

# *Prosopis glandulosa* Torrey (Leguminosae-Mimosoidae) at Swang'oma, Lake Chilwa plain: A blessing in disguise?

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## ABSTRACT

A study to assess the ecological and social effects of mesquite, *Prosopis glandulosa*, was conducted in Swang'oma, Phalombe, Lake Chilwa Plain, South Eastern Malawi. A questionnaire was used to collect information on the perceived advantages and disadvantages of mesquite in the area. Results showed that all people relied on mesquite as a source of fuelwood, some as a source of income (44%) and to a lesser extent as a source of poles, timber and for fencing maize gardens. However, mesquite was considered as a nuisance by all people because of the spines (physical hazard), blocked short cuts to the harbour (71%), limiting grazing area in the floodplain (54%) and also taking up land for growing maize and rice. Thus, it was apparent that a balance needs to be struck between maximising the perceived benefits from mesquite whilst minimising the threats brought by its presence.

## 1 INTRODUCTION

*Prosopis glandulosa*, commonly called mesquite is a multi-purpose nitrogen fixing tree. It is a native of Mexico and grows in a wide variety of temperatures and soil conditions. However, it best thrives under deep, well-drained alkaline soils (von Carlowitz, 1986). Mesquite has a number of uses including being a source of firewood, timber, live fencing, fodder for livestock, food for humans, medicines, honey from bees, cosmetics, ropes, ornamental shade, dyes and paints and is also used in dune stabilisation (Bell & Castetter, 1937, Felger, 1977, von Carlowitz, 1986, DeLoach & Cuda, 1994). It coppices readily because it has numerous underground buds which sprout in response to injury above ground. Seed are dispersed by livestock that consume the pods which later pass out the seeds with the dung.

Despite its advantages as an agroforestry tree, invasiveness is the outstanding species specific problem of mesquite (von Carlowitz, 1986). An invasive species is an introduced species which has invaded natural ecosystems and acts as an agent of change within these systems (IUCN, 2000). This

implies that under favourable conditions, mesquite has the potential of outcompeting and displacing native vegetation because it grows very fast and has an efficient seed dispersing mechanism. Apart from being invasive, mesquite is also a spiny species. These spines act as a defensive mechanism against herbivores but they are a physical hazard to humans.

Mesquite is a useful tree in its native area but became invasive in Swang'oma because of favourable growing conditions. The present study was conducted with the aim of assessing the ecological and sociological impacts of mesquite at Swang'oma before any mitigation measures are brought in. This paper will highlight results in relation to the benefits and threats of mesquite at Swang'oma.

## 2 *P. GLANDULOSA* IN SWANG'OMA

Swang'oma is an important harbour on the southern part of Lake Chilwa (Figure 1). The population is predominantly poor (income of less than US\$50 per year for 50% of the respondents) and people depend on farming and fishing as sources of food and income. Different types of livestock are kept such as cattle, goats, pigs and poultry (EAD, 2000).

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The Forestry Research Institute of Malawi (FRIM) carried out a series of trials in the late 70's to early 80's to screen multipurpose trees for social forestry and agroforestry in different silvicultural zones of Malawi (Ngulube, 1992). Germplasm of species *Acacia deanii*, *Leucaena leucocephala*, *Parkinsonia aculeata* and *Prosopis glandulosa* was obtained from Central America. The ability of a species to survive in a silvicultural zone is a primary criteria in selection for agroforestry purposes and FRIM's initial objective was to determine survival rates of these species. Some species in the trials had a high survival rate whilst others showed poor survival, one of which was mesquite (40% survival). However, mesquite had good coppicing ability and was also 'thorny', making it a good candidate for live fencing but appropriate management was required particularly when it showed potential to become a weed due to its ability to produce abundant seed within two years of planting.

Mesquite was deliberately introduced at Swang'oma in 1986 by FRIM as a live fence around Eucalyptus trials at Makhanga Primary School, Pherere village (Munyenembe & Sambo, 1998). The school is located some 2 km south-west of Swang'oma harbour on the edge of the Lake Chilwa floodplain. By March 1996, when its invasive ability was discovered, *P. glandulosa* had grown to maturity at the point of introduction, and had dispersed and established itself on the floodplain. It had rapidly replaced indigenous species in an area estimated from 8-10 km (Munyenembe & Sambo, 1998). The spread was enhanced by the presence of livestock in the area especially cattle and goats which dispersed its seeds to new locations.

