

TECHNICAL PAPER 17

Development of Forest Trails and Drive Routes in the Amani Nature Reserve

East Usambara Catchment Forest Project

1995

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Foreword

Amani and the East Usambara forests are well known both in Tanzania and abroad. Since more than a century the area has been visited by expeditions and individuals who are interested in the biology, natural beauty, economic potential of the rain forests of the East Usambara mountains.

The establishment of a nature conservation area in Amani has been proposed since the 1980's. In 1988 the Amani Forest Inventory and Management Planning Project made a specific proposal included as part of the general framework for management of the East Usambara forests. The proposal of establishing the Amani Nature Reserve has been the major focus of the East Usambara Catchment Forest Project (EUCFP) which started in 1991.

However, until recently little was done to provide visitors with opportunities to see and experience the sub-montane rain forests they so often are interested in. In 1994 the East Usambara Catchment Forest Project started preparing for the establishment of a network of nature trails to service visitors arriving to the area. Karimjee Jivanjee Ltd., owners of some of the tea estates in the area and a considerable estate of natural forest, also had a wish to develop trails for their visitors.

In early 1995 the East Usambara Catchment Forest Project and the Karimjee Agriculture Ltd. agreed to commission a consultancy to assist the EUCFP staff to develop a set of forest trails and drive routes in the Amani Nature Reserve area. The result is a comprehensive trail guide and a proposal for how to mark and establish the trails in the field, and some general proposals and ideas on how to further develop visitor oriented tourism in the East Usambaras. This is the first step in an effort of the East Usambara Catchment Forest Project to develop services and publication material for the visitors who come to see and experience the East Usambara mountains.

We sincerely hope that these trails guides, once completed and printed, will be useful to those who wish to get a closer look at the these magnificent forests.

13 November 1995

M.I.L. Katigula
Project Manager

Stig Johansson
Chief Technical Adviser

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1 BACKGROUND

1.01 The Commonwealth Development Corporation (CDC) was contracted for a consultancy to design forest trails in the Amani Nature Reserve (ANR) by the East Usambara Catchment Forest Project (EUCFP) with additional financial support from Karimjee Agriculture Ltd (KAL). The EUCFP is implemented by the Forestry and Beekeeping Division (FBD) with implementation support from the Finnish Forest and Park Service (FPS). The aim was to design and prepare a number of trail guides for visitors to the East Usambara mountains and forests which would make the area more accessible to visitors and could later form the basis of an ecotourism development plan.

1.02 The consultancy was undertaken by Antony Ellman (CDC Agriculturalist and Socio-Economist) and Alan Tye (Consultant Biologist), working closely with a team of Tanzanian foresters from the EUCFP (Sosthenes Rwamugira, Bruno Mallya and Frank Mahenge), and a botanist (Ahmed Mndolwa) from the Tanzania Forestry Research Institute (TAFORI). 20 workdays per consultant were allocated, over a 3 month period between April and June 1995.

1.03 The terms of reference of the consultancy, including the objectives, suggested strategy, team members, budget and expected outputs, are attached (Annex 9). The summary report was compiled by Antony Ellman but it is believed to represent the views of both consultants as well as the Tanzanian members of the team.

2 THE TASK

2.01 Although East Usambaras are internationally renowned for the diversity of their plant and animal populations, and receive many visitors each year from around the world, the facilities for visitors and the ease of access to different parts of the mountains and forests are very poorly developed. A major objective of the consultancy was therefore to “put East Usambaras on the map”, both within Tanzania and internationally, and to raise awareness of their interest, beauty and biological importance.

2.02 Eight forest trails were designed, walked and described in detail. Three driving routes were also designed and described, and a tour of one of the tea factories on the mountain was proposed.

2.03 In each case the whole team walked the trail or drove the route, all members keeping notes on points of interest to be incorporated in the guide. One of the two consultants then prepared a draft description which was discussed with other members of the team to ensure that nothing important had been omitted. Wherever feasible, people living along the routes covered in the guide were also consulted on various aspects of the trails, so that the exercise served a training and awareness raising purpose as well as producing the trail descriptions.

2.04 It would have been desirable to re-walk the routes to check that the descriptions are accurate and not misleading. Unfortunately the time allocated for the consultancy did not permit this to be done except in one or two cases. However, it is now proposed to invite interested residents or visitors to the area to try out the guides in practice, which may be a more useful way of achieving the same objective.

3 OUTPUTS

3.01 Attached to this report are the following documents:

- 1) A Guide to Trails and Drive Routes in Amani Nature Reserve, with an introduction to the area, directions on how to reach Amani, descriptions of eight walking trails, a tea factory tour and three driving routes;
- 2) A Suggested List of Sketches to illustrate the trail descriptions;
- 3) A List of Tree Labels Required along the trails;
- 4) A List of Maps Required and Already Prepared to accompany the trail descriptions;
- 5) Two Lists of Recommended Signposts and Signboards to clarify the directions in the Trail Guides;
- 6) Suggestions for Additional Trails that could be developed at a later stage;
- 7) Suggestions for the contents of a more comprehensive East Usambara Guide Book which could be prepared at a later stage; and
- 8) Suggestions for a Questionnaire to be completed by early users of the guide as a means of improving its usefulness.

3.02 Discussion is still needed on several of these lists, as well as incorporation of the maps and illustrations in the trail descriptions and editing of the guides themselves in the light of user experience. The reports, though comprehensive according to the terms of reference of the consultancy, should therefore be seen as drafts for further discussion, in which the consultants and team members will be glad to participate.

4 ANALYSIS

4.01 A question raised at the start of the consultancy was whether each trail guide should be prepared as a stand-alone leaflet or as part of a consolidated booklet. In view of the overall length of the document, it could be preferable to present the trail guides as a series of inter-related leaflets with an introduction common to all. This would give more flexibility and save costs. The option should be considered carefully at the design stage.

4.02 The length of each trail description has turned out to be greater than was originally anticipated. This is partly because of the need for detailed directions to avoid the risk of visitors getting lost (which can be reduced on some trails once the recommended maps and signposts have been prepared), but mainly it is because of the number of interesting things to be seen and learnt on the trails which the writers feel should not be omitted. Visitors who make the effort needed to reach Amani are most likely to be serious naturalists or walkers who would want detailed ecological, social and historical information on the area. Hence a shorter, more superficial guide is not considered appropriate for East Usambaras. However, it is suggested that:

- 1) route maps should be included wherever possible to reduce the need for including detailed physical directions in the text;
- 2) the layout chosen for the guide should be such as to make it easier for users who are not interested in every detail to skip some components without losing the overall thread.

4.03 The obvious case where this can be done is with the Amani Botanical Garden Tours (T.1, T.2, T.7): the plantation maps suggested in 3.01(2), and the tree labels and keys suggested in 3.01(5), will make it possible to dispense with much of the tree-by-tree account in these trail descriptions and should make these guides much more digestible.

4.04 The same applies to the Driving Routes (D.1-D.3), whose directions could be less detailed if adequate route maps are available.

4.05 The final layout of the trail guides, and the way the illustrations are incorporated with the text, will be crucial in making the descriptions more user-friendly than they are at present. A number of options could be considered:

- (1) a columnar approach, with distances on the left, landmarks and points of interest in the centre, and illustrations on the right;
- (2) a boxed design, with text wrapped around scattered boxes containing relevant illustrations to break up the density of the written material;
- (3) a combination of these or other designs, on which professional editorial advice should be taken.

4.06 It is suggested that decisions on the final layout of the guide should await feedback from test-users of the trail descriptions in their present format. For this purpose a Visitor Questionnaire has been prepared (para 3.01(6)).

4.07 A final question which needs to be addressed is:

- (1) how best to finance on a sustainable basis the proposed Amani Nature Reserve and the facilities which visitors to the area would require; and
- (2) what financial contribution the visitors themselves can be expected to make, to reduce the burden on the Tanzania Government and on donor agencies whose input cannot continue for ever.

4.08 Most people who come to East Usambaras are likely to be "down-market" visitors who want simple, low-cost accommodation and facilities and do not have vast amounts of money to splash around. Heavy-spending package tours with demands for luxury accommodation and facilities would be quite out of place in Amani. However, there is a need for expenditure on improved transport and accommodation, for which private sector investors with concern for the environment may be an appropriate source.

4.09 Further to this, most visitors to East Usambaras would and should be willing to make a bigger financial contribution to upkeep of the area than is asked of them at present. The East

Usambara Trust Fund suggested at the end of the first section of the guide may be one way of achieving this; entrance fees to the Nature Reserve and sale of the guide book would also raise some revenue, but too high charges could frighten people away. This aspect of making the trails sustainable clearly needs more thought but is beyond the bounds of this consultancy.

5 CONCLUSION

5.01 It is apparent that the task undertaken by the consultancy team was very ambitious in the time allocated for the job, and that a lot more work remains to be done. However the team members hope, and feel, that a good start has been made and that later work taking account of user comments will result in a useful end product.

5.02 The critical issue will be to find an acceptable layout which integrates text and illustrations and makes the guides digestible without loss of essential detail. The consultants and team members will be happy to contribute to this process to the extent of their competence and availability; we hope that the work done so far will make a constructive contribution to the conservation and improvement of East Usambara's forests, people's livelihoods and environment.

A GUIDE TO TRAILS AND DRIVE ROUTES

IN AMANI NATURE RESERVE

DRAFT FOR COMMENTS AND TESTING

**Ministry of Tourism, Natural Resources and
Environment, Tanzania
Forestry and Beekeeping Division**

**Department of International
Development Co-operation, Finland
Finnish Forest and Park Service**

Tanga 1995

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INTRODUCTION

1 The East Usambaras: Structure and Environment

The East Usambara Mountains form part of a broken chain of mountain ranges which, in Tanzania, stretches in a great arc from the Pare Mountains in the north, to East and West Usambaras near the coast at Tanga, and round to the Uluguru and Uzungwa Mountains inland from Dar es Salaam (see Map 1). The East Usambaras cover about 1,500 sq.kms. and rise to a height of just over 1,500m. They consist of five major mountain blocks, of which the Amani range is the largest (see Map 2). The central plateau of the Amani block falls away in a series of ridges, on one of which stands the village of Amani itself.

The East Usambaras are only 40 km from the sea, and the prevailing winds ensure that they receive high rainfall (mean 1,800-2,200 mm pa) which is well distributed through the year. The rains fall in two monsoons, the south-east (March-June) and north-east (October-December). The heaviest rains are normally in April-May. There are two drier seasons, one hot (January-February) the other cool (July-September), with mean maximum temperatures of 27.1°C and mean minimum temperatures of 13.4°C.

The mountains consist of crystalline rocks (mainly gneisses, granulites and amphibolites) and are thought to be of great age, probably over 25 million years. In some parts garnets, pyroxenes and hornblendes can be found. The soils are generally deep, well drained, acid and of moderate fertility. Most of the nutrients are in a shallow surface layer which is quickly leached when the forest is cleared. The topsoils are remarkably resistant to erosion, but exposure of steep slopes causes a major risk of landslides during the monsoon season.

2 Ecology: indigenous flora and fauna

East Usambara is famous for the exceptional diversity of its plant and animal communities. Most of this richness centres on the forests, which are thought originally to have covered the entire area. Apart from the bare hills on the western escarpment (visited on the Ndola Trail, T5), which were already clear when visited by the German explorer and missionary Krapf in the 1840s, the forests remained largely intact until the 1880s when the first plantations, mainly of coffee, were established by German planters and large scale extraction of timber began. A further period of intensive clearance took place in the 1950s when tea planting expanded, and this has been followed by more extensive logging, and by clearance for small-scale agriculture by a rapidly increasing population.

Two types of forest are present: lowland and submontane, with a transitional zone between 500m and 900m altitude. Each forest type supports its own range of unique plant and animal species. 217 indigenous tree species have been recorded in the area, some trees reaching heights of over 60m. The trees have a wide range of uses in building, carving, furniture-making, traditional medicines, etc. A list of some of the important tree species and their uses is in Table 1.

The East Usambara forests are internationally renowned for the high number of endemic species they contain (ie those found here and nowhere else). For example, more than a quarter of the 30-odd species of amphibians and reptiles in East Usambara are found nowhere else in the world. Among plants, the submontane forests are especially rich in endemic

species: 50 tree species are found only in East Usambaras or a few other locations in Eastern Tanzania, Kenya and Mozambique. There are also many threatened species of birds, insects and other animals and plants.

These special characteristics of the flora and fauna are probably due to a long period of isolation from other forest areas, combined with exceptional climatic stability over perhaps 50 million years during which many species unique to the forests have been able to evolve.

Usambara is famous as the home of most of the species of African Violet *Saintpaulia*, named after Baron Walter von Saint Paul Illaire, the German administrator of Tanga Province in the 1890s. The cultivated varieties are mostly derived from *S. ionantha*, originally discovered by the Baron near Tanga in 1892.

There are also many tree species found only in Usambara and a few other places.

Allanblackia stuhlmanni (local name Msambu) is one which will be seen on several of the trails described in this guide: it grows only in Usambara and a few other forests of East Africa. It is common in submontane forest and is often left on farmland because its red-brown fruit, the size of a large coconut, contains seeds from which an edible oil, used also in soap-making, can be extracted.

The wide range of birds to be seen and heard in the East Usambara mountains are a further indicator of the ecological importance of the forests. Many bird species are strictly dependent on forest habitat for at least part of their life cycle: some species found in the forest understorey will not even venture near the edge of the forest, let alone outside it. Unfortunately birds living in the interior of the forest are notoriously difficult to see, and it is not even common to hear many bird calls except near dawn or if a feeding flock of mixed species insectivorous birds is encountered.

On the other hand, many of the birds for which East Usambara is famous (that is, those with very restricted ranges) are not birds of the understorey but normally frequent the forest canopy or "edge" habitats such as the gaps left by fallen trees. These species are naturally adapted to gardens and forest edge, and many can be seen in the grounds of the Amani Research Centre. Table 2 lists some of the birds that may be encountered on the trails, and indicates where and how commonly they may be found.

Unlike other groups of animals, the mammals of East Usambara are less special although some are quite conspicuous. Yellow Baboons *Papio cynocephalus* and Blue Monkeys *Cercopithecus mitis* will probably be seen, but the Black and White Colobus Monkey *Colobus polykomos* is shyer and more difficult to spot. Civet *Viverra civetta* and Slender Mongoose *Herpestes sanguineus* are quite common, but Bush Pig *Potamochoerus porcus*, though a frequent pest on cultivated land, are rarely seen in daylight hours.

3 Ecology: introduced species

Three of the walks in this guide include parts of the Amani Botanical Garden, originally planted by German scientists in the early years of the 20th century. The garden was established for the purpose of exploring the potential of various crops, from both Tanzania and other parts of the world, for commercial cultivation in East Africa. It extends from the valley of Sigi River at an altitude of 400 m (Trail T7), through the Medical Research Centre at 900 m (Trail T1) to the peak of Mbomole Hill at 1,100 m (Trail T2), thus allowing trials for both lowland and highland species.

Many of the original plantings in the Botanical Garden have disappeared, but additions were made during the period of British administration. Major surveys of the plantations were carried out in the 1930s by the famous botanist PJ Greenway, who worked at Amani between the wars, and in 1961-62 by the Muheza District Agricultural Officer BJ Honess. More recent surveys were carried out by Ruffo and Bech in 1989, and by the Tanzania Forestry Research Institute in 1993.

Partly as a result of the introductions made by the Amani Botanical Garden, many naturalised plant species from other parts of the world now flourish in the Amani area. Some of these have spread only slowly, or grow only in disturbed habitats such as farmland where they pose little threat to the biodiversity of the area. A few, however, have proved more invasive and are having an adverse effect on some native species, if only that they take up space which would otherwise be occupied by indigenous species and thereby reduce their population sizes and gene pools.

Such invasive species include the South American melastome *Clidemia hirta* and Curse of India *Lantana camara* (also from the Americas), which are now two of the most common species among the vegetation of semi-disturbed habitats with regenerating scrub. *Clidemia* can easily be recognised by the pattern of veins on its rather hairy leaves [SKETCH] and by its small white flowers and purple berries. *Lantana* is a thorny scrambler, with small bunches of pink and yellow flowers and black berries [SKETCH]. Another common naturalised shrub is the wineberry *Rubus rosifolius*, a thorny bramble with edible red compound berries [SKETCH].

Even trees can be weeds: *Maesopsis eminii*, locally called Mhesi, is indigenous in north-west Tanzania and western Africa but not in East Usambara. It was originally introduced by the Germans in the Botanical Garden, but later plantations were established in the 1960s at Kwamkoro (see Trail T3) for use as timber and as a shade tree for other tree seedlings. These plantations form an enormous reservoir of seeds, which are dispersed over great distances by the larger hornbills, which swallow the olive-like fruit whole and regurgitate the seeds elsewhere [SKETCH of tree and seeds]. *Maesopsis* is now one of the commonest trees around Amani: it forms a belt at the edge of almost every block of forest, and has extensively invaded forest where there has been even limited disturbance through, for example, cutting of saplings for building poles.

There are also several introduced animal species at Amani, which were probably brought in inadvertently on plant material from overseas. One of the commonest millipedes in Amani is actually native to New Zealand.

4 Human Settlement of East Usambaras

People are thought to have been living in East Usambara for upwards of 2,000 years. There is archaeological evidence of Early Iron Age settlements dating back to between 100 and 400 A.D. in both East and West Usambara. The fortified hilltop at Ndola (Trail T8) may be the remains of such a settlement. In more recent history, but still several hundred years ago, the Wasambaa, a Bantu-speaking people whose main base is in West Usambara, established villages in East Usambara mainly along the western rim of the escarpment. Typically Sambaa villages were spread along the crests of ridges for defensive reasons, with food gardens running down the slopes. Cattle and sheep were herded, and bananas, maize, sorghum, yams and cassava were then, as now, the main food crops.

The Sambaa had a very loose form of government until around 1740, when Mbegha, a Kilindi Chief possibly of Arab origin, became ruler of Usambara following an outbreak of tribal warfare. The Kilindi Chiefs brought stability to East Usambara for at least a century, but from the 1850s there was a long period of unrest, exacerbated by slave trading which caused major depopulation of the area. During this period German military representatives concluded highly unequal treaties with certain Sambaa chiefs, through which almost all the land of East Usambara was officially handed over to the Germans "for all time".

This allowed German settlers to establish coffee plantations, the first in 1891, as well as Cinchona (which was the main source of quinine for German troops in the 1914-18 war: remains of one plantation can be seen on the Monga Trail T4). At lower altitudes oilpalm, rubber, cocoa and tobacco were planted. Forest clearance and logging continued (the remains of a German sawmill built at Sigi can be seen at the start of Trail T7), and some forest plantations were also established: teak at Kihuhwi (off the road to the left on the drive from Muheza to Amani) and other exotic and indigenous species were planted, but none on a large scale.

By the end of the period of German rule (1891-1916) most of the coffee estates had been abandoned due to disease and disappointing yields. During the period of British administration of Tanganyika (1918-1961) establishment of plantations continued and there was a great expansion of Forest Reserves. Tea was planted on the Karimjee Jivanjee estates at Monga and Derema in the 1940s (see Trails T4 and T6), and at Bulwa and Kwamkoro (T3 and D2) in the 1950s. The high labour demand of this crop brought immigrant workers to East Usambara from many parts of Tanzania, notably Kigoma (on the border with Burundi), Iringa, Njombe and Mbeya, resulting in a highly mixed population and further pressure on forests and agricultural land.

Since gaining independence from Britain in 1961, the rural population has grown at an estimated 2.6% pa. There has been a continued movement of people to East Usambara from less densely populated parts of the country in search of land and employment. Many of the immigrants have been allocated land for agriculture, putting further pressure on the forests and cultivated areas. There is now a crisis of settlement which will not be easy to address.

5 Population and Infrastructure

The present population of the eleven villages on the Amani plateau is around 15,500 (some 3,000 households) while a further 4,000 people live permanently on the tea plantations. The villages have populations ranging from 80 to 450 households. Each village has an elected village government, and every ten households elect a chairperson who forms the lowest rung of the administrative infrastructure. Some village governments, conscious of the threat to their environment through deforestation, are setting up environmental sub-committees to try to protect the remaining forest, soil and water resources.

Most villages have a primary school and there is an agricultural secondary school established by one of the tea companies, where students earn part of their school fees by working part of the day on the estate. There are three Government dispensaries, in addition to those run by the tea companies on every estate. Few villages have piped water or electricity, but the estate populations are somewhat better supplied.

Communications are a major problem in East Usambara, especially in the rainy season. The road from Muheza to Amani is rough but passable throughout the year, though a four wheel drive vehicle is to be preferred. Many of the internal roads, however, become dangerously slippery in the rains and some areas are unreachable. Two buses climb daily from Muheza to Amani (and beyond when road conditions allow), leaving Muheza in the afternoon and returning the next morning. There is a telephone operator at Amani Post Office, but the telephones have functioned only sporadically for many years.

6 Land Use and Economy

The total land area on the Amani plateau, where all but two of the trails described in this guide are found, is some 126 sq km or 12,600 hectares, of which approximately 21% is taken up by five tea estates, 32% is agricultural land belonging to the 11 villages dotted among the estates, 18% is public forest land of which part has been already cleared for agriculture, and 23% is State Forest Reserve controlled by the Government's Forest and Beekeeping Division.

The tea estates dominate the formal economy of the plateau. Two estates, Kwamkoro and Bulwa, were nationalised in the 1970s and are now owned and run by the East Usambara Tea Company, a joint venture between the Tanzania Tea Authority and the Commonwealth Development Corporation (CDC: a British Government development financing organisation). CDC also manages two of the privately owned estates, Monga and Derema, which belong to a long-established Tanzanian company, Karimjee Agriculture Ltd. The fifth estate belongs to an Indian company, Bombay Burmah Ltd.

The tea estates employ between them an average of some 4,000 people per day, 45% of whom live on estate land, 39% come from nearby villages and 16% are from elsewhere in the district. The tea grown is high yielding but was mostly planted from seedlings rather than clonal cuttings; also, Amani being at a rather low altitude for top quality tea cultivation, it does not command the highest prices. In the long run it will be necessary to replace the seedling tea with new, more productive clones. Chemical fertilisers and in some cases herbicides are used, but no other agrochemicals since the crop is not susceptible to any major pests or diseases found in East Usambara.

Eucalyptus plantations have been established on all five tea estates to grow fuel for the factories. The trees mature in seven years and grow again after coppicing. Though criticised elsewhere by environmentalists for reducing biodiversity and affecting groundwater supplies, the negative impact can be controlled if species and planting location are carefully selected. Eucalyptus planting has reduced pressure on the natural forests as a source of fuelwood and is very popular with estate companies and village farmers alike.

