



## Summary Report of Tanzanian Mpingo 98

*Tanzanian Mpingo 98*, the second expedition from the Mpingo Conservation Project, conducted seven weeks of field investigations in the area around Migeregere village in Kilwa District, southern Tanzania. Although close to the coast (Migeregere is about 30km inland from the Indian Ocean) the vegetation is quite different from the coastal scrub which predominated at Mchinga, site of *Tanzanian Mpingo 96*. Here there are plenty of good-sized trees and the habitat more accurately fits the Miombo classification than that of coastal woodland. Many ephemeral water courses criss-cross the site, and vegetation around these is generally dense and quite lush compared to open woodland prevalent elsewhere. Another 20km inland from the village is Mitaurure Forest Reserve, and half of the plots used in the ecological surveying were situated inside the reserve. The whole area is relatively rich in mpingo in comparison to the whole of Lindi region.

As with the first expedition the ecological survey was our core activity: the whole morning of each working day was devoted to it. We surveyed a total of 150km<sup>2</sup> of forest – 75km<sup>2</sup> inside Mitaurure FR, and 75km<sup>2</sup> outside of it. In doing so we identified over 90 different tree species, with many others identified to genus or family, or reliably distinguished by Swahili name, but which we unfortunately could not translate. The local knowledge of our game guards (although we did not see any, the buffalo, elephant and lion all roamed the area, and so the guards were a reassuring precaution against unexpected encounters) was invaluable in the identification process, as they were far more familiar with the local flora than any of the rest of the team. *Brachystegia longifolia* (the Swahili name of which - miombo - and is now used to classify an entire ecosystem), *B. spiciformis* and *Julbernardia globiflora* were the common larger trees, sometimes forming a semi-closed upper canopy. Combretums (*C. apiculatum* and *C. molle* were the commonest), *Diplorhynchus mossambicensis* and *Pseudolachnostylis maprouneifolia* were the most frequently found species in the understorey. Small patches of grassland were dotted mosaic-like through the area, usually containing a few Combretums and Acacias.

The survey plots were divided equally into three categories: river (though usually the ‘river’ bed was dry), fire (those that had clearly been burned that year) and normal plots. No significant differences in mpingo distribution or density were found between different plot types. Neither did we discover any significant variation in the different measures of size (girth, height, straight length and canopy area) that we made on all mpingo. However we did find that trees in fire plots are much more likely to have multiple stems: about 40% of trees compared to 10% in river and normal plots. We also found inconclusive evidence to support the widely held belief amongst carvers and harvesters that mpingo grows in clusters.

Tree size, as measured by circumference at breast height, showed a healthy bell curve, in contrast to the heavily skewed population at Mchinga, 75% of which belonged to the smallest size category. The table below summarises the size measurements taken; many of the maxima maybe new records for mpingo.

<i>Measure Mean</i>	<b>CBH (cm)</b>	<b>Height (m)</b>	<b>Canopy Area (m<sup>2</sup>)</b>
Normal plots	94	11.3	36
Fire plots	69	8.4	24
River plots	61	8.5	21
<b>All plots</b>	<b>70</b>	<b>8.9</b>	<b>25</b>
<i>Standard error</i>	36	4.1	20
<b>Maximum</b>	150	20.1	99

We found that the ratio of tree height to girth was nearly always between 7 and 22 with a few outliers. This relationship was uniform with respect to height suggesting that growth followed no regular pattern (e.g. vertical growth favoured in young trees) and that environmental factors were determinant throughout the tree's life.

