6.0 SOCIO-ECONOMICS

6.1 INTRODUCTION

The decision regarding the type of legislation that should be instated to ensure the sustainable protection of Derema Forest Corridor cannot purely base on biological considerations, socio-economic factors have also to be taken aboard.

A socio-economic study was therefore, conducted in the five villages surrounding Derema Forest Corridor namely; Kisiwani, Kwemdimu, Msasa IBC, Kwezitu and Kambai to assess the Derema forest resource use, its extent and the associated impacts. In addition to these, human populations, economic activities, attitudes and problems concerning Derema forest were recorded.

6.2 METHODS

6.2.1 Study area description

Figure 6.1 shows the location of the study villages in relation to both Derema Forest Corridor and Amani Nature Reserve. Kisiwani village is located south of Derema forest and forms a bridge between this forest and Amani Nature Reserve to its northeastern edge. To the east of Derema is Kwemdimu village, and Msasa IBC village is on the western side of Derema and adjacent to Msasa IBC further north, is Kwezitu village which in relation to the corridor, it is northwest. The villages of Kisiwani, Kwemdimu and Kambai are also bordered by Longuza Forest Plantations to the east.

6.2.2 Sampling and data collection

Sampling units and sampling exercise

The sampling units were communities living in the five villages around forest areas of the Derema Forest Corridor. Samples included village leaders and environment/forest committee members and representatives of farmers. Other stakeholders were Muheza District Council, Muheza District and Tanga Regional Catchment Forest and Natural Resources Offices and the Forest and Beekeeping Division. A preliminary survey, with great assistance from forest officers and village leaders in their respective areas helped gathering information on the above listed groups.
Figure 6.1 Amani Nature Reserve, Derema Forest Corridor and the study villages
1 = Kisiwani  2 = Msasa IBC  3 = Kwezitu  4 = Kwemdimu  5 = Kambai
Data collection

In order to capture the socio-economic profile of the five adjacent villages, social survey methods applying Participatory Rural Appraisal (PRA) were employed. The methods are well documented by Gorden (1975), Chambers (1992) and Martin (1995) and were successfully applied by several researchers such as Brokensha and Riley (1980) in Kenya, Kajembe (1994), Kilahama (1994) and Kikula (1996) in Tanzania, Bishop and Scoones (1994) in Botswana, Fujisaka et al. (1994) in Thailand, Campbell et al. (1995) in Zimbabwe and Cunneyworth (1996) and Doggart et al. (1999) in Kambai and Manga Forest Reserve respectively, both of Tanga, Tanzania. Also intensive desk studies were executed for collection of secondary data.

These methods were divided into two categories: interviews with individuals and group discussions in which there were meetings, participatory mapping, preference ranking and historical time lines. Unprompted questionnaires were used to guide the interviews and discussions, as recommended by Casley and Lury (1987).

Use of these methods in the present study could yield information on the communities’ forest dependency, forest status and values, ranking priorities and constraints to conservation of biodiversity and management options for this forest. Others are: impact of resource use by the adjacent communities, conservation measures that Forest and Beekeeping Division and other stakeholders should follow and development of a system for monitoring aspects of forest biodiversity.

Data analysis

Qualitative data were analysed through categorisation and content analysis and presented in graphical or tabular form. Prioritisation of the information was conducted, employing percentage of total frequency cited in order to obtain ranks of importance.
6.3 RESULTS AND DISCUSSION

6.3.1 The villages, Population and Economic activities

Table 6.1 below depicts the human population in the five study villages in which the total population is estimated at around 7,880 with Kwezitu leading with 2,310 people. The majority of the people in the villages are the locals of Wasambaa and Wabondei tribes. The other minority is from immigrants of the Wangoni, Wahehe, Wakinga, Wamakonde, Waha and Wasukuma who initially came into the area for employment on the sisal or tea estates or with Sikh Sawmills.

Livelihood is based mainly on subsistence farming and sale of cash crops in which the main markets are Muheza town and Tanga city. The farming is dominated by crop cultivation mainly using hand hoe, a mixed intercropping practice of crops as shown in Table 6.1. As also noted by Ngaga (2006) in the area, the optimal crops production have been constrained by poor soil fertility, land scarcity, low crop prices, poor soil conservation measures, poor cultivars that have low productivity, poor agricultural extension services and unreliability of seasons. Other bottlenecks are vermin, inadequate capital for supplying necessary agricultural inputs, poor infrastructure and accessibility of the markets.