Village agriculture can be seen on several of the trails and drives. The major food crops grown are maize, cassava and bananas. None of them grow particularly well in this environment and many farmers have other fields for rice and maize further down the escarpment. Cardamom and sugarcane have until recently been the major cash crops for smallholders, along with cloves, cinnamon and other spices. Cardamom requires shade and organic manure: it is commonly the first crop grown on land partially cleared from forest, but yields are difficult to sustain and after a few years the remaining trees are commonly felled and maize, cassava or sugarcane (used for juice, small-scale sugar manufacture and brewing of the local liquor, "Boha") are planted instead.

In recent years farmers have shown increasing interest in planting tea as a cash crop for sale to the tea factories, either on their own land in place of cardamom and sugarcane, or on estate land under a tenancy scheme initiated by the tea companies. Tea as a permanent crop, totally covering the soil and with a guaranteed market outlet, is a more environmentally friendly crop than those it replaces, but care is needed to ensure that it does not create food shortages by supplanting food crops, or lead to further encroachment on the forest reserves.

Non-agricultural economic activities are very limited in East Usambaras. There is a dairy farmers' cooperative in Amani which takes milk to Tanga for processing, and in most villages there are carpentry, sewing and other shops but for the most part the economy is still dominated by village and plantation agriculture.

7 The Future of East Usambaras

The future of the East Usambara forests and mountains as a pool of global biodiversity, and as a water catchment for Tanga Region, depends on maintaining a symbiotic relationship between the people who live in the mountains and the natural resources on which they depend. There is a growing recognition that large extents of forest reserve cannot be safely protected without the support of the local population. What is needed is -

- sharing of responsibility for forest conservation and management, and of the resulting benefits, between Government and local communities
- substitute or displacement activities through which the local population can earn compensation for what they lose by conserving the natural resources

Several national and international initiatives have been taken towards this end -

- East Usambara Catchment Forest Project, managed by the Forest and Beekeeping Department and assisted by the Government of Finland, aims to incorporate existing and new Forest Reserves in an Amani Nature Reserve and to promote improved agricultural and forestry practices in surrounding villages

- East Usambara Conservation and Agricultural Development Project, run by the Ministry of Agriculture and assisted by the European Union and International Union for Conservation of Nature (IUCN), encourages on-farm tree planting, soil conservation and more sustainable land use practices
- East Usambara Tea Company and Karimjee Agriculture Ltd support tea and fuelwood planting by smallholders, which gives them a surer cash income, reduces pressure on the forests and helps the companies by increasing factory throughput
- Amani Dairy Farmers Association, assisted by the Dutch Government, distributes dairy cattle to farmers on credit and helps them with milk production and marketing as a contribution to family nutrition and income

The development of ecotourism in East Usambaras, which this guide aims to promote, is part of the process of strengthening the economy while bringing home the importance of the forests to the local community as well as to a wider audience.

8 Introduction to the Trails

The trails and driving routes described in this guide have been selected to enable visitors to see and enjoy the wide range of physical, biological and social environments which East Usambara has to offer. The following paragraphs describe in outline the major features of each route, to enable visitors to choose which ones are of greatest interest to them.

- Two of the trails (T1 and T7) are in the high and low altitude sections of Amani Botanical Garden and will be of greatest interest to botanists
- Two others (T2 and T3) are largely in natural Forest Reserves and may be of most interest to naturalists and foresters
- Three trails combine walks through village and plantation agriculture, two with sections of natural forest (T4 and T6), one primarily in open grassland (T5)
- One trail (T8) climbs through difficult mountain terrain where it is easy to get lost: this trail should be attempted only with a guide

Several trails incorporate visits to sites of historical interest -

- early German plantations (T1, T2, T7)
- a pit dug for hidden treasure (T8)
- the site of a German hospital and graveyard (T6)
- the remains of what may be an Early Iron Age settlement, not far from which a tribal war was fought in the 1880s (T5)

The three driving routes described (D1-3) pass through forest, tea plantations and village agriculture and provide an easy way of viewing the range of scenery, ecology and forms of land use found in East Usambaras.

The driving routes, or indeed some of the walking trails, can be combined with a visit to one of the tea factories on the mountain (T9), but it is advisable to make prior arrangements with the factory management.

The table below describes at a glance the features of each route. Fuller details are in the individual trail descriptions which follow.

9 Access and Accommodation

East Usambara is roughly equi-distant between the capital city of Tanzania, Dar es Salaam, and the centres of the northern tourist circuit, Moshi and Arusha. Muheza at the foot of the mountains is 4-5 hours drive on a good tarred road from either Dar es Salaam (330 km) or Moshi (320 km). Buses ply regularly on these routes, leaving Dar es Salaam, Moshi or Arusha between 6 and 10 am and taking 6-8 hours to reach Muheza. Muheza is 45 km (30 minutes) from the coastal town of Tanga on a tarred road.

From Muheza to Amani is 35 km on a road which is reasonable for all but the last 7 km: this section is steep, rocky and rough. A 4WD or high clearance vehicle is recommended, especially in the rains. The journey time is 1.00-1.50 hours. There is also a daily bus service from Muheza to Amani, run by the East Usambara Bus Company known locally as Liemba. Two 60-seat buses leave Muheza bus stand at around 2 pm each afternoon. One goes to Amani and continues to Kwamkoro Tea Estate and (in dry weather only) Monga Tea Estate. The other turns right 2 km before Amani and continues to Derema and Bulwa Tea Estates. Both buses leave the mountain for Muheza at around 7 am the next morning. The Kwamkoro bus passes through Amani at about 7.30 am, the Bulwa bus passes the junction below Amani at about the same time. The journey from Amani to Muheza or vice-versa takes 2-3 hours depending on the weather and the state of the road. The buses are usually very crowded and it is advisable to arrive early to be sure of a seat.

For travellers reaching Muheza too late for the afternoon bus to Amani, simple accommodation is available at Ambassador Hotel on the main road to Tanga, or at cheaper guest houses in town. There is a wider choice and a higher standard of accommodation in Tanga (Panori, Marina, Raskazone, Mkonge).

In Amani there is a 6 room rest house attached to the Medical Research Institute, from which all the trail descriptions are assumed to start. There is a 4 room rest house on the main road, run by the IUCN project. Camp sites are being developed near Kwamkoro and Monga. There is a 2 room guest house at Bulwa, and tea estate bungalows at Monga and Ndola may in time become available to visitors but this should not be relied on. There are also plans to open a rest house at the Amani Nature Reserve Headquarters at Sigi.

Appendix 1: A guide to trails and drive routes in Amani Nature Reserve

| Trail No. | Trail Name | Time (hrs) /Distance (km) from Amani | Ease of terrain | Points of special interest |
|------------------|----------------------------|---|---|--|
| T.1 | Amani Bot Gdn (Res Centre) | 1-3 hours walk close to Rest House | Very easy | Wide range of indigenous and introduced plants |
| T.2 | Mbomole Hill | 1-3 hours, 4 km walk | Not difficult, slippery in rains | Natural forest, experimental tree plantations, fine views |
| T.3 | Kwamkoro Forest Reserve | 25 min (9 km) drive to start; 2-4 hour (6-10 km) walk | Easy walk on flat terrain | Natural forest, Maesopsis plantation, African Violet sites, Arboretum |
| T.4 | Monga Trail | 15 min (6 km) drive to start; 1.5 hr (3.2 km) walk | Easy walk on mainly flat terrain | Natural forest and tea plantation |
| T.5 | Ndola Trail | 50 min (18 km) drive to start; 1.5-2.0 hr (5 km) walk | Moderately easy with some climbing | Village agriculture, open grassland, fine views, fortified hilltop |
| T.6 | Derema Trail | 5-7 hour (12 km) walk with shorter options | Long walk, mostly easy with some steep climbs | Forest, village agriculture, tea plantation, German grave, fine views |
| T.7 | Amani Bot Gdn (Sigi) | 20 min (8 km) drive to start; 1-3 hour walk | Easy walk, mostly on flat terrain | Palms, spices, fruit trees, water powered mill |
| T.8 | Amani-Sigi Mountain | 20 min (8 km) drive to start; 4 hr climb | Steep climb, slippery in rain | German railway and sawmill sites, village agriculture, lowland and submontane forest, treasure pit |
| T.9 | Tea Factory | 20 min (9 km) drive to start; 1 hr tour | Easy | Tea manufacture from start to finish |
| D.1 | Ndola Drive | 2-3 hr (43 km) drive | Rough road, hilly, 4WD essential in rains | Farmland, tea and forests, magnificent scenery and views |
| D.2 | Bulwa Drive | 1.5-2.0 hr (22 km) drive | Easy drive except in rains | Forest and tea plantations |
| D.3 | Monga Drive | 1.5-2.0 hr (32 km) drive | Fairly easy except in rains | Village, tea plantation, forest and open land, fine views |

10 Conclusion:

These notes and trail descriptions are a precursor to a comprehensive guidebook to the East Usambaras which is under preparation.

The aim of the guide is to make East Usambara more accessible to both Tanzanian and foreign visitors, and also to ensure that some of the benefits from tourism flow back to the local population. This will be achieved partly through the employment opportunities created in the Rest Houses, trail maintenance, and recruitment of trained local guides. It is also hoped that resources will become available for further investment in conservation and development of East Usambaras, to which visitors to the area may wish to contribute.

It costs a great deal of money to conserve forests and environment and to improve services to the local population. To ensure that any revenue available is channelled in a manner that is both equitable and sustainable, the Amani Nature Reserve management proposes to establish an East Usambara Trust Fund to which visitors will be encouraged to contribute. If you wish to do this, please contact the ANR Headquarters at Sigi and, if you so desire, specify the purpose for which you would like your donation to be used: for example, environmental conservation or research, improvements to village services, agricultural or forestry research and development, etc. A form for this purpose is included at the end of this guide.

We hope you will enjoy your stay in East Usambara, and would appreciate if you would take a few minutes to fill in the questionnaire at the back of the guide so that we can learn from your experience and make the stay of future visitors (including yours on your next visit!) even more enjoyable.

Driving route from Muheza to Amani

35 km (1-1.50 hours) on a rough road. Four wheel drive or high clearance car recommended.

**Dist from
Muheza
(km)**

- 0.0 Turn off the main Segeera-Tanga road at the BP petrol station (on your left coming from Segeera, on your right coming from Tanga). **Recommend ANR Board here.**
- 0.2 Bear left on broken tarmac road.
- 0.5 Keep left at fork and after 50m turn right, Signpost Amani (**recommend ANR Board**). Cross a tarred road and keep on towards the railway crossing. Cross the railway line.
- 0.7 After 100m follow the main road round to the left.
- 3.4 A concrete road sign on your right marks "Baden-Powell Road", so named because Lord Baden-Powell, founder of the scout movement, enrolled the first Tanganyika Scouts here in 1938. The road leads to Magila, where the first Anglican Mission in Tanganyika was established in 1867. Ignore the side road unless you want a 4 km diversion to see the mission (the church and other buildings are still used by a school).
- 4.1 Continuing on the main road, you will soon see Magoroto Mountain to your right, with an oilpalm estate (not visible from the road) on the site of one of the first coffee plantations established by German settlers in 1895.
- 8.5 You come to Ubembe Village; from here to Sigi the road follows in part the track of the German railway built in 1902 to carry timber out from the Usambaras (for description see Amani-Sigi Mountain Trail, T.8).
- 13.6 The road descends to Bombani, where you follow the road round to the left (**recommend ANR Board**). Kihuhwi-Sigi Forest Reserve is ahead of you.
- 15.1 Cross a bridge to enter Longuza Teak Plantation: teak trees, with broad leaves and a mass of white flowers between April and August, have been planted in this area from the 1890s right up to 1988. The trees can be harvested after about 25 years, and are a valuable foreign exchange earner.
- 15.5 After 400m keep to the right where a major road bends off to the left (**recommend SP**), and cross a small bridge.
- 22.5 Drive through an avenue of *Casuarina equisetifolia* trees to enter Kisiwani, with a telephone box on your right.

- 25.5 You reach Sigi, the terminus of the old railway, with the site of the station building to your right and a wooden house where the station master lived above you to the left. You are now entering the proposed Amani Nature Reserve (**recommend sign**).
- 26.0 Cross the bridge over the Sigi River to enter the lower part of Amani Botanical Garden, with a mixture of fruit and spice trees and many introduced palms and other trees on either side of the road (**see Amani Botanical Garden: Sigi tour: signs recommended**).
- 26.5 Pass a Ministry of Agriculture nursery on your left where a variety of tree seedlings can be bought.
- 27.5 Cross Kwemkuyu River with a water-powered maize mill on your right. Commence the climb to Amani, through 12 sharp hairpin bends on a steep and rocky road. The whole of this area is within the Amani Botanical Garden, with a range of mainly hardwood trees and monkeys frequently to be seen.
- 32.5 At a major junction with sign posts to Kwamkoro and Bulwa Tea Estates keep left towards Amani and Kwamkoro.
- 34.5 Enter Amani, ignoring minor roads to left and right. At a major cross road turn right up a steep stony road towards the Post Office and Medical Research Institute (sign posted).
- 34.7 Turn left at the top of the hill and continue for 200m till you reach the Rest House on your right.

TRAIL REF: T.1

Amani Botanical Garden: Research Centre Tour

1-3 hour walk around the plantations of Amani Botanical Garden, in the immediate surroundings of the National Institute of Medical Research, Amani Centre.

Introduction to the Research Centre:

The research centre is surrounded by botanical plantations of great historical interest, containing a wide range of indigenous and exotic species. It was originally established in 1893 by the German colonial government as a health centre with a small botanical garden. In 1902 it became the headquarters of an agricultural station, the “Biologisch-Landwirtschaftliche Institut, Amani”, staffed by such famous German scientists as Zimmerman, Stuhlmann, Engler and Peters. Soil, fertiliser and plant disease research was conducted and a collection of some 650 “useful plants” had been built up by 1914. The station was occupied by British forces in 1916. It was closed for a short period after the war, but re-opened in 1926 as the East African Agricultural Research Station with a further series of British scientists including the botanist P.J.Greenway and the ornithologist R.E.Moreau who worked at Amani in the 1930’s and 1940’s.

The Amani centre was renamed the East African Agricultural and Forestry Organisation (EAAFRO) in 1948, by which time a collection of some 62,000 botanical specimens had been built up in the herbarium. Between 1948 and 1953 EAAFRO and its collections were moved to Nairobi, and the East African Institute of Malaria, then located at Muheza, moved up the mountain to the more pleasant climate of Amani, although there was then very little malaria in the highlands and most of the research was conducted in the plains.

In 1954 the Institute was renamed the East African Institute of Malaria and Vector Borne Diseases, and in 1979 it was absorbed into the newly established Tanzanian National Institute of Medical Research (NIMR). NIMR has a staff of some 160 in Amani and 90 in Muheza. Research is conducted in fields of immunology, medical parasitology and entomology, biostatistics and epidemiology. The major diseases covered are malaria, filariasis, onchocerciasis and (in West Usambara only) plague. The centre includes laboratories, library, offices, workshops and a rest house. Visitors interested in particular aspects of medical research may approach the Director of the Institute (in working hours). Visitors wishing to eat or stay at the Rest House should contact the Rest House Keeper.

The walk:

takes in the majority of the Laboratory, Monga Road and Boma Hill Plantations of the Amani Botanical Garden (**Recommend Sign Boards**). These three plantations were established largely for ornamental purposes around the station buildings, and were planted mainly between 1902 and 1913. This guide describes the more distinctive plants to be seen in the three plantations; knowledgeable botanists will find a great deal more of interest than is listed here.

The tour begins in the centre of the Laboratory Plantations, at the Amani Rest House front door, from which can be seen, just to the right, a clump of the Chinese Fan Palm *Livistona chinensis*, of which many were planted at Amani. You may notice the slim, brown, Palm Swifts *Cypsiurus parvus* diving in amongst the fronds of these and other palms on this tour; they attach their nests to palm leaves. To the right of the *Livistona* is a clump of the feathery Golden Cane Palm *Chrysalidocarpus lutescens*.

Turn right around the side of the R.H.. In the grass at the right season are thousands of pink and white Windflowers *Zephyranthes* sp. At the back corner of the R.H. stands a small Indian Almond tree *Terminalia catappa*, with horizontal layered branches and edible seeds. Down the bank ahead, are several blue-flowered bushes of Purple Wreath *Petrea volubilis*, two more fan palms and a Nandi Flame tree *Spathodea nilotica*.

Round the back of the R.H., up on the left, stands a white-flowered specimen of the well-known Frangipani tree *Plumeria rubra*, with a *Posoqueria latifolia* bush to the right of a clump of bananas *Musa sapientum*. The *Posoqueria* bears pendant clusters of long, tubular, white flowers, which pop open when touched; they are pollinated by long-tongued moths. Behind these, up towards the Amani Welfare Centre (the "Club"), is a line of conifers: from left to right there are one Cook Island Pine *Araucaria cookii*, two Moreton Bay Pines *A. cunninghamii*, an Usambara Podo *Podocarpus latifolia* (slightly lower down the slope) and a tall Norfolk Island Pine *Araucaria excelsa*. In front of this stands a Funeral Cypress *Cupressus funebris*, which seems to attract a variety of birds.

Walk down to the hedge of Mexican Cypress *Cupressus lusitanica* and along it to the right. Next to the Funeral Cypress stands a Pencil Cedar *Juniperus virginiana*. The view below you is over the Monga Road Plantations, which are reached later in this walk. From here, you can see a tree of the indigenous *Rauvolfia caffra* and another Nandi Flame, with a feathery-leaved *Albizia chinensis* just over the edge of the slope. The huge tree crown is a *Canarium schweinfurthii*. You are now looking NW from the north corner of the R.H. (left of the front door).

Walk past the weather station, with three *Araucaria cookii* (the middle one broken but re-sprouting) on the right. Over the hedge to the right, by the road, is a small Cannonball Tree *Couroupita guianensis* (**sketch**), which has large, scented flowers and heavy, round fruit. There is another *Petrea* next to it, and two low, spiky bushes of the lily *Dasyilirion glaucophyllum*.

Go down the steps; the building ahead is the library, with a large *Araucaria cunninghamii* in front of it and, to the right across the road, a hedge of Dwarf Bamboo *Shibataea ruscifolia* with a tree of the indigenous *Bridelia micrantha* behind it.

Pass in front of the library; two trees across the road to the right are a Malay Apple *Eugenia malaccensis* and a fig *Ficus* sp. bearing many epiphytes. Behind them are many self-seeded *Maesopsis eminii*. Walk ahead along the road with a laboratory set diagonally on your left. The fan palm on the right, opposite the corner of the building, is another *Livistona chinensis* and there is yet another on the left between the next buildings. Ahead on the right is a large Mango *Mangifera indica*.

Turn back and take the path up the side of the laboratory, between it and the library. At the side and back of the library is a flower bed with Zebra Plants *Calathea zebrina* (striped leaves), Day Lilies *Hemerocallis aurantiaca* (yellow flowers) and “Amaryllis” *Hippeastrum equestre* (red flowers). Pass two more *Livistona chinensis* and, beyond, you see three tall Cabbage Palmetto palms *Sabal palmetto*. Keep the *Livistonas* to your left and pass down between two small buildings, down the steps towards the workshop. Turn left below the *Sabals*, towards the big *Canarium* seen earlier from the R.H.. One of the *Sabals* has a strangling fig *Ficus usambarensis* growing up it (which was severely cut back in 1994).

Follow the path on down. On the right, down the slope, you see a line of Caribbean Royal Palms *Roystonea oleracea* (tall, with a green crown-shaft below the leaves). Closer, an Avocado *Persea americana* (branched) and a Candlenut *Aleurites moluccana* (straight trunk; seeds yield an oil) stand side by side, with a big *Maesopsis*. Behind, on the far slope, is natural secondary forest. Further along the path, to the right are two more Funeral Cypresses and, nearer, 3 m to the right of the path which now becomes a road, a *Parinari excelsa* (indigenous, with edible, yellow, plum-like fruit); this one is doing poorly, with very sparse leaves. After the Funeral Cypresses stands a single Monterey Cypress *Cupressus macrocarpa*. Down across the road, next to the reservoir and between the line of Royal Palms (thicker trunks), stands a single, slender palm, a *Chrysalidocarpus madagascariensis*. Above the path on the left is a large tree with very dark leaves, an indigenous *Cynometra* sp. Pass down under some overhanging *Bauhinia purpurea*, with their typically two-lobed leaves [SKETCH] (the genus is named after the botanist twins Bauhin) and showy purple flowers. Continue to the junction, where you leave the Laboratory Plantations and enter the Monga Road Plantations.

Just across the junction is another Usambara Podo, with its dark, fine leaves. Facing it, to the left is a Caribbean Royal Palm, a tall *Chrysalidocarpus madagascariensis* (drooping, untidy leaves) and three slender Princess Palms *Dictyosperma album* (two tall, one short; with horizontal, neat fronds). Moving down the road towards the bridge, you pass two clumps of Spanish Dagger *Yucca gloriosa*, behind the Princess Palms, then an Indian Almond (horizontal branches, some reddish leaves) with a juvenile *Chrysalidocarpus madagascariensis* beneath it. Behind the yuccas is a clump of spiky, indigenous screw-palms *Pandanus stuhlmanni*. After the Indian Almond stand two tall fan-palms, *Livistona* cf. *australis*, with two medium and one short fan-palms (with bigger leaves), *Sabal* cf. *causiarum* (Puerto Rican Hat Palm).

Walk down to the bridge over the Dodwe River (**Sign Board**). Just after the junction on the left is a vine with large blue flowers, *Thunbergia grandiflora*. Take the road upwards, to the left of this vine, and look for the footpath on the right down to the river. Take this; the sluice is the remains of a dam which formed the old Amani boating lake, on which was kept a small boat called “Mbu” (Mosquito). Cross the stream and up the other side to the road, which is the main road to Monga. At this point the Botanical Garden ends. Turn right, back along the road. Up the slope on the left is a big Oil Palm *Elaeis guineensis*. On the right by the road are three tall indigenous trees clothed in the climber *Scindapsus aureus*; some of its leaves are flecked with gold. The first tree is a *Maranthes goetzeniana* (known from only a few mountain forests of E Africa), the other two are *Allanblackia stuhlmanni*. In the vegetation behind, can be seen one or two tall, palm-like trunks topped with a fan of banana-like leaves; these are Travellers’ “Palms” *Ravenala madagascariensis*, a relative of bananas, and so-called because water can be obtained from the leaf bases.