The expedition pioneered the use of a new technique to determine harvestable wood. For each mpingo tree surveyed, we Estimated the maximum Straight Length (ESL) of trunk or branch (it did not have to be of uniform thickness or even include the widest point, though often it did) which was neither bent or laterally twisted. Estimates varied from 0 to 8m (mean 2.0m), and were closely correlated with girth and height. Assuming a uniform thickness equal to the CBH (this would usually have been a slight over-estimate) it was then possible calculate an Estimated Straight Volume (ESV) for each tree, which averaged at 126dm<sup>3</sup> over the whole survey. In comparing this with other figures it is important to note that this value is quoted 'overbark', and there is considerable wastage before the production of billets. Regression analysis of ESV against girth and height produced the following best fit models:

1.  $ESV = 155g^3 - 42.6g^2 + 108g - 20.0$  (  $r^2 = 0.56$  )
  2.  $ESV = 0.112h^3 - 2.44h^2 + 35.5h - 89.1$  (  $r^2 = 0.36$  )
  3.  $ESV = (3.88g + 0.124h + 0.154)^3$  (  $r^2 = 0.66$  )
  4.  $ESV = (3.92g + 0.135h)^3$  (  $r^2 = 0.63$  )
  5.  $ESV = 62.5g^{2.66} h^{0.46}$  (  $r^2 = 0.90$  )
- ( ESV in dm<sup>3</sup>, girth g in m, height h in m.)

Note that all models had wide confidence intervals indicating they only held true for large samples.

Interviews with foresters and saw-millers showed that there were two principal factors governing whether a tree is worth harvesting:

- Thickness (theoretical min. girth = 107cm, but in practice logs of only 50cm were found)
- Length of obtainable log (min. length of 0.70m in practice)

We adopted the rule that trees which had a CBH of 70 cm or more and ESL of at least 1m (due to the accuracy of measurement this translates into actual straight lengths of 75cm+) were considered harvestable. Only 50% of trees surveyed matched these conditions, occurring at a density of 4.2 trees per hectare. The average ESV of harvestable trees was 163dm<sup>3</sup> which amounted to a total of 13.01m<sup>3</sup> of extract will timber at 1.03m<sup>3</sup> per hectare.

The closest competitors in various size classification is to each mpingo tree were analysed the patterns affecting the size of the mpingo. Those whose closest competitors in the pole category (10 ≤ CBH < 30cm) or tree category (30 ≤ CBH < 80cm) were Combretums tended to be larger than average.

30% of all plots surveyed contained juvenile mpingo (seedling or sapling) within the 20 m radius. There was no relationship between presence of adults and juvenile mpingo. Juveniles were more likely to be found where canopy cover is under 40%. The dominant species in the immediate area of each juvenile was less likely to be *Brachystegia* and *Pterocarpus* for mpingo than for other species. Overall the mpingo population in the Migeregere area was in good health with plentiful seedlings, although until we know the true effects of the frequent bush fires on seedling growth, we cannot predict how many of these will live to maturity.

The expedition also investigated the attitudes of local people towards mpingo, what uses they put it to, and the extent of their knowledge about the tree. Some of the techniques of *Rapid Rural Appraisal* (RRA) were used to assist this investigation, but primarily it was an exercise of simple group interviews. Groups were divided according to age and gender, and there were notable differences between them. Women professed to know little about conditions in the bush, but were clearly aware of the practical difficulties of using mpingo for firewood (it burns with such a hot flame that holes are easily burned through their poor quality pots). Other reported uses for mpingo included building materials, furniture, charcoal, and various household tools and utensils. The leaves were mentioned as having medicinal properties, and everyone knew about the logging and use by carvers.

Questions about the phenology of mpingo did not generate very coherent answers, but interviewees were a lot clearer that burning occurs predominantly towards the end of the dry-season. Logging, surprisingly, was not reported as being restricted to the dry season. However, answers to these questions were quite inconsistent, perhaps indicating that although some men saw it as 'the most important use for mpingo', the employment it provided was extremely sporadic. People were aware of government restrictions and local by-laws relating to the felling of trees, but did not appear to pay them much attention. This was reflected in the state of Mitaurure Forest Reserve. The expedition had expected to find many differences between the forest inside the reserve and that outside, but this was not the case. The only significant distinction was in mpingo girth; the trees outside averaged at 88cm compared to 57cm inside. Logging, burning, land clearance and hunting appeared to take place with little regard for the unmarked borders of the reserve. Indeed, though local people were knew of the reserve's existence, their location of it was somewhat smaller than that shown on maps.