Table 6.1 Summary of population, forest resource issues and economic activities in the study villages

<table>
<thead>
<tr>
<th>Name of village</th>
<th>Human population</th>
<th>Farms within DFC</th>
<th>Village Forest Reserve</th>
<th>Agricultural crops grown</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Resettled from DFC</td>
<td>%</td>
<td>DFC</td>
</tr>
<tr>
<td>Kisiwani</td>
<td>689</td>
<td>59</td>
<td>8.6</td>
<td>74</td>
</tr>
<tr>
<td>Kwemdimu</td>
<td>1,617</td>
<td>244</td>
<td>15.1</td>
<td>265</td>
</tr>
<tr>
<td>Msasa IBC</td>
<td>2,200</td>
<td>570</td>
<td>25.9</td>
<td>744</td>
</tr>
<tr>
<td>Kwezitu</td>
<td>2,311</td>
<td>216</td>
<td>9.3</td>
<td>420</td>
</tr>
<tr>
<td>Kambai</td>
<td>1,061</td>
<td>39</td>
<td>3.7</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>7,878</td>
<td>1,128</td>
<td>14.3</td>
<td>1,547</td>
</tr>
</tbody>
</table>

Source: URT (2006), DFC = Derema Forest Corridor
6.3.3 Land tenure
Land is traditionally owned, patriarchally inherited and controlled by clan with majority of the households owning between 0.8 and 1.6 ha. Women do not own land but are given farmlands by their husbands, fathers or brothers. Immigrants to these villages apply land from the respective village governments or given/lent by friends.

6.3.4 Forest Resource utilization and impacts to Derema Forest Corridor
As portrayed in Figure 6.1, all the villages are land locked and only Kambai and Kwezitu have village forest reserves (Table 6.1) the utilization of forest resources therefore, is relied entirely on Derema Forest Corridor.

The products and services sought from the forest include: agricultural land, fuelwood, building poles, timber, medicine and ropes. Others are wild food (vegetables, fruits, nuts from Allanblackia stuhlmannii and Elaeis guinense, mushrooms and game meat) and basketry materials from fronds of Phoenix reclinata.

Further observations indicated the significance of forest resources use to females more than their male counterparts. While firewood is most in demand by females and only women collect spices, mushroom and vegetables from the forest, timber is of interest only to men. Participatory approach to resource management with consideration for women who are the most affected group and encouragement of grassroots resource conservation organizations need to be in place. It is only in Kwezitu and Msasa IBC where there are women groups concerned with environmental issues.

The following are the impacts of the forest resource utilization which pose threats to conservation of the biodiversity of Derema Forest Corridor as observed during the field survey:

i) Forest encroachment
The villagers surrounding Derema corridor had plots and were cultivating inside the forest, in which the main crop was cardamom. Kisiwani, Kwemdimu and Msasa IBC occupied the western side and Kwezitu and Kambai the eastern side of the forest. Table 6.1 shows that 14.3% of the villagers have been affected by the resettlement plan in which 1,547 farm plots have been reclaimed back to the forest and now still recovering.

Cardamom cultivation is practiced in the forest after completely clearing the understory and middle layer, leaving only the tree canopy to provide shade. Cultivation becomes unprofitable after about 7 years therefore, a new site is sought whereas the old one is cleared completely for such annual crops as maize, sugarcane or cassava. In this case, Stocking and Perkin (1992) and Hamunen (1998) noted that when the field is finally abandoned, it degrades into Lantana camara, Clidemia hirta, and Psidium guajava scrub, which renders regeneration of other species very difficult.
Other researchers have documented that about 26% of the forested area of the East Usambaras, which varies from 11,000 ha (Johansson and Sandy, 1996) to 17,000 ha (Sah, 1996) is assumed to be under cultivation, mainly of cardamom. This practice threatens the biological diversity in the area because some of the species cleared and suppressed are endemic to this area. The local extinction of some bird species for instance, has been claimed to be due to forest degradation from forest cultivations (Newmark, 2000).

On-farm research conducted by Reyez et al. (2006) demonstrated that organic cardamom could be profitably grown in homegardens. By implementing agroforestry systems, the harmful impact of cardamom cultivation on the forests might therefore, be dramatically reduced.

Derema Forest Corridor is currently still a general land forest governed by the village Land Act and Land Regulations. As per Act 2002, a management plan for the forest is urgently needed. Enormous forest areas have been converted to agricultural land. Statistics show that in 31 years time between 1975 and 2006 the forest cover in East Usambara diminished by 16,680 ha.

Some illegal timber harvesting is taking place in the forest in which yet, some tree species such as *Athocleista grandiflora* are being debarked for medicinal use, claimed to treat asthma, worms and hernia. The other tree species with medicinal properties include *Myrica salicifolia*, *Rauwolfia caffra*, *Albizia gummiifera*, *Rhus natalensis*, *Ficus thonningii* and *Vangueria escalenta*.