Kalindekafe (1998) and Munyenembe & Sambo (1998) highlighted the potential dangers posed by mesquite at Swang'oma. All pointed to the ecological problems of mesquite that had to be addressed before it colonized the wider area around Swang'oma, displacing people and livestock and blocking access to fishing points.

### 3 MATERIALS AND METHODS

A semi-structured questionnaire was used to interview 52 respondents (17 male and 35 female) representing nearly 70% of the total households around Swang'oma. The questionnaire was pre-tested during a prior reconnaissance trip for validation. Relevant corrections were made before final administration. Respondents were randomly selected based on location, i.e. those from upland, floodplain and those living in between. More women than men were interviewed because most of the men were out fishing during the time of the interviews. In addition,

Table 1: Utilisation of mesquite by respondents at Swang'oma

| Use                     | % frequency |
|-------------------------|-------------|
| Firewood                | 100         |
| Firewood sales / income | 44          |
| Poles                   | 12          |
| Fencing                 | 11          |
| Shade                   | 10          |

a group discussion with 25 fishermen found near the harbour was conducted to get their views on the effect of mesquite in the area. Two traditional leaders were also interviewed. The data were analysed using the Statistical Package for Social Scientists (SPSS).

## 4 RESULTS AND DISCUSSION

### 4.1 Benefits due to the presence of mesquite

The people of Swang'oma use mesquite as a source of firewood, income poles, fencing and shade. (Table 1).

All respondents depended on mesquite as a source of firewood for home use whilst 44% sold it for income. Sambo *et al.* (1999) reported on the extensive degradation of forests and natural woodlands in the Lake Chilwa catchment, including Swang'oma, resulting in part from firewood shortage. Previously, people in Swang'oma were obtaining firewood from Makhanga Hill but nowadays there are restrictions to protect the few indigenous trees left on the hill. Some people buy firewood from Mozambique traders but not all can afford this since the majority of the people are poor. Hence, people utilise mesquite as a source of firewood. The firewood is sometimes sold to fishermen who claimed that the smoke produced enhances the outlook of the dried fish. The money realised (a pile of 7 stakes was selling for MK5, US\$0.05) is used to buy a number of items including food in times of shortage, clothes, bicycles and livestock such as goats and chickens. On a visit to the nearby island of Njalo in 2000, piles of mesquite were found at a fishing village, ready for use to smoke fish (Sambo, personal communication). Women emphasised on the need for access to fuelwood particularly given its increasing scarcity in the area. It was pointed out that the presence of mesquite reduced the distance and time spent in fuelwood collection. Another bonus was that firewood selling is easier to get involved in when compared with other smaller businesses which require skills training, loans and equipment.



Figure 1: The geography of Lake Chilwa and its catchment, Malawi. The study site, Swang'oma, is marked on the southern lakeshore.

In addition, 11% of the respondents use mesquite for fencing maize and rice gardens. The spines of mesquite provide an effective barrier around maize and rice fields which would otherwise be destroyed by livestock if left unprotected. The branches are cut whilst green and placed around the gardens where they remain effective even when dry because of the spines. Mesquite is also an effective live fence for cattle kraals. Almost all the kraals around Swang'oma had mesquite trees as part of the fence, and in certain cases, barbed wire was put around growing mesquite trees. The live fences have the added advantage of being the source of fodder for livestock and the branches can be cut for firewood. Besides, the fence is permanent and does not require regular replacement.

Poles, for constructing bathrooms and *thandala* (a raised platform for drying pots and plates), are also obtained from mesquite plants (12% of respondents). Poles need replacement every 2 or 3 years because they are not termite resistant. That is why they are not normally used for housing, yet are suitable for bathroom and *thandala* construction. Some naturally growing trees are kept around homesteads and pruned for shade (10% of respondents) taking advantage of the fact that mesquite has got a tendency for apical dominance and a well developed crown. Trees kept for shade were common around most homes and churches.

One ecological benefit due to the presence of mesquite that was pointed out was that mesquite plants improve soil fertility. There was no need to apply organic fertilizers on areas that had been cleared of mesquite because subsequent crops especially maize produced high yields. Another possible benefit that was observed during field work is the provision of habitat to wildlife especially small mammals (a hunter was sighted who had killed a rabbit among the mesquite bushes). The fact that this was not highlighted by the respondents might indicate that the community depends upon fish as a source of protein rather than hunted mammals.

Mesquite has several other uses as noted by von Carlowitz (1986) such as making of handcrafts, furniture and wood carvings. However, these are not yet popular with people of Swang'oma. Presumably, this is because *P. glandulosa* is an introduced species in the area and people are yet to discover its other uses.