After the completion of the main fieldwork phase, some members of the expedition additionally toured Lindi Region in order to meet foresters from other districts, and assess how well conditions compared to Migeregere. The purely qualitative conclusion was that the forest is sufficiently similar for results to be directly compared, and lessons learned at Migeregere to be applied elsewhere. However an extrapolation of current stocks was fraught with difficulty, for there were a number of major unknown factors to consider: extent of forest cover, harvestability of mpingo (including the effects of fire and heart-rot), varying abundance (Migeregere had been deliberately selected as a site of high density which is not representative of the whole) and the prevalence of illegal harvesting. The end result was an estimate for Nachingwea District (where most harvesting takes place, and where we could obtain some reasonable license data) of anything between 10 and 190 years worth of harvestable stocks. When compared with the 70 to 100 years which mpingo generally takes to reach harvestable size, this is cause for alarm that stocks could run out very soon. Overall, however, the expedition could neither confirm nor refute the view that the species is under imminent threat of commercial extinction.

The tour also included visits to a number of saw-mills, which reported huge discrepancies in the number of logs required for 1m<sup>3</sup> of mpingo billets suitable for export. Some of these differences could be put down to the clear difference in quality: some mills were having trouble selling sub-standard billets. The usage of mpingo is inherently inefficient due to natural faults in the wood, but there is potential for significant improvements in its efficient use by integrating the activities of sawmills and carvers. It was clear that most loggers were having to compromise on the minimum size tree they would consider viable for felling, with obvious consequences for the sustainability of the harvest. All saw-mill managers and carvers acknowledged wide-spread illegal harvesting, but predictably all protested their own innocence. Most foresters, who lack the funds to properly patrol their districts, were naively ignorant of the scale of illegal harvesting.

The most worrying fact of all though, is the impending bridge over the River Rufiji. Due for completion in 2001, and with general road improvements to follow, the whole region should be greatly opened up for development (the harbours at Lindi and Mtwara have already been dredged). Nobody would deny that this is a long over-due boost for one of the poorest parts of Tanzania, but it poses a major threat to the forests which currently cover much of Lindi Region. Despite the poor soils, immigration from the relatively is a danger which must be considered, but more pressingly the invasion of logging companies out to make a quick buck could catastrophically reduce the area's stocks of commercial trees in only a few years. That our findings indicate that they are unlikely to make much money from mpingo that is not carefully treated is not expected to deter them. Mpingo is the most highly valued tree in the region, and likely to be a top target for any loggers.

To conclude: it is clear that mpingo is threatened by adverse burning regimes, illegal harvesting and deforestation. Mpingo is not yet a critical case – we still have time to adopt the right management strategies to save it, but time is running out. There is a growing trend towards conservation in partnership with local communities, rather than exclusion from protected areas, and we think mpingo could be well suited to this style of management. There are difficulties to be sure: especially the long time between seedling and economic return, and education of local communities will be a major task, but, in the absence of economically risky plantations, community management is the only model likely to keep mpingo harvesting sustainable. Moreover the economic value of mpingo in the West means that it is possible to use it as a key species around which a more complex conservation plan can be built.

Sustainable harvesting of mpingo in its natural habitat can only be achieved through understanding the tree's ecology in a wider socio-economic context, and the work of the Mpingo Conservation Project will continue. The expedition has five key recommendations:

- An inventory of Tanzania's mpingo stocks is urgently needed.
- Sawmills and carvers need to make more efficient use of harvested trees by integrating their activities.
- Steps need to be taken immediately to encourage early burning of miombo woodland.
- The use of miombo by villagers should be considered in decision-making.
- Mpingo in Lindi region should be protected from illegal logging and woodland clearance which will result from improved road links with Dar Es Salaam.

Success with these five points will make conservation of mpingo through sustainable exploitation that much more likely, with benefits for local people, Tanzanian carvers and the whole Tanzanian economy, Western musicians and music lovers, and lastly the precious miombo woodlands where mpingo grows.

### **The Team**

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