The disturbed or secondary forest is also composed of such exotic tree species as *Tectona grandis*, *Artocarpus integrifolia* and *Cedrella odorata*, palms *Elaeis guineense* and *Arenga pinnata* and some agricultural crops dominated by cloves, banana, cinnamon, cardamom, black pepper, *Telfarea pedata* (kweme) and cassava.
With the current shortage of staff (6 but at the moment only 4 available) at the district level, it is likely these problems to exacerbate as it is for forest areas in Sakale, Ndola and Mlesa where there is scramble for gold and Semdoe in which during this study, part of the forest had just been turned into a cassava field unnoticed, for a year.

ii) Forest fires
The kind of farming that is common in the area is “slash and burn agriculture”. During dry season (June – October), forest fires occur spreading from surrounding farmlands in which cleared debris are burnt during land preparation. Another cause of forest fires is hunting for wildlife and collection of honey. Shemdoe (2008) documented that 20 ha of Kambai Village Forest Reserve (equivalent to about 62%) were destroyed in two fire incidences in 2007 and 2008.

iii) Fuelwood crisis
Findings from this study indicate that fuelwood consumption in this area is high with an annual average of 210 head loads of fuelwood per household. According to FAO (1983), this is equivalent to 74.0 m$^3$ per household or 12.3 m$^3$ per head. With the current population increase in the area, with density ranging from 30 to 60 persons km$^{-2}$ that relies substantially on forest areas and surroundings to meet basic survival needs, Derema forest is at dilemma.

Besides the domestic demand, the East Usambara Tea Company (EUTCO) and FOMA soap industry located in Tanga city both with a total demand of 11,600 tons year$^{-1}$, rely partly on the supply of fuelwood from Kwezitu and Kambai which each, can only supply 120 m$^3$ (equivalent to 2 ha) year$^{-1}$.

iv) Wild animal poaching
Derema Forest Corridor harbours a number of wildlife as indicated by the results on faunal survey. Some of these animals are hunted by the communities in the villages surrounding the forest for meat and in some cases with the sole purpose of reducing populations of wild animals which may attack their crops. Hunting of forest dwelling animals takes place both in forest and farm areas. Evidence for illegal game poaching was widespread in Derema Forest Corridor. This included animal snares, hunting using dogs and hunters’ shouts.

The games of particular interest include vervet monkey (*Cercopithecus aethiops*), blue monkey (*Cercopithecus mitis*), giant forest hog (*Hylochoerus meinertzhageni*), giant rat (*Paraxerus ochraceus*), cane rat (*Thryonomys swinderianus*) and warthog (*Phacochoerus aethiopicus*). Others are colobus monkey (*Colobus angolensis*) and baboon (*Papio cynocephalus*). Bushmeat tends to be for domestic consumption. Also, beehives are most often found in forest areas.
v) **Allanblackia stuhlmanii species’ perpetuation threat**

*Allanblackia stuhlmannii*, a tree species endemic to the Eastern Arc Mountains of Tanzania and Kenya is of most importance to the food industry because of the edible oil that can be extracted from the seeds. Currently, it supplies 350 metric tonnes of seeds year\(^{-1}\) (Mathew *et al.*, 2009).

There is a current increase in the use of biotechnology leading to the increased use of enzymatic technology that will come to the fore in the future, that is highly likely to open up new and exciting possibilities in the region of making and modifying new lipid structuring materials, inherently free from trans fatty acids. According to Wassell and Young (2007), using enzyme technology results in avoidance of trans-fats, the environment is therefore spared and a natural product is obtained with natural flavours and better retention of other healthy substances from the oils.

The current collection of seeds of *Allanblackia stuhlmanii* is conducted haphazardly picking the superior, leaving inferior ones for regeneration. If this trend goes unchecked, there will be weaker and weaker future generations of this resource and ultimately it may become doomed. The Advisory Committee on Novel Foods and Processes (ACNFP) expressed concern that *Allanblackia stuhlmanii* is considered a threatened species.

### 6.3.5 Peoples attitudes to conservation

The people appreciated the values of the forest and in general, almost all people in the five villages accept the biodiversity conservation measures of Derema Forest Corridor, taking Amani Nature Reserve which is in the neighbourhood as a yardstick. This can be drawn from Table 6.2 in which 41.7% of the interviewees responded positively; reflecting this opinion and 58.3% reflected the end of an everlasting ambiguity and conflicts between the communities around the forest and the government. It is to the community’s expectations that firstly, clear boundaries between them and the forest will be established and maintained. Secondly, there will be improved availability of forest products (53.1% of the responses) and improved income through eco-tourism and research and training activities.