On the left, towards the bridge, is a clump of *Pandanus stuhlmanni*, one with quite tall trunks, and a tree with bright red bracts *Warscewiczia coccinea*. On the right is another big native tree, shrouded with *Scindapsus*, a *Parinari excelsa*. Back from the road, on the right, are two mid-level Macaw Palms *Aiphanes erosa* with square-ended leaflets, and a very large, spreading Sugar Palm *Arenga pinnata*, with its hairy-looking stem and leaf bases (the hairs are actually long, thin spines). Just after the *Parinari* are two slender stems of the Golden Cane Palm *Chrysalidocarpus lutescens* and, behind them, two African Date Palms *Phoenix* cf. *reclinata*. Just before the bridge, on the right, is a larger clump of Golden Cane Palm, carrying a sprawling Dutchman's Pipe vine *Aristolochia brasiliensis*.

Cross the bridge and turn left; a few metres along the road is an open area on the left, by the Indian Almond. Go under the branches of the latter, off the road. Notice at ground level the Sensitive Plant *Mimosa pudica*, so called because the leaves close sequentially when touched. Indistinct paths lead into the undergrowth here, to the site of the old station greenhouses. You can still see their foundations, covered with a mass of *Bougainvillea formosa*, with its purple bracts enclosing small cream, tubular flowers. There is one tall, curving *Sabal* cf. *causiarum*, covered with *Scindapsus* and other climbers of the aroid family (Araceae), especially *Philodendron* spp., including the arrow-head shaped leaves of *P. sagittifolium*. On other trees in the area are the divided leaves of Ceriman (Cheese Plant) *Monstera deliciosa*, while the ground is covered by straggling, fern-like *Selaginella* spp., with their bluish green leaves, amongst which are clumps of small, white-flowered irises. There are larger clumps of Zebra Plant and, by the stream, clumps of the large (up to 2 m), bifurcated, rather yellowish green leaves of the aroid-like *Cyclanthus bipartitus*. Near the foundations are some small trees with slender, whitish stems, of *Piper chaba*: its flower spikes taste and smell like its relative, Black Pepper *P. nigrum*.

Return to the road and take the left-hand fork, by the reservoir. By the pond edge is a large, indigenous timber tree, *Adina microcephala*, with a branching trunk; this species usually grows by water. In the water are Giant Arrowhead plants *Sagittaria montevidensis*, with spikes of white flowers. Just behind the first Royal Palm after the dam, on the left, is an old Queensland Nut *Macadamia ternifolia*. Up on the right is a clump of the palm-like Cyclanth, Panama Hat "Palm" *Carludovica palmata* and opposite it, by the stream, three Swamp Cypress *Taxodium distichum*. The three or four trees with broad leaves on the left here are Tung Oil trees *Aleurites montana*; the oil, extracted from the seeds, was used in paint manufacture. Most of the trees along here are self-seeded *Maesopsis eminii*. Pass under some big clumps of Golden Bamboo *Bambusia vulgaris*, where the road enters more natural forest, on the left in the river valley, with tree ferns *Cyathea manniana*. Some small trees with broad, thick leaves, on the left of the road, are *Tabernaemontana* sp., with fragrant, white flowers and double-sphere fruits. The next clump of bamboo, with dark green stems, up the slope on the right, is Building Bamboo *Gigantochloa aspera*. As you come in sight of a signboard at the junction ahead, on your left is a huge *Maranthes goetzeniana*; this tree has very hard timber which is extremely difficult to work. A big clump of *Pandanus stuhlmanni* stands on the left, just before the junction.

This junction was called, in British colonial days, "Piccadilly Circus", after the famous junction in London, because it has nine roads radiating from it, not all of which are immediately obvious. A white-flowered azalea *Rhododendron mucronatum* stands on the corner to your right and the twisted trunk of a *Syzygium guineense* on the left. Turn very

sharp right, between the signs (not along the main road) and, after less than 20 m, fork left up the hill towards the Director's House. On the right is a spiky Sisal plant *Agave* sp. under a yellow-flowered *Cassia multijuga*; on the corner, a red-flowered bush of *Ixora chinensis* under a native *Albizia gummifera* and, on the left, a tall, straggly Silky Oak *Grevillea robusta* opposite a Champac *Michelia champaca*, whose flowers produce an oil used in perfume manufacture. A little further, on the right, is another Nandi Flame and on the left a tall thin Mediterranean Cypress *Cupressus sempervirens* next to an African Date Palm *Phoenix reclinata*. On the right is a clump of low Rattan Palms *Calamus asperrimus*.

Pass below several big Oil Palms; another Princess Palm stands below the Director's House on the right, with a grove of *Eucalyptus maculata* on the left. Take a right turn up the steps through the hedge of Mexican Cypress. On the right of the steps is a small *Allanblackia* and at the back of the office block ahead, a Sago "Palm" *Cycas revoluta*. The big tree on the right, in the middle of the lawn, is a purple-flowered ornamental *Lysidice rhodostegia*. The tall thin conifer on the left is another Mediterranean Cypress.

Walk up to the end of the offices; on the wall is a Creeping Fig *Ficus pumila*. Walk around to the front of the offices, then bear right towards a tall Mediterranean Cypress in front of the Post Office. On the right, between the offices and the Director's House, is a large *Cycas circinnalis* and a tall, straggly bush of Pride of India *Lagerstroemia indica*. At the back left of the Director's House, is another poinsettia-like *Warscewiczia coccinea*.

Turn left in front of the Post Office and back along the road to the Rest House.

TRAIL REF: T.2

Mbomole Hill Trail

4 km walk (round trip), including climb of c. 150 m through forest and plantations of Amani Botanical Garden, to fine views over surrounding countryside; time 1-3 hours.

Leave Amani Rest House by the back door, turn right on the road up to Amani Welfare Centre (bar), pass to the right of the building and follow the path down past a large fig tree *Ficus capensis* (with buttresses) on your left, to reach the main road. Turn right on the road, pass the Amani Dairy and take a gravel drive on the right up to the offices of East Usambara Conservation and Development Project (**signboard**). Follow the drive to the left of the offices then to the right of two houses, going uphill close to the second house **[RECOMMEND SIGNPOST]**. The road soon enters the forest and passes the EUCDP toilets **[RECOMMEND REQUESTING IUCN TO CLOSE AND REMOVE THEM]**.

The forest here is heavily invaded by *Maesopsis eminii*. The trailside undergrowth consists largely of a variety of ferns, with some wineberries *Rubus rosifolius*, an introduced, thorny scrambler with red, edible fruit. On the path you will see the fruit of *Allanblackia stuhlmanni* (Msambu), described in the introduction to the guide. The continuous, penetrating, high-pitched buzz of cicadas will be obvious on warm days **[DRAWING]**.

After about 300 m, the track bends sharp left and you take a left fork (less well-used) off the main track, immediately after the bend **[SIGNPOST]**, where stands a tall tree fern *Cyathea* sp.. The branch straight ahead comes out at some farms after about 500 m. The undergrowth here consists largely of the introduced *Clidemia hirta*, a variety of ferns and tree seedlings, and *Clidemia*'s common indigenous relative *Calvoa orientalis*, with its small pink flowers and semi-succulent stems.

Some 250 m from the junction, you pass on the right a path going steeply up; this is the return shortcut (see map). Pass under a large fallen log across the trail **[TRAIL NEEDS SLASHING BUT RECOMMEND LEAVING THE LOG]**. Look out for big epiphytic ferns with strap-like leaves (*Asplenium nidus*); one stands opposite a large buttressed *Parinari excelsa* on the right **[LABEL]**.

The trail now begins to pass between the Bomole Plantations of the Amani Botanical Garden, which were mostly planted in 1904 and 1905, under the German administration. The track soon makes a sharp right, with a more open area ahead (the site of a former conifer plantation) **[TRAIL NEEDS SLASHING FROM HERE]**. On the path **[THE SLASHING SHOULD NOT BE TOO ENTHUSIASTIC!]** are plants of the ginger-like *Renealmia engleri*, which is only found in a few forests of Kenya and Tanzania. On the left, just by the abandoned cab of an old lorry, a relic of the logging carried out in the 1970s, are some small, slender trees of the quinine-producing Red Cinchona *Cinchona succiruba*, which has broader leaves than its more commonly cultivated relative, Ledger's Cinchona *C. ledgeriana*, and less bitter-tasting bark **[SKETCHES]**. These were the source of quinine used for malaria control

by the German troops in East Africa during the First World War. On the right is a plantation of the aromatic timber tree Japanese Camphor *Cinnamomum camphora*, with many seedlings growing on the path; camphor is extracted by steam distillation of the leaves, wood or roots. This species self-seeds easily and has the potential to become another invader of the natural forest. A little higher up the trail, the Japanese Camphor trees are interplanted with (added in 1908) Cajuput Oil or Punk Trees *Melaleuca leucodendron*, a SE Asian relative of the eucalypts, with spongy, papery bark and aromatic, oil-producing leaves.

A path soon joins from the right; carry straight on. Just after it are more Red Cinchona, on the right. Skirt the roots of a recent tree-fall (1993), and shortly enter a belt of natural forest. The Botanical Garden was planted in blocks cut from the forest, which in places was left standing between the plantations, as here. This area has many epiphytic ferns and, in the undergrowth, lots of *Dracaena usambarensis*, like canes with lily-like leaves in a bunch on top. The track curves to the left and a small clearing becomes visible on the left, where was formerly a plantation of the timber Toon Tree *Cedrela toona*. This is followed by a clump of the native bamboo *Oreobambos buchwaldii* and, shortly on the right, the remains of a huge dead *Ocotea usambarensis*, the indigenous African Camphorwood tree, of which very few remain in East Usambara.

The trail then re-enters plantations, with a clump of the tall East African Juniper *Juniperus procera*, which is indigenous to Usambara but planted here, on the left. Among these conifers, take the steep path up on the left, leaving the old road. Here, the undergrowth consists largely of self-seeded saplings of Strawberry Guava *Psidium cattleianum*, which has thick, aromatic leaves and edible fruit. This plant is a pernicious weed in other areas of the tropics and could become so here.

The path soon turns right and levels out. On the left is a plantation of Ledger's Cinchona and, soon on the right, a large specimen of the Himalayan Cypress *Cupressus torulosa* [**LABEL NEEDED**]. Next on the left, is a large *Maesopsis* with a big epiphytic Bird's Nest Fern *Asplenium nidus* at its base. After about 20 m, again take the path up on the left, leaving the old road, just by a small conifer on the left, a Japanese Cedar *Cryptomeria japonica*. In the right season, you will notice small bushes on the right with bunches of striking, white, tubular flowers or clusters of purple berries. These are a species of *Pavetta*, a genus with six of its species more or less endemic to Usambara. The old road is soon joined again and the path passes through a plantation of *Cryptomeria*, with a glimpse of the view to Monga Forest on the left. The path again zigzags to the left, up through a plantation of Pencil Cedar *Juniperus virginiana* and more *Cryptomeria*. Ahead can be seen a weeping Funeral Cypress *Cupressus funebris*.

The path again cuts left, through some natural forest regeneration. On the ground by the path grow violet-flowered plants of a *Streptocarpus* sp., a relative of the African Violets. Here is the first of several points with panoramic views over the surrounding country [**SKETCH OF VIEW AT END OF TRAIL DESCRIPTION?**]. Climb the rocks past a Whistling "Pine" *Casuarina equisetifolia* and a Funeral Cypress on the left, to reach the hilltop, which is covered by prickly *Lantana camara* scrub (Curse of India) and bushes or small trees of Strawberry Guava. The *Lantana* flowers are much favoured by butterflies and by Collared Sunbirds *Anthreptes collaris*, which can usually be seen here: tiny birds with a metallic green back and (in the male) throat, and yellow underparts.

On the cliff edge to the left, stand two large Mediterranean Cypress *Cupressus sempervirens*, with aloes *Aloe* sp. on the rocks. A variety of other timber and ornamental conifers was planted on the hilltop (1904-6), and many remain [NEED LABELS]. Following the track across the hilltop, you pass a small concrete “beacon” below a Eucalyptus sapling, which marks the corner of Amani West Forest Reserve. After this are more *Cryptomeria japonica* on the left, a Monterey Cypress *Cupressus macrocarpa* on the right, and a Mexican Cypress *Cupressus lusitanica* ahead (the path passes between its branched trunk). Just ahead are spectacular views [see sketch map] north over the distant Mgambo Tea Estate to Mt Nilo (1506 m, the highest point in East Usambara), west over Karimjee Agriculture’s Monga tea estates and forest (above which you may see on clear days the high ridges of West Usambara) and, between trees to the east (right as you cross the hilltop), back over the buildings of Amani Research Centre to Mt Mlinga (1069 m). On ahead, a little down the slope, stands a tangled grove of the native screw-palm *Pandanus stuhlmanni*, like enormous tree-pineapples.

Retrace your steps back across the hilltop and down the trail. Pass through the belt of natural forest as far as the first major trail junction (where you meet the plantation of Japanese Camphor); fork left here (you came up from the right). This part of the plantation has the Japanese Camphor and Punk Trees on the right and Red Cinchona on the left. After the track makes a right turn, the Japanese Camphor is interplanted with Usambara Podo *Podocarpus usambarensis*; this is a conifer, but with narrow, flat leaves, rather than the more typical “pine needles”.

After a large Japanese Camphor tree bearing an old metal label, on the right, and a red-trunked Red Eucalypt *Eucalyptus resinifera* on the left, take the path to the left, leaving the old road, steeply down to another section of the road (where you rejoin the upward route); turn left and retrace your steps home.

TRAIL REF. T.3

Kwamkoro Forest Trail

*Access: 9.5 km (25 min.) drive from Amani Rest House on all-weather road.
Level walk of 3 km each way in forest plantations to African Violet site,
with optional additions of
(a) 1.5 km circular walk around Kwamkoro Arboretum and
(b) 1 km (each way) extension to views from escarpment.
Total walking distance 6-10 km; time 2-4 hours.*

Access (distances are km from Amani R.H.):

- 0 km Drive down from R.H.; ignore first right turn, to house; at 50 m, fork sharp right; at 200 m, go right at junction with main Amani-Kwamkoro road.
- 0.5 Pass dairy and entrance to East Usambara Conservation and Development Project on right; plantation of *Maesopsis eminii* on left forms part of Amani West Forest Reserve; the natural forest on right is also in Amani West F.R.. Road passes through farmland with mixed cultivation of sugarcane, cassava, bananas and maize; some clove trees, cinnamon and cardamom (**SKETCHES**). Road climbs to top of ridge to village of Shebo Meza with
- 3.0 fine view of Mt Mlinga (1069 m) behind you to the left (east) and first glimpse of Kwamkoro Tea Plantation ahead. Road descends with frequent sharp bends; look out for oncoming traffic and take great care in wet weather. Kwamkoro F.R. lies to left across valley.
- 5.8 On left is the sprawling village of Mlesa, with the site of the former Kwamkoro sawmill, now occupied by a project of the Foundation for Sustainable Rural Development.
- 6.4 Cross wooden bridge and stop at barrier to enter Kwamkoro Tea Estate; sign the gatekeeper's book. Drive along valley with Lukungwi River to the left.
- 6.9 Ignore road to right leading into tea; cross small bridge and immediately turn right; keep to main road, with tea on left.
- 8.1 Reach Kwamkoro Tea Estate offices (on left) and factory (ahead on right, above road); continue ahead over a small bridge, passing a junction on right and leaving factory on right. **[Recommend Signpost]**. There are shops in Kwamkoro where cold drinks and basic provisions can be purchased. The road climbs as you leave the factory complex, with tea on both sides and Kwamkoro F.R. beyond it.
- 9.1 F.R. closes in to road.
- 9.5 Turn left off main road, over concrete bridge to Kwamkoro Forest Office (signpost). Park at the office; if open, introduce yourself to the Forest Officer before setting off on the trail. You may be able to obtain the services of a guide here if you wish.

On return drive, 1.5 km after leaving Forest Office, at a sharp right bend, take the lower (right) of the two roads (a junction hidden on the outward drive).

The walk:

begins at the Forest Office, passing along the road in front of it towards the forest. The Forest Station is responsible for Kwamkoro Forest Reserve and several other F.R.s in the proposed Amani Nature Reserve. Several ornamental trees are planted around it. The walk is entirely within Kwamkoro F.R., which has been protected since 1923; in the area around the Forest Office there are some 700 ha of forest plantations, established in the 1960s to replace the timber which had been extracted in earlier logging operations. The plantations are mainly of *Maesopsis eminii* (local name Mhesi), introduced from western Tanzania or Uganda, and *Cephalosphaera usambarensis* (Mtambaa) which is indigenous to East Usambara.

After about 2 minutes' walk, you see the forest nursery on your right, with potting sheds, storage chambers for soil, sand and manure, mixing chambers, a seedbed area and pot beds. The capacity of the nursery is about 45,000 seedlings, although it is not usually full. Seedlings are tended for at least 3 months before planting out. The nursery produces seedlings for F.R. boundary planting (mostly *Eucalyptus saligna*), gap filling and enrichment (indigenous species), and for distribution to villagers. The forest officers will be happy to show you around and explain the nursery operations.

The path soon enters the forest, which at this point consists of a plantation of *Maesopsis* and *Cephalosphaera* planted in 1972. *Maesopsis* has a logging cycle of about 40 years, while *Cephalosphaera* is much slower growing. As an experiment, many areas were underplanted with *Cephalosphaera*, expecting that *Maesopsis* would provide some shade for the *Cephalosphaera* saplings which normally grow in deep forest. However, the thinning schedule was not followed and, in fact, the *Cephalosphaera* was found to grow faster without shade than with it.

The path follows an old road, leading to and beyond the Kwamkoro Arboretum; initially, a small stream is on your right. Look out for a few *Anthocleista grandiflora* (Mpumu) trees near the track; their trunks are many-branched and the leaves very large and up to 75 cm long. In this area, you will also begin to see tree ferns *Cyathea manniana* (local name Long'e), with slender, spiny trunks up to about 5 m in height. Sap from their young leaves is used by the local Shambaa people as a cure for stomach ache.

Some 100-200 m after entering the forest, you will see, on rocks bordering the far side of the stream, some plants of a species of African Violet, *Saintpaulia confusa*. This is not the species from which most of the cultivated varieties are derived, but is a close relative. It grows on shaded damp rock faces, which few other plants colonise. Please do not attempt to reach the plants. In the undergrowth by the path, you may be lucky enough to find some red berries like raspberries. These are Wineberries *Rubus rosifolius*, and they are edible. They are one of the many introduced species of undergrowth plant in East Usambara, which have largely replaced the native flora of semi-disturbed, undergrowth habitats. Also in this area, and throughout the trail, you will notice a low-growing plant with a striking pattern of three or five main veins on the rather hairy leaves (**SKETCH OF LEAF**). This is *Clidemia hirta*, an introduced plant from South America, which is proving a weed in many parts of the world. It has small white flowers and purplish, hairy berries.

The path crosses a bridge, after which the plantation has many natural forest tree species, mainly Mtambaa, coming up underneath. Keep your ears open for bird calls; forest birds are often difficult to see but you are likely to hear many. One of the commonest calls is that of

the Olive Sunbird *Nectarinia olivacea* [SKETCH], whose song sounds like a squeaky wheel being cranked at different speeds.

On the left, you will glimpse the stream again, in an area where the growth of the Mtambaa has been experimentally encouraged by clearing the undergrowth and climbers. You may pass a coconut-sized, reddish fruit on the trail, this is *Allanblackia stuhlmanni* (Msambu), whose seeds yield an edible oil. It is a tree found only in a few mountain rainforests of East Africa. You may also see fruit of *Maesopsis* itself. Some fall when young, when they are small and green; as they ripen they pass through yellow and red to black, when they look like olives, but are not edible. On warm days, you will hear the persistent buzz of cicadas along most of this section of the trail.

After walking for about 10 min., you pass a large specimen of *Maranthes goetzeniana* (Ng'anga), growing about 2 m above the track on the right (**TRAIL MARK RECOMMENDED HERE**). The undergrowth is still largely *Clidemia*, along with various members of the ginger family, especially species of *Aframomum* (SKETCH), with bright red fruit at ground level, and *Costus* (SKETCH), with spiralling stems and showy, mainly white flowers in terminal bunches.

A little further, on the right, is a dense stand of natural regeneration of Mtambaa, although the forest is still dominated by *Maesopsis*. On the trees in this area you will see more epiphytic ferns, and in the trailside undergrowth, occasional Busy Lizzy plants *Impatiens walleriana*, with showy pinkish purple flowers; they are native here. At a sharp bend to the right (**TRAIL MARK**), stands a huge, dead trunk of *Ocotea usambarensis*, the African Camphorwood tree, which is not regenerating in East Usambara, although no-one knows why. Another invader which you may notice here and in more disturbed and open areas of the trail is Curse of India *Lantana camara*, with its small pretty bunches of tiny pink and yellow flowers, and straggling, thorny stems.

At another bend to the right, is an open area on the left, where a logging company had a camp in the early 1980s (**SIGN POST TO POTENTIAL CAMP SITE**). There is still plenty of *Maesopsis* in this area, but where there is an occasional adult Mtambaa you may find its fallen seeds on the trail; they are the size and shape of an elongated hen's egg. This track almost always has muddy patches, in which you may see the tracks of small mammals, such as mongooses or civets. In drier areas, you may come across the scrapings of Bush Pigs *Potamochoerus porcus*.

Shortly, on the left, you pass an area with a dense canopy and clear understorey. Most of the forest along this trail is plantation or was heavily damaged by logging in the early 1980s, but here you see something which looks more like natural forest understorey. Just near a smooth log by the side of the track is a *Beilschmiedia kweo* (Mfimbo) tree; this is an important timber species which is endemic to the Usambara and Udzungwa Mts of Tanzania.

[WE RECOMMEND THAT THE FOLLOWING PARAGRAPH BE INCLUDED IN THE WRITTEN GUIDE, BUT THAT THE VIOLET SITE BE MONITORED (COUNTS OF PLANTS AT REGULAR INTERVALS)].

Now start to look out for a path on your left. If you walk down the path to the stream at the bottom (some 50 m), you will see, on rocks by the stream, more African Violet plants of the same species. Please do not damage or remove any part of the plant. On top of the rocks are plants of the ginger-like *Reinealmia engleri* [SKETCH] which is found only in a few forests of Kenya and Tanzania.

Back on the road, at the next sharp bend to the left, the track bridges the stream again and there is a sign on the right announcing the Kwamkoro Arboretum [SIGN BOARD]. This was originally planted in 1960-63 as a trial for tree species, both indigenous and introduced, with commercial potential, to see how well they grow at this altitude and climate. Most species performed poorly and measurements were discontinued for all except *Beilschmiedia kweo*, which is still measured at intervals.

