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Supplementary Material

A bottom–up savanna fire fuel consumption inventory and its application to savanna burning in Kafue National Park, Zambia

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Supplementary Materials

Supplementary Material S1. Index equations

$$\boldsymbol{Burned\ Area\ Index\ (BAI)} = \frac{\mathbf{1}}{(\mathbf{0.1} - \boldsymbol{Red})^{\mathbf{2}} - (\mathbf{0.06} - \boldsymbol{NIR})^{\mathbf{2}}}$$

$$\boldsymbol{Leaf\ Chlorophyll\ Index\ (LCI)} = \frac{\boldsymbol{NIR - RedEdge}}{\boldsymbol{NIR + Red}}$$

$$\boldsymbol{Normalised\ Difference\ Vegetation\ Index\ (NDVI)} = \frac{\boldsymbol{NIR - Red}}{\boldsymbol{NIR + Red}}$$

Supplementary Material S2. Global warming potential

Table S1. Global warming potential (GWP) on a 100 year horizon for various greenhouse gases.

Species	GWP_{100} (source)
CO	2.2 (IPCC AR5)
CH_4	27.2 (IPCC AR6)
N_2O	273 (IPCC AR6)

Values given are from the Intergovernmental Panel on Climate Change (IPCC) AR6 report except for CO where no value is available, so the value from AR5 is used.

Supplementary Material S3. UAV model

Figure S1. UAV RF model BIAS for (*a*) grass, (*b*) litter, (*c*) total fine fuel, and (*d*) shrubs, sorted by location of the transect. The red dotted line lies on $y = 0$. Training data are included as grey dots.

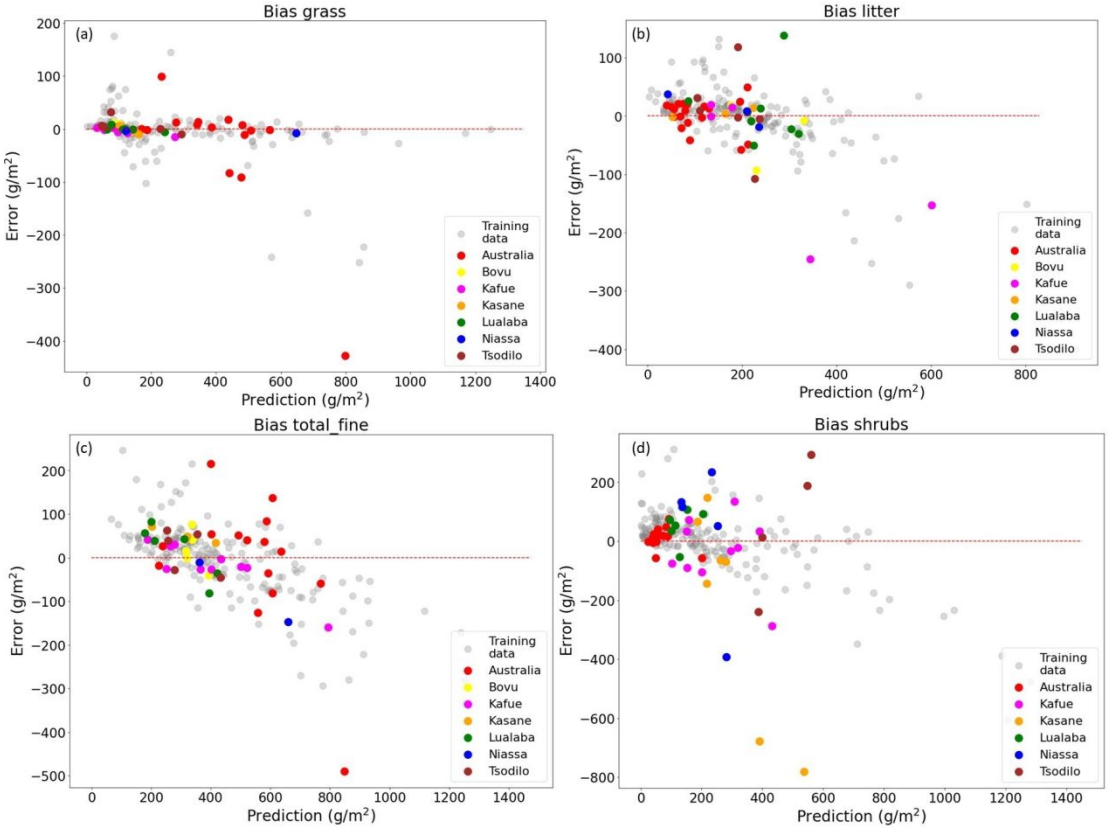


Figure. S2. UAV RF model feature importance for (a) grass, (b) litter, (c) total fine fuel, and (d) shrubs.

