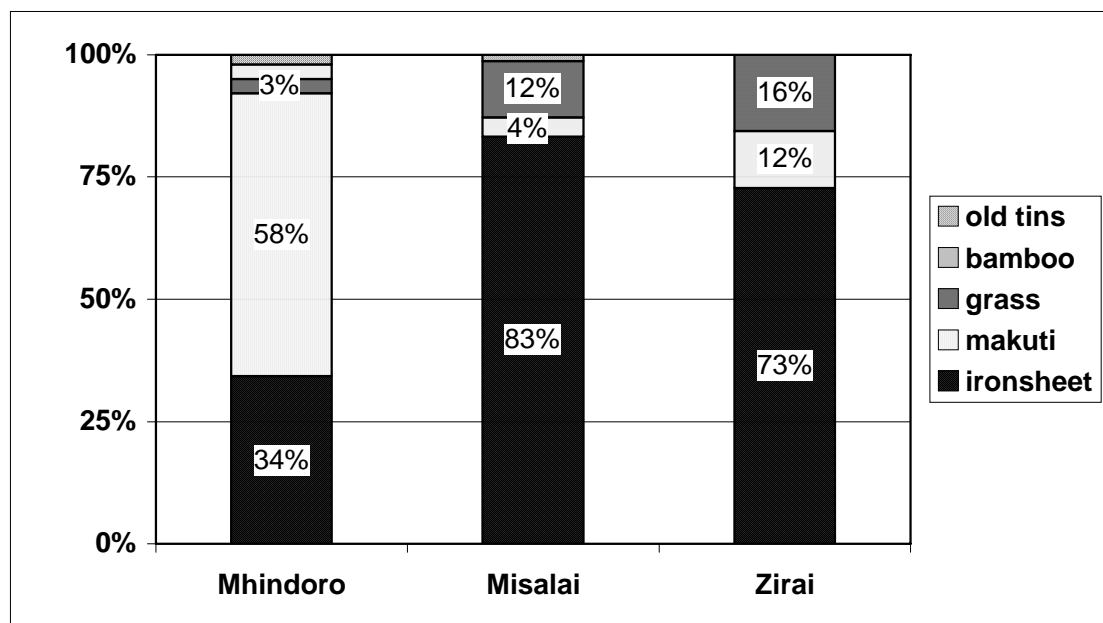
### 3. Primary indicators collected in three wards in Muheza district during field study

#### 3.1 Physical capital asset indicators



**Figure 3.1.1** The percentage of main water sources used during the dry season by households in three different wards in Muheza district. A spring is defined as an open, shallow and natural water hole. A well is defined as an open cemented, deep water hole where water is retrieved by bucket or pump. A river or a stream is defined as a natural flowing water way.

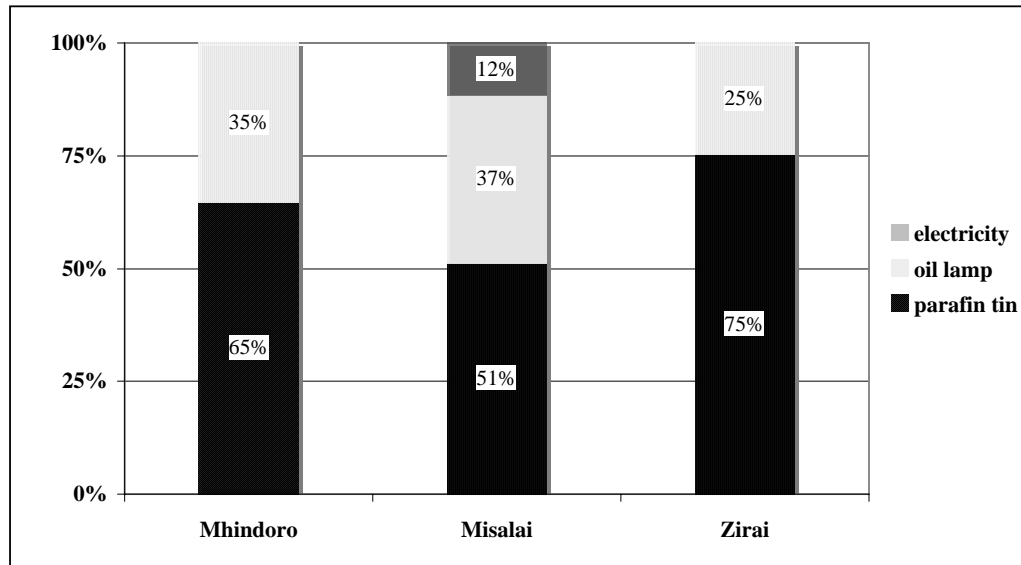
*Excel file: analysisdatausambara sheet: 1.1 water source*



**Figure 3.1.2** Different types of roofing material that are used by households in the respective localities. Makuti is a roofing material made from fine weaved coconut leaves. Percentages of the iron sheet, makuti and grass thatched roofs are shown in the graph.

*Excel file: analysisdatausambara sheet: 1.2 roofing*

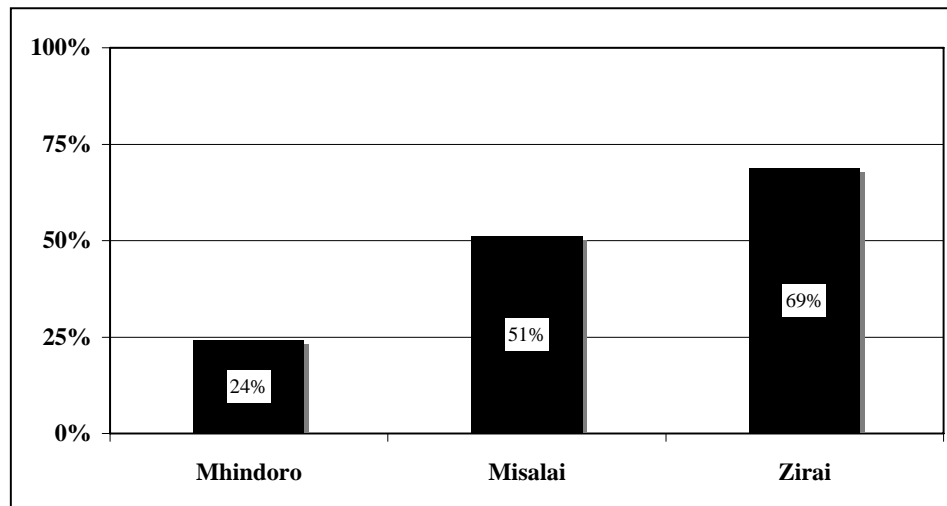
### 3.1 Physical capital asset indicators (continued)



**Figure 3.1.3** The type of lighting that is used by a household. When a household used both the paraffin tin (koroboi) and the oil lamp (kandili) the oil lamp was only counted because it is seen as an improvement in living standard. Electricity could come from a solar-battery or from a line. The percentages for the tin with paraffin the oil lamp and electricity are shown in the graph.

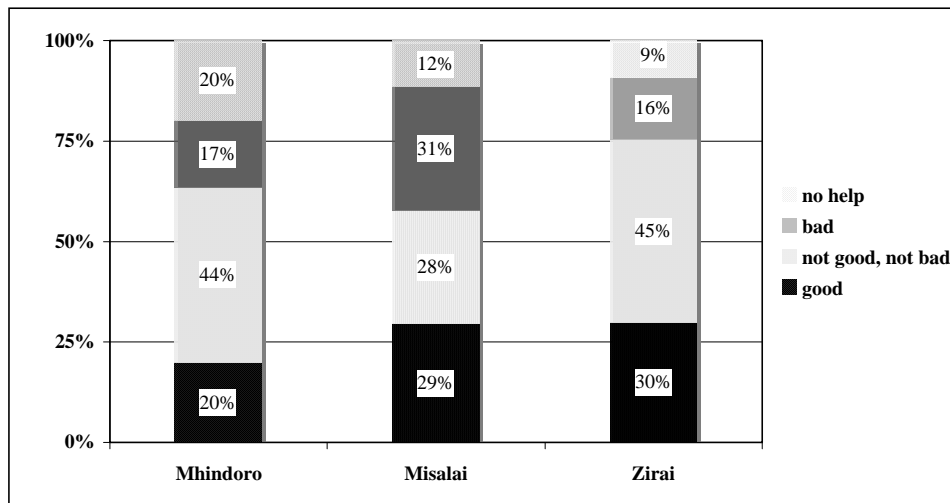
*Excel file: analysisdatausambara sheet: 1.3 lighting*