[RECOMMEND CLEARING AND MAINTAINING THE CIRCULAR TRAIL THROUGH THE ARBORETUM. HOWEVER, ON THIS AND OTHER WALKS WHERE TRAIL CLEARANCE IS RECOMMENDED, IT SHOULD NOT BE DONE IN THE USUAL FASHION (WHICH IS TO CLEAR C. 3 M WIDTH). THIS DESTROYS TOO MUCH OF THE INTEREST IN THE TRAILSIDE UNDERGROWTH. INSTEAD, RECOMMEND CLEARING TRAILS ONLY 1 M WIDE BUT, WHERE THE PATH IS ALONG A WIDER TRACK, AS IN THE ARBORETUM, THE FULL WIDTH OF 3 M SHOULD BE CLEARED EVERY 3-4 YEARS TO PREVENT SHRUB AND TREE GROWTH, WITH A NARROWER, 1 M PATH BEING CLEARED EVERY YEAR.]

OPTIONAL ADDITIONS TO TRAIL

(a) Just after the arboretum signboard, you will see the start of a circular walk through the arboretum; take this, if you wish, for a detour of about 1.5 km. While walking along it, you may see side paths which are opened at intervals to permit access to individual experimental trees. Along parts of this walk, the undergrowth contains, along with *Clidemia hirta*, many plants of its native relative (family Melastomataceae), *Calvoa orientalis*, with small pink flowers and leaves with the classic melastome venation pattern, described [PICTURED?] above. After about 100 m you see on the left a patch of *Araucaria* conifers, with much natural regeneration of the fine-leaved, indigenous timber tree *Newtonia buchananii* (Mnyasa). There are some large *Newtonia* in this area; they can be recognised by the buttresses at the base of the trunk. The circular walk returns to the main track on the opposite side of the stream, just before the arboretum sign. **RECOMMEND LABELLING TREES IN ARBORETUM; A SPECIES LIST WITH YEAR OF PLANTING FOLLOWS:**

Terminalia ivorensis 61, *T. superba* 62, *Araucaria cunninghamii* 60-1, *A. cookii* 60, *Grevillea robusta* 61, *Cedrela odorata* 60, *Bombax rhodognaphalon* 60, *Tectona grandis* 62, *Pinus merkusii* 62, *P. caribaea* 63, *Cephalosphaera usambarensis* 61, *Newtonia buchananii* 61, *Maesopsis eminii* 60, *Acrocarpus fraxinifolius* 60, *Beilschmiedia kweo* 61, *Burttavya nyasica* 63.

MORE COULD BE SAID IN THE GUIDE ABOUT EACH OF THESE SPECIES, IF THEY ARE LABELLED.

(b) Continue along the main track for about another 1 km, to a point where a side track branches off to the right. This climbs for about 100 m to the site of an old Forest Department R.H. **[SIGN BOARD FOR POTENTIAL CAMP SITE]**, on the western escarpment of East Usambara, with views over the plain to the south and across the Lwengera Valley which separates East and West Usambara Mts.

Retrace your steps to the Forest Office.

TRAIL REF: T.4

Monga Trail

6.5 km drive each way and 3.2 km walk through forest and tea

Access: 6.5 km (15 min) drive from Amani Rest House on forest road.

Distances are km from Amani Rest House.

- 0 km From RH drive 200 m through Medical Research Institute, turn right at Post Office down steep hill to main Amani-Muheza road. Turn left and in 500 m sharp left again at signpost to Monga.
- 1.1 Note cluster of Caribbean Royal Palms *Roystonea oleracea* on right by reservoir for Amani water supply.
- 1.2 Ignore two minor roads to left, cross stone bridge and follow valley road with site of old boating lake to your left, now colonised by reeds and bullrushes and used for cultivation of cocoyams (local name Majimbi).
- 2.7 Large rock to left of road marks the boundary between Karimjee Forest (part of proposed Amani Nature Reserve) and public lands of Mbomole Village (**signboard here**). Note cloves, cinnamon, sugarcane and banana cultivation to your right.
- 3.3 Turn left at junction and cross small stream. After 300m ignore road to your right, cross small bridge and enter Mbomole Village. Note clump of “wine bamboo” *Oxytenanthera abyssinica* to right, used for making local brew (ulanzi).
- 3.8 Line of mature *Eucalyptus saligna* above road to the left marks re-entry to Karimjee Forest.
- 4.1 Enter Monga Tea Estate. Tree nursery to your right established by East Usambara Conservation and Development Project distributes tree seedlings to villagers.
- 4.4 Take right fork following valley bottom (road to left leads to campsite on forest boundary, an optional 3km diversion).
- 5.2 At tea leaf collection shed with bamboo to the right you re-enter the forest (road joining from the left descends from the campsite). Continue on winding road through tea and forest. Note heavy invasion of *Maesopsis eminii* in forest degraded by logging and pitsawing.
- 6.5 Park your car at the quarry. Do not leave valuables in view.

The walk: begins by taking the minor road into the forest on the left. 30 m along, on the right, are many quinine trees *Cinchona ledgeriana*, remaining from an old plantation in this area. They have slender trunks, up to about 7 m, and narrow leaves, often with some turning red. The large forest trees present to the left would have been left when the plot was cleared for the quinine. The area has since been heavily invaded by *Maesopsis*. The undergrowth by the track consists largely of two other introduced species, *Clidemia hirta*, a low-growing plant with a striking pattern of veins on its hairy leaves and the straggling, thorny Curse of India *Lantana camara*, which has small bunches of pink and yellow flowers. In more open places, on the left, is bracken *Pteridium aquilinum* which is native to the area, the same species as in Europe and worldwide.

Shortly you reach a clearing on the left, in which have been planted trees of *Grevillea robusta*. This is an Australian tree which grows well in Usambara and is popular for boundary planting, agroforestry and light timber; it is recognisable by its greyish, feathery leaves.

About 25 m after re-entering the forest, on the left, is a large strangling fig around a *Newtonia buchananii* (Mnyasa) tree. The Mnyasa has very finely-divided leaves, visible (with binoculars) in the crown which emerges high above the forest canopy. The plants by the track, with leaves the size of dinner plates, are *Piper umbellatum*, a relative of the cultivated black pepper. About 15 m after the Mnyasa/fig, also on the left, is a huge *Parinari excelsa* (Mbula) which also supports a fig. Another 15 m onward, back from the path on the right, is the large, straight, smooth, buttressed trunk of a magnificent Mnyasa [TRAIL MARK]. The undergrowth here contains a variety of ferns and on the trail you may see fruit and flowers of *Allanblackia stuhlmanni* (Msambu); the flowers are large, pink and "plastic"-looking, the fruit reddish brown and the size of a large coconut. It is not advisable to eat your lunch directly under an Msambu! The seeds, which yield an edible oil, are dispersed by Bush Pigs *Potamochoerus porcus*. You will still see quinine trees on the right, and plants of the endemic Busy Lizzie *Impatiens usambarensis* on the path. Many of the large trees in this area support a network of climbing vines, which cling closely to the trunks. This is *Colocasia scandens* (local name Kiandama) which is used in local medicines.

On this walk you may well encounter a mixed party of insectivorous forest birds, which draw one's attention by the variety of calls suddenly apparent in the otherwise quiet forest. Ten or more species may move together, for security and for the extra insects flushed into view by their passage. One of the commonest birds in parties is the Paradise Flycatcher *Terpsiphone rufiventris*, red and grey with an enormously long tail, and harsh chattering calls [SKETCH].

The path leaves the Karimjee forest (part of Amani Nature Reserve, boundary marked by pit to left of trail) and enters a 18 ha field of tea planted in 1953. You may see pluckers picking the young shoots into bamboo baskets. Only the first two leaves and a bud are picked for best quality tea. Pluckers can pick from 40 up to 100 kg per day. If the bushes are brown, the tea has been recently pruned: this is done every three years to keep the plucking table at a reasonable height and to encourage new growth. The prunings are left on the bush to avoid sun scorch, and are later dropped between the rows as an organic mulch.

From the tea field there is a fine view over mixed natural forest, tea and distant scrubby grassland. A block of fast growing Eucalyptus trees, planted as fuelwood for the tea factory to substitute for indigenous species, can be seen on the hillside to your right. One hectare of well grown Eucalyptus is sufficient to dry the leaf of 3 hectares of tea.

Walk through the tea to a large clump of *Anthocleista grandiflora* (Mpumu, used as cure for asthma) and bamboo. Join the main Kwamkoro-Monga road by a further clump of bamboo and a grove of *Rauvolfia caffra* (Ng'wati) trees; these have sparse leaves and white flowers. Turn right and immediately right again through more tea (signposted Field No 8).

Climbing the hill you will see a block of riverine forest and, higher up, the remains of a windbreak of *Hakea saligna*. A large block of Eucalyptus is to the left. On the edge of the field look out for pink or white tea flowers (tea is a species of *Camellia*) and green or brown fruits (**drawing**) which are often found on the edge of the tea fields.

Near the top of the field, strips of wiry Vetiver grass *Vetiveria zizanioides* (locally called khus-khus) are planted on the roadside for erosion control. Keep to the right and at the junction, with Monga staff houses to your left, turn right.

There is a fine "tree" across the junction which actually consists of two host species - *Morinda asteroscepa* and *Parinari excelsa* - with two types of strangling fig *Ficus* spp. using the hosts for support, clumps of parasitic mistletoe (Loranthaceae), and an epiphytic cactus, *Rhipsalis baccifera*, towards the upper left, with long, dangling stems [SKETCH]; this is the only cactus native to Africa.

Follow the main road towards Amani for 1.2 km, through an avenue of red flowering *Spathodea nilotica* (Nandi Flame trees) until you rejoin your car at the quarry.

TRAIL REF: T.5

NDOLA TRAIL

ACCESS: 18 km (50 minute) drive each way through forests roads and tea plantations.

TRAIL: a fairly easy walk of 4-5 km (1.5-2.0 hours) through village cultivation and open grassland with fine views across Lwengera Valley to the West Usambara mountains.

Access (distances are km from Amani Rest House):

- 0 km Follow directions of Driving Route 1 from Amani RH as far as Kwamkoro Tea Estate offices.
- 8.0 On entering estate office compound take right turn over bridge with Kwamkoro Tea Factory above you to your left. In 100m take left fork around workshop fence, then first right with a pond to your left and tea above you to your right.
- 9.1 Climb winding hill and at first crossroads keep straight ahead ignoring road to your left lined with Nandi Flame trees *Spathodea nilotica*.
- 10.3 Continue on main road with forest to your left and Mtakuja Village (a hamlet of Mlesa Village which you drove through between Amani and Kwamkoro) across a stream to your right. This village lies in unprotected forest land which, with growing population pressure, is being rapidly cleared for agriculture.
- 11.1 Ignore road branching up to your left (signposted Marikitanda Tea Research Station) and continue ahead, with marsh to your right and tea to your left.
- 12.2 Turn right over bridge, ignoring the small road to the left before the bridge. In 300m cross another bridge and fork left, signposted Ndola Division.
- 13.1 The road climbs to a junction with a bougainvillea bush in the central roundabout. [There is an optional 2km circular diversion at this point to Ndola Falls, only worth seeing in the rainy season: see Driving Route 1]. If you do not take the diversion, or after completing it, go straight on with the bougainvillea bush on your left and descend the hill with Kwamkoro FR on both sides.
- 13.6 Take right (lower) fork and shortly drive through shallow stream (stony base). [Another optional diversion, for which 4WD is needed in wet weather, is to take the left fork which passes through attractive forest and tea, and adds 1.1 km to the access route: see Driving Route D.1].
- 14.3 Ignore road joining from left. After 1 km you will see Ndola Estate office and workers' houses below you to the right.
- 15.9 Keep to left on upper road at two junctions in quick succession.
- 16.3 Pass large wooden house on your left, previously occupied by Ndola Estate manager, and fork right along hedge of evergreen Mexican Cypress *Cupressus lusitanica*.
- 16.7 At first leaf shed fork right down the hill towards Ubiri Village. Estate tea is to the right and a block of tea leased to tenant farmers is on the left (because of a shortage of tea pluckers at Ndola, and the reluctance of many villagers to work as permanent estate labourers, the tea company decided to lease parts of the estate land to village

- farmers under one year renewable agreements. This has raised productivity considerably and provided a regular source of income to villagers).
- 17.2 At foot of hill where tea ends, cross a small stream and climb steeply through Ubiri Village to half built Primary School at top of hill.
- 17.6 Park car in shade of Eucalyptus trees on level area to the right of the school. Do not leave valuables in view. Introduce yourself to one of the teachers if the school is in session, and set off on the walk.

Ubiri Village and School:

The village has a population of around 465 (86 households) and a land area of 363 ha, of which 142 ha are cultivated. Ubiri is an old village whose population has been increased in recent years by immigrants, mainly from West Usambara, in search of agricultural land. There is no electric power or running water supply. The nearest health facility is at Ngua (for tea estate workers' families only) or at the foot of the escarpment in Korogwe District, of which Ubiri is a part for administrative purposes.

The primary school serves both village and estate workers' children. It has 5 teachers and 117 pupils. It is very short of equipment and its construction is incomplete for lack of funds. If you wish to contribute to improvement of Ubiri's school, please see Introduction to this Trail Guide, Section 10.

The walk:

Take the footpath to the left of the school through plantations of the fast growing fuelwood species *Eucalyptus saligna*. These were planted in April 1992, partly by the schoolchildren and partly by Ubiri farmers, to supplement the village fuel supplies in this largely treeless environment. As you climb beyond the Eucalyptus plantation you will see -

to your right:- village cultivation of sugarcane, cassava, maize and bananas. The dwarf bananas (Malindi) are for cooking and eating, the tall variety (Kisukari) is for brewing banana beer [**Recommend Sketches**]. You may see home processed tea from the tenant plots being sun-dried in front of some of the houses.

to your left:- halfway down the escarpment Kinyamaiye Village where many Ubiri farmers also have plots of land for cultivating maize, beans, mangos and avocados, none of which grow well on the colder hilltop fields.

at the foot of the escarpment:- Lwengera Sisal Estate, established by German planters in the 1880's. It is now run by the Tanzania Sisal Authority, but has fallen on hard times with the decline in demand for baler twine and sisal matting. Halfway across the valley is the tree-lined Lwengera River, with paddy rice and maize growing in the wet land close to the river banks.

across the Lwengera Valley:- the West Usambara mountains to the north west. The forests and tea fields of Ambangulu Tea Estate may be visible on a clear day. Korogwe town is below the low hill to the south west, and Kwamdolwa Convent is on the lower slopes to the north of Korogwe.

Continue along the footpath keeping close to the escarpment edge and crossing two grass-covered hilltops. To your right you will see lines of Eucalyptus and indigenous tree species planted on the hillsides. Soil pits dug to the left and right of the path mark the boundaries of

50 ha of village land leased by Ubiri Village Government to the East Usambara Tea Company for fuelwood plantations for the tea factories. The planted land will revert to the village after two harvesting cycles.

The path disappears before you start the climb to the third and highest hilltop, locally called Lutindi (height 1,141 m). It is topped by what appears to be the remains of a fortified settlement, possibly dating from the early iron age and perhaps near the site of a battle between rival sons of a Kilindi chief who ruled much of Usambara in the mid-19th century. Three concentric terraces encircle the summit, one partially ringed with rocks, which would have made it difficult for invaders to reach the top unseen **[Recommend Sketch]**. The single tree on the summit is a myrtle, *Myrica salicifolia*, local name Mshegeshi, which has medicinal properties.

From the summit you can see **[Recommend Sketch of View]** -

to the north: Nelusanga Village, a hamlet of the next village along the escarpment, Kwemwewe (whose name means "the place of hawks": these birds are much disliked by farmers since they prey on young chicks), and behind it a view of Mount Nilo;

to the north-east: the plantations and indigenous forests of Monga Tea Estate;

to the south: Ndola estate and workers' houses;

to the west: Lwengera Valley and beyond to West Usambara mountains.

Vegetation on the Ndola hillsides consists primarily of two grass species: a broad-leaved one locally called Kinyusi, and a finer-leaved grass name known as Khus khus. This is a wild relative of Vetiver Grass now widely used for erosion control. Kinyusi is less combustible than Khus khus and is used for thatching houses. Bracken *Pteridium aquilinum* is plentiful, indicative of the acid soils on which tea thrives, and there are many herbs including several of the mint family Labiatae. The area is heavily grazed by cattle and goats. Birds of prey can often be seen circling overhead - the White-necked Raven *Corvus albicollis*, Augur Buzzard *Buteo rufofuscus* and a variety of falcons may be seen.

Opinions vary on whether the hills were ever forested and, if they were, why they are now so denuded. Older inhabitants of Ubiri say that their ancestors always built their villages on the hilltops and cultivated in the valleys. A popular myth is that, in the distant past, Lutindi was heavily forested and was topped by an earthenware pot from which water flowed constantly to supply the village. One day, due to the misdemeanours of the inhabitants, the spirits were angered and broke the pot which then overflowed and washed the whole village and its forest cover into the valley below!

A more probable, if less romantic, explanation is that, perhaps following prehistoric deforestation, the shallow gravelly soils, together with strong winds, constant grazing, burning of grass and cutting of wood for fuel and building, have prevented establishment of all but the hardiest of tree species and thus kept the hilltops bare.

Return towards Ubiri by the same route. When you reach the last hillock before the village, for a change of view take the path which circles the hill to the left (east), passing through an outlying hamlet of Ubiri before you reach the school and your car.

Return drive to Amani:

If you want the shortest and quickest return route to Amani, follow the access route in reverse. If you want to take a longer and different route you can turn left instead of right when you reach the Ndola Division signpost (12.2 km on the access route) and follow the second half of Driving Route D1 through Monga and Mbomole to Amani.

TRAIL REF: T.6

DEREMA TRAIL

A 5-7 hour (12 km) walk, starting from Amani Rest House and passing through forest, tea plantations and village agriculture with steep climbs, places of historical interest and panoramic views. Shorter options covering parts of this demanding trail are also described.

Section 1: Amani RH to German Hospital and Gravestone Site.

Walk past Amani Post Office to administration block of the National Institute of Medical Research (NIMR). Take the concrete path along the front of the building with the Post Office behind you; at end corner turn left and go down steps through hedge of Mexican Cypress. Turn left, down to the junction known as Piccadilly Circus (see map). Cross the road which leads back to your left (signposted to Monga), ignore the next road descending to the left and go directly forward along a level track under a large fig tree *Ficus altissima* with epiphytic ferns (**recommend new label**).

In about 30m pass a large *Treculia africana* tree (**Label and Sketch**) on left with round furry fruits. The old Botanical Garden nursery area is in the valley to your left with Amani West FR beyond. There is a Cuban Royal Palm *Roystonea regia* to the left. Cattle sheds of the NIMR dairy herd are to your left, below a big clump of Golden Bamboo *Bambusia vulgaris*. Mature oil palms *Elaeis guineensis* (local name Michikichi or Miwesi) are to left and right.

At the next junction, with a house above you to the right, go straight forward down a narrow footpath (the track to your left leads to NIMR staff houses, the second of which was once occupied by the famous ornithologist R.E. Moreau who worked in Amani from 1927 until the 1940s).

The path descends to a side road leading left to the Catholic Church (signposted). Cross this side road and take the small grassy footpath which drops into the valley straight ahead, leaving the main Muheza road on your right (**recommendation: Signpost, and footpath needs slashing**). The path is lined by a variety of introduced brambles (*Rubus* spp.), all of which have edible fruits.

Shortly you pass two Rain Trees *Samanea samana* to your right with exposed roots, epiphytic ferns and hanging vines and strands of the epiphytic cactus *Rhipsalis baccifera* (**recommend sketch of hanging fronds**). Take the path to the right 20m after these trees and in 50m join another path turning left along what was once the main Amani-Derema road.

After 25m cross a wooden bridge over the Dodwe River. The undergrowth contains a range of introduced and indigenous plants including *Rubus* spp., *Lantana camara*, *Clidemia hirta*, *Aframomum* spp. and *Costus* spp. There is heavy invasion of *Maesopsis eminii* in the forest to the left.

After about 500m enter Derema tea plantation with forest ahead and to the right and a view of Derema Tea Factory across the valley. The strip of open land separating the forest blocks has been proposed as a potential forest corridor linking the northern and southern sections of the East Usambara forests **[check with Hatim]**.

In about 300m turn left up the main road which leads to Mbomole Village **[Recommend Sign Post]**. There is a housing camp below you to the right and the proposed Derema FR is on the far ridge to the right.

When the road flattens out, with a basin of tea plantation and a nursery site below you, take the path through the tea along a small ridge to the right. In about 20m turn left into the tea field (descending towards the valley bottom); turn left again on the first terrace (**recommend SP**), and in about 50m turn right down a drainage line towards a clump of bamboo (**recommend cut steps**), crossing a further terrace to reach the road.

Turn left along the road into a small patch of woodland with *Cedrela odorata* and *Maesopsis eminii* trees, and follow the road round to the right. When parallel to the nursery site, turn down to the right through the tea to reach the bottom of the valley (**see sketch map**).

The tea nursery has a sieving and potting shed where the soil mixture is prepared and put in polythene sleeves. The tea cuttings are planted in the sleeves which are set out in shaded beds for up to nine months before planting out in the field (the nursery is not permanent, but its site will still be visible even if the nursery is not in use).

Take the road out of the nursery site to the left; at the first junction fork right and shortly turn right again over the bridge across Kwemkuyu River. Follow the road along the valley, with bamboo to the left, passing through clumps of Eucalyptus to reach Kwemkuyu tea pluckers' quarters. Follow the road which zigzags up the hill through the village, and immediately after passing the last house take the footpath to the left of the road up through the tea plantation. Turn left when you meet the road at the top, and in 200m join the main Amani-Bulwa road and turn left again. Walk for about 500m until you come to a leaf collection shed under a clump of bamboo.

[NB if you have a driver and do not want to walk the whole trail, he could meet you at this leaf collection shed; it is also a convenient take-off point for visiting the German hospital and grave stone sites, see below].

From the leaf collection shed climb a small footpath to the right, passing between the tea and woodland (**recommend SP**). After about 200m turn left into the wood (**recommend SP**), and in 50m come out of the wood on to a road where you turn right. As you reach the ridge there are views across the valley to hamlets of Msasa IBC village (named after a company called International Business Combine which had a logging concession here in the 1950's), and to the proposed Derema FR on the hill behind.

In the forest to the left of the tea is the site of an old German hospital which served the expatriate population of both highlands and lowlands from the 1880's to 1916. Very little remains of the building, the materials having been removed for use elsewhere, but the area is pitted with holes and trenches which people dug after the departure of the Germans in search of the buried treasure which they are widely believed to have left behind.

