**Appendix S8 –** **Model Assumptions and Limitations.**

**Assumptions and limitations of MYRLIN**

Allometric equations and wood density

MYRLIN is based on data from humid tropical forest species. This has resulted in effective implementation in many tropical locations (Nicol *et al.* 2002; van Gardingen 2003), but is not known to have been utilised within miombo woodland (D. Alder personal communication, 3 March, 2014). Converting MYRLIN output (DINC) to AGB growth required a number of assumptions including an average wood density value and a generalised allometric equation. This can lead to inaccuracies when estimating the biomass of individual tree species (Chave *et al.* 2004) due to the influence of local environmental variables (Fonseca *et al.* 2012). Wood density data is rarely available in the tropics (McWilliam *et al.* 1993) and few allometric equations developed specifically for miombo woodland exist (Abbot 1999; Frost 1996; Ryan *et al.* 2010). Despite this, the AGB growth per hectare modelled within this study is comparable with other studies undertaken within miombo woodland (e.g. Guy 1981; Chidumayo 1990; Frost 1996).

Land cover estimation

The validity of village level results was largely influenced by the calculated area of land use categories derived from the Globcover map.

Grassland was present in all villages, despite Globcover failing to identify its existence within Villages 2, 3, and 4. Similarly, in Village 1 the local community, supported by field observations, categorised the majority of the village land use as cropland (rice paddy fields), rather than the forest cover suggested by Globcover. This may be because the land use has changed since the map was produced, or because the resolution was not sufficient to accurately determine the land use categories. In addition, Globcover does not provide data defining the area of settlement within each village.

The last national forest map was produced using Landsat in 1992 (GOM 2010) and as human influence is having a rapid and substantial impact upon the tree cover in Southern Malawi, the provision of current, more resolute images or maps would enable more accurate determination of land use categories. This would improve future estimations of sustainability at village level and allow more informed management decisions from local bylaws to national policies.

Off-take rates

To assess the sustainability of current off-take, this study assumes that all wood is sourced from the village and that the consumption in villages is equal. In reality, wood may be sourced from local markets and per capita consumption rates are likely to vary between and within villages, with larger households consuming less wood per capita than smaller households (Biran *et al.* 2004). Household surveys within the villages are currently being conducted by ASSETS researchers to enable more accurate off-take data.

**Assumptions and limitations of LPJ-GUESS**

Cell dynamics

The largest variations in AGB growth between the districts occurred in 2003 and 2005. However, due to the proximity of the districts, it seems improbable that the climate would vary substantially between adjacent cells. LPJ-GUESS models grid cells independently (Smith *et al.* 2001), and therefore processes may not affect neighbouring cells resulting in disparate results between adjacent cells. In reality, adjacent cells are likely to be affected by species dispersal, local climatic conditions, fire and runoff fluctuations.

Human influence

Miombo woodlands have been subject to anthropogenic modification, thus LPJ-GUESS results, modelled under the sole influence of natural processes, are likely to be larger than actual AGB growth rates. This has also been identified as a limitation when applying LPJ-GUESS to other human modified landscapes (Tang *et al.* 2010).

Resolution

The resolution of the LPJ-GUESS grid cells (0.5° x 0.5°) meant that estimates of AGB growth cannot be calculated for the different land use categories modelled using MYRLIN or to individual village estimates within the Zomba District.

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