### 3.2 Social capital asset indicators



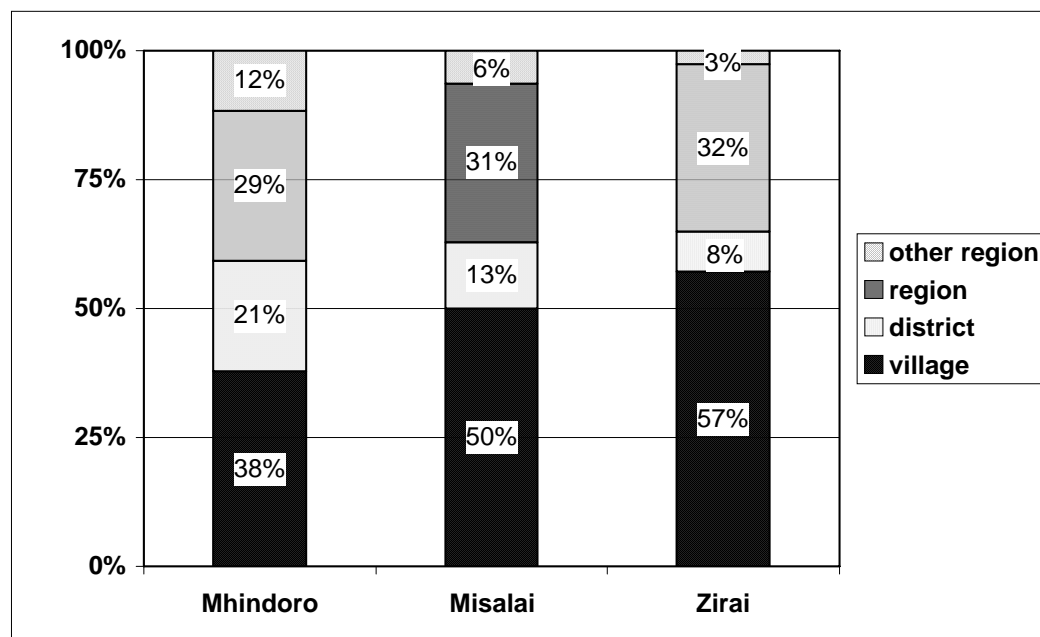
**Figure 3.2.1** Percentage of households in which anybody from that household is a member of an agricultural group, a natural resource management group or an other social group. *Excel file: analysisdatausambara sheet: 2.1 groups*

### 3.2 Social capital asset indicators (continued)



**Figure 3.2.2** This graph shows the perception of households on level of assistance from the social services like schools, health care and roads by the local government. The category no help was selected when people indicated that they did not receive any assistance from social services

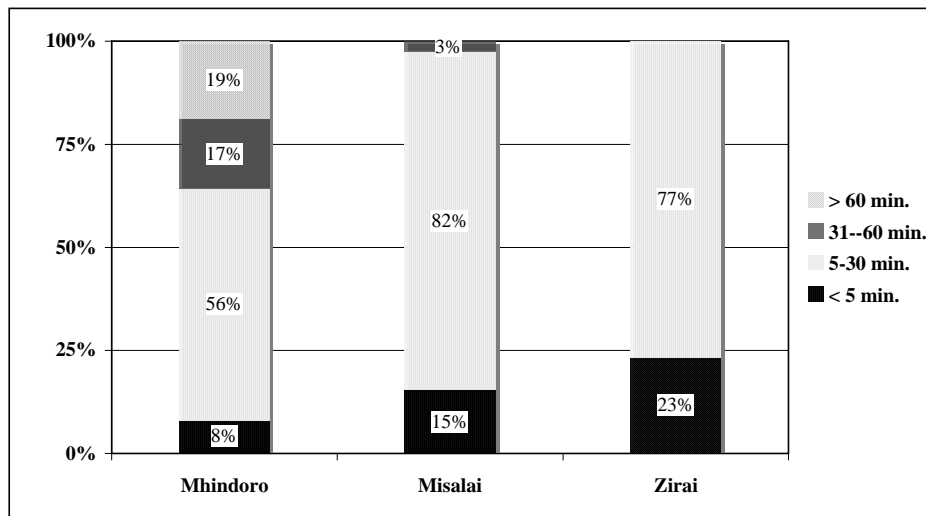
*Excel file: analysisdatausambara sheet: 2.2 social services*



**Figure 3.2.3** The original birth area of the household heads. The category district shows those household heads that were born in Muheza district but outside the village. The category region is for household head born in Tanga but outside Muheza. Another region is outside Tanga.

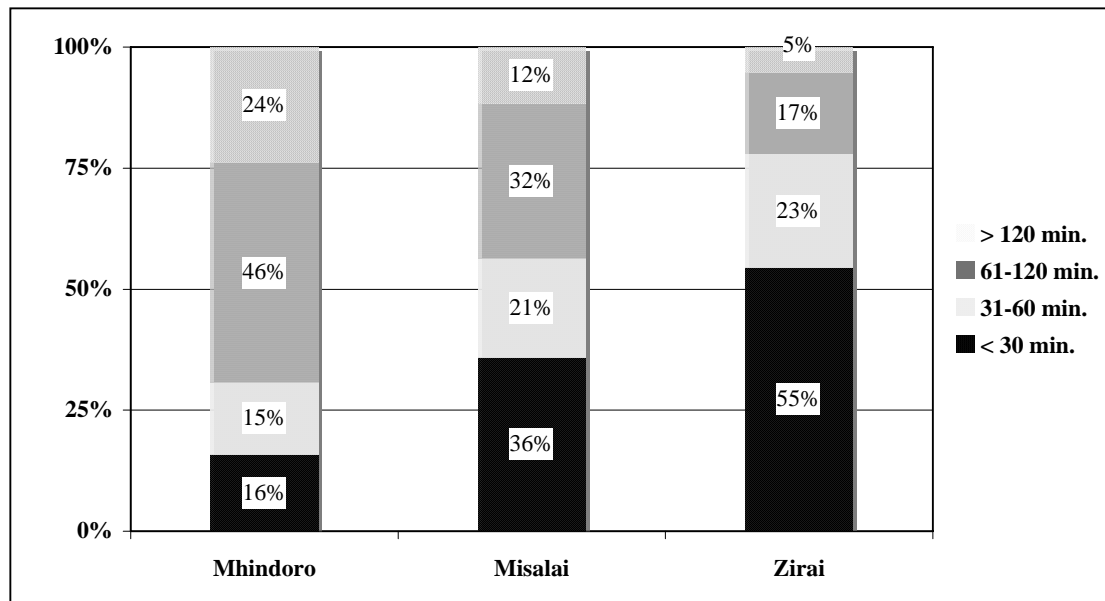
*Excel file: analysisdatausambara sheet: 2.3 birth place*

### 3.3 Human capital asset indicators



**3.3.1** The estimated walking time in minutes to drinking water (one-way) during the dry season. The average walking time in Mhindoro is 46 minutes, in Misalai the walking time is 13 min and in Zirai this is 9 minutes.

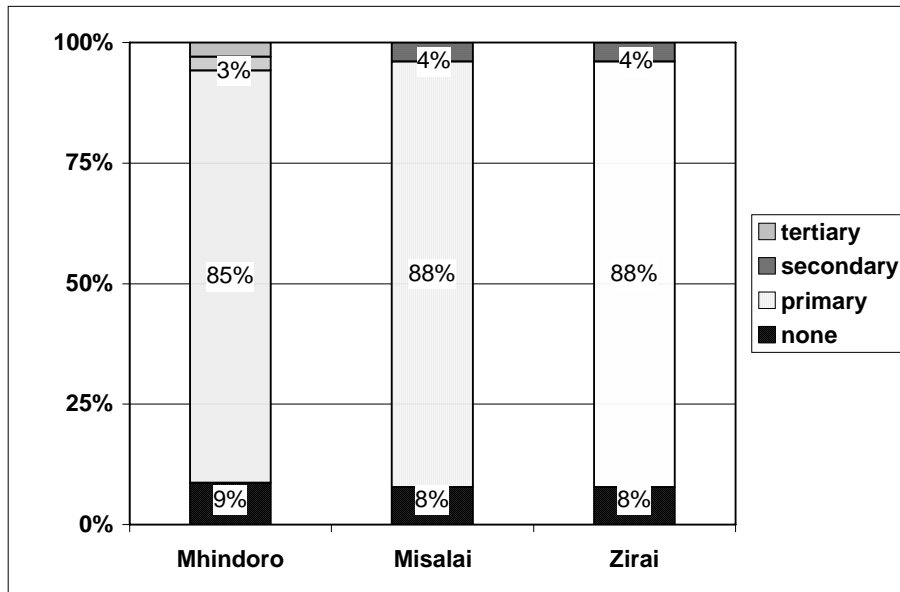
*Excel file: analysisdatausambara, sheet: 3.1 distance water*



**3.3.2** Walking time (one-way) to nearest health facility which is considered hospital or dispensary. The average walking time to the nearest health facility in Mhindoro is 105 minutes, in Misalai the walking time is 75 minutes and in Zirai this is 54 minutes.