Concerning the management of Derema Forest Corridor, while none of the respondents preferred it to be annexed to Nilo Nature Reserve, 23.8% proposed to form its own new nature reserve and the majority (76.2%) proposed an annex with Amani Nature Reserve. The communities are willing to participate in the conservation of the forest in the following indicated activities listed in the order of scores: Enrichment tree planting in gap spots (43.2%), forest patrols (31.8%), boundary maintenance and forest fire fighting (13.6%), involvement in educating others on bio-diversity conservation (6.8%), beekeeping as a non-consumptive use of the forest (2.3%) and in-situ conservation of bio-diversity in their own farms (2.3%).
The following nevertheless, need to be put in place to enhance participatory management of the forest: Educating the community on bio-diversity conservation (62.9%), practicing transparency and maximum community involvement in the forest management (11.4%), availing a liaison officer in each village (8.6%), knowing the community’s needs from the forest and making a clear policy on this issue (5.7%), practicing and maintaining good relations between community and the conservation institutions (8.6%) and remunerating the community by conserving bio-diversity which forms source of River Zigi (2.8%).

Table 6.2 Summary of communities’ responses related to Derema Forest Corridor management issues

<table>
<thead>
<tr>
<th>No.</th>
<th>Questions</th>
<th>Responses</th>
<th>Responses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>What are your opinions on Derema Forest Corridor being elevated to a nature reserve?</td>
<td>Positively accepted since bio-diversity will be conserved as that of Amani Nature Reserve</td>
<td>41.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Forest boundary and fire lines will be made clear, avoiding everlasting ambiguity and conflicts between the community and government</td>
<td>58.3</td>
</tr>
<tr>
<td>2.</td>
<td>What are your expectations if Derema becomes a nature reserve?</td>
<td>Increased availability of forest products</td>
<td>53.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Income will be boosted through eco-tourism and research activities</td>
<td>46.9</td>
</tr>
<tr>
<td>3.</td>
<td>If Derema becomes a nature reserve, what is its best management option?</td>
<td>Annexed to Amani Nature Reserve</td>
<td>76.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annexed to Nilo Nature Reserve</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Form its own reserve</td>
<td>23.8</td>
</tr>
<tr>
<td>4.</td>
<td>What are the potential roles that the community can play in the conservation of Derema Forest Corridor?</td>
<td>Safe guarding the forest through patrols</td>
<td>31.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enrichment tree planting in gap spots</td>
<td>43.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boundary maintenance and forest fire combating</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beekeeping as a non-consumptive use of the forest</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Involved in educating others on bio-diversity conservation</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-situ conservation of bio-diversity in their own farms</td>
<td>2.3</td>
</tr>
<tr>
<td>5.</td>
<td>What do you think should be done to enhance your participation in the conservation of Derema Forest Corridor?</td>
<td>Educating the community on bio-diversity conservation</td>
<td>62.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practicing transparency and maximum community involvement in the forest management</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practicing and maintaining good relations between community and conservation institutions</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowing the community’s needs from the forest and making a clear policy on this issue</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remunerating the community by conserving bio-diversity which forms source of River Zigi</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Availing a liaison officer in each village</td>
<td>8.6</td>
</tr>
</tbody>
</table>
Moreover, the communities commended the whole exercise of resettlement for farm plots displaced for biodiversity conservation in the Derema Forest Corridor, whose process was much more participatory than that used for Amani Nature Reserve.

6.3.6 Management of Derema Forest Corridor
As it has also been noted by TBA (2007), Derema Forest Corridor is the only forested connection in the East Usambaras to translocate any species to repopulate other forested areas. Moreover, the forest is a source of water for River Zigi which entirely feeds the population of Tanga City. The water sources are found around Kwemdimu, Antakae and Magoda and form tributaries for the river.

From this study, it is proposed to first, establish the legal status for the Derema Forest Corridor then annex it to Amani Nature Reserve. This is because, there is a continuity of similar biodiversity in the two forests and secondly, since the two are juxtapositioned and are within the same political district of Muheza, their management will be much more facilitated. Nilo Nature Reserve which is located in Korogwe District is cut-off by human settlements at Kizerui village.

6.3.7 Potential Strength and Opportunities
Derema Forest Corridor and its surrounding villages are potentially strong with enormous opportunities to excel, if fully recognized and utilized. These include eco-tourism, forest resources, suitable soil and weather conditions and development institutions around in combination with the communities’ willingness to participate in the conservation of Derema Forest Corridor. The roads however, are very poor and the other infrastructures including such items as associated services like developed campsites, restaurants etc. are completely lacking. The road network and condition are too pathetic to encourage eco-tourism business.