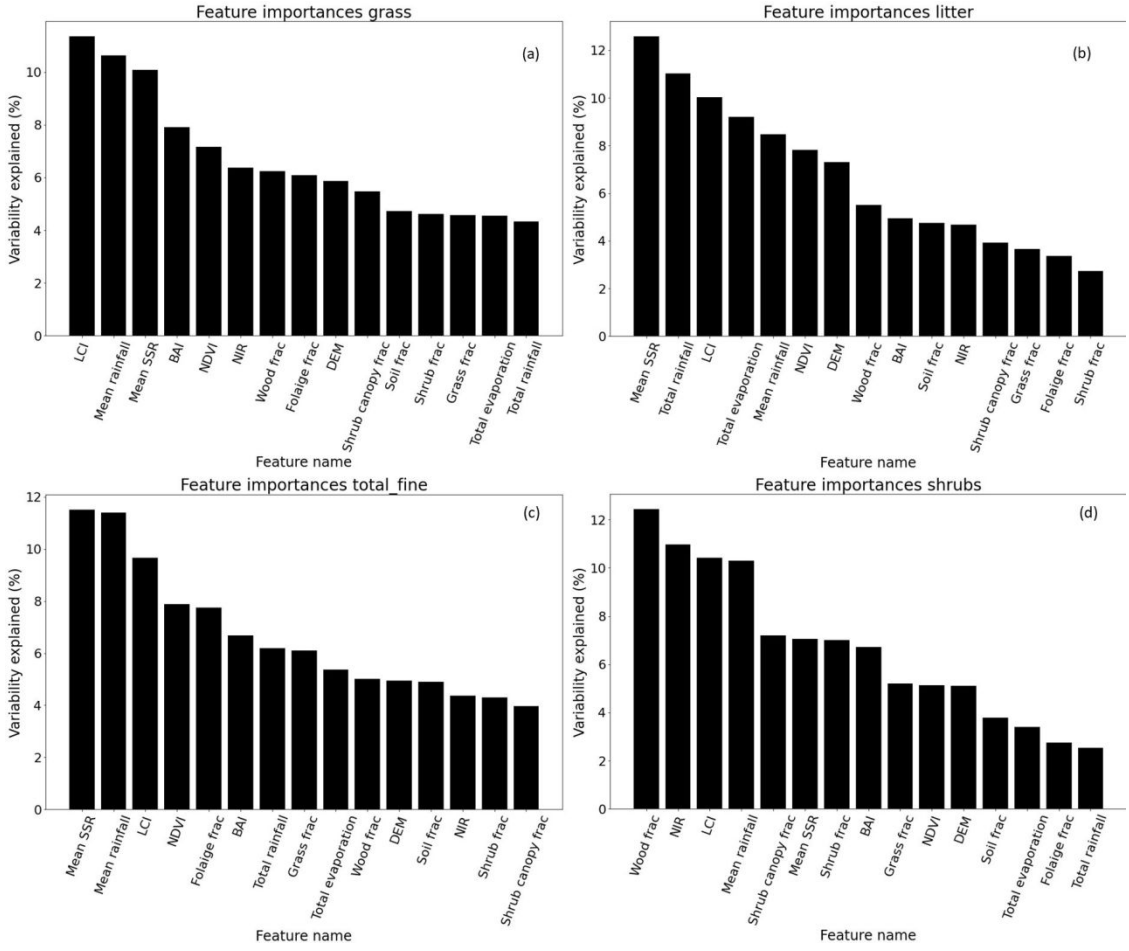
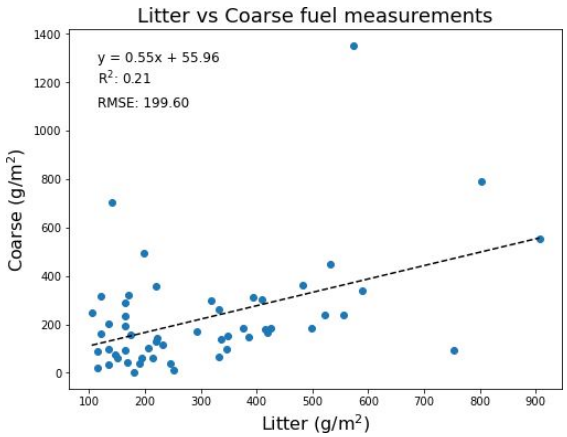