*Excel file: analysisdatausambara, sheet: 3.2 distance health*

### 3.3 Human capital asset indicators (continued)



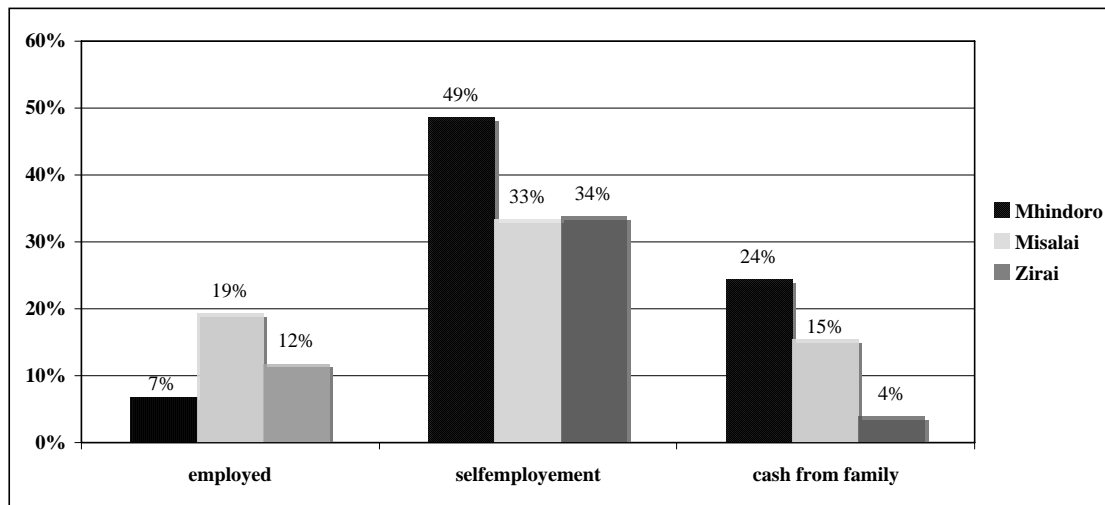
**3.3.3** Education level of the household heads in the different wards. The graph shows the percentages of household heads that received no formal education, those who attended primary school and those that attended secondary.

*Excel file: analysisdatausambara, sheet: 3.3 education head*

**3.3.4** This graph gives the average household composition for adults and boys and girls under 18 years. The graph shows the average number for each category of the household.

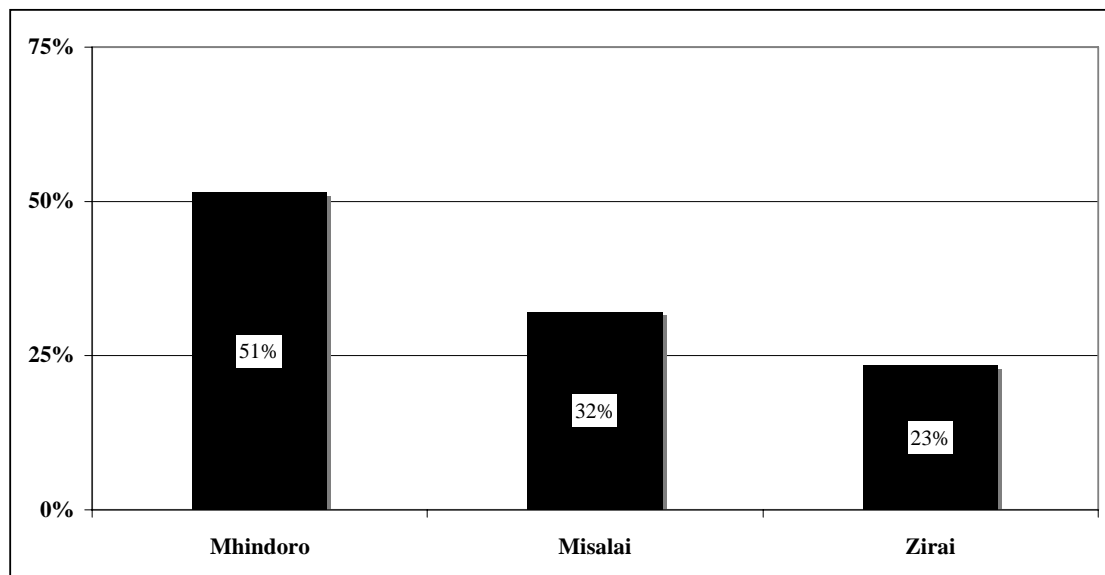
*Excel file: analysisdatausambara, sheet: 3.4 housecomp*

### 3.4 Financial Capital Asset Indicators



**3.4.1** This graph shows the percentages of households with a member that is permanently employed, of households with a member that earns income from self-employment and these households that receive money from family members on a regular basis. Those jobs with a permanently income but without official pension payment are also considered aemployed for example people that work for the tea companies. Some common xamples of self employment are a shop, a carpenter, selling food and casual land labour.

*Excel file: analysisdatausambara, sheet: 4.1 employment*



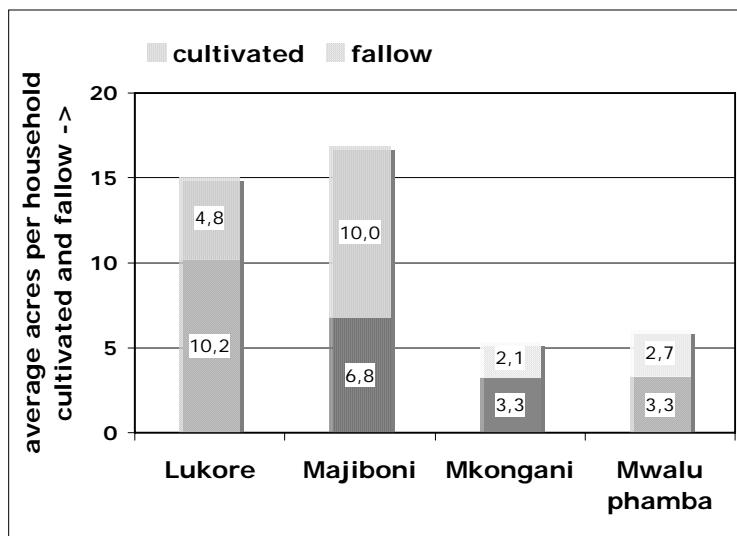
**3.4.2** Percentage of household that hired labourers in the last year. Labours were mostly hired for work in their farm and work in their shop.

*Excel file: analysisdatausambara, sheet: 4.2 hiredlabour*

### 3.4 Financial Capital Asset Indicators (continued)

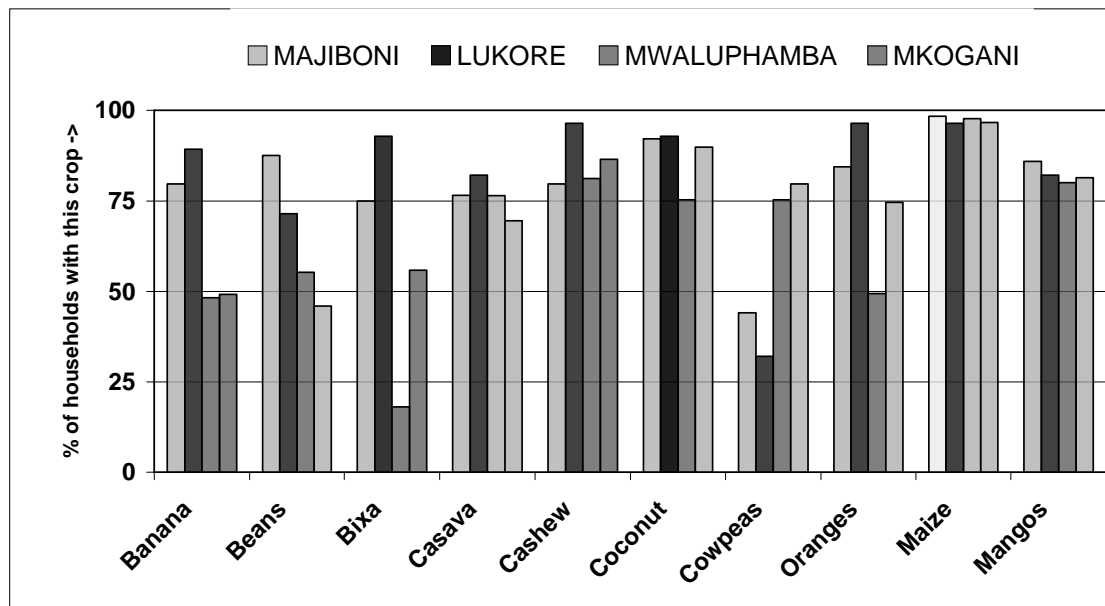
3.4.3 Households that receive money from relatives that are not part of the current household. Often these are sons and daughters that work in towns in and around Kwale district. *Excel file: Analysikubodatasheet, sheet: 4.3 other income*

