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Fuel accumulation, consumption and fire patchiness in the lower rainfall savanna region

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Summary

This chapter outlines field studies and subsequent analyses undertaken for the purposes of deriving robust parameter values for fuel load accumulation (FLA), fire patchiness (P), and burning efficiency factors (BEF) for incorporation into a savanna burning emissions abatement methodology for areas of lower rainfall (600–1000 mm p.a.). We apply a broadly similar methodology to that developed for the current higher rainfall (>1000 mm p.a.) savanna burning abatement methodology. FLA data were assembled from 648 transects sampling the full rainfall envelope over a wide variety of landscape conditions that support characteristic unmodified flammable savanna vegetation structural types. Patchiness data were assembled from 3325 observations utilising three assessment methods. Fuel combustion (pyrolysis) and BEF data were derived from 90 fire treatments under a range of fire severity conditions, and categorisation of fire severity under early dry season (EDS) and late dry season (LDS) conditions was derived from observations of 392 fires at 267 permanent plots over the period 2009–2013.

Mean total fuel loads in the early (5.66 t ha^{-1}) and late (6.15 t ha^{-1}) dry seasons, and those of constituent components (fine fuels, coarse woody fuels, heavy woody fuels, shrub fuels), were less than those sampled under higher rainfall conditions. Based on data presented in Chapter 7, most input of litter fuel (leaf, twigs) occurred in the LDS (73%) (after August). Accumulation of fine fuels was effectively described by Olson curve and regression models for each of six vegetation/fuel types (described in Chapter 4), but not for lancewood and tussock grasslands fuel type combinations. Fires were observed to be more patchy early (79% of area burnt) than late (97%) in the dry season. BEFs for fuel components were observed to vary little between EDS and LDS, and overall were lower for coarse (sticks) and heavy (logs) woody debris components, and shrub fuels. Fine fuels exhibited high BEFs given a much larger grass component and subsequent more complete pyrolysis although, overall, our data suggest that fire treatments were of lesser intensity than observed under higher rainfall conditions. This assessment indicates that, for implementing a savanna burning abatement project in lower rainfall areas, two parameters are of particular importance – accumulation of greater proportions of fuel loads with litter inputs later in the season, and patchier early season fires.