#### 4.2 Threats

People cited a number of threats due to the presence of mesquite at Swang'oma (Table 2).

All respondents were in agreement that spines were a major problem due to mesquite at

Table 2: Threats associated with mesquite as reported and perceived by respondents at Swang'oma. (m=male, f=female, T=Total)

| Threat                      | % frequency |    |     |
|-----------------------------|-------------|----|-----|
|                             | m           | f  | T   |
| Spines as a physical hazard | 33          | 67 | 100 |
| Limited access              | 29          | 42 | 71  |
| Loss of grazing ground      | 17          | 37 | 54  |
| Health hazard               | 2           | 38 | 40  |
| Loss of biodiversity        | 2           | 17 | 19  |
| Loss of rice dimbas         | 8           | 11 | 19  |
| Catfish caught far away     | 2           | 11 | 13  |
| Block view to Njalo Island  | 0           | 6  | 6   |
| Limit area for cultivation  | 2           | 4  | 6   |
| No more salt harvesting     | 0           | 4  | 4   |
| Washing area now far        | 0           | 2  | 2   |

Swang'oma. Stories were narrated about women who have had septic wounds for over 10 months due to being pierced by mesquite. However, spines are not a deterrent enough because firewood continues to be harvested.

Limited access to the shoreline was also highlighted as a threat by 71% of the respondents. It was pointed out that nowadays it takes long for people to get to fishing points on the lake because some short-cuts through the floodplain have been blocked. Previously, the main road to the harbour was partially blocked by thickets of mesquite (Sambo & Munyenyebe, personal communication) but at the time of the study, the road was accessible because mesquite had been physically removed and the stumps burnt by residents.

Another threat posed by mesquite is loss of grazing ground (54%). Currently, mesquite occupies 8-10km<sup>2</sup> of the floodplain and there are fears that if the spread is not checked, it might colonise the entire area around Swang'oma and choke out grasses that livestock feed on, thereby jeopardising the nutrition of the animals. Forty percent of the respondents cited unscrupulous people, as an indirect threat, who take advantage of the privacy from mesquite bushes and use the area as toilets during the dry season. These people take advantage of the clear spaces within the invaded area. Consequently, such areas become a potential health hazard because they act as a source of water borne diseases such as cholera and bilharzia during the rainy season. This confirms what was reported by Zimba & Kaunda (1999) on the prevalence of bilharzia, cholera and other abdominal diseases in the Lake Chilwa catchment. The offenders are usually fishermen who live in temporary shelters during the 'open fishing season' when fishing is allowed.

It was learnt that when such culprits are caught, they are either ordered to leave the harbour or are fined heavily and told to dig a toilet with immediate effect.

Other threats that were cited included loss of biodiversity (19%) in the sense that other woody plant species are absent in the floodplain; only mesquite is present. The present situation at Swang'oma arose because mesquite entered into a "vacant niche" which had been created due to deforestation. Respondents indicated that previously, the floodplain was wooded with species from the genera *Dalbergia*, *Acacia* and *Combretum* (the last species to disappear being *Acacia nilotica*), which had been cut down for a number of uses including firewood, timber and canoe making. By the time mesquite was introduced at Makhanga School, the floodplain was already bare. Mesquite 'escaped' from the source and, due to its invasive characteristics, it quickly filled this deforested area which had favourable ecological conditions for its spread. Mesquite has a quicker growth rate (in Swang'oma) than the indigenous species. It also has an efficient seed dispersing mechanism and the dense spreading growth habit which, when combined with stem-cutting by humans, makes regrowth of other vegetation impossible.

Another problem cited by 13% of the respondents was the hinderance to catfish catches around households during the rainy season. Previously, the floodplain was bare of vegetation and floodwaters came very close to the upland areas. Hence, catfish were being caught close to the houses. Nowadays, due to the presence of mesquite, it is no longer possible to catch catfish close by. Instead, people have to wade past mesquite bushes to catch fish. The spines of mesquite, in particular, pose a practical problem bearing in mind that the water level in the floodplain can be knee-deep during the rainy season. Some respondents (19%) were worried that there is now limited area for rice cultivation in the floodplain due to the presence of mesquite; 6% complained of the blocked view to Njalo Island for aesthetic reasons and a minority of the respondents (4%) indicated that salt harvesting is no longer possible. Further inquires though revealed that salt harvesting ceased nearly 10 years ago (before mesquite was established) because the soils no longer had salt incrustations.