### 3.5 Natural Capital Asset Indicators

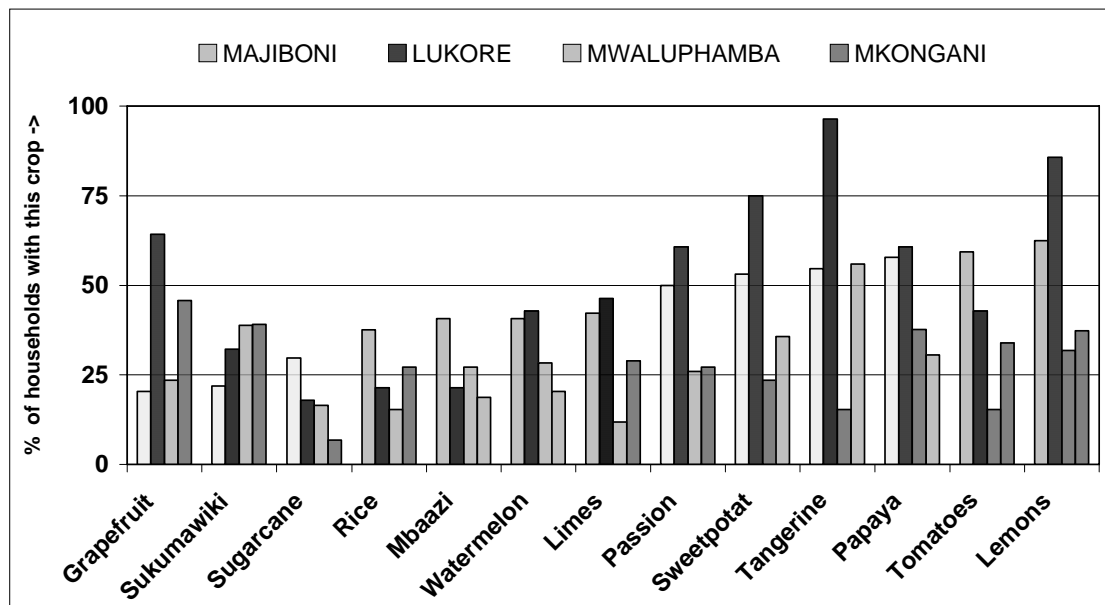


**Figure 3.5.1** The average number of acres per household, which are cultivated since the last two rainy seasons (1 year). Additionally the average number of acres that lie fallow per household are given. The average number of acres owned by a household is shown as the total land cultivated and fallow. Land with annual crops in the last two seasons was considered cultivated. Land with perennials and/or trees on it in the last two seasons was considered as fallow. *Excel file: Analysikubodatasheet, sheet: 5.1 cultfallow*

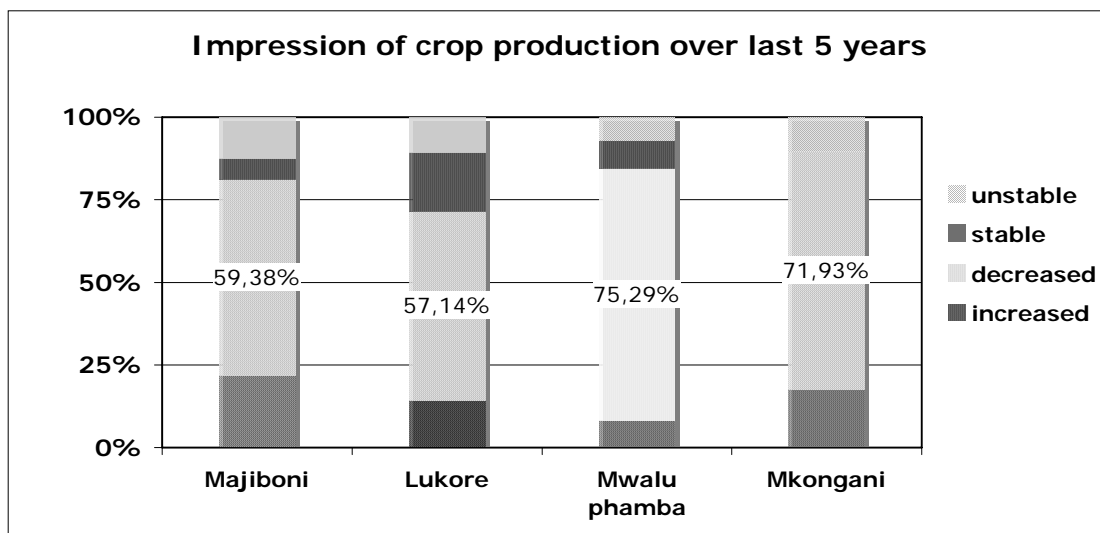
### 3.5 Natural Capital Asset Indicators (continued)



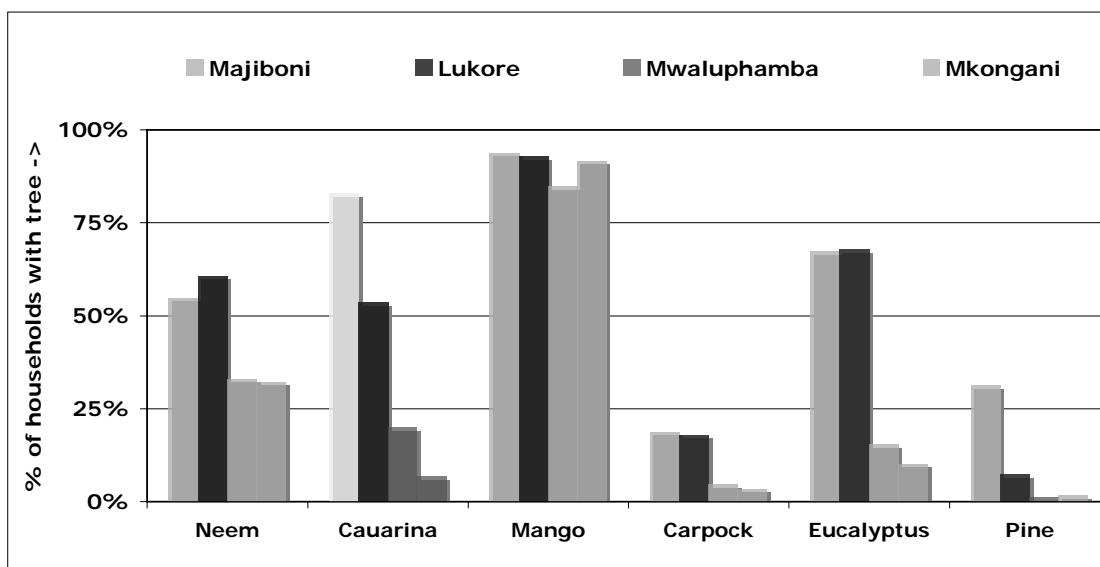
3.5.2.1 Percentage of households that have grown this crop in the last two seasons (1 year) for the respective locations. For translation of the crop names please look at Appendix 5. Excel file: *Analysikubodatasheet, sheet: 5.2 crops ana*



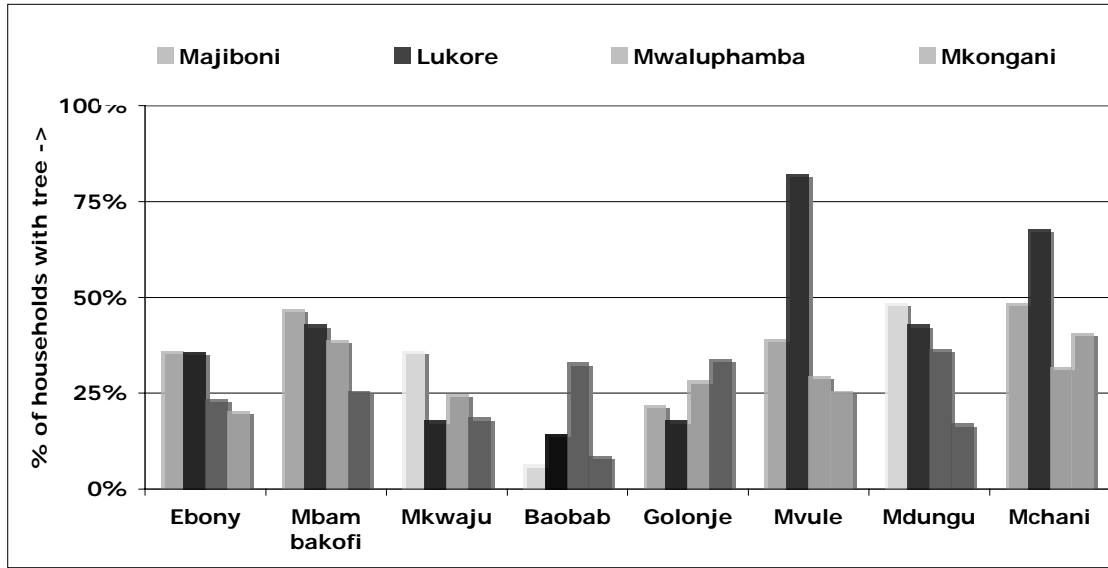
3.5.2.2 Percentage of households that have grown this crop in the last two seasons (1 year) for the respective locations. For translation of the crop names please look at Appendix 5. Excel file: *Analysikubodatasheet, sheet: 5.2 crops ana*