100m down the road from the hospital site, on a terrace in the tea to the left (**SP**), is the grave of Dr Felix Schutte, who was doctor at the hospital in the 1890's. The inscription on the marble gravestone reads -

| | |
|-------------------------|----------------------------|
| Hier ruht in Gott | Here rests in God's arms |
| Fern von den Seinen | Far from his family |
| mein theurer Sohn | my beloved son |
| Dr Med Felix Schütte | Dr Felix Schütte |
| geb. Berlin 1 Juni 1864 | born in Berlin 1 June 1864 |
| gest. 2 Mai 1895 | died 2 May 1895 |

Section 2: Grave Site to Kilimahewa Village Viewpoint.

From the gravesite you can see to your right (south) Mdarasini (cinnamon tree) village with Amani Sigi FR behind it. Follow the road down through the tea, passing through a small patch of woodland before entering another field of tea. Continue on the same road for about 1 km, when you come to a junction with three large trees: *Sapium ellipticum* (Mkongoo) to the left, *Rauvolfia caffra* (Mweti) to the right and *Milicia excelsa* (Mvule) to the front. Turn left past a small clove plantation and continue downhill to the left.

At the end of the clove plantation (about 300m) turn right, passing under a leaf shed which straddles the road. There are *Maesopsis* trees in the valley to the right and a Eucalyptus grove on the crown of the ridge behind. In 200m turn right through the tea to another leaf shed on the road, with a further grove of cloves to the right. Turn right along the road, and at the next leaf shed (about 500m) cross a bridge and go left up a path between tea and forest with a stream and water pipe to your left.

In 100m you reach the water intake. Climb steeply to the right, and in 20m turn left with the forest to your left and tea to your right. In 200m turn left to cross a small stream and climb steeply for 500m, turning right at the junction to reach a cluster of 5 houses amidst bananas, cloves, cardamom, sugarcane and other crops. This is Makadawa, a sub-village of Msasa IBC.

Take the road to the left of the village, and after 100m climb the steep path to the right through mixed woodland and village cultivation with tea on your left. The path veers to the left at the top of the tea, where looking back to the north-west you can see the gravestone and hospital sites which you left a short while back.

Continue climbing to the ridge at Kilimahewa Village (the name means "hill of winds"). Along the ridge there are magnificent views to the south and east, where the villages in the plains (Kisiwani, Bombani, Muheza), Longuza teak plantation, Magoroto mountain, Mlinga peak and Amani Sigi FR can be seen. On clear days you can see the Pangani estuary on the Indian Ocean, and if you are lucky you may even glimpse the north shores of Zanzibar Island (**recommend sketch-map**).

Turn right through Kilimahewa Village and in about 300m (**check the distance**) take a path down to the left by a Whistling Pine *Casuarina junghaliana* to reach Magoda Village with its jakfruit trees, mangos, coffee, cinnamon, cloves, cardamom, citrus, avocado and annual

crops. Passing a large tin-roofed house near the end of the village, climb to the right through Eucalyptus trees to another superb viewpoint at the start of the tea plantation. If you lose your way in Magoda, ask for directions to Derema Tea Factory which will put you back on the right path.

Section 3: Kilimahewa to Derema Waterfall and Amani.

Follow the road through the tea, noting several *Dracaena steudneri* trees (local name Papata) with striking rosette-like leaf clusters [**Recommend Sketch**]. Come to a solid German-built house which is the oldest building on the mountain (**check if Hatim knows construction date**), and follow the road round to the right. When you see a white house below you, Nanguruwe Falls can be seen in the distance with Amani Sigi FR behind it. Derema Tea Factory is below you to the left and Amani Village can be seen above it.

Pass through an avenue of Eucalyptus trees and at the crossroads take the middle of the 3 roads (you can take the left hand road for a detour to the factory if you wish). At the next junction (about 300m) turn right. The road winds down through mixed secondary forest with many self-seeded Sugar Palms *Arenga pinnata*. A rushing waterfall is audible to your left and an interesting rock formation is above you to the right. Tree Hyrax *Dendrohyrax validus*, locally called Pimbi or Pelele, can often be seen on the rocks [**Recommend Sketch**].

200m after the rock, branch left at a Mexican Cypress *Cupressus lusitanica* tree down a steep hill to the road at the bottom. Turn left, cross the Kwemkuyu River and in 500m you will see the impressive rapids of the river below you to the left. In a further 300m cross a bridge over the Dodwe River (a tributary of the Kwemkuyu) and turn immediately right up a path through forest with the river to your right and a fine *Pterocarpus tinctorius* tree to your left.

Join the Muheza-Amani road at the top of the path and turn right. In 400m go straight over a crossroads, and continue for 1 km till you reach Amani. At the next crossroads (Piccadilly Circus), with the signpost to Monga to your right, climb the path to the buildings of the Medical Research Institute and the Rest House.

OPTIONS FOR MODIFYING DEREMA TRAIL

- 1) Walk the whole trail: 12 km, 5-7 hours and quite demanding.
- 2) Drive to parking place on Derema-Bulwa road, walk to gravestone and hospital sites and back to car: 10 km drive, 2 km (30 minute) walk.
- 3) Drive to Derema Tea Factory, walk the trail in reverse to Kilimahewa Viewpoint and return to car: 10 km drive, 3 km (45 minute) walk.

If you have a car with driver:

- a) walk from Amani to parking place on Derema-Bulwa road, car meets you there and drive to Derema Factory or return to Amani.
- b) drive to parking place on Derema-Bulwa road, walk to Kilimahewa Viewpoint and on to Derema Tea Factory where car meets you and return to Amani.

(Recommend route map to clarify these options).

Trail Ref: T.7

Amani Botanical Garden: Sigi Tour

A 1-3 hour walk around the palmetum, spice and fruit gardens.

Access

Park at the Sigi H.Q. of the Amani Nature Reserve, 8 km (30 min.) drive from Amani on the main Amani-Muheza Road. Walk back on the road to the bridge over the Sigi River, towards Amani.

The tour

encompasses parts of the Sigi-Chini, Sigi-Juu and Coconut Slope Plantations of the Amani Botanical Garden. These areas were originally cleared of forest and planted up by the Germans, mainly between 1902 and 1913; initially they consisted of a palmetum and plantations of fruit trees and other trees with uses other than timber (e.g. spices and oils). Later additions were made, first by the British administration and then by the Tanzania Government in the 1960s, most of the latter additions being spices. This guide gives a tour of the most interesting parts of the palm, fruit and spice plantations. The more conspicuous species are listed, but knowledgeable botanists will find much more of interest than it is possible to describe here. Depending on the time of your visit, edible fruits of one or more species may well be available. Some species are very popular with the local people and are soon collected, while others are all but ignored.

The tour begins just before you enter the Sigi-Chini (“Lower Sigi”) Plantations, which occupy the far bank of the river. Just before the bridge on the left, is a clump of Golden Bamboo *Bambusa vulgaris* with, under it, the spiralling stems of the indigenous, ginger-like *Costus subbiflorus*. On the right, after the bridge, is the first of the fruit trees, a Yellow Plum *Spondias lutea*, with edible fruit [**LABELS RECOMMENDED FOR ALL SPP LISTED HEREIN**]. Beside the *Spondias* are two large-leaved Elephant Fruit *Dillenia indica* [**Sketch of leaves?**]

Climb the bank to the left and pass between three dye-producing *Euclea* sp. with, behind them, a low, sprawling Ebenaster or Black Silk Dye *Diospyros mollis*, also a dye producer. Next on the left are two small, oil-producing Tallow Trees *Pentadesma butyracea* and ahead a tall, old *Albizia chinensis* with Stagshorn Ferns *Platynerium angolensis* and Black Pepper vines *Piper nigrum* growing on it. Walk on, to the left of this, and ahead on the left is a Yellow Sapote *Lucuma salicifolia*. Straight ahead is a plantation of Black Pepper vines, growing up living stakes of pollarded Cigar-box “Cedar” *Cedrela odorata*. Between the pepper and the river is another Yellow Sapote. On the far side of the pepper plantation is a small grove of Breadfruit trees *Artocarpus communis*, a tree with divided leaves, widely grown for its starchy fruit in Zanzibar but little used in mainland Tanzania [**Sketch of leaves and fruit?**]. Here are also more *Cedrelas*, awaiting pepper vines.

At the roadside, by the Breadfruit, is an old Clove tree *Eugenia aromatica*, planted in 1902, and behind the Breadfruit, by the river, a big tree with dark, simple leaves, a Marang *Artocarpus odoratissima*. A short detour to the left, under the Marang and past a grove of Star Apple *Chrysophyllum cainitum*, leads to a short (30 m) path down the river bank to the

old dam for the former water-powered sawmill which stood, in German times, across the road from the Nature Reserve H.Q.

Back by the road, between two Breadfruit, are two big bushes of *Posoqueria latifolia*, with night-scented bunches of pendant, tubular, white flowers. Between these and the river are some tall trees with bare trunks and compact crowns: Ylang-Ylang *Cananga odorata*, an important source of fragrant oil for perfumes.

Continue up through the Sigi-Chini Plantations, with the road on your right. You pass through a small grove of Strawberry Guava *Psidium cattleianum* (small trees with smooth, reddish bark), with a large Mango *Mangifera indica* between them and the river, to reach more *Cedrela* with Black Pepper and the potting shed of the Ministry of Agriculture nursery. Just at the edge of the *Cedrela*/pepper is another big Yellow Plum with more Stagshorn Fern. Ahead are a small and a tall Queen Palm *Syagrus romanzoffianum* and, just at the back of the shed, a thinner Betel-nut Palm *Areca catechu*. The thicker palm, with a green crown-shaft just below its fronds, is a Caribbean Royal or Cabbage Palm *Roystonea oleracea*. More *Spondias* are visible between the palms and, looking a little to the right, above the shed, the dark-leaved crown of a big Tallow Tree, probably the parent (planted in May 1908) of the small trees seen earlier. The edible oil is extracted from the seeds, which are enclosed in a large, red-brown fruit.

Walk up the bank ahead, to the base of the Queen Palms, and, on the left, are small Bilimbi trees *Averrhoa bilimbi*, with their flowers and fruit carried on the trunk [**Sketch**]. The fruits are acid and good for jam. The big palm here with a thick trunk bearing long spines is a Sugar Palm *Arenga cf. pinnata* [**Sketch**]. Walk through the brush towards a clump of Golden Bamboo (green and yellow varieties), passing two Pará Rubber trees *Hevea brasiliensis*. This is the species which nowadays provides most commercial rubber. There are many cuts on the trunks where people have demonstrated the flow of latex. During the first world war, the Amani Institute produced large quantities of high quality rubber from plantations of this species in the Botanical Garden. The path leading off to the left, to the river, has some Jakfruit trees *Artocarpus integra* by it, which also bear their huge fruit on the trunk [**Sketch**].

Climb the bank ahead and bear left under the bamboo; on the right is the many-branched, dark trunk of a small Carambola or Starfruit tree *Averrhoa carambola*, a relative of Bilimbi with a larger, sweeter fruit [**Sketch**]. Walk along the terrace above the river through the bamboo grove, with lots of self-seeded Sugar Palm seedlings. Up on the bank to the right is a round-leaved *Livistona rotundifolia* palm, with several small ones on the path. The bigger palms here are more Sugar Palms: after one with a curved trunk, bending over the path, are several Oil Palms *Elaeis guineensis*, then another *Livistona rotundifolia*, right on the path. Up in a gap on the right is another tall Caribbean Royal Palm and, by the trail, more Sugar Palms; their spines are up to 1 m long. Opposite these, down by the river, is a group of tall, dull green spikes of Black Bamboo *Gigantochloa ater*, followed by a clump of *Bambusa bambus* (thicker stems) then some *Gigantochloa aspera*. More Sugar Palms now stand on both sides of the track; their yellow, round fruit, a favourite food of Blue Monkeys *Cercopithecus mitis*, can often be seen on the ground.

Climb the 1.5 m bank at a gap in the vegetation on the right, to emerge into the Ministry of Agriculture nursery; fruit and spice seedlings, among others, are for sale. Pass through, on to the road, under some large trees: a straight-trunked, native timber tree, Mvule *Milicia*

excelsa, a big, dark-leaved Mammey Apple *Mammea americana* and a Mango, which flank a Princess Palm *Dictyosperma album*.

Turn left up the road. Several tall, slender *Livistona rotundifolia* stand on the left, then a dense vine of Betel Pepper *Piper betel* cloaking the trunk of a dead palm; in South Asia, its leaves are chewed together with the nuts of Betel Palm. On the right of the road is a bank of Oil Palms and on the left, after some tall *Arengas* and *Livistonas*, a low *Licuala spinosa* fan palm, with dissected leaves, with some small cane-palms, Macarthur Palms *Ptychosperma macarthurii* behind. Next to the road, after a standing, broken trunk (of a Cuban Royal Palm *Roystonea regia*), stands a tall, untidy Savanna Palm *Sabal mauritiiiformis* (a fan palm), while another *Sabal* visible through the back in the canopy is a tall Puerto Rican Hat Palm *S. causiarum*. A small palm coming up behind the Savanna Palm is a replacement Cuban Royal. The last fan palm visible here has its crown at mid-level, it is a Root-spine Palm *Cryosophila nana*.

About 40 m after the Savanna Palm, also on the left, is a tall *Attalea funifera* palm with, between it and a dead standing tree, two small, slender Betel-nut Palms. All around their bases are the large fronds of low Ivory Nut Palms *Phytelephas macrocarpa*.

On the left through an opening you will see (and hear) a small waterfall at the point where the Kwemkuyu (which flows from the right) and the Sigi Rivers join. Just between the road and the fall are the tall fronds of a raffia palm *Raphia monbuttorum*. Climb the road bank near some big rocks on the left; the opposite bank of the river here is an island at the junction of the two rivers. There are various palms visible, of species already mentioned. Carry on up the road, passing three tall, slender Princess Palms. After the shed on the right are some strangling figs *Ficus* spp.. Carry on, up to the bridge over the Kwemkuyu, where stands a water-powered maize mill, built in 1986. Crossing the bridge takes you into the Coconut Slope Plantations of the Botanical Garden [**Sign Board**].

About 15 m up the road beyond the mill, take the path down from the road on the left; it is lined with Mexican Cypress *Cupressus lusitanica* saplings. The nursery at the bottom is run by the Tanzania Forestry Research Institute (TAFORI). On the left, as you go down, are some small, palm-like False Sago “Palms” *Cycas revoluta* and the tall fronds (up to 20 m long) of two raffia palms *Raphia vinifera*. At their bases are small plants of a flowering relative of bananas *Musa rosea*. On the right, by the path, is a Moreton Bay Pine *Araucaria cunninghamii*, then a Spindle Palm *Hyophorbe indica*, then a fine young Cook Island Pine *Araucaria cookii*.

Enter the nursery area. On the right is a big clump of Panama Hat “Palm” (actually in the family Cyclanthaceae) *Carludovica palmata*, which often has bright orange flowers or fruits at the base of the leaves. Pass through the nursery area, keeping the river on the left. A small bush of *Garcinia edulis* stands on the far edge of the clear area and on the right are two tall Queen Palms. Straight ahead is a grove of Panama Rubber *Castilla elastica*, which was extensively exploited as a source of rubber before Pará Rubber became the more widely used. Beyond the *Castilla* trees is a TAFORI growth trial of Mtambaa *Cephalosphaera usambarensis*, an indigenous timber tree, in an area where these trees had self-sown. On the rocks to the right, at the bottom of the slope, are several strangling figs *Ficus* spp.; pass to the left of the lowest of them and, on the left, is a small Fishtail Palm *Aiphanes caryotifolia*, with

wedge-shaped leaflets [**Sketch**]. About 30 m ahead, with crowns at mid-level, are two Palmetto Palms *Sabal palmetto*.

Either retrace your steps through the nursery to the road, or climb up to the right (after reaching the Palmettos), passing up the side of a rock outcrop with a fig on it, to the road above, where you turn right. Above the road here is a plantation of the large-leaved Teak *Tectona grandis*; on the way down to the bridge you can see the crowns of the two tall Queen Palms (whose bases you passed at the nursery) on the right.

Cross the bridge and head back down the road. After the shed on the left, the road bends left with, on the left corner, three tall, feathery-leaved *Peltophorum dasyrachis*, which are used as light shade and are favoured by honeybees. Carry on down the road until you have the Ministry of Agriculture nursery entrance on your right. On the left here is a grove of Mangosteen *Garcinia mangostana*, held by some to be the most delicious of all tropical fruit [**Sketch of Mangosteen fruit**]. Just below them is another Mammey Apple, opposite the one on the right of the road, mentioned earlier, and behind it some *Garcinia xanthochymus*, also a fruit-producer.

Climb the bank to the left, under these trees, and turn right through a plantation of Cardamom *Elettaria cardamomum*, a lily-like relative of ginger. The flower and fruit spikes may be seen at the base of the leaf stalks. The first area of Cardamom is planted under the *Garcinia xanthochymus*. Climb up behind these to a small group of *Hydnocarpus ilicifolia*, a source of chaulmoogra oil formerly used in the treatment of leprosy, and to some tall, delicate fan palms above, *Sabal princeps*. Turn to the right below these, along the contour, until you reach two short, massive palms together: a spiny *Arenga* and a fan palm *Sabal* sp. (with two more a little further) and above them a tall thin *Phoenix* sp. From here, you can see, on the opposite side of the valley, the slopes of Amani-Sigi Forest Reserve (climbed in the Amani-Sigi Mountain Trail).

Below the *Sabals* are four tall, thin Nutmegs *Myristica fragrans*, also with Cardamom growing beneath them. Drop down to them, passing on your right a *Hydnocarpus anthelminthica*, also a medicinal species. Turn left, parallel with the road and pass another grove of *Cedrela*/Black Pepper with, up the slope above, small Clove trees and below, next to the road, a Lemon *Citrus limonium*. Go down to the road, passing under a large-leaved Marang.

Behind the group of houses is a clump of Sweet Lime *Citrus nobilis*, while next to the metal storage container are three Litchi trees *Litchi chinensis* and behind them, several bushes of Pitanga Cherry *Eugenia uniflora*. Moving down, parallel to the road, you pass a tall *Spondias cyathea* next to the Litchis, and two Orange trees *Citrus sinensis* under it. Still walking parallel to the road, you come into an open area with coppiced Cinnamon trees *Cinnamomum zeylanicum*, and more Oranges. Near the road are two straggly bushes of the yellow-flowered *Acacia farnesiana*, whose pods contain a sticky pulp which yields Cassie Oil. At the back of this plot, at the foot of the slope, are some Physic Nut *Jatropha curcas* shrubs with Vanilla Orchids *Vanilla planifolia* trained up them.

Behind the big Breadfruit, next to the road here, are some small Bullock's Heart trees *Annona reticulata*, so named for the shape, size and reddish colour of the ripe fruit [**Sketch**]. Next to the road, below the Breadfruit, are some Calabash Trees *Crescentia cujete*, whose fruit are

hollowed out to make the famous water containers, then a double line of large trees with dark leaves, Malay Apples *Eugenia malaccensis*, and a triple line of finer-leaved Clove Trees *E. aromatica* and, above the road corner, a line of taller, more slender Bay-Rum Trees *Pimenta acris*. Finally, after some straggly, short *Prunus persica*, a clump of about six Annatos *Bixa orellana*, used for dye and a spice. You are now back at the Sigi Bridge.

General recommendation for this and the NIMR centre tour.

After labelling the plants, these two tours should be re-written, perhaps just providing a map of the paths and plantation borders and indicating that it is possible to wander anywhere within the plantations and see the plants in any order. The guide as written here sticks to a well-defined route in order to permit identification of the plants from their location. This will be less necessary after labelling has been done, and visitors will then be able to explore more widely than indicated here. There are also many plants passed by on this walk which are not mentioned in the guide; if they are labelled the guide can be considerably abbreviated.

Trail Ref: T.8

Amani-Sigi Mountain Trail

*Access: walk begins at Sigi H.Q. of Amani Nature Reserve,
8 km (30 min.) drive from Amani Rest House.
Steep walk of 4-6 km round trip, climbing c. 450 m through primary and
secondary lowland and submontane forest, to ridge top;
time 3-5 hours.*

From Amani Rest House drive 8 km down the main road towards Muheza, through the Botanical Garden and with public lands of Mlesa Village to your right. At 7 km the road crosses a bridge with a hydro-powered grain mill on your left, and in 1.5 km after passing through a fruit and spice garden (see Trail No T.7) cross another bridge and park your car on the right below an old wooden building built on a rock above the road.

This building was the station-master's house in German times, when a branch line of the main Tanga-Moshi railway operated as far as Sigi to carry timber (mainly *Beilschmiedia kweo*, local name Mfimbo, and *Milicia excelsa*, local name Mvule) from the Usambara forests to the coast. The station-master's house was later converted to a primary school, and is now scheduled to be rehabilitated as part of the Amani Nature Reserve headquarters. Note the square block on the rock in front of the house which used to hold the station bell.

The trail starts along a track to the north-east, passing between a small shop and a cluster of houses with the Sigi River to the right. The railway line used to extend along this path to a water tank where the engine's boiler was filled. The remains of the tank can be seen to the left of the path. Note also the cattle enclosure composed of *Cedrela odorata* and spiny *Spondias lutea* trees to your left [**Recommend Sketch**].

At 100m, before crossing a log bridge, you will see a path to the right leading down to the Sigi River, where a German-built dam can be seen a few metres downstream. This served a water-powered sawmill built by the "Deutsche Holzgesellschaft für Ostafrika" in 1909. Part of the sawmill machinery can be seen at the side of the main road opposite the car park. Logs were rolled and winched down to the mill from what are now the Amani West and Amani Sigi FRs.

Returning to the path, cross the log bridge over Wata Stream. You will see to your left and right many introduced palms and other plants escaped from the Botanical Gardens, including *Castilla elastica* (Panama Rubber) used for latex extraction before Para Rubber *Hevea brasiliensis* was introduced from Brazil, as well as Raffia, Oilpalm (Michikichi or Miwese), etc.

After 200m cross Nangaruwe river to enter the public lands of Chemka Village. As you climb the path from the river you will see to your left a hand-operated sugarcane crusher. Cane juice is used to make the local liquor called Boha which is sold in many bars in the village. Note also cultivation of coconut, cassava, cardamom, bananas, pawpaws, sweet potato and cocoyams above and below the path.