The presence of *Arenga pinnata* (syn. *Arenga saccharifera*) in the area growing wildly, could have served economically the communities substantially. Uhl and Dranfield (1987) documented that *Arenga pinnata* is an economically very important palm native to tropical Asia particularly India, Malaysia, Indonesia and Philippines in which it is commonly known as Arenga Palm and Sugar Palm. In these countries, the sap is tapped yielding a sugar known in India as gur, and can also be fermented into vinegar and wine. The average yield is 5 kg of juice/day/tree with an average sugar content of 13.5%. The immature fruits are widely consumed as food and can also be canned after boiling in sugar syrup. This plant is a potential resource for bio-fuel in the form of ethanol (Riffle and Craft, 2003).

According to Uhl and Dranfield (1987) and Riffle and Craft (2003), the sugar palm tree is considered a multipurpose tree, also producing starch, helping in apiculture, used as fuel, producing fibre and timber, serving as live fence and supplying a kind of poison and medicine.
The following are the institutions governmental and non-governmental, working in the East Usambaras Derema being inclusive:

i) **Umoja wa WaFugaji Amani (UWAMA)**
The association is non-governmental, which started its dairy cow zero-grazing activities in 1980’s. This is a small-scale dairy development project with support from Heifer International. Farmers sell milk to the established centre in Amani and taken to the dairy farmers’ cooperative in Tanga, to eventually be sold to Tanga Fresh, mainly for yoghurt production.

ii) **WWF through Tanzania Forest Conservation Group (TFCG)**
This international trust fund runs several development projects as listed below:

a. Butterfly farming project which started in 2002 dealing with 320 farmers so far in the East Usambara areas. The project runs activities in the 5 villages dealing with farmers in Kambai (70 farmers), Kwemdimu (50), Kisiwani (28), Msasa IBC (50) and Kwezitu (80). The income accrued therefrom is distributed as follows: 65% farmers, 28% office running and 7% community development.

b. East Usambara Landscape Restoration Project which started in 2004 and operating in Kambai, Kwezitu and Shambangeda. It deals with fisheries in Mgambo, Kwezitu, Misarai, Zirai, Kizerui and Kuze Kibago and beekeeping in Kisiwani and Kwemdimu.

c. **Allanblackia stuhlmanii** planting and seed collection project whose activities started 2008 in collaboration with ICRAF, TAFORI and CIFOR, Landscape Mosaics. The areas of operation are Shambangeda, Msasa IBC, Shebomeza, Mbomole, Antakae, Ubiri, Kwezitu and Misarai. A central nursery was established at Kwamkoro. Adaptive efforts are being made to raise the tree within village conditions, including grafting to reduce maturity times to 5-6 years from the current over 10 years.

d. Piloting **Ocimum kilimandscharicum** farming and extraction of essential oil project which started in 2009. It is operating in Maramba.

e. In order to reduce dependence on forest for fuelwood and house construction materials, TFCG has been advocating and supporting fabrication and use of fuelwood efficient stoves and construction of modern house using bricks and iron sheets. So far 2,206 stoves are in use, making an average of 123 stoves per village and at least 25% g/houses have been constructed.
f. Through Derema Re-settlement Plan which was initiated and implemented in 2006 and 2007 respectively in which 1,128 farmers were compensated and 1,547 farm plots within Derema forest reclassified.

iii) Novella Development Tanzania Limited (NDTL)

Novella Development Tanzania Limited started *Allanblackia stuhlmanii* planting and seed collection project in Amani in 2003, operating in Msasa IBC, Shambangeda and Kwezitu.

iv) Amani Nature Reserve

Amani Nature Reserve is a government institution, encouraging the following activities in the area: production of improved adobe blocks for building construction, spice farming on existing farms out of the forest, fish farming and modern beekeeping. So far there are six fish ponds in operation, producing about 30 kg. of fish each three months. There is little animal protein in the Amani villages, so the fish sell at good prices.

The beekeeping programme has offered modern beehives to villages to increase honey and beeswax production. So far only about 20 hives have been set up, but there is enthusiasm to take up this activity.

Other encouraged and supported activities include training in anti-erosion techniques and training and recruitment of nature guides in which the priority is given to people from the Amani Nature Reserve buffer zone villages including Kisiwani and Msasa IBC.

v) Eastern Arc Mountains Conservation Endowment Fund (EAMCEF)

This is a trust fund operating through a project for conservation of important areas in Amani. The following are the activities carried out by EAMCEF:

a. Boundary survey, demarcation and consolidation
b. Staff capacity building
c. Patrol
d. Creating awareness on conservation of environments
e. Establishment of forest nurseries

vi) Muheza District Council

Muheza District Council was responsible during sensitizing the communities in the five villages, boundary survey, marking and consolidation and the compensation process. Other conservation activities done include tree planting, forest patrols, conservation of water sources and sustainable harvesting of own trees in the public land.

vii) CARE

CARE is a non-governmental humanitarian institution fighting global poverty. In the East Usambaras, it started in May 2009 operating through Village Community Banks (VICOBA) with a slogan of WEKEZA, literally meaning “invest”.