**Figure 3.5.3:** Impressions of crop production over the last 5 years from households in different locations. Per location the percentage of the decreased category is given. Reasons that were given for increased production were improved farming methods and good rain. Reasons that were given for a decrease in crop production was mainly drought or unreliable rain followed by wildlife, low soil fertility and crop diseases. The reason for stable production was mainly unknown and improved farming methods. The reason for unstable production was also related to unreliable rain and crop raiding by wildlife.  
*Excel file: Analysikubodatasheet, sheet: 5.3 production*

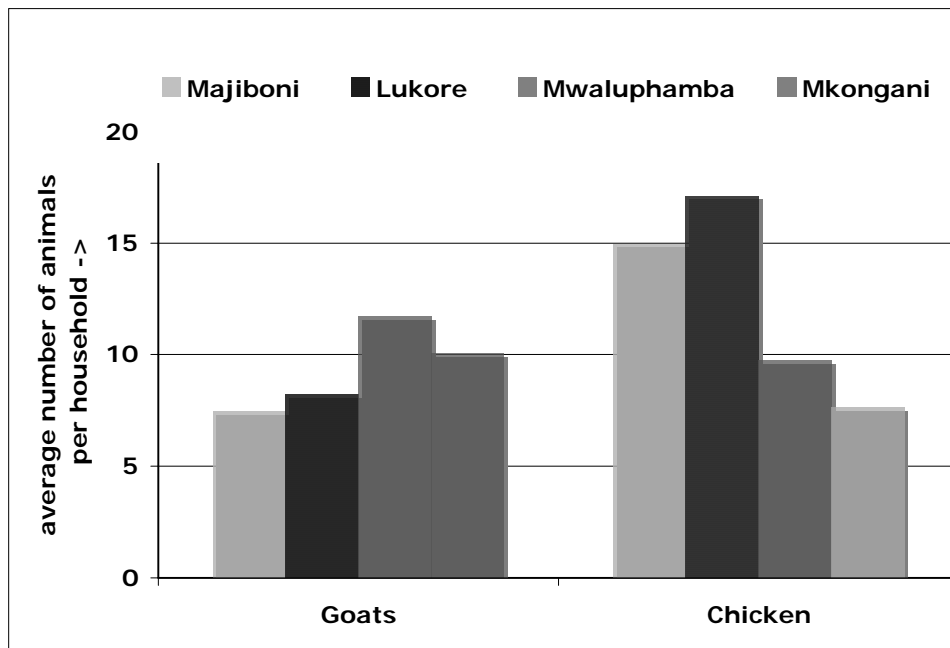


**3.5.4.1** The percentage of households that own that particular tree species. This graph does **not** say anything about how many trees are owned per household; it just shows whether a household owns this tree species. For information about income, the average amount of trees and scientific names please look at the table in appendix 2 and 3.  
*Excel file: Analysikubodatasheet, sheet: 5.4 trees*



**3.5.4.1** The percentage of households that own that particular tree species. This graph does **not** say anything about how many trees are owned per household; it just shows whether a household owns this tree species. For information about income, the average amount of trees and scientific names please look at the table in appendix 2 and 3.

*Excel file: Analysikubodatasheet, sheet: 5.4 trees*



**3.5.5** The average amount of goats and chicken owned only including the households that own those animals. However most households own goats and chicken. See appendix 6 for details on what percentage of households own goats and chicken.

*Excel file: Analysikubodatasheet, sheet: 5.5 chickgoat*

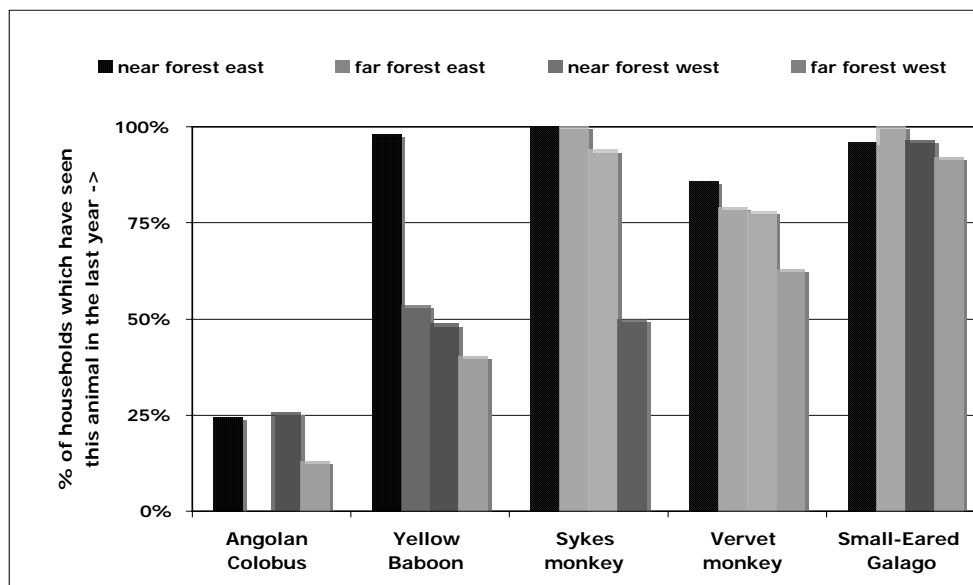
### 3.6 Biodiversity Indicators

	Near or Far (from forest)		# interviews
<b>Near forest east</b>	Villages bordering forest	Majiboni and Lukore	43
<b>Far forest east</b>	Villages distant forest (5 km)	Majiboni and Lukore	49
<b>Near forest west</b>	Villages bordering forest	Mwaluphamba and Mkongani	82
<b>Far forest west</b>	Villages distant forest (5 km)	Mwaluphamba and Mkongani	62

#### Possible interpretation of animal sighting percentages.

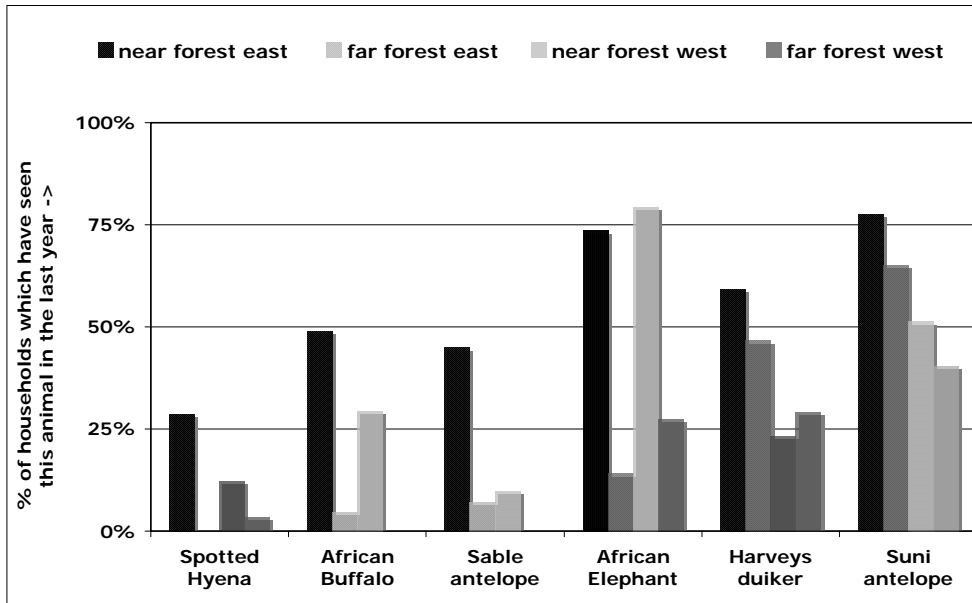
This information can only give a very general idea of the distribution of these animals because of the high level of possible errors that can occur while asking this question.