Pass a few houses and follow a minor path up the hill to the left of the village, then descend again towards the river. Note the strangling fig on the *Bombax rhodognaphalon* tree to your left. Across the valley you can see Amani East FR and the proposed Derema FR.

Cross Nangaruwe River once more to re-enter Amani-Sigi FR, and follow the track up a steep slope on the left side of the river valley through typical lowland rainforest. In the undergrowth are many plants of *Dracaena usambarensis*, with cane-like stems and terminal bunches of lily-like leaves. On the next section of the trail, you pass large specimens of many valuable species of timber tree, indicating that the forest has not been heavily logged in the past. These species include Mtambaa *Cephalosphaera usambarensis*, Mnyasa *Newtonia buchananii*, Mvule *Milicia excelsa* with its red and yellow markings on the exposed roots **[NEED TO LABEL GOOD SPECIMENS OF EACH OF THESE, AND OTHERS]**.

After climbing for some time, you pass a rock outcrop on the left. In damp weather, you may see tree-hole crabs scuttling across the leaf-litter. These belong to a species thought to occur only in East Usambara. Look out also for large green slugs on the tree trunks. You will almost certainly hear the liquid calls of the Green-headed Oriole *Oriolus chlorocephalus* **[Sketch]**; it is said to call its name, “oriole”. You will also notice the persistent popping call of the Green Barbet *Buccanodon olivaceum*. Both of these birds are specialities of the Eastern Arc mountain ranges of East Africa. A common climbing plant, with its stems sticking to the trunks of trees along much of this part of the trail, is *Colocasia scandens* (Kiandama), which is used in local medicine. A common tree in this area is *Pachystela msolo* (Msambia), a lowland forest species with a deeply ridged trunk, from which tool-handles are conveniently cut **[Sketch of trunk]**.

As the path levels somewhat, the understorey opens out, indicating forest in good condition, with a closed canopy and low light intensity below. There has been manual logging (pitsawing) here in the past, but not for many years. At a junction in the path, take the more definite right-hand branch **[SIGNPOST]**. If you see scrapings and shallow diggings in the surface of the soil, these are signs of Bush Pig *Potamochoerus porcus* **[SKETCH]**; the pigs are fairly common but you will be extremely lucky to see any sign of the small forest antelope, duikers *Cephalophus* spp., although they do occur here. They are heavily hunted and consequently rather rare and very shy.

After another rock outcrop on the left, the path climbs a steeper, clearer area where the line of the path is indistinct; you can zigzag up to make the climb easier. The path is beginning to enter submontane forest, with more epiphytic Bird's Nest Fern *Asplenium nidus*, with strap-like leaves, on the trees. Submontane trees which begin to be found in this section include *Allanblackia stuhlmanni* (Msambu) and *Greenwayodendron suaveolens* (Ng'weti) **[LABELS NEEDED]**, named after the famous botanist P.J. Greenway, who worked at Amani in the 1930s and 40s. You will notice that Msambia is not found on these higher slopes.

You soon pass a rock outcrop on the right, then between two further outcrops to reach the top of the ridge. On the ridge, a common understorey plant is *Aframomum usambarense*, with big, single, pale lilac flowers borne at ground-level at the base of the leafy stems. This species is only found in East Usambara. Walk some 300 m along the ridge to the left (north), to a huge pit, about 15-20 m deep, dug by treasure-seekers during 1992-3 under the

trigonometrical station here, whose pillar (number TP HIVA) now lies by the side of the pit. It is a common belief in Tanzania that relics of the German period mark sites where the Germans buried their wealth when the country was taken over by the British during the first world war. Be careful of the sloping sides of the pit! From this point, one can obtain views through the trees to Amani (NW) and Derema tea factory (N).

Turning south along the ridge, it is possible to reach, in about 2 km, the highest point of Amani-Sigi (1070 m), passing many large African Camphorwood trees *Ocotea usambarensis*, a montane species which is now rare elsewhere in East Usambara. **[TRAIL NEEDS EXPLORATION, CUTTING AND MARKING]**

On the way down, a little further north-east than the uphill route, the trail passes through a large area with few big trees, dominated by the latex-producing *Funtumia elastica* and the invasive *Maesopsis eminii*. There are many small Mtambaa in the open understorey. This area was probably intensively logged by pitsawyers some 20 or 30 years ago.

RECOMMENDATIONS

This trail needs to be marked and the more overgrown sections maintained; also it would be advisable to fence off the treasure pit at the trig point. Until this has been done, visitors are not recommended to attempt the walk without a guide as it is easy to get lost, and not impossible for the foolhardy to fall down the pit.

A decision needs to be made on whether the destination of the trail is the ridge with the trig point and pit, or the highest point of Amani-Sigi. There are many alternative routes to both. When clearing and marking the trail the best route should be explored. We recommend including the climb to the ridge, the pit site and the summit.

This walk should not be included in the trail guide without warning that a local person to guide the visitors is needed. Potential guides include: Mzee Juma from the houses at Sigi Station (does not speak English), Otieno (forester at Longuza), Idi (TAFORI employee at Sigi Botanical Garden). Others could doubtless be found when ANR Headquarters is opened.

TOUR T.9

TEA FACTORY TOUR

1 hour guided tour of one of the tea factories on the Amani Plateau, by arrangement with the Company management; a nominal charge will be levied, and visitors receive a complimentary pack of freshly made tea

Access and Arrangements: there are five tea factories in East Usambaras, four of which may be visited by prior arrangement with the factory managers. The factories are at -

Kwamkoro: visit easily combined with Ndola Drive (D.1), Kwamkoro Forest Trail (T.3) or Ndola Trail (T.5);

Bulwa: visit conveniently combined with Bulwa Drive (D.2) or Monga Drive (D.3);

Monga: visit easily combined with Monga Drive (D.3) or Monga Trail (T.4);

Derema: visit can be combined with Bulwa Drive (D.2) or Derema Trail (T.6).

It is necessary to make prior arrangements for the visit, both to ensure that the factory is operating at the time proposed, and also to alert the Factory Manager and to enable him to lay on a suitable guide. A notice board is available at Amani Rest House, where visitors can make their request before 10 am on any working day. 24 hours notice is recommended, but a visit on the same day may be possible. The board will be cleared at 10 am each working day, and the applicant will be notified if there is any problem at 10 am the next day.

The factories normally operate throughout the year, though Derema Factory is closed during the low season for tea production (roughly June-September when it is cold and dry) and other factories will also be temporarily shut down during these months for maintenance. The hours that the factories operate depend on the amount of leaf delivered: during the “flush” periods (roughly March-May and October-December) tea making frequently goes round the clock. During the low season, processing may start only at 11 am and be finished by 2 or 3 pm. Between 12 and 2 pm is probably the safest time to arrange a visit during the low season. Visits should be arranged on a working day (Mondays to Fridays plus alternative Saturdays) unless during the flush when every day is a working day.

The location of the factories is shown on Map 3, and directions for access are covered in the driving routes referred to above.

The Visit: the tea factory tour takes about 1 hour, and covers the whole process including -

- receipt and weighing of the leaf as it comes in from the field
- withering with hot air fans to remove excess moisture
- cutting, tearing and curling to prepare the leaf for fermenting
- fermentation either in trolleys or in a continuous fermentation unit
- drying in a steam drier or “fluid bed drier”
- sorting and packing

The whole process from delivery of leaf to packing of dried tea is normally finished in less than 24 hours, depending mainly on the air temperature and water content of the leaf. Visitors are asked to pay a nominal charge to compensate for the time allocated by the factory guide. In return each visitor will be presented with a complimentary pack of East Usambara tea.

Drive Ref: D.1

Ndola-Monga Drive

43 km (2-3 hour) round-trip drive from Amani Rest House on all-weather road; in wet weather, some sections may become muddy and impassable except by four-wheel drive.

Distances are km from Amani R.H.

- 0 Drive down from R.H.; ignore first right turn, to house; at 50 m, fork sharp right; at 200 m, go right at junction with main Amani-Kwamkoro road.
- 0.5 Pass dairy and entrance to East Usambara Conservation and Development Project on right; plantation of *Maesopsis eminii* on left forms part of Amani West Forest Reserve; the natural forest on right is also in Amani West F.R.. Road passes through farmland with mixed cultivation of sugarcane, cassava, bananas and maize; some clove trees, cinnamon and cardamom (**SKETCHES?**). Road climbs to top of ridge to village of Shebo Meza with
- 3.0 fine view of Mt Mlinga (1069 m) behind you to the left (east) and first glimpse of Kwamkoro Tea Plantation ahead. Road descends with frequent sharp bends; look out for oncoming traffic and take great care in wet weather. Kwamkoro F.R. lies to left across valley.
- 5.8 On left is the sprawling village of Mlesa, with the site of the former Kwamkoro sawmill, now occupied by a project of the Foundation for Sustainable Rural Development.
- 6.4 Cross wooden bridge and stop at barrier to enter Kwamkoro Tea Estate; sign the gatekeeper's book. Drive along valley with Lukungwi River to the left.
- 6.9 Ignore road to right leading into tea; cross small bridge and immediately turn sharp right; keep to main road, with tea on left.
- 8.1 Reach Kwamkoro Tea Estate offices (on left) and factory (ahead on right, above road); continue ahead over a small bridge, passing a junction on right and leaving factory on right. Road climbs, with tea on both sides and Kwamkoro F.R. beyond it.
- 9.1 F.R. closes in to road.
- 9.5 Ignore left turn off main road which leads to Kwamkoro Forest Office (see Kwamkoro Forest Office Trail); pass between Forest Officers' housing and emerge into Ngua Division of Kwamkoro Tea Estate, with the
- 9.9 Estate Manager's house below, to the left. Just before a concrete bridge over the Kwemkulo River, the road is lined with Nandi Flame Trees *Spathodea nilotica*, bearing epiphytic ferns. More are planted among the tea on the left. Pass the buildings of Ngua Division workers' houses.
- 10.8 Pass a small quarry for murrum (road surfacing material) and a junction on the left. The swamps along this drive, including the one here, are dominated by several species of sedges, grasses and rushes, including the conspicuous bulrush *Typha australis*. They often contain trees of *Morinda asteroscepa* (with white bracts) and *Voacanga obtusa* (white flowers and big, oval leaves). On the slope to the right can be seen a plantation of Eucalyptus, fuelwood for the tea factories.
- 11.0 Pass below some wooden workers' houses, and drop down the slope to a sharp right bend with a pond on the left where croaking frogs can usually be heard.

- 11.6 Just after the bend, take the left-hand (upper) of two roads. Climb the slope below the wooden office of Tanesco, the Tanzania Electricity Supply Co.
- 12.2 At the crest of a hill, with a tea collection shed to the left and roads up to the manager's house on the right, go straight ahead, downhill, with a view left over Ngua Camp to the Lwengera Valley which separates West and East Usambara. On a clear day can be seen Mafi Hill (a southern outlier of the West Usambaras) and the southern extremity of the main West Usambara massif. The forest ahead on the left (beyond a larger building, the dispensary) belongs to Mikwinini Village.
- 12.4 Going down the slope, pass a junction on the left, from which you have a view over Mikwinini, so-called because it is at the site of a former plantation of quinine trees. Continue downhill between the tea and the Forest Reserve. Bordering the tea fields is a line of Khus-khus Grass *Vetiveria zizinioides*, planted to control soil erosion.
- 12.9 Ignore a road on the right.
- 13.1 Ignore road on the left leading to Mikwinini Village (50 m after this road is a path leading into the forest on the left, where a small fuelwood plantation has been established by the tea company. Take a short walk into the forest here if you feel like a break from driving).
- 13.5 Ignore a road on the right into the tea. Keep the forest (Kwamkoro F.R.) on the left, with lots of *Voacanga obtusa* by the stream.
- 14.4 The narrow tea field on the right after crossing the bridge has been proposed for reforestation; it could form an important forest corridor, linking two separate blocks of the Amani Nature Reserve.
- 14.9 Ignore a road to the right, to Marakitanda Tea Research Station where new clonal tea has been planted. The scrub by the road on the right of this section of the track contains many vines of the wild climbing lily *Gloriosa superba*, whose flowers, here of a yellow variety, live up to its name. Continue downhill to
- 15.8 a junction and turn left over the bridge with a swamp and cultivation of cocoyams on the right.
- 16.1 Cross another bridge and turn left towards Ndola Division (signposted). Ndola and Ngua were originally independently-owned tea estates, supplying tea to the factory run by Kwamkoro Estate. The road now climbs to
- 17.0 a junction with a round, trimmed bougainvillea bush (trimmed so hard that it rarely shows many flowers). To follow the main route, keep left. For an optional 2 km detour through the tea to view Ndola Falls, bear right after (not before) the bush, and keep left at every junction you meet until you return to the bougainvillea bush. After 0.5 km, you see the falls below you on the left. The hilltop which this detour circumnavigates has another manager's house on top. Back at the bougainvillea bush, continue downhill, entering the forests of Amani Nature Reserve (Kwamkoro F.R. on the left).
- 17.5 Take the left fork, uphill through the tea (this section of the route can become very muddy after rain: an alternative is to take the right fork which rejoins the route at the 20.1 km junction below).
- 17.9 On the right are "mother-bushes" used to produce cuttings for the propagation of clonal tea. More Eucalyptus are planted beyond, on the right.
- 18.1 Ignore a road joining from the right; drop to the forest edge and cross a small wooden bridge.
- 19.6 Drive through Eucalyptus trees until you re-enter the tea, with a view of some bare hills to the left, the highest of which is crowned by earthwork fortifications (see Ndola Trail). The road zigzags down through the tea to

- 20.1 a junction. Keep straight on, passing a small patch of forest, and climb steeply through the tea.
- 21.7 Ndola Camp and offices, bearing left (upper roads) at two junctions in quick succession. The roads to the right go down to the camp.
- 22.1 Pass the former manager's house (a black wooden bungalow on your left) and fork right.
- 22.5 At a leaf collection shed fork left (the right fork is the one to take for access to the Ndola Trail).
- 23.2 Park by another leaf shed at the end of the road, and walk ahead up the slope (with tea on the left and Eucalyptus on the right) for about 100 m, to the escarpment of East Usambara, from where there are magnificent views to the west over the plains south of West Usambara, with the isolated Mafi Hill and the main block of the West Usambaras to the right (northwest). At the foot of the scarp can be seen a line of white flowering teak trees *Tectona grandis* (with white flowers between March and August) which marks the western boundary of Mnyusi Scarp Forest Reserve Start the return journey to Amani by driving back down the hill towards Ndola, with views over Ubiri Village to the left. Continue on the route by which you came,
- 25.4 past the Ndola camp and offices, keeping up to the right.
- 26.9 Take the left (lower) fork at a leaf shed (on the outward route you came down here from the right). The swamps in this area are important water catchments, and habitat for rare birds and frogs.
- 27.6 Ford a small stream (not deep) and continue straight ahead, ignoring a road to the right. The swamp on the left is dominated by *Voacanga obtusa*.
- 28.1 The road coming down from the right was the outward route; carry straight on.
- 28.6 Bear right at the bougainvillea bush.
- 29.6 Turn left at the main road, and come to Sangarawe Village.
- 30.2 Stop at the road barrier and sign the gatekeeper's book. Note sugarcane cultivation in degraded village forest land on your right.
- 30.8 Cross Kihara River to enter Monga Forest, part of the proposed Amani Nature Reserve.
- 31.2 Three large trees to the right of the road are *Aningeria adolfredircii* (local name Mkuti), *Maranthes goetzeniana* (Ng'anga) and *Parinari excelsa* (Mvula) with strangling fig [**Recommend labels**].
- 31.5 Tree ferns can be seen in the valley to the right, and a number of *Allanblackia* trees (see Introduction).
- 31.7 Enter tea plantation of Monga Estate, belonging to Karimjee Agriculture Ltd .
- 32.9 At the bottom of a hill, just after a clump of bamboo *Bambusa vulgaris* on the right, follow the road up to the right between the tea. Note strip of riverine forest to your left, and rows of feathery *Hakea saligna* planted as windbreaks in the tea behind.
- 34.1 Turn right at the junction at the top of the hill (you could if you wish make a 0.4 km diversion to the left to visit the Monga Tea Factory, but it is advisable to make prior arrangements through the Rest House). Facing you at the junction is a tree which actually consists of two host species - *Morinda asteroscepa* and *Parinari excelsa* - with two types of strangling fig *Ficus* spp. using the hosts for support, plus clumps of parasitic mistletoe (Loranthaceae) and an epiphytic cactus *Rhipsalis baccifera* with long dangling stems. *Rhipsalis* is the only cactus native to Africa.
- 34.3 Down a driveway to your right you will see a fine estate house belonging to the Karimjee family. Continue down the main road through an avenue of Nandi Flame Trees *Spathodea nilotica* with clumps of Golden Bamboo *Bambusa vulgaris* to your

- left.
- 35.1 On your right is a quarry which is the start of the Monga Trail (T.4).
- 35.8 There is a fine indigenous tree *Cephalosphaera usambarensis*, local name Mtambaa, on the right of the road [**Recommend Label**].
- 37.1 The swampy land to the left of the road, dominated by sedges *Cyperus* spp. with sugarcane and degraded secondary forest behind, marks the boundary between the Karimjee forests and the public lands of Mbomole village.
- 37.4 A tree nursery established by the East Usambara Conservation and Agricultural Development Project, from which seedlings are distributed to villagers for a nominal charge, is on the left.
- 38.2 Pass on the left clumps of thin-stemmed Wine Bamboo *Oxytenanthera abyssinica* from which sap is extracted for making a local liquor. Follow the road round to the left over a concrete bridge.
- 38.6 Cross a small stream and fork right. The Dodwe River is on your right.
- 39.3 The large rock on the right marks the boundary of Amani West FR.
- 40.7 Follow the road to the left (you are now in the Amani Botanical Garden) with the water supply for the Rest House and the Medical Research Institute on your left.
- 42.1 Join the main Muheza-Amani road, turn sharp right up the hill to Amani.
- 42.6 Take the stony road up the hill to your right to reach the Rest House.

DRIVE REF: D.2

DEREMA - BULWA DRIVE

22 km (1-1.5 hour) round-trip drive from Amani Rest House through forests and tea plantations; in wet weather some parts are impassable except by four-wheel drive

Distances are km from Amani Rest House

- 0 Drive down the main road towards Muheza.
- 2.2 At a major junction where you forked left coming up to Amani, turn sharply to the left, signpost (not visible until you are at the hairpin bend) to Bulwa and Derema Tea Estates.
- 2.5 Turn right at a bridge over the Dodwe River. The rapids of Kwemkuyu River are below the road to the right, with Derema Forest behind them.
- 3.4 Turn right at another bridge to cross Kwemkuyu River.
- 3.7 A disused water-wheel which used to drive the Derema coffee pulper is on the left. Derema was originally a coffee estate established by German planters, but the crop failed and was replaced by tea in the 1940s.
- 3.8 Ignore the road turning left across a narrow bridge (Signpost Bulwa) and keep straight on towards Muhedi and Marvera (**Recommend Signpost**). An optional 2 km diversion to the right at this junction takes you to Derema Tea Factory, which can be visited if prior arrangement is made. However, this factory is currently only used at flush periods so a visit to Bulwa Factory, passed later in the drive, is easier to arrange.
- 4.3 The swampy land to the left of the road contains a mixture of bulrushes *Typha australis*, sedges *Cyperaceae* and reeds *Graminae*. The path on the right by a leaf shed leads to Magoda Village with fine views over the plain, visited in Section 2 of the Derema Trail (T.6).
- 5.1 The road to the left leads to the German grave site, also visited in Section 2 of the Derema Trail (T.6). [**Recommend signposts to the grave site: this is the only way it can be reached by vehicle**]. If not taking the diversion, continue forward, and at the next junction
- 5.3 take the middle road, leaving a small road that crosses a shaky bridge to Msasa Village on your right. Pass through marshy land, with distinctive round topped clove bushes *Eugenia aromatica* across the swamp to the right.
- 5.7 A house built for temporary tea pluckers who come in for the peak harvesting months (known as the “flush”) is on the right. Continue up the hill, and
- 6.5 descend to Msasa IBC Primary School and an old wooden house which was once the home of the manager of a sawmill which operated here in the 1950s and 1960s. Keep straight ahead with village cultivation of cassava, sugarcane, cloves and cocoyams on the right.
- 7.6 Enter Derema Forest, much invaded by *Maesopsis eminii* (see Introduction).
- 8.5 Leave the forest to come out into Marvera Tea Estate. This belongs to an Indian company, Bombay Burmah Estates Ltd, and currently operates on a lower input/lower output basis than the other tea companies in East Usambara. Another

- Bombay Burmah estate in West Usambara is experimenting with organic tea production, but it is uncertain whether the higher price that can be obtained for such tea compensates for the lower yield.
- 9.4 Turn right at the next junction, up the hill towards Marvera Tea Factory.
- 9.8 Leaving the factory on your right, go left past a small dispensary and shortly branch left with igloo-like workers' houses below you to the right.
- 10.8 Pass Marvera Primary School on the left. Keep left across a stream, with marshy land on your left and tea above you to the right.
- 11.1 Keep to the right close to the tea. Cross a wooden bridge and after 300 m
- 11.9 take the right turn over another bridge with a long low building which is Bulwa Dispensary on your left.
- 12.1 The road up the hill to the right leads to Bulwa Tea Factory, an optional 2 km detour if you wish to visit the factory. Arrangements should be made through the Rest House Keeper in Amani.
- 12.2 Fork left at the next junction to reach Bulwa town, where cold drinks and basic provisions can usually be obtained. At the top end of the town, on the left, is Bulwa Club where meals can be obtained (if ordered in advance) and limited accomodation (two rooms) may be available.
- 12.9 Fork left and stop at the barrier leaving Bulwa town, where you may be asked to sign the gatekeeper's book.
- 14.5 Cross a bridge over Kwamkuni River and keep right.
- 14.9 Turn right and recross Kwamkuni River.
- 15.1 Note cardamom cultivation close to the road on your left (see sketch in Introduction).
- 16.4 Cross Kwamkuni River for the third time, and shortly pass a vast overhanging rock on the left of the road.
- 16.9 Enter Derema Tea Estate with forest on your right.
- 17.7 Note scattered *Milicia excelsa* (Mvule) trees retained in the tea on your left. Mvule is a much favoured timber for furniture making: it is now a protected species which may be felled, even on private land, only with a licence from the Forest Department.
- 18.8 Descend to Derema town, cross the bridge which you passed on the outward journey, and turn right.
- 19.2 Cross the bridge over Kwemkuyu River and turn left.
- 20.4 Reach the junction with the main Muheza to Amani road and turn sharp right up the hill to Amani.
- 22.1 Fork left, following the signpost to Kwamkoro Estate.
- 22.4 Turn right up the stony track to the Medical Research Institute and the Rest House.