45
viii) Tea estates
The tea estates surrounding Derema Forest Corridor include Derema, Kwamkoro, Mgambo and Monga. The factories of these estates need fuel wood for curing tea. These factories together, with soap industries in Tanga City have signed a Memorandum of Understanding with farmers, facilitated by Tanzania Forest Conservation Group (TFCG), in which the farmers would grow and supply fuelwood for these factories. The tree planting activities are supported by TFCG.

ix) Tanzania Forestry Research Institute (TAFORI)
This is a government research institution, operating in the area through the Amani Botanic garden.

x) Other stakeholders of Nature conservation
These include conservationist and foresters, donor agency representatives, researchers, eco-tourists and government employees. These interact with one another and with the local people at different levels and in different spheres of influence. Diverse as they might appear, all have in one way or another some interest in what is taking place, as far as the management of the forests is concerned.
6.4 CONCLUSION AND RECOMMENDATIONS

From this study, it is evident that the livelihoods of the communities in the five villages adjacent to Derema Forest Corridor rely on farming and forest resources. The optimal crop production however, is constrained by poor soil fertility, land scarcity, poor marketing, poor agricultural extension services and unreliability of seasons. Other bottlenecks are vermin, inadequate capital investment and poor infrastructure.

In spite of the great role that women play in natural resource use no women groups concerned with environmental issues, Women Environmental Association (WEA) have been set up in the villages except Kwezitu and Msasa IBC which could be considered a set-back for conservation measures.

The utilization of forest resources is associated with a number of threats to the Derema Forest biodiversity conservation including forest area encroachment, forest fires, fuelwood crisis, wild animal poaching and Allanblackia stuhlmanii perpetuation threat.

From the interviews made, it is evident that the communities are willing to participate in the biodiversity conservation of Derema. Nevertheless, forest boundaries and fire lines have not yet been made clear and therefore a cause of everlasting ambiguity and conflicts between the community and government. Also people need: basic education on biodiversity conservation, a liaison officer in each village for biodiversity issues, a clear policy on forest resource use and maintenance of good relations between community and the conservation institutions.

The area nonetheless, is endowed with resources and potentials for developing other income generating activities. These potentials include eco-tourism, suitable soil and weather conditions and development institutions around. It is clear that villages involved have increased income per month and have positive views towards the development projects.

The significance of Derema Forest Corridor in terms of biodiversity, gene pool conservation and services (source of water for River Zigi, eco-torism, etc.) need to be safeguarded.

The following are recommendations drawn from this study:

- In order to enhance marketing of agricultural crops and facilitate the eco-tourism in the area, all access roads should be well developed and maintained regularly.

- For securing sustainable supply and utilization of fuelwood in the programme area, implementation of the action plans proposed by Shemdoe (2008) should be advocated. These include awareness creation and advocacy programmes on tree
planting, prohibiting the use of fire as a tool during farm preparation, provision of alternative income generating activities to reduce the total dependence on the forest resources. Others are encouraging fabrication and wide use of the improved fuelwood stoves and use of alternative source of energy like palm shells.

- Participatory approach to resource management with consideration for the affected groups meeting social and economic needs of the community and encouragement of grassroots resource conservation organizations are recommended. This is in favour of women who play great role in natural resource use.

- In order to avoid everlasting ambiguity and conflicts between the community and government, clear forest boundaries and fire lines should be made clear and consolidated. Moreover, enough biodiversity liaison officers need to be availed.

- To assist the communities developing income generating activities, in the Derema Forest Corridor management plan, entrepreneurial education on small enterprises should be emphasized. This education need to be provided before compensation is effected. The alternative land given as compensation to the farmers should be accompanied with title deeds. There should also be a stipulated mechanism (such as a Memorandum of Understanding) in which the farmers will be obligated to deal with the problem of their planted trees within the forest through harvesting and denial of their further regeneration.

- The village committees should be aware that they are accountable even for the Central Government forests. There should be involvement of local communities in boundary and fire line maintenance, farm forestry activities and also tree gap filling. The Management Plan should entail facilitation of developing Village Resource Management Plans for the buffer zone villages in this study.

- The local communities sacrifice for national and global interests such as biodiversity conservation. And quite often-upstream sacrifices are unrecognized by downstream people and so undervalue them. Therefore, the major challenge facing practitioners and researchers is to strive putting mechanisms in place to remunerate these communities and increase the forest direct use values.