< 10%	unlikely sighting
>10-25%	very rarely seen
26-50%	rarely seen
51-75	commonly seen
76-100	very commonly seen

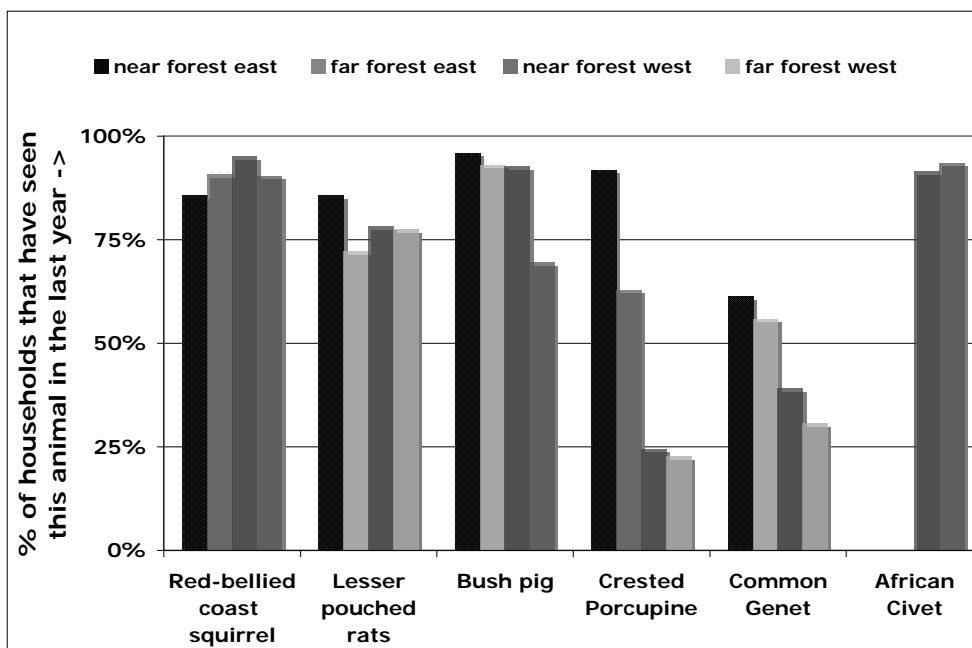


**Figure 3.6.1:** Percentage of households, which have seen these primates in the last year in and around their farms. Please remember that these figures just give a very general indication of the distribution of these primates. (scientific names in appendix 4)

*Excel file: Analysikubodatasheet, sheet: 6.1 animals*



**Figure 3.6.2:** Percentage of households, which have seen these animals in the last year in and around their farms. Please remember that these figures just give a very general indication of the distribution of these animals. (scientific names in appendix 4)  
*Excel file: Analysikubodatasheet, sheet: 6.1 animals*



**Figure 3.6.3:** Percentage of households, which have seen these animals in the last year in and around their farms. Please remember that these figures just give a very general indication of the distribution of these animals. For the African Civet there is only data available from the west side of Shimba Hills National Reserve i.e. Mwaluphamba and Mkongani locations. (scientific names in appendix 4)  
*Excel file: Analysikubodatasheet, sheet: 6.1 animals*

#### 4. Secondary indicators collected

Secondary indicators were collected from the different governmental district offices in Kwale including the Central Bureau of Statistics. Due to the limited time this indicator information has not been processed yet. In table 4.1 the indicators are listed for which more detailed information has been acquired. The softcopy of this information can be obtained from CFCU in Ukanda with a Flash disk or a burnable CD (see address on front page). With this report a CD was given to the major partners with the raw information of these indicators and several other indicators, which have been obtained from the Central Bureau of Statistics. In table 4.2 and 4.3 some of the main indicators of Kwale district of the year 2004 can be found.

Capital asset	INDICATOR	YEAR	LEVEL	SOURCE
Physical (build)	Number of schools	2006	Location	District Education Office
	Percentage of households with access to piped water	2005	Location	District Water Office
Human	Percentage of underweighted children	2005	Health facility	Ministry of Health Kwale
	Major causes of out patient morbidity	2005	Health facility	Ministry of Health Kwale
	Number of children under 1 fully vaccinated	2005	Health facility	Ministry of Health Kwale
	Primary school gross enrolment rate	2005	School and location	District Education Office
Financial	Poverty index	2005	Location	District Statistical Office
Natural	Area of crops	2005	Division	District agricultural officer Kwale
	Number of livestock	2005	Location	District livestock officer Kwale
Biodiversity	Number of forest patrols	2005+ 2004	Site specific	Forest department Kwale

**Table 4.1 Some statistics of Kwale district**

Courtesy by  
CENTRAL BUREAU OF STATISTICS - KWALE  
DISTRICT FACT SHEET

CATEGORY		UNIT	2004
<b>AREA ( Sq.Km)</b>			
1	Total Area	Km <sup>2</sup>	8.260,0
2	Arable Area	Km <sup>2</sup>	120,0
3	Non Arable Area	Km <sup>2</sup>	67,7
4	Gazetted Forest	Km <sup>3</sup>	350,4
5	Length of Coast line	Km	250,0
<b>TOPOGRAPHY &amp; CLIMATE</b>			
1	Altitude - Highest	Meters	842
2	Altitude - Lowest	Meters	0
3	Rainfall Average - Kinango/Samburu	mm	550,0
4	Rainfall Average - Matuga	mm	1.100,0
5	Temperature Average	°C	26,0
<b>POPULATION</b>			
1	Total Population Size	Persons	558.051
2	Total Population Size - Male	Persons	263.700
3	Total Population Size -Female	Persons	294.351
4	Total Population of Primary school Going Age (6-13)	Persons	144.966
5	Population Density - Average	Persons/Km <sup>2</sup>	67,6
<b>DEMOGRAPHY</b>			
1	Crude Birth Rate	Per 1000	45
2	Crude Death Rate	Per 1000	13
3	Infant Mortality Rate	Per 1000	70
4	Life Expectancy	Years	51,2
5	Population Growth Rate	% p.a	2,6
<b>SOCIAL - ECONOMIC INDICATORS</b>			
1	Women Headed Households	Persons	29.352
2	Children Headed Households	Persons	162
3	Average Household Size	Persons	5,3
4	Absolute Poverty - Rural	%	44,8
5	Sectorial Contribution to Household Income - Agriculture	%	80,6
<b>AGRICULTURE SECTOR</b>			
1	Average Farm Sizes ( Small Scale)	Acres	10
2	Average Farm Sizes ( Large Scale)	Acres	100
3	Total Acreage under Food Crops	Ha	27.930
4	Total Acreage under Cash Crops	Ha	45.326
5	land carrying capacity	Livestock Unit	7-10
<b>FISHERIES</b>			
1	Population of Fish Farmers	Persons	6.000,0
2	Fish Ponds	Number	11,0
3	Landing Beaches	Number	41

**Table 4.2**

CENTRAL BUREAU OF STATISTICS - KWALE  
DISTRICT FACT SHEET

CATEGORY	UNIT	2004	
<b>AREA ( Sq.Km)</b>			
<b>FOREST</b>			
1	Population engaged in Forest Related Activities	%	15
2	Size of Gazetted forests	Ha	35.043,9
3	Size of non-gazetted forests	Ha	187.000,0
<b>CO-OPERATIVE SECTOR</b>			
1	Number of Co-operatives	Number	91
2	Membership of Co-operatives	Persons	6020
3	Annual Turnover of Co-operatives	Kshs	30.937.181
<b>HEALTH SECTOR</b>			
1	Doctor/patient ratio	Per Doctor	1:64,330
2	Number of health Facilities	Number	60
3	Number of Hospital Beds/Cots	Number	315
4	Average Distance to nearest Health Facility	Km	29
5	population with HIV	%	18
<b>EDUCATION SECTOR</b>			
1	<b>Pre- Primary</b> - Schools	Number	316
2	<b>Primary</b> - Schools	Number	274
3	Primary - Boys Enrolment	Persons	72.017
4	Primary - Girls Enrolment	Persons	59.137
5	Teacher/pupil ratio	Per teacher	1:34
6	<b>Secondary</b> - Schools	Number	29
7	Secondary - Enrolment	Persons	9.150
8	Teacher/pupil ratio	Per teacher	1:21.4
9	<b>Tertiary</b>		
10	Polytechnics	No.	7
11	Colleges	No.	1
<b>WATER SECTOR</b>			
1	Number of households with access to piped water	No.	23.489
2	Number of households with access to potable water	No.	63.538
3	Average distance to nearest potable water point	Km	2,5
<b>ENERGY SECTOR</b>			
1	Number of households with Electricity Connection	No.	12.000
<b>ROADS SECTOR</b>			
1	Kilometres of Trunk Roads (A)	Km	148,5
2	Kilometres of National Roads (B)	Km	0,0
3	Kilometres of National Roads (C)	Km	193,8

## 5. Discussion

Then Usambara landscape tracking tool initiative shows that it is possible to incorporate conservation and development into one tool. The state of local livelihoods in the three wards in Muheza district is well characterized by the different indicators that have been chosen for this field study. The questionnaire that collected information for this tracking tool also attempted to characterize certain environmental and biodiversity indicators. The interpretation of the results presented in this report must be done very broadly. Only major variations between locations and/or other variables should be considered as an indication of a difference between those locations/variables.

