Fire, land-degradation and woodland restoration in northern Malawi

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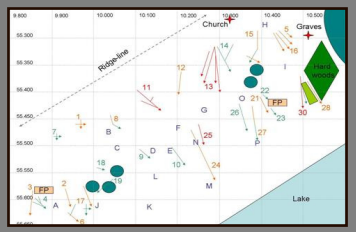
Background

Deforestation, annual burning and poor agricultural practice are causing significant land-degradation in the area surrounding the historic town of Bandawe. There are remnant areas of woodland and dense stands of fruit trees around houses but these are fragmented. Local woodland resources and existing primary forest in the nearby hills are under increasing pressure.

A programme of adaptive management has begun by mapping evidence of severe soil erosion (gullies) as well as nearby households affected by the erosion and remaining forest resources in the area around Bandawe. We also interviewed the twenty identified households focusing on understanding awareness of land-degradation, the impact of soil erosion, perceived causes of the problems and suggested methods for restoration.

Results of the mapping exercise



Evidence of soil erosion was mapped (left) by walking three transects through the village parallel to the shoreline of Lake Malawi. When gullies were encountered the top and bottom ends were marked with a GPS and their depth and width recorded. Gullies were mapped as severe (red), moderate (orange) or mild (green) based on their cross-sectional area. Nearly all the gullies were orientated parallel to the line of the slope and associated with heavily used footpaths (centre).

The majority of the land-area was covered in tussock grasses dominated by *Pennisetum purpureum* and showed signs of significant soil movement with the ground surface significantly lower between grass tussocks (right). Small areas of woodland remained (map, dark green) but were species poor and composed of fire tolerant species such as *Combretum* sp. and *Rourea orientalis*, or valued species such as *Parninari curatellifolia* (mbola plum). Two community forest areas have recently been planted (map: green = native hardwoods, bright green = *Eucalyptus*).

Individual homesteads were also mapped (A-P) and the owners later interviewed about their experiences of land-degradation and use of fire. Many of the houses bore evidence of erosion with exposed foundations and sand deposition around them. The majority of households had thatched roofs and utilised native hardwoods, cut live in the surrounding hill forest, as wood-fuel.

Results of household interviews

Whilst there was awareness of the link between fire and erosion (Fig. 1), erosion was perceived in a very direct manner with damage to property and crops often commented on. Suggested restoration methods followed a similar pattern with an emphasis on protecting property and tackling visible signs of the problem rather than the root causes.

Modifying fire regimes was not seen as a realistic possibility as it would reduce grass productivity for thatching (Fig. 1). Fire was perceived as damaging existing trees despite frequent efforts to protect them with firebreaks. A lack of ability to control burns effectively was seen as a major problem in creating fire free areas. Whilst the idea of planting trees was popular, no mention was made of natural regeneration or the need for fire control to protect planted or establishing saplings.

Tree planting was frequently mentioned as a restoration method and exotic fruits and *Eucalyptus* were considered particularly popular (Fig. 2). Such trees have already been widely planted and have a demonstrated ability to increase food diversity and timber production rapidly. Native fruits are popular but already available in remnant woodland areas and perhaps not as “fashionable”. A number of native fruits showed promise for use in erosion control.

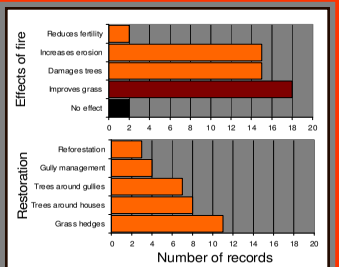


Fig. 1: Interviewees perceptions of the impacts of fire (top: positive, negative and neutral responses are shown in brown, orange and black) and their preferred options to counter soil erosion (bottom).

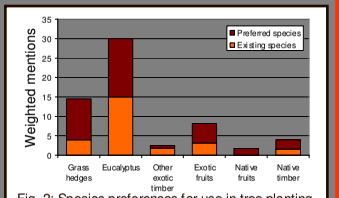


Fig. 2: Species preferences for use in tree planting. The y-axis shows the total number of times a species belonging to each group was mentioned divided by the number of species in that group.

Conclusions

Soil erosion and forest clearance are closely linked and this is well understood by local people. However, their preferences and efforts are directed to tackling the symptoms of gulley erosion and property damage rather than the root causes of deforestation and mis-management of fire. Poverty reduces the community’s willingness to experiment with alternative land-management techniques. We should therefore aim to create diverse secondary woodlands that build on existing forest combining native and exotic species to provide tangible goods and services rapidly. This approach is crucial for gaining support for restoration efforts and for protecting remaining forest resources. Changes to fire regimes may be necessary but need to account for impacts on fire hazard and the provision of essential services such as thatch or grazing. The research fed directly into community education on fire and woodlot management and a number of households agreed to set-aside areas from regular burning. Research is required on fire behaviour, rates of soil erosion, successional pathways and grass productivity under different fire regimes .

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