- Sustainable harvest levels of seeds should only be done after conducting harvest assessments, regeneration and yield studies. Harvesting commercial quantities of seeds can affect not only species regeneration, but genetic composition and quality of the resource, if only inferior fruits and seeds are left to regenerate. In harvests of wild fruits, the effect on wildlife populations must also be considered. Summarily, harvesting of *A. stuhlmanii* seeds should contribute to
the maintenance of the network of Derema Forest Corridor, rules and regulations therefore should strictly be adhered to.

- A long term management of *Allanblackia stuhlmanii* is required since there is a current increase in the use of biotechnology.

- The communities should be assisted tapping the existing potentials of *Arenga pinnata*. This wildly spreading plant is hitherto, regarded as an invasive species with heavy shade and dense root system allowing very few plants to thrive under it, with hardly yield though.

- Establishment of the legal status of Derema Forest Corridor should be done first then the forest annexed to Amani Nature Reserve. This is because, there is a continuity of similar biodiversity in the two forests and they are juxtapositioned within the same political district of Muheza, their management will be much more facilitated.

- Continuous monitoring of improvements in community conservation of the reserve is required for establishing the impacts of the development projects in the villages involved.
7.0 CONCLUSIONS

Derema Forest Corridor, a proposed National Forest Reserve covers an area of 938.53 ha or 9.4 km², in the central area of the East Usambara range. With altitudes between 190 - 1,130 m above sea level, it consists of lowland and sub-montane forests and grassland and patches of woodland.

Species Richness
The Forest was found to contain a minimum of 1,435 species of trees, shrubs and herbs; 29 mammal, 41 bird, 35 reptile, 15 amphibian, 62 butterfly, 11 beetle, 6 mollusc and 3 millipede species (Table 7.1).

Flora
Twelve species were recorded which are endemic to the Usambara Mountains. Eighty species have ranges restricted to the Eastern Arc and/or East African lowland forests. One hundred and thirty species are dependent only on primary forest, and of these species ten are also endemic or near endemic to the Usambara Mountains. Ninety eight non-forest tree, shrub and herb species are established within the reserve boundaries. Sixteen species are alien in the area.

Fauna
Five bird, one reptile and two butterfly species were recorded which are endemic to the Usambara Mountains and two mammal, four bird, nine reptile, six amphibian and three butterfly species were recorded as near-endemics, having ranges restricted to the Eastern Arc and/or East African lowland forests. Fifty-three species are considered dependent only on primary forest, and of these species, 24 are also endemic or near endemic to the Usambara Mountains. Seventeen non-forest species are established in the reserve.

Table 7.1 Summary of floral and faunal families and species identified

<table>
<thead>
<tr>
<th>Taxon</th>
<th>No. of families</th>
<th>No. of species</th>
<th>Ecological type</th>
<th>Endemic status</th>
<th>IUCN status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>F f O</td>
<td>E N CE EN NT V</td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td>153</td>
<td>1,435</td>
<td>130 235 98</td>
<td>12 80</td>
<td>- 2 - - -</td>
</tr>
<tr>
<td>Mammals</td>
<td>13</td>
<td>29</td>
<td>8 10 1</td>
<td>0 2</td>
<td>0 1 1 1 2</td>
</tr>
<tr>
<td>Birds</td>
<td>18</td>
<td>41</td>
<td>8 12 9</td>
<td>5 4</td>
<td>1 0 4 5 2</td>
</tr>
<tr>
<td>Reptiles</td>
<td>9</td>
<td>35</td>
<td>12 11 3</td>
<td>1 9</td>
<td>0 3 0 7 3</td>
</tr>
<tr>
<td>Amphibians</td>
<td>7</td>
<td>15</td>
<td>10 5 0</td>
<td>2 6</td>
<td>0 1 1 6 7</td>
</tr>
<tr>
<td>Butterflies</td>
<td>16</td>
<td>62</td>
<td>15 37 4</td>
<td>5 3</td>
<td>- 2 - - -</td>
</tr>
<tr>
<td>Beetles</td>
<td>3</td>
<td>11</td>
<td>- - -</td>
<td>- -</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Molluscs</td>
<td>6</td>
<td>6</td>
<td>- - -</td>
<td>- -</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Millipedes</td>
<td>2</td>
<td>3</td>
<td>- - -</td>
<td>- -</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>1,637</td>
<td>183 310 115</td>
<td>25 104</td>
<td>1 9 6 20 6</td>
</tr>
</tbody>
</table>
**Disturbance**

Forest products commonly extracted by villagers include building poles, withies and stacks, medicines and wild food (bush meat, edible plant leaves and mushrooms). Timber extraction at a commercial scale has now largely stopped, however secretive pole and timber continue to take place by local villagers. Another forest disturbance comes from wild fires. The highest rates of disturbance were in the areas adjacent to the communities. It is clear from the agricultural crops (cloves, cardamom, mango, and banana trees) within the forest that recent cultivation had been taking place in some of these open areas.