During the administration of questionnaires there are several possibilities for the occurrence of errors. The first possibility is; different interpretation of questions by the enumerators. An example arose where certain enumerators did have different Swahili translations for crops or animals names during the initiation of the questionnaire. The second possibility for error is when the enumerator has to decide how to classify a certain answer. How do you, for example, classify the walking time (one-way) when an interviewee tells you he needs the morning to get water. The third possibility where an error can arise is when the interviewee gives a false answer because he/she feels restricted at expressing the true answer. This restriction could be because the answer is too personal (disease) or maybe even illegal (forest use). Another possibility for an untrue answer is when the interviewee expects a certain result when another answer is given. We have seen cases where interviewees of neighbouring households gave very different answers on the distance of water probably because they expected more help when a longer distance was given.

Despite the high possibility for making errors the results still give a good general indication of the livelihood and environmental situation.

*There are also cases where all the locations have about the same score on a question. When it was asked who benefits most from the forest, in each location about 75% of the interviewee responded with the answer "government". This shows well what perception most people have on National Reserve that is close to there home.*

*Still the general impression is that often the households in Lukore and Majiboni are better off compared to those in Mwaluphamba and Mkongani. This general pattern might be the result of two aspects 1) less rain in on the west side of Shimba hills National Reserve and therefore lower agricultural production and 2) the average amount of acres own by a family. In Lukore and Majiboni this is an average of 15 acres per household while in the two other locations the average number of acres owned is about 5.*

*When the data on animal sighting was analysed a differentiation was made between east and west Shimba Hills National Reserve and between far and close from the Reserve instead of the locations. For some animals like the Elephant there was a clear difference in sightings between those villages that were close to the forest and those that were further away (see graph 3.6.2). Some other animals were seen more on the east side of Shimba hills like Harveys Duiker and the Crested Porcupine. Additionally there were those species that were seen at all places by same percentage of households like the Red-bellied coast Squirrel and the Small-eared Galago (Bush Baby).*

More discussion and analysis on these results is needed to determine better what is the exact meaning of the different indicators. It was decided however in the short time that was available to analyse and write this report (1,5 week) it was better to present most

results and come with more precise presentation and interpretation in the final report that is expected by the end of 2006.

## **6. Way forward for landscape tracking tool**

In Usambara landscape tracking tool initiative five capital assets were considered: Human, social, natural, financial, physical and (biodiversity). The final detailed report of the entire Kwale landscape tracking tool initiative is expected by the end of 2006 and will be distributed to the stakeholders.

However results presented in this report form a basis for communities and conservation and development stakeholders in Usambaras to hold discussions on desired outcomes of landscape interventions. This discussion should take place regularly between the CBOs based in villages, local administration (village elders, chairmen, chiefs, DO), government offices, NGOs private sector. This discussion platform can form the basis of a long-term co-operation where ideas on desired outcomes, information and progress on activities can be shared. It was found that there is an urgent need for a closer network, information sharing and working relations among the conservation and development stakeholders.

A slightly adjusted questionnaire should be used in several wards in and surrounding the East Usambara mountains so that comparison among these areas is possible. Understanding of the livelihood and environmental situation of local communities can contribute to the success at any location where interventions for conservation and development are taking place. For this short study questionnaires were only administered in 3 wards of Muheza district but in certain wards in and around the Usambaras like no questionnaires were administered. Additionally there are other forests bordering communities in Kwale where livelihood and conservation are intervention are taking place. In these areas the administration of this questionnaire could also prove a valuable contribution to knowledge.

It is often a struggle for several NGOs to accomplish their goals and visions in the localities because the perceptions of local people are not taking into account. So there is a need that each organisation/person involved fully understands the interests of the other. That understanding can help with achieving a single more realistic goal. The landscape tracking tool's future could be a centre of information, which forms the basis of stakeholders discussions to reflect on ground interventions.

To make sure that this initiative continues it is essential that somebody be permanently employed. This person should bring together the information provided by different stakeholders and lead the administration of questionnaires in other localities in Kwale. This information should be available in at least two locations in Kwale for anybody interested. Probably the best organisations for sharing this information to other organisations and the public are the CBS office in Kwale and WWF - CFCU office in Ukunda.

## 7. Appendices

### Appendix 1: Villages covered during fieldwork

#### KUBO: (South) East of Shimba Hills National Reserve

##### MAJIMBONI LOCATION

**Situated:** South Eastern border of Shimba Hills National Reserve.

**Location Area:** 78.0 km square

**Population size:** 3651 males and 3503 females

**% individuals below poverty line** 59%

**Health Facilities:** 2 (Shimba Hills, Mwapala)

**Schools:** 7 primary schools (Kidongo, Makobe, Kipambani, Stephen Kanja, Mwapala, Boyani & Shimba hills.)

##### Villages covered:

2 villages bordering S.H reserve	2 villages far (about 5km) from SH reserve
(i) Kidongo: Long E 39,22760 Lat: S 4,19267 Alt: 149	(i) Mwapala: Long: E 39,27808 Lat: S 4,18946 Alt: 153
(i) Msulwa: Long: E 39,25894 Lat: S 4,16634 Alt: 214	(ii) Mwalumba: Long: E 39,25481 Lat: S 4,20313 Alt: 148

**Sampled households:** in 3 days, 24<sup>th</sup> April 06 (Kidongo), 25<sup>th</sup> April 06 (Msulwa & Mwapala), 26<sup>th</sup> April 06 (Mwapala & Mwalumba)

Villages	# of questionnaires	estimated # of households	estimated % households sampled
Kidongo	16	140	11%
Msulwa	19	160	12%
Mwapala	15	170	9%
Mwalumba	14	130	11%
Total	63		

##### LUKORE LOCATION

**Situated:** On the extreme South Eastern tip bordering Shimba Hills Reserve

**Location Area:** 26.3 km square

**Population size (2005):** 1511 males and 1556 females

**% individuals below poverty line:** 75%

**Health facilities:** 1 (Lukore dispensary)

**Schools:** 2 primary schools: (Mkanda & Lukore primary schools)

##### Villages covered:

Village bordering SH reserve	Village far (about 5km) from SH reserve
Mkanda 3 Long: E 39,20018 Lat: S 4,20015 Alt: 134m	Mkanda 2 Long: E 39,19427 Lat: S 4,21061 Alt: 129

**Sample households:** in 1 day, 27<sup>th</sup> April 06: Mkanda 2 & 3

Villages	# of questionnaires	estimated # of households	estimated % households sampled
Mkanda 3	14	100	14%
Mkanda 2	14	140	10%
Total	28		

## KUBO: (South) East of Shimba Hills National Reserve

### MWALUPHAMBA LOCATION

**Situated:** Extreme South Western border of Shimba Hills National Reserve.

**Location area:** 145.8 km square

**Population size:** 8966 males and 10432 females

**% individuals below poverty line:** 68%

**Health facilities:** 1 (Lukore dispensary)

**Schools:** 9 primary schools

#### Villages Covered:

2 villages bordering SH forest	2 villages far (about 5km) from SH forest
(i) Tsezani Long: E 39,21730 Lat: S 4,13169 Alt: 199m	(i) Mlafyeni Long: E 39,21422 Lat: S 4,10850 Alt: 175m
(ii) Bahakanda Long: E 39,19437 Lat: S 4,16210 Alt: 222m	(ii) Mirihini Long: E 39,18021 Lat: S 4,12918 Alt: 194m

**Sample households:** in 3 days, 29<sup>th</sup> April 06 Tsezani, 30<sup>th</sup> April 06 Bahakanda & Mlafyeni, 1<sup>st</sup> May 06 Bahakanda & Mirihini

Villages	# of questionnaires	estimated # of households	estimated % households sampled
Tsezani	28	150	19%
Bhakanda	16	200	8%
Mlafyeni	20	90	22%
Mirihini	21	90	23%
Total	85		

### MKONGANI LOCATION

**Situated:** On Southern tip bordering Shimba Hills National Reserve

**Location Area :** 96.7 Km square

**Population size:** 7347 males 7971 females

**% individuals below poverty line:** 67%

**Health Facilities:** 2 (Kibuyuni dispensary & Mkongani)

**Schools:** 7 primary schools

#### Villages covered:

2 villages bordering SH forest	2 villages far (about 5 km) from SH forest
Mkomba Long E 39,15737 Lat S 4,18000 Alt 183	Mtsamviani Long E 39,13474 Lat S 4,15686 Alt 204
Tiribe Long E 39,15249 Lat S 4,19760 Alt 171	Mzinji Long: E 39,13326 Lat: S 4,17475 Alt 170

**Sample pop.:** in 2 days, 2<sup>nd</sup> May 06 Mkomba & Mtsamviani, 3<sup>rd</sup> May 06 Tiribe & Mzinji

Villages	# of questionnaires	estimated # of households	estimated % households sampled
Mkomba	15	200	8%
Tiribe	23	230	10%
Mtsamviani	14	120	12%
Mzinji	7	100	7%
Total	59		

## Appendix 2: Tree data

**Table 7.1:** The data for this table is presented per location. In the first column are the common English or Swahili species names. The tree list with English and scientific names can be found in table 7.2 (appendix 3).