DRIVE REF: D.3

MONGA-BULWA DRIVE

35 km (2-3 hour) round trip drive from Amani Rest House on farm roads which can be muddy and slippery in wet weather. Scenic views of forests, tea plantations, village agriculture and distant mountain scenery.

Distances are km from Amani Rest House

- 0 From RH drive 200 m through Medical Research Institute, turn right at Post Office down steep hill to main Amani-Muheza road. Turn left and in 500 m sharp left again at signpost to Monga.
- 1.1 Note cluster of Caribbean Royal Palms *Roystonea oleracea* on right by reservoir for Amani water supply.
- 1.2 Ignore two minor roads to left, cross stone bridge and follow valley road with site of old boating lake to your left, now colonised by reeds and bulrushes and used for cultivation of cocoyams (local name Majimbi).
- 2.7 Large rock to left of road marks the boundary between Karimjee Forest (part of proposed Amani Nature Reserve) and public lands of Mbomole Village **[Recommend signboard here]**. Note cloves, cinnamon, sugarcane and banana cultivation to your right.
- 3.3 Turn left at junction and cross small stream. After 300m ignore road to your right, cross small bridge and enter Mbomole Village. Note clump of “wine bamboo” *Oxytenanthera abyssinica* to right used for making local brew (ulanzi).
- 3.8 Line of mature *Eucalyptus saligna* above road to the left marks re-entry to Karimjee Forest.
- 4.1 Enter Monga Tea Estate. Tree nursery to your right established by East Usambara Conservation and Development Project distributes tree seedlings to villagers.
- 4.4 Take right fork following valley bottom (road to left leads to campsite on forest boundary, an optional 3km diversion).
- 5.2 At tea leaf collection shed with bamboo to the right you re-enter the forest (road joining from the left descends from the campsite). Continue on winding road through tea and forest. Note heavy invasion of *Maesopsis eminii* in forest degraded by logging and pitsawing.
- 6.5 Pass an earth quarry on your left (this is the starting point for Monga Trail T.4).
- 7.8 Pass two roads leading to the left, and continue for 400 m until you see Monga Tea Factory on your right. A visit to the factory is possible but arrangements should be made in advance (see Factory Tour T.9).
- 8.4 Branch right at the tea estate offices and climb the hill, taking care of two traffic taming bumps across the road (ignore the small road to the left after the first bump).
- 8.9 Pass a Clonal Multiplication Plot on your left, where promising tea clones are multiplied: cuttings are taken from the "mother bushes" and planted in nurseries (one of which will be passed shortly on this drive) before planting out in the field. At the edge of the plot is a strip of wiry Vetiver Grass *Vetiveria zizanioides* planted to control soil erosion.
- 9.3 Ignore the road leading down to the right.
- 9.9 The road to the left leads to Maramba tea nursery where the cuttings taken from the

- Clonal Multiplication Plot (see above) are kept in polythene sleeves in a nursery bed for about 9 months before planting out. The nurseryman will be happy to show you round if you are interested and he is there.
- 10.2 At the next leaf shed follow the road round to the left, climbing steeply with the Estate Manager's house above you to the left.
- 10.4 Below you to the right you will see Mzungumi Dam, from which water is pumped to the tank on top of the hill behind you to supply Maramba nursery, Monga factory, offices and staff housing.
- 10.7 There is a fine view to your right over Monga Forest and tea plantation, with Maramba Village in the valley, Misalai Village nestling in the grassy hill beyond it, Bulwa and Marvera tea factories to the right, the sacred forest of Handei on the highest hill ahead of you, and beyond in the distance the outline of Mwangwe Mountain, part of the West Usambaras, visible on a clear day [**Recommend panoramic sketch**].
- 11.2 The road continues through mixed (mainly secondary) forests, Eucalyptus and tea plantations. The young tea plants amidst a mulch of grass, reeds or crushed sugar cane stalks are "infills" planted to fill gaps where old plants have died.
- 11.7 The tree on the left of the road with a hole through its trunk is an Msambu or Mkanye (**Check**): an edible oil is extracted from its seed.
- 11.9 At the junction with an island in the middle of the road turn right. The trees on the left are an Mnyasa, Flakumi and Mohoye (**Sambaa names, check with Mndolwa**).
- 12.2 The view to the left is over Kwemwewe Village (the name means "place of hawks") with a primary school and the mountains of West Usambara (Korogwe and Bumbuli) beyond.
- 12.9 An avenue of Nandi Flame Trees *Spathodea nilotica* lines the road. At the next leaf shed bear right (the road to the left leads to Kwemwewe Village with a smallholder tea scheme planted in 1972).
- 13.1 The line of Eucalyptus trees planted on both sides of the road marks the boundary between Monga Estate and Kwemwewe village land.
- 13.7 The road passes through a young plantation of Silky Oaks *Grevillea robusta* (local name Mkabera) and Teak *Tectona grandis*, to reach Kwevihombo Village where many tea estate workers live. Teak grows less well at this altitude than in the lowlands, as at Longuza teak plantation which you passed through on the road up from Muheza.
- 14.8 Drive through intensive village cultivation of sugarcane, maize, cassava, beans and many small plots of tea planted by village farmers as "outgrowers" to the tea companies. The company supplies plants, fertilisers and technical advice, and buys the leaf at a price which currently gives farmers a better income than they can earn from any other crop. As a permanent crop covering the whole ground area, tea is also environmentally preferable to the annual crops which it replaces.
- 17.3 Continue downhill, taking great care in the rainy season when the road becomes very slippery, to reach Mgambo Village with a maize mill on the left and many small shops as you go down through the village. The primary school is across the valley to the left in a grove of Eucalyptus trees.
- 17.7 Near the bottom end of Mgambo Village, with the estate employees' houses and a dispensary in front of you, fork left.
- 18.1 Turn right when you reach a large fish pond and at the end of the pond follow the road round to the left, soon crossing a bridge below the sluice.
- 18.5 Ignore a small road leading to the right, and climb the hill with tea on both sides of

- the road.
- 19.3 Follow the main road as it bears round to the right.
- 20.1 Keep to the main road bearing right through a Eucalyptus plantation.
- 21.3 Start the descent of a long steep hill with tea to your left. Take extreme care in wet weather as the road becomes dangerously slippery.
- 22.2 Turn right at the bottom of the hill and drive up to Bulwa town, where cold drinks and basic provisions can usually be obtained. At the top end of the town, on the left, is Bulwa Club where meals can be obtained (if ordered in advance) and limited accommodation (two rooms) is sometimes available.
- 22.9 Fork left and stop at the barrier leaving Bulwa town, where you may be asked to sign the gatekeeper's book.
- 24.5 Cross a bridge over Kwamkuni River and keep right.
- 24.9 Turn right and recross Kwamkuni River
- 25.1 Note cardamom cultivation close to the road on your left (see sketch in Introduction).
- 26.4 Cross Kwamkuni River for the third time, and shortly pass a vast overhanging rock on the left of the road.
- 26.9 Enter Derema Tea Estate with forest on your right.
- 27.7 Note scattered *Milicia excelsa* (Mvule) trees retained in the tea on your left. Mvule is a much favoured timber for furniture making: it is now a protected species which may be felled, even on private land, only with a licence from the Forest Department.
- 28.8 Descend to Derema town, cross the bridge over Kwemkuyu River and turn right.
- 29.2 Cross another bridge over Kwemkuyu River and turn left.
- 30.4 Reach the junction with the main Muheza to Amani road and turn sharp right up the hill to Amani.
- 32.1 Fork left following the signpost to Kwamkoro Estate.
- 32.4 Turn right up the stony track to the Medical Research Institute and the Rest House.

ACKNOWLEDGEMENTS

PRODUCTION AND EDITORIAL TEAM

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Appendix 2.

LIST OF ILLUSTRATIONS FOR FOREST TRAIL GUIDE

1 Introduction

It might be best to keep the introduction as solid text, but if we want to break it up a bit the following drawings would be appropriate (if they are not put in the introduction they should come in some of the trail descriptions instead):

- 1) *Saintpaulia ionantha*: Section 2 or Kwamkoro Trail
- 2) *Allanblackia stuhlmannii*: outline of tree, flower and fruit in Section 2 or Monga Trail
- 3) *Viverra civetta* and/or *Colobus polykomos*: end of Section 2
- 4) *Clidemia hirta*: sketch of veined leaves in Section 3 or any forest trail
- 5) *Lantana camara*: flowers and berries in Section 3 or any forest trail
- 6) *Maesopsis eminii*: sketch of tree and seeds in Section 3 or any forest trail
- 7) *Bycanistes brevis*: Silvery-cheeked hornbill, next to *Maesopsis* seeds which it distributes

2 Muheza to Amani Drive:

- 1) *Tectona grandis*: outline of teak tree with inset of leaf and flowers at 15.1 km (entry to Longuza Teak Plantation)
- 2) Station Master's House: sketch of wooden house could be included at 25.5 km (entry to Amani Nature Reserve)

3 Amani Botanical Garden, Research Centre Tour:

- 1) *Couroupita guianensis*: flower and fruit of Cannonball Tree at para 5 of walk
- 2) *Bauhinia purpurea*: two-lobed leaves at para 10 of walk
- 3) Other distinctive trees, birds or plants as advised by Mndolwa or Alan if more drawings required to break up the text

4 Mbomole Hill Trail

- 1) Cicadas in para 2
- 2) *Cinchona succirubra* and *C. ledgeriana*: outline and leaves of Red and Ledger's Cinchona in para 5
- 3) *Psidium cattleianum*: leaves and fruit of Strawberry Guava in para 8
- 4) *Dracaena usambarensis*: maybe sketch of canes and leaf bunches if another illustration is wanted

5 Kwamkoro Forest Office Trail

- 1) Sketches of cinnamon, cardamom and clove trees/plants at Shebo Meza village section of access route
- 2) *Saintpaulia confusa*: sketch in para 5 if not included in Introduction
- 3) *Clidemia hirta*: sketch of leaf veins at para 5 of the walk (if not shown in Introduction)
- 4) *Nectarinia olivacea*: Sketch of Olive Sunbird at para 6 of walk
- 5) *Aframomum* and *Costus* spp: sketches of fruits and flowers in para 8
- 6) *Renealmia engleri*: sketch in para 12

6 Monga Trail

- 1) *Cinchona ledgeriana*: could come in para 1 of walk if not used in Mbomole Hill Trail (could even be repeated)
- 2) *Allanblackia stuhlmannii*: fruit and flower here (Walk para 3) if not in Introduction
- 3) *Terpsiphone rufiventris*: sketch of Paradise Flycatcher in para 4
- 4) *Camellia*: drawing of tea fruit and flower in para 8
- 5) *Vetiveria* spp: could sketch clump of Vetiver Grass in para 9 if further picture wanted
- 6) *Rhipsalis baccifera*: sketch dangling cactus stems in para 10 if further picture wanted

7 Ndola Trail

- 1) Malindi and Kisukari Bananas: could have drawings of these in Walk para 3 to split up the text
- 2) Sketch of fortified settlement on Ndola Hill, Walk para 6

8 Derema Trail

- 1) *Treculia africana*: tree with furry fruits in Section 1 of walk, para 2
- 2) *Samanea saman*: Rain Tree with hanging fronds of *Rhipsalis* in Section 1, para 5
- 3) *Dracaena steudneri*: rosette-like leaf clusters, Section 3 of walk, para 1
- 4) *Dendrohyrax validus*: drawing of Tree Hyrax in Section 3 of walk, para 2

9 Amani Botanical Garden: Sigi Tour

Any number of trees could be illustrated. Depending on the number wanted a choice could be made from the following:

- 1) *Dillenia indica*: leaves of Elephant Fruit, para 2 of tour
- 2) *Artocarpus altilis*: leaves and fruit of Breadfruit tree, tour para 3
- 3) Black pepper on pollarded *Cedrela odorata*: para 6 of tour
- 4) *Arenga pinnata*: sketch of Sugar Palm, tour para 7
- 5) *Artocarpus integra*: Jakfruit, tour para 7
- 6) *Averrhoa carambola*: Starfruit (Carambola), para 8 of tour
- 7) *Aiphanes caryotifolia*: Fishtail Palm, tour para 14
- 8) *Garcinia mangostana*: fruit of mangosteen, para 16 of tour
- 9) *Annona reticulata*: fruit of Bullock's Heart tree, tour para 20

10 Amani-Sigi Mountain Trail

- 1) Cattle enclosure of *Cedrela odorata* and *Spondia lutea*, tour para 3
- 2) *Bombax rodognaphalon*: sketch of strangling fig on wild kapok tree, tour para 7
- 3) *Pachystela msolo*: sketch of Msambia tree with prominent ridges used for tool handles, tour para 10
- 4) *Buccanodon olivaceum*: Green Barbet tour para 10
- 5) *Potamochoerus porcus*: Bush Pig, tour para 11

Appendix 3.

LIST OF TREE LABELS REQUIRED

Labels should be stamped on metal sheet and fixed to the tree trunk at eye height.

- Where the full botanical as well as the popular name is put on the label, a sheet size of 30 cm x 15 cm is suggested
- Where a tree number referring to a key is used, a size of 20 cm x 12 cm is enough

The trees which should be labelled or numbered on each trail are as follows:

T1: Amani Botanical Garden: Research Centre Tour

Livistona chinensis
Chinese Fan Palm

Chrysalidocarpus lutescens
Golden Cane Palm

Spathodea nilotica
Nandi Flame Tree

Plumeria rubra
Frangipani

Araucaria cookii
Cook Island Pine

Araucaria cunninghamii
Moreton Bay Pine

Araucaria excelsa
Norfolk Island Pine

Cupressus funebris
Funeral Cypress

Podocarpus latifolia
Usambara Podo

Cupressus lusitanica
Mexican Cypress

Juniperus virginiana
Pencil Cedar

Rauvolfia caffra

Albizia chinensis

Canarium schweinfurthii

Couroupita guianensis
Cannonball Tree

Bridelia micrantha

Eugenia malaccensis
Malay Apple

Maesopsis eminii
Mhesi, Msizi

Mangifera indica
Mango

Sabal palmetto
Palmetto Palm

Roystonea oleracea
Caribbean Royal Palm

Persea americana
Avocado

Appendix 3: List of tree labels

| | |
|--|--|
| <i>Aleurites moluccana</i> Candlenut Tree | <i>Parinari excelsa</i> |
| <i>Cupressus macrocarpa</i> Monterey Cypress | <i>Chrysalidocarpus</i> <i>madagascariensis</i> |
| <i>Julberbardia magnistipulata</i> | <i>Bauhinia purpurea</i> |
| <i>Dictyosperma album</i> Princess Palm | <i>Pandanus stuhlmanni</i> Screw Palm |
| <i>Livistona australis</i> Fan Palm | <i>Sabal causiarum</i> Puerto Rican Hat Palm |
| <i>Elaeis guineensis</i> Oil Palm | <i>Scindapsus aureus</i> |
| <i>Maranthes goetzeniana</i> Ng'anga | <i>Allanblackia stuhlmanni</i> Msambu |
| <i>Ravenala madagascariensis</i> Traveller's Palm | <i>Warscewiczia coccinea</i> |
| <i>Aiphanes erosa</i> Macaw Palm | <i>Arenga pinnata</i> Sugar Palm |
| <i>Adina microcephala</i> | <i>Macadamia ternifolia</i> Queensland Nut |
| <i>Carludovica palmata</i> Panama Hat Palm | <i>Taxodium distichum</i> Swamp Cypress |
| <i>Aleurites montana</i> Tung Oil Tree | <i>Bambusa vulgaris</i> Golden Bamboo |
| <i>Tabernaemontana spp.</i> | <i>Gigantochloa aspera</i> Building Bamboo |
| <i>Agave spp.</i> Sisal | <i>Cassia multijuga</i> |
| <i>Syzygium guineense</i> | <i>Albizia gummifera</i> |
| <i>Cupressus sempervirens</i> Mediterranean Cypress | <i>Phoenix reclinata</i> African Date Palm |
| <i>Grevillea robusta</i> Silky Oak | <i>Calamus asperrimus</i> Rattan Palm |
| <i>Eucalyptus maculata</i> | <i>Cycas revoluta</i> |

Sago Palm

Lysidice rhodostegia

Cycas circinnalis

T.2: Mbomole Hill Trail

Cinnamomum camphora
Japanese Camphor

Melaleuca leucodendron
Cajuput Oil (Punk) Tree

Cupressus torulosa
Himalayan Cypress

Ornamental conifers
(to be decided)

T.3: Kwamkoro Forest Trail

Maesopsis eminii
Mhesi, Msizi

Cephalosphaera usambarensis
Mtambaa

Anthocleista grandiflora
Mpumu

Newtonia buchananii
Mnyasa

Terminalia ivorensis
(planted 1961)

Terminalia superba
(planted 1962)

Araucaria cunninghamii
(planted 1960-61)

Araucaria cookii
(planted 1960)

Grevillea robusta
(planted 1961)

Cedrela odorata
(planted 1960)

Bombax rhodognaphalon
(planted 1960)

Tectona grandis
(planted 1962)

Pinus merkusii
(planted 1962)

Pinus caribaea
(planted 1963)

Cephalosphaera usambarensis
(planted 1961)

Newtonia buchananii
(planted 1961)

Maesopsis eminii
(planted 1960)

Acrocarpus fraxinifolius
(planted 1960)

Beilschmiedia kweo
(planted 1961)

Burttavya nyasica
(planted 1963)

T.4: Monga Trail:

Newtonia buchananii
Mnyasa

Allanblackia stuhlmanni
Msambu

T.5: Derema Trail

Ficus altissima

Treculia africana

T.7: Amani Botanical Garden: Sigi Tour

Spondias lutea
Yellow Plum

Dillenia indica
Elephant Fruit

Diospyros mollis
Ebenaster (Black Silk Dye)

Pentadesma butyracea
Tallow Tree

Albizia chinensis

Pouteria campechiana
Yellow Sapote

Artocarpus altilis
Breadfruit Tree

Syzygium aromaticum
Clove Tree

Artocarpus odoratissima
Marang

Chrysophyllum cainito
Star Apple

Cananga odorata
Ylang-Ylang

Psidium cattleianum
Strawberry Guava

Mangifera indica
Mango

Syagrus romanzoffianum
Queen Palm

Areca catechu
Betel-nut Palm

Roystonea oleracea
Caribbean Royal (or Cabbage) Palm

Averrhoa bilimbi
Bilimbi Tree

Arenga pinnata
Sugar Palm

Hevea brasiliensis
Para Rubber

Artocarpus heterophyllus
Jakfruit Tree

Averrhoa carambola
Carambola or Starfruit

Livistonia rotundifolia

Elaeis guineensis
Oil Palm

Gigantochloa ater
Black Bamboo

Mammea americana

Milicia excelsa

Appendix 3: List of tree labels

| | |
|---|---|
| Mammey Apple | Mvule |
| <i>Dictyosperma album</i> Princess Palm | <i>Licuala spinosa</i> Fan Palm |
| <i>Sabal mauritiiformis</i> Fan Palm | <i>Sabal causiarum</i> Puerto Rican Hat Palm |
| <i>Cryosophila nana</i> Root-spine Palm | <i>Attalea funifera</i> |
| <i>Phytelephas macrocarpa</i> Ivory Nut Palm | <i>Raphia monbuttorum</i> Raffia Palm |
| <i>Ficus spp.</i> Strangling Figs | <i>Cupressus lusitanica</i> Mexican Cypress |
| <i>Cycas revoluta</i> False Sago Palm | <i>Raphia vinifera</i> Raffia Palm |
| <i>Araucaria cunninghamii</i> Moreton Bay Pine | <i>Hyophorbe indica</i> Spindle Palm |
| <i>Araucaria cookii</i> Cook Island Pine | <i>Carludovica palmata</i> Panama Hat Palm |
| <i>Castilla elastica</i> Panama Rubber | <i>Cephalosphaera usambarensis</i> Mtambaa |
| <i>Aiphanes caryotifolia</i> Fishtail Palm | <i>Sabal palmetto</i> Palmetto Palm |
| <i>Tectona grandis</i> Teak | <i>Peltophorum dasyrachis</i> |
| <i>Garcinia mangostana</i> Mangosteen | <i>Garcinia xanthochymus</i> |
| <i>Elettaria cardamomum</i> Cardamom | <i>Hydnocarpus ilicifolia</i> Chaulmoogra Oil Tree |
| <i>Sabal princeps</i> Fan Palm | <i>Myristica fragrans</i> Nutmeg |
| <i>Hydnocarpus anthelminthica</i> | <i>Citrus limonium</i> Lemon |
| <i>Citrus nobilis</i> Sweet Lime | <i>Litchi chinensis</i> Litchi |

Appendix 3: List of tree labels

Eugenia uniflora
Pitanga Cherry

Spondias cyathea

Citrus sinensis
Orange

Cinnamomum zeylanicum
Cinnamon

Acacia farnesiana
Cassie Oil Tree

Annona reticulata
Bullock's Heart Tree

Crescentia cujete
Calabash Tree

Eugenia malaccensis
Malay Apple

Pimenta acris
Bay-Rum Tree

Bixa orellana
Annato

D.2: Ndola Drive

Aningeria adolf-friedricii
Mkuti

Maranthes goetzeniana
Nang'a

Parinari excelsa
Mvule

Cephalosphaera usambarensis
Mtambaa

Appendix 4.

LIST OF MAPS PREPARED OR REQUIRED

1. **Map of Tanzania showing Eastern Arc and location of East Usambaras:** suggest adding Dar es Salaam, Tanga, Muheza and Moshi to Fig 1.1 of Hamilton and Bensted-Smith
2. **Location of East Usambara Mountains within Tanga Region:** Fig 1.2 of Hamilton and Bensted-Smith
3. **General map of area covered by the trail guide:** suggest enlarging lower half of Fig 2.1 of Hamilton and Bensted-Smith, and adding the following place names: Ndola, Kwemwewe, Mgambo, Misalai, Mbomole, Chemka, Sigi, Amani-Sigi FR
4. **Map showing approximate location and route of all trails and driving routes:** suggest adapt 1:50,000 topographical map; if it comes out too crowded, put the driving routes on a separate map (draft in guide)
5. **Sketch of Amani Botanical Garden - Research Centre Tour:** drawing of whole route attached; maps required of each plantation showing tree numbers with names in key
6. **Sketch of Mbomole Hill Trail:** two page drawing in guide; needs reduction
7. **Sketch of view from top of Mbomole Hill:** to show location of Kwamkoro, Monga, Mgambo, Mt Nilo, NIMR, Mt Mlinga and Forest Reserves
8. **Sketch of Kwamkoro Forest Trail:** draft in guide
9. **Sketch of Derema Trail showing major landmarks and park places:** draft prepared from 1:10,000 map; needs copying and reduction to A4 size
10. **Sketch of view from Kilimahewa Village:** to show location of Kisiwani, Bombani, Muheza, Longuza Teak, Magoroto, Mlinga, Amani-Sigi, Pangani and Zanzibar
11. **Sketch of Amani Botanical Garden - Sigi Tour:** draft sketch of whole tour in guide; maps required of each plantation with tree numbers and names in key

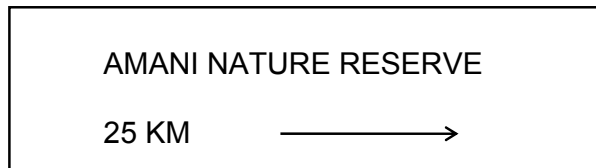
Appendix 5.