There were mixed reactions when respondents were asked as to whether mesquite had to be removed due to the threats (Table 3). Table 4 evaluates the potential consequences of removing mesquite from the Swang'oma area.

Respondents, especially women (64%) worried over the fact that the removal of the plants

Table 3: Responses of people when asked whether mesquite should be removed from the Swang'oma area

| Response | % frequency |        |
|----------|-------------|--------|
|          | male        | female |
| Yes      | 46          | 36     |
| No       | 54          | 64     |
| Total    | 100         | 100    |

Table 4: Potential consequences of clearing mesquite at Swang'oma.

| Consequence              | % frequency |        |       |
|--------------------------|-------------|--------|-------|
|                          | Male        | Female | Total |
| No firewood              | 13          | 33     | 46    |
| No income                | 12          | 15     | 27    |
| Easy access              | 10          | 13     | 23    |
| Hunger / death           | 2           | 8      | 10    |
| No free firewood         | 0           | 10     | 10    |
| No cooling effect        | 0           | 6      | 6     |
| Exploit Makhanga Hill    | 4           | 0      | 4     |
| No building poles        | 4           | 0      | 4     |
| No health hazard         | 0           | 2      | 2     |
| Less fertile             | 2           | 0      | 2     |
| <i>Acacia</i> spp return | 2           | 0      | 2     |
| No effect                | 6           | 12     | 17    |

would exacerbate the already existing widespread poverty since some people have come to depend on sales of mesquite firewood for disposable income (Table 1). Besides, there is extensive deforestation in the area and not everybody can afford to buy firewood from Mozambique. The women were the main firewood collectors in the home so that it is not surprising that they were more worried than the men. Some households cannot afford to buy fertilisers and do not normally realise high yields. Thus, these households run out of food supplies before the next harvesting season. Such people would eventually go hungry because they would not be able to afford maize or flour. Currently, these households depend on mesquite sales as their only source of income.

A warning was also given that in the absence of 'free firewood', people would defy orders not to cut indigenous trees in Makhanga Hill because their immediate needs would outweigh long term conservation concerns. However, 23% of the respondents were adamant that mesquite had to go because removal would eliminate the spines and ease accessibility to the shoreline. Interestingly, the temporary fishermen indicated that they could buy firewood from Mozambique. Some respondents (especially those that had houses away from the colonised

area) indicated that they could obtain permits for firewood from the Forestry Office as was the case before mesquite was introduced. However, 44% of the respondents who depended on mesquite for firewood and income attributed such views to laziness and jealousy.

## 5 CONCLUSION AND RECOMMENDATIONS

The study showed that the presence of mesquite is both beneficial and a threat to the people of Swang'oma. The attitudes of people towards mesquite are important to understand if effective control measures are to be implemented. Variation in perception of the 'worth' of mesquite by different stakeholders might lead to conflict of interests. Two main viewpoints can be identified. At one end of the spectrum is a poor villager who sees mesquite as the family's source of fuelwood and cash income derived from harvesting trees as critical for survival. In contrast, is the local conservationist who views mesquite as invasive or another villager who advocates total removal of mesquite because it interferes with his livelihood. These different perspectives are of fundamental significance to the success of efforts aimed at conservation of natural resources in the area by controlling invasives such as mesquite.

Generally, respondents agreed that mesquite was a physical threat due to the spines even though it was a source of firewood. However, other respondents (particularly men) complained about the lack of development in the area such as lack of safe drinking water and good roads. The implication was that the presence of mesquite in Swang'oma was not the only pressing issue to be addressed; there was need to also consider the basic necessities of development.

Considering the attitudes of people to the presence of mesquite and the need for its control as an invasive, the following are recommended:

- Gradual thinning out of the mesquite bushes. It would be premature and ill advised to eradicate mesquite plants without first putting in replacements and cushion measures against the firewood shortage in the area.
- Replanting of suitable indigenous species in the bare areas in the floodplain so as to meet requirements for firewood, canoes, fish smoking and soil amelioration.
- Movement of livestock to mesquite free upland areas has to be restricted. The present land use pattern in the area has to be maintained so

that the upland continues to be exclusively for farming and off-limits for livestock grazing. This would limit the spread of the seeds.

Introducing mesquite as a live fence for *Eucalyptus* trials at Swang'oma was not a prudent decision given the prior knowledge of its invasive ability. The present problem has to be controlled if the integrity of the Lake Chilwa catchment is to be maintained.

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