In the first column of each location (see sample size in brackets behind location name) the percentage of household that own that tree species is presented. In the second column per each location the percentage of tree owners, which receive income or expect to receive income from this tree is presented. When for example 5% of the households own this tree and 50% expects to receive income it could well be that 2 households have said to own this tree and 1 household (i.e. 50%) sees it as a source of income. The third column per location presents the average amount of trees owned per household, only including those household that own that species into the calculation.

	<b>Majiboni (64)</b>			<b>Lukore (28)</b>		
	% households with tree	% income expectation	average # of trees per HH	% households with tree	% income expectation	average # of trees per HH
<b>Neem</b>	55%	31%	6	61%	12%	3
<b>Cuarina</b>	83%	85%	9	54%	80%	8
<b>Mango</b>	94%	85%	6	93%	46%	5
<b>Carpock</b>	19%	0%	2	18%	0%	4
<b>Eucalyptus</b>	67%	58%	5	68%	53%	5
<b>Pine</b>	31%	65%	3	7%	100%	5
<b>Ebony</b>	36%	43%	3	36%	20%	2
<b>Mbambakofi</b>	47%	53%	4	43%	33%	5
<b>Mkwaju</b>	36%	35%	2	18%	0%	1
<b>Baobab</b>	6%	50%	2	14%	0%	1
<b>Golonje</b>	22%	21%	2	18%	20%	2
<b>Mvule</b>	39%	52%	3	82%	39%	3
<b>Mdungu</b>	48%	42%	3	43%	8%	2
<b>Mchani</b>	48%	87%	4	68%	53%	3

	<b>Mwaluphamba (85)</b>			<b>Mkongani (59)</b>		
	% households with tree	% income expectation	average # of trees per HH	% households with tree	% income expectation	average # of trees per HH
<b>Neem</b>	33%	4%	2	32%	5%	2
<b>Cuarina</b>	20%	18%	4	7%	25%	2
<b>Mango</b>	85%	21%	4	92%	33%	4
<b>Carpock</b>	5%	50%	2	3%	50%	3
<b>Eucalyptus</b>	15%	8%	1	10%	33%	3
<b>Pine</b>	1%	0%	1	2%	0%	1
<b>Ebony</b>	24%	10%	3	20%	17%	2
<b>Mbambakofi</b>	39%	33%	3	25%	53%	2
<b>Mkwaju</b>	25%	5%	2	19%	36%	1
<b>Baobab</b>	33%	21%	2	8%	20%	1
<b>Golonje</b>	28%	13%	2	34%	5%	2
<b>Mvule</b>	29%	44%	3	25%	47%	2
<b>Mdungu</b>	36%	6%	2	17%	10%	2
<b>Mchani</b>	32%	30%	2	41%	29%	3

### Appendix 3: Translation of tree species

**Table 7.2**

No	Common name	Scientific name	Local name
1	Neem tree	<i>Azadirachta indica</i>	mwarubaini
2	Casuarina	<i>Casuarina equisetifolia</i>	mvinje
3	Mango tree	<i>Mangifera indica</i>	mwembe
4	Carpock	<i>Ceiba pentandra</i>	msufi
5	Eucalyptus	<i>Encephalatos hildebrandtii</i>	msanduku
6	Pine	<i>Pinus sp.</i>	?
7	Jacaranda	<i>Jacaranda mimosifolia</i>	jakaranda
8	Ebony	<i>Dalbergia melanoxylon</i>	mpingo
9	Mahogany	<i>Brachylaena huillensis</i>	muhuhu
10	unknown	<i>Azzeria quanzensis</i>	mbambakofi
11	Tamerine tree	<i>Tamarindus indica</i>	mkwaju
12	Baobarb tree	<i>Adanisonia digitata</i>	mbuyu
13	Aloe	<i>Aloe secundiflora</i>	Golonje/kiluma/chitozi
14	unknown	<i>Milicia excelsa</i>	Mvule
15	unknown	<i>Zanthoxylon chalybium</i>	mdungu
others	unknown	<i>Albizia adianthifolia</i>	Mstani
		<i>Erythrophyllum suavoliensis</i>	mgelekele
		<i>Parkia sulicoidea</i>	mnyanza
		<i>Gigasiphon macrosiphon</i>	mnyenze
		<i>Trichilia emetica</i>	munwamadzi
		<i>Terminalia catappa</i>	mkungu
		<i>Brachysitigia spiciformis</i>	mrihi

#### Appendix 4: Translation of mammals

**Table 7.3:** Translation for mammals commonly found around Shimba Hills National reserve.

No.	Common name	Scientific name	Local/Swahili name
1	Black& white Angolan colobus monkey	<i>Colobus angolensis</i>	mbega
2	Spotted hyena	<i>Crocuta crocuta</i>	fisi
3	African buffalo	<i>Syncerus caffer</i>	nyati
4	Red bellied coast squirrel	<i>Paraxerus palliates</i>	tuhe
5	Common genet	<i>Genetta genetta</i>	kanu
6	Sable antelope	<i>Hippotragus niger</i>	shambi
7	African elephant	<i>Loxodonta africana</i>	ndovu
8	Harvey's duiker	<i>Cephalophus harveyi</i>	funo
9	Zanj elephant shrew	<i>Rhynchocyon pertesi</i>	Jule/fugu
10	Bush pig	<i>Potamochoerus larvatus</i>	nguluwe-tsaka
11	Bush tailed moongose	<i>Bdeogale crassicauda</i>	kitu
12	Lesser pouched rats	<i>Beamys hindei</i>	panya-mwitu
13	Suni antelope	<i>Neotragus moschatus</i>	chimvarya/chiphala
14	Crested porcupine	<i>Hysrix cristata</i>	nungu
15	Yellow baboons	<i>Papio cynocephalus</i>	nyani
16	Sykes monkey	<i>Cercopithecus albogularis</i>	chima
17	Vervet monkey	<i>Cercopithecus aethiops</i>	tumbiri
18	Lesser/greater bushbaby	<i>Otolemur garnettii</i> and <i>Otolemur crassicaudatus</i>	komba
19	African civet	<i>Civettictis civetta</i>	kala/fungo
other	Helmeted guineafowl	<i>Numida meleagris</i>	kanga

## Appendix 5: Translation of crops & Domestic animals

**Table 7.4** Crops translations

No.	Common name	Local/Swahili name	No.	Common name	Local/Swahili name
1	maize	mahindi	18	cowpeas	kunde
2	beans	maharagwe	19	onions	vitunguu
3	banana	ndizi	20	tomatoes	tamata/tomato
4	sweet potato	viasi tamu	21	pigeon peas	mbaazi
5	cassava	muhogo	22	sorghum	mawele
6	oranges	machungwa	23	millet	wimbi
7	lemons	limau	24	watermelon	tigiti/watermelon
8	grapefruit	madanzi	25	Sugarcane	miwa
9	limes	ndimu	26	passion	matunda
10	tangerines	chenza	27	kale	sukumawiki
11	pawpaw	paipai/papaya	others	green peas	pojo
12	mangos	maembe		pumpkin	malenge
13	groundnuts	njugu		avocado	avokado
14	bixa	rangi		guavas	mapera
15	cashew nut	korosho		pineapple	mananasi
16	rice	mchele/mpunga		<i>Solanum bojeri</i>	tungunja
17	coconut	nazi		zeitun	zabibu

## Appendix 6. Domestic animals

**Table 7.5** The domestic animals translation

No.	Common name	Local/Swahili name
1	Local cow	Ng'ombe wa kienyeji
2	Dairy cow	Ng'ombe maziwa
3	Local chicken	Kuku wa kienyeji
4	Layers	Kuku mayai
5	Broilers	kuku nyama
6	Ducks	mabata
7	Goats	mbuzi
8	Sheep	kondoo
9	Rabbits	sungura

**Table 8.6** The percentage of households that own that particular type of livestock per locality.

location	localcow	dairycow	localchick	layers	boilers	ducks	goats	sheep
Majiboni	39%	3%	95%	16%	5%	11%	69%	13%
Lukore	50%	11%	96%	0%	0%	18%	79%	14%
Mwaluphamba	22%	0%	86%	0%	0%	13%	58%	8%
Mkongani	27%	2%	83%	0%	0%	8%	54%	7%

**Table 8.7** The average amount of animals owned per locality. The average is only calculated over the household that own this particular animal.

location	localcow	dairycow	localchick	layers	boilers	ducks	goats	sheep
Majiboni	8	2	15	570	123	6	7	4
Lukore	5	2	17	0	0	3	8	8
Mwaluphamba	7	0	10	0	0	5	12	5
Mkongani	6	3	8	0	0	4	10	5