LIST OF SIGNPOSTS AND SIGNBOARDS

All posts wooden. Approximate size 60 cm x 20 cm

1 Driving from Muheza to Amani

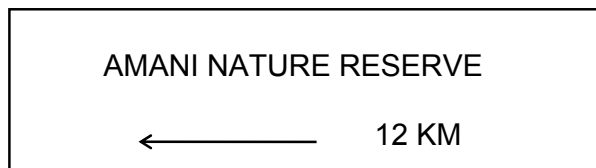
1.1 At BP Station on Segera-Tanga road (Muheza turn off to Amani), same both sides:



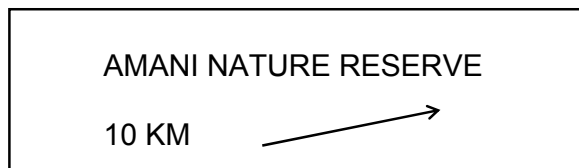
1.2 At Muheza Pharmacy (0.5 km mark):



1.3 At Bombani (13.6 km mark)

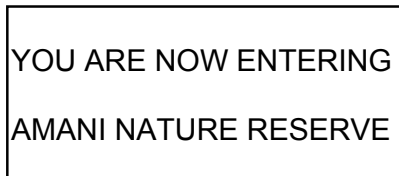


1.4 At Mashewa Turn Off (15.5 km mark)

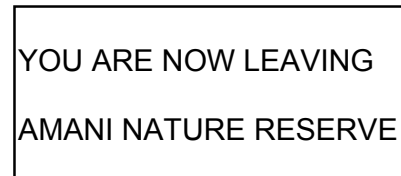


1.5 At Sigi Headquarters of Amani Nature Reserve (25.5 km mark):

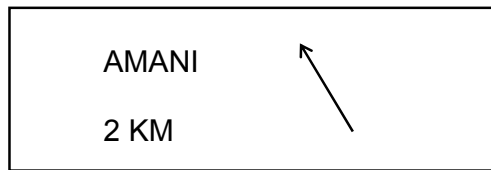
Front



Reverse



1.6 Junction (Kibaoni) at top of Sigi climb (32.5 km mark):

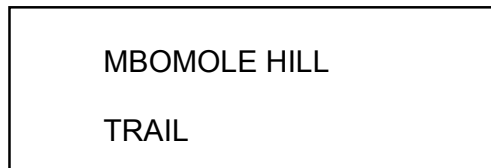


1.7 Amani Market and Post Office crossroads (34.5 km mark), same both sides:

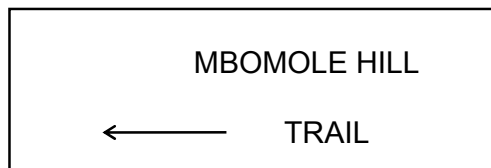


2 Mbomole Hill Trail

2.1 At EUCADEP Office Compound:

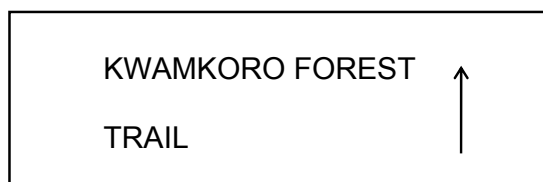


2.2 300 m beyond the last IUCN House:

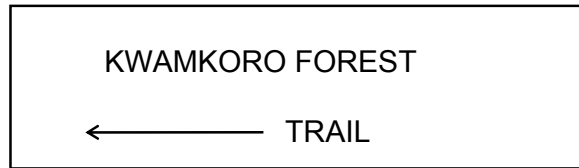


3 Kwamkoro Forest Trail

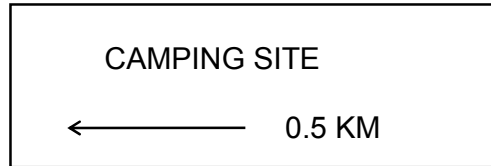
3.1 At Kwamkoro Tea Estate Office (8.1 km mark):



3.2 At bridge leading to Kwamkoro Forest Office (9.5 km mark):



3.3 At bend where logging company had its camp (para 10 of walk description):

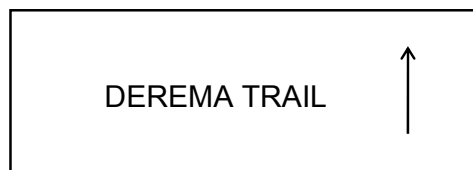


3.4 At turn off to site of old Forest Department Rest House (last para of trail guide: optional addition (b)):

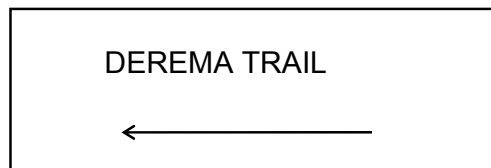


4 Derema Trail:

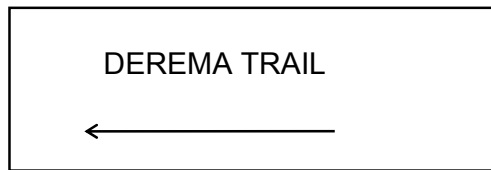
4.1 Footpath down from road to Catholic church (Section 1, para 4):



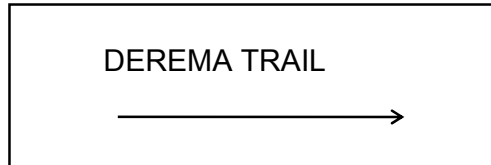
4.2 At road leading to Mbomole Village (Section 1, para 8):



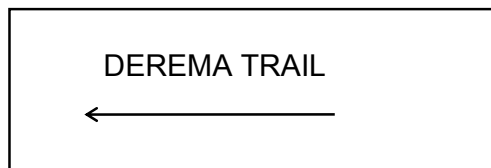
4.3 At terrace in tea plantation (Section 1, para 9):



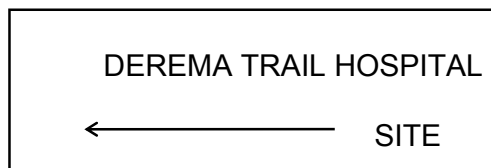
4.4 At leaf collection shed which is take off point for grave and hospital sites (Section 1, para 14):



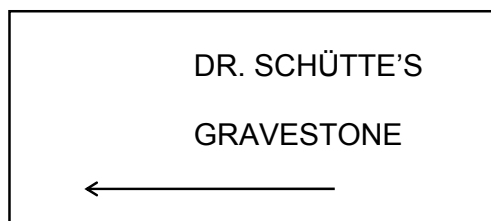
4.5 200 m above the leaf collection shed (Section 1, para 14):



4.6 At entrance to German hospital site (Section 1, para 15):

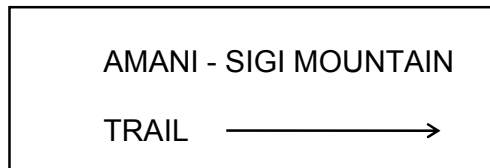


4.7 At turn off to marble gravestone (Section 1, para 16):

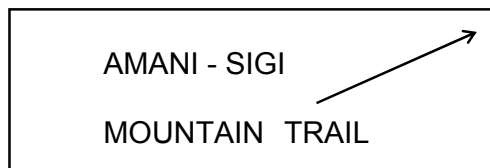


5 Amani-Sigi Mountain Trail

5.1 At shop below Station Master's House (trail description, para 3), same both sides:

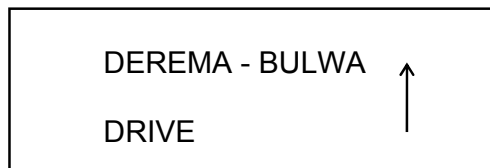


5.2 At junction inside Amani-Sigi Forest Reserve (trail description, para 10):

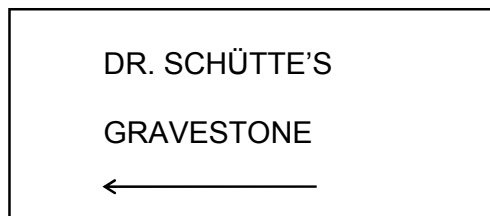


6 Derema-Bulwa Drive

6.1 At Derema Bridge (3.8 km mark):



6.2 At turn off to grave site (5.1 km mark):



1 Amani Botanical Garden

(Size 30 cm x 60 cm)

AMANI BOTANICAL GARDEN
LABORATORY PLANTATIONS

AMANI BOTANICAL GARDEN
MONGA ROAD PLANTATIONS

AMANI BOTANICAL GARDEN
BOMA HILL PLANTATIONS

SITE OF
AMANI BOATING LAKE

(Size 20 cm x 40 cm)

DODWE RIVER

SIGI RIVER

(Size 30 cm x 60 cm)

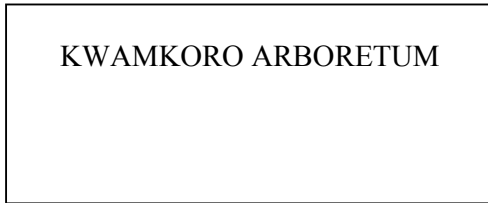
AMANI BOTANICAL GARDEN
COCONUT SLOPE PLANTATIONS

AMANI BOTANICAL GARDEN
SIGI PLANTATIONS

AMANI BOTANICAL GARDEN
SIGI CHINI PLANTATIONS

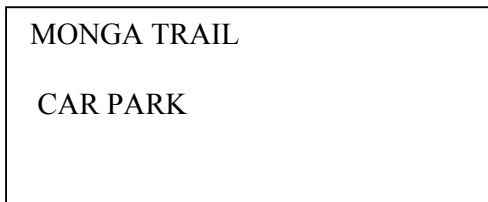
2 Kwamkoro Forest Trail

(Size 20 cm x 60 cm)



3 Monga Trail

(Size 30 cm x 50 cm)



Appendix 6.

LIST OF ADDITIONAL TRAILS

1. Chemka Village to old Amani Hydro-electric station
2. Amani-Shebomeza-Mbomole-Amani
3. Mikwinini to Ndola, return by car
4. Kwamkoro-Kwamkoro College-Marikitanda-Kwamkoro
5. Kwamkoro to Potwe (this could be a continuation of the Kwamkoro Forest Trail; car should meet walkers at Potwe and return to Amani or Tanga via Muheza)
6. Ubiri to Lwanga or Mkokola (this could be a continuation of the Ndola Trail or Drive; car should meet the walkers at the foot of the escarpment and return to Amani or Tanga via Korogwe or Muheza)
7. Sigi Spice Garden to Derema factory (car could drop walkers at Sigi and pick them up at Derema, or they could walk on to Amani)
8. Mgambo to Handei (fortified village and sacrificial site) return via Misalai
9. Mbomole Hill to old tea nursery site
10. Derema to Msasa (site of another fortified village mentioned by Justin Willis but not yet identified)
11. Sigi to Bulwa ya Wenyaji: walk along part of what was the old Sigi-Muheza road before the railway was built
12. More walks around the Botanical Gardens

Appendix 7.

GUIDEBOOK FOR EAST USAMBARAS - SUGGESTIONS FOR CONTENTS

Since the trail descriptions include rather more detail than originally anticipated, the proposed guide book takes on a somewhat different complexion. I think it should include the following:

- 1) An introduction stressing the importance of East Usambaras in the context of global biodiversity, and covering in summary fashion much of the ground in the introductory chapter of the trail guide.
- 2) Detailed chapters on different aspects of the physical, biological, historical, social, economic, institutional and developmental situation in East Usambaras. Each chapter would be written by a specialist in the subject discussed. These chapters would include:
 - Geology, topography, climate, soils, ecology
 - Forest cover, changes over time, uses and abuses, forest reserves, conservation and development strategies
 - Amani Institute and Botanical Garden; history and description
 - Plant populations, diversity, indigenous and introduced, endemism, threatened species, economic importance
 - Medicinal plants
 - Animal population, diversity, endemism
 - Birds
 - Reptiles and amphibians
 - Insects
 - Human population, history, origin, demography, institutions, culture
 - Social, economic, administrative and political organisation, infrastructure, services
 - Economy, village and plantation agriculture, agro-industry, forest utilisation, communications, markets
 - Conservation and development initiatives, successes and failures, future threats and opportunities

- 3) A logistical section on how to reach East Usambaras, how to get around, where to stay, where and when to see different items of interest to general visitors as well as specialists.
- 4) A section outlining the range of things to do and see in East Usambaras, eg forest trails, driving routes, cycling, camping, birdwatching, historical sites, village agriculture, plantations, tea factories, Botanical Gardens, Medical Research Institute
- 5) Part 2 of the Guide Book would be the forest trail and driving route descriptions as prepared (with modifications and additions in the light of users' experience).
- 6) The Guide Book should be profusely illustrated, with adequate maps, photographs and drawings as well as comprehensive lists of plant and animal species to put East Usambaras fully on the national as well as international map.

NB These suggestions have been prepared by Antony Ellman incorporating the notes left by Alan Tye but have not been discussed in detail with him or with other members of the forest trail team. They are presented as a first draft for later discussion.

Appendix 8.

VISITOR QUESTIONNAIRE

1 Visitor

1.1 Name.....

1.2 Address.....

1.3 Nationality.....

1.4 Occupation.....

1.5 Number of accompanying: adults.....
 children.....

2 Visit

2.1 Date and time of arrival.....

2.2 Coming from.....

2.3 Date and time of departure.....

2.4 Going to.....

2.5 Method of transport: own car..... hired car.....
 whether 4WD.....
 bus..... bicycle.....
 motorcycle.....other (specify).....

2.6 Where did you stay?.....

2.6 Did you book accommodation in advance?.....
 Please state how.....

2.7 Which trails or drives did you follow?.....
.....
.....

2.8 What else did you do during the stay?.....
.....
.....

3 Expectations and interests

3.1 Why did you decide to visit East Usambaras?

- friend's recommendation.....
- read about the place (please state source).....
- other reasons (please specify).....

3.2 What are your major interests? Please number in order of priority (1=greatest to 5=least interest):

- | | |
|-----------------------------|------------------------|
| Plants (general)..... | Animals (general)..... |
| Forests..... | Agriculture..... |
| Birds..... | Insects..... |
| Environment..... | Conservation..... |
| Mountains..... | Geology..... |
| History..... | Demography..... |
| Social..... | Economic..... |
| Other (please specify)..... | |

3.3 What did you hope to see or do in East Usambaras?.....
.....
.....

4 Satisfaction

4.1 Overall were you satisfied with your visit?.....

4.2 If not, why?.....

4.3 What specifically did you enjoy or not enjoy?.....
.....

4.3 Was the accomodation satisfactory?.....

4.4 Were people friendly and helpful?.....
.....

4.5 Which trails and drives did you enjoy:
most.....least.....
please explain why.....
.....

4.6 What suggestions do you have which would have made your visit more enjoyable?.....
.....
.....

4.7 Would you have liked to stay:
more days.....less days..... what to you would be the ideal length
of stay.....

4.8 Do you think you will come again?.....
when?..... for how long?.....
what will you do next time?.....

5 Trail Guide

5.1 Did you find the trail guides useful?.....
.....

5.2 What especially did you like.....
.....
or dislike about the guide?.....
.....

5.3 Do you think the trail descriptions have:
too much detail..... too little detail.....
about the right amount?.....

5.3 What suggestions would you make for improving the guides?
.....
.....
.....

6 Tour Guide

6.1 Did you have someone with you as a guide for any part of your stay?.....
.....

6.2 Who was your guide?.....

6.3 Was he or she useful?.....

6.4 If you did not have a guide, would you have liked to have one?..... Please
state why.....
.....

7 Costs

7.1 Did you find the costs of your visit:
too high..... too low..... reasonable.....

7.2 Which particular aspects of the stay, if any, did you think were over-priced or under-
priced?.....
.....
.....

7.3 Would you like to contribute more to the costs of maintaining Amani Nature Reserve and its surroundings?
.....

7.4 Which aspect would you most like to support financially:

Environmental research or conservation.....

Village services (improvements to schools, health facilities, water supply).....

Road improvement.....

Agricultural research and development.....

Forestry research and development.....

Other (please specify).....

7.5 An East Usambara Trust Fund is proposed under the management of the Amani Nature Reserve, to ensure that any financial contributions made by visitors or other donors are equitably used for the purposes specified. Please make your contribution at the Amani Nature Reserve Headquarters at Sigi on your way out, or send to:

East Usambara Catchment Forest Project
P.O. Box 5869
Tanga, Tanzania
(Tel & Fax: 255-53-43820)

8. Additional comments. Please add any further comments or suggestions you would like to make.....
.....
.....
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.....
.....
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THANK YOU FOR YOUR CONTRIBUTION AND FOR YOUR HELP IN FILLING THIS QUESTIONNAIRE. WE HOPE YOU ENJOYED YOUR VISIT AND LOOK FORWARD TO SEEING YOU AGAIN IN AMANI.

TERMS OF REFERENCE
FOR THE
EAST USAMBARA FOREST TRAILS CONSULTANCY

Post Title: East Usambara Forest Trails Consultancy

Duty Station: Tanga, Tanzania

Duration: Maximum 40 days (20 per consultant), April 1995

1. Background

The East Usambara Mountains are an area of outstanding natural beauty, with some of the oldest rainforests in Africa and a wide variety of plant and animal species many of them found nowhere else in the world. The area is also of considerable historical and current interest, with a growing village population practising intensive agriculture alongside modern tea plantations, as well as a number of precolonial, colonial and present day sites that are worthy of visits.

However these features are poorly documented and signposted such that it is not easy for visitors to the area to find their way around. The East Usambara Catchment Forestry Project (EUCFP), which has the broad objective of conserving the East Usambara forests and environment, has plans to establish a number of nature trails and signboards in the proposed Amani Nature Reserve, and to involve the local population in developing an ecotourism programme from which they as well as forest conservation will benefit. There are also plans to develop a guidebook presenting the East Usambara Mountains in the near future.

Mr Hatim Karimjee, Managing Director of Karimjee Agriculture Ltd (KAL) which owns two of the tea estates in East Usambaras, has similar plans for marking tourist walks and drives in the forests attached to the KAL estates.

A short consultancy is proposed, jointly sponsored by EUCFP and KAL, to collect and collate information on selected parts of the East Usambaras which could attract tourists, and to locate suitable walks or tours for visitors which could later form the basis of an ecotourism development plan.

2. Objectives

The study will have the following objective:-

1. To design a limited number of walks or tours for short and long term visitors to the East Usambaras, including preparation of sketch maps and suggestions on how the routes (trails, drive routes, and access routes) should best be marked (signboards, type, text, location etc.) and developed (priority routes are listed below);

2. To prepare trail guides and notes to accompany these walks and tours, describing points of interest including;
 - The physical and biological environment and the plant and animal species which may be encountered
 - The social and economic history and current status of the area and items or issues of interest which can be examined on the walks or tours
3. To involve where possible local people, and train EUCFP field staff in site identification and description;
4. To suggest any further trails to be developed or investigations and studies that might be needed for developing an appropriate form of ecotourism in the East Usambaras; and
5. To design a visitor questionnaire and a questionnaire or other method for testing the trails and routes established; and
6. To suggest the format and possible contents of a detailed guidebook to the East Usambaras which would be prepared at a later stage.

3. Approach

It is proposed that the consultancy be undertaken by Mr. Antony Ellman, CDC Agriculturalist currently attached to the East Usambara Tea Company, and Dr Alan Tye, Consultant Biologist. The East Usambara Catchment Forest Project team will include Sosthenes Rwamugira, ANR In-Charge, Ahmed Mndolwa, TAFORI, Bruno Mallya Kwamkoro Forest Station In-Charge and Frank Mahenge, Assistant Forest Officer Kwamkoro Forest Station. The EUCFP team will be involved in all stages of the work.

Published and unpublished data sources will be used for compiling the notes and plans, supplemented by field investigations and by the knowledge of the team.

It is envisaged that the consultancy will require a total of some 20 mandays for field work and 20 mandays for report preparation (i.e 10 plus 10 mandays by each consultant).

4. Work Programme

| <u>Activity</u> | <u>Tentative time required</u> |
|------------------------------------|--------------------------------|
| Desk study | 1 |
| Trails identification, development | 10 |
| Write up | 9 |

5. Expected outputs

1. Nine trails and three drive routes established with proposals for signboarding and marking;
2. Trail descriptions for the proposed forest trails;
3. Proposal for the contents of a guidebook for the East Usambara Mountains;

4. Proposal for a visitor survey and a method for testing the trails and descriptions; and
5. Proposal for future trails to be developed or studies required.

The consultants will prepare a report on the work and submit their report, trail descriptions and other material by 31 May 1995.

6. Provisional List of Forests Walks and Tours

The following is a preliminary list of priority routes which should be investigated by the consultants. Others may be added in the course of the consultancy.

1. Amani (IUCN Compound) to Mbomole Hill;
2. EARO/NIMR compound tour: ornamental gardens, site of old boating lake;
3. Sigi palm and spice garden tour including site of German railway terminus and station master's house;
4. EUCFP Forest office, Kwamkoro: forest trail with African Violet site;
5. KAL Bungalow through Monga tea plantation and return via forest path;
6. Derema tea factory to waterfall via German military graveyard site;
7. Ubiri village to Ndola Hill: mountain walk to fortified site of original Kilindi settlement;
8. Amani - Sigi peak: mountain climb through intact rainforest;
9. Kwamkoro or Monga: tea factory tour (by appointment);
10. Several driving routes could be described, eg:
 - Amani-Kwamkoro-Ngua-Mikwinini-Ndola-Monga-Amani
 - Amani-Monga-Mgambo-Bulwa-Derema-Amani
 - Amani-Derema-Msasa-Marvera-Bulwa-Derema-Mbomole-Amani