**Conservation**

The forests of the East Usambara Mountains are globally recognized as being a significant hotspot of biodiversity. These natural resources, whose floral and faunal diversity contain a high number of endemic species, are a conservation priority. Due to human activities nonetheless, these forests have been fragmented and therefore providing greater insecurity for the flora and fauna therein, particularly the endemic and near-endemic species. For those species that are forest dependent, forest reserves now provide almost the only available habitat. In these areas, the only forested connection to trans-locate any species to re-populate other forested areas is the Derema Forest Corridor. At present, no legal status protects this forest other than basic legislation regarding water catchments and the felling of specific tree species. From a biological and socio-economic perspective, protection of this forest is of utmost importance. This work proposes establishment of a legal status of Derema Forest Corridor, then annexing this forest to Amani Nature Reserve. The conservation and management measures that Forest and Beekeeping Division and other stakeholders should follow to improve forest cover and maintain biodiversity of the forest are stipulated in Appendix 3 and 4.
REFERENCES CITED


APPENDIX 1. TERMS OF REFERENCE

PROJECT: COMPENSATION AND GAZETTEMENT PROCESS OF DEREMA FOREST CORRIDOR, EAST USAMBARA – TANZANIA.

TERMS OF REFERENCE

TASK:- Consultancy Work to Carry out Biodiversity Survey and Collect Relevant conservation Information from Derema Forest Corridor (Proposed National Forest Reserve) in the East Usambara Forest Landscape.

1. Background

The forests of the East Usambaras are among the most important vegetation for biodiversity conservation in Africa. These forests contain high rates of endemism in both plant and animal species. They are also home to communities of poor people who need to utilize the forests’ natural resources for survival. The East Usambara forests are largely located in Muheza district (90%) and the balance is in Korogwe district. It is estimated that about 120,000 people live in these areas, distributed across 61 villages.

The major threats to the forests in the East Usambaras are fire, spreading from surrounding farmlands, logging, gold mining and farmland encroachment particularly into the yet ungazetted forests. There is also a serious issue of invasive species outstandingly, of the tree *Maesopsis eminnii* and various shrubs, herbs and lianas.

In Muheza District the East Usambaras are embedded in one nature reserve (Amani), 11 forest reserves, one proposed forest reserve (Derema), four village forest reserves and two private forests. Outside these reserves, most of the forests have been cleared for farmland and the remaining forests are in private land.

Studies have indicated that if the forests become too fragmented and isolated, a number of the species only known to exist from these forests will become globally extinct. Forest loss will also disrupt the ecological services currently provided by the forests to the villages and towns in the vicinity of the East Usambaras.

The Derema Forest Corridor, located in Muheza District Tanga with about 500 ha of land, was once used for cardamom farming and other human activities, now is to be gazetted later this year as a National Forest Reserve. Adjacent to this corridor however, are five villages namely; Kisiwani, Kwemdimu, Msasa IBC, Kwezitu and Kambai with a total human population of 7,878 out of which 14.3% is dependent in one way or another, on this forest. In order to accomplish the gazettement mission, development of a management plan for this forest is essential and this is only made possible after conducting both biodiversity and socio-economic surveys of the forest.
2. Main Objective

The overall objective of this study is to collect all important bio-physical and socio-economic information for enhancement of formulation of management plan of the Derema Forest Corridor.

3. Specific Activities

From the above highlight of Derema Forest Corridor, the proposed specific activities to be conducted in the forest for the biodiversity survey include the following:

b) Carry out biological baseline surveys
c) Identify and provide information of biological values and importance of this forest
d) Provide a system for monitoring aspects of forest biodiversity
e) Assess levels of disturbance by the incidences of tree cutting, cardamom farms, planted exotics and other colonizing plant species
f) Collect opportunistic data (species list) on all other groups of vertebrates and invertebrates
g) Undertake socio-economic appraisal of the impact of resource use by the adjacent communities
h) Provide recommendations, after analyses on:
   i. Species richness microhabitat - through zoning and mapping
   ii. Flora and Fauna records and distribution
   iii. Current disturbance incidences (severity and incidences)
   iv. Conservation and management measures that Forest and Beekeeping Division and other stakeholders should follow to improve forest cover and maintain biodiversity of the forest including management potentials and options such as remaining an autonomous Forest Reserve, annexation to Amani Nature Reserve or Nilo Nature Reserve, application of JFM arrangements etc
   v. Indicate possible roles of the different stakeholders in the conservation and potential actual benefits
   vi. The forest status monitoring indicators to be tracked over time.