Figure S3. Relationship between litter and coarse fuel load measurements across all transects. Top left-hand corner displays the relationship in the form of a linear equation, as well as the R^2 and RMSE values.



Supplementary Material S4. S2 Model

Figure S4. S2 RF model BIAS for (*a*) total fine fuel, (*b*) litter, and (*c*) shrubs. The red dotted line lies on *y* = 0. Training data are shown in grey.

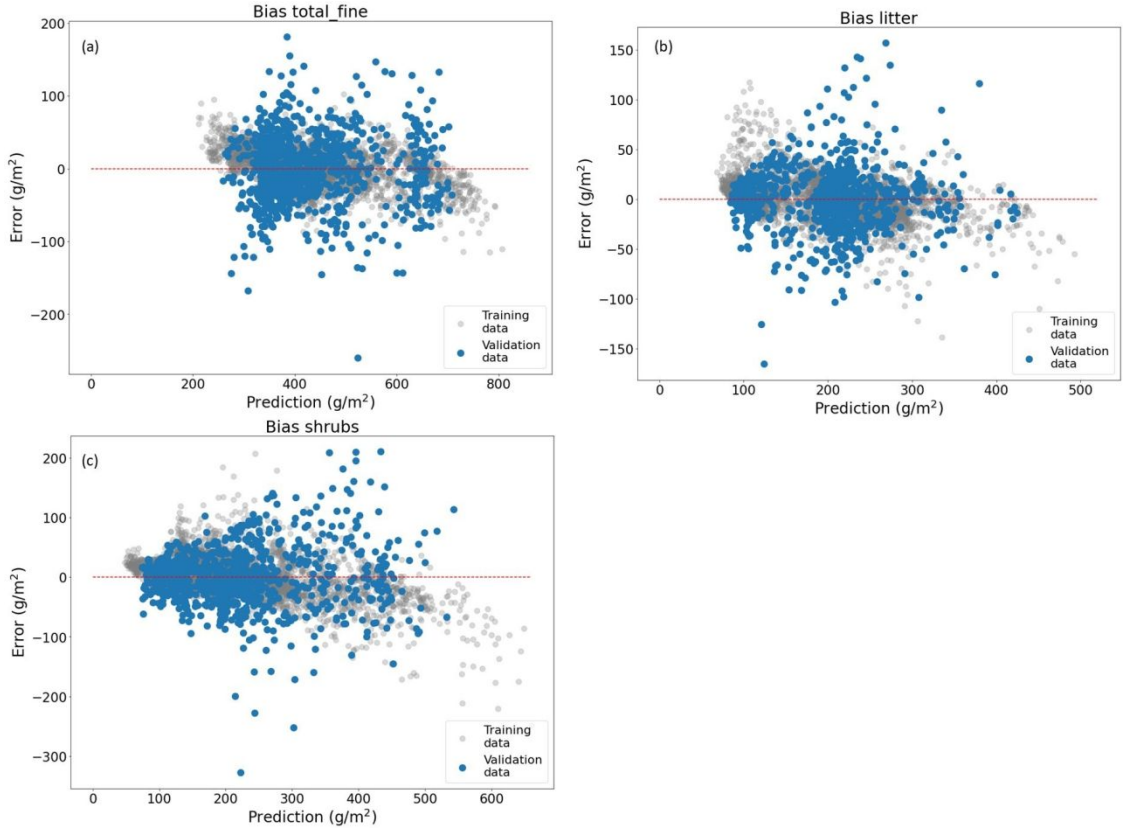


Figure S5. UAV RF model feature importance for (*a*) total fine fuel, (*b*) litter and (*c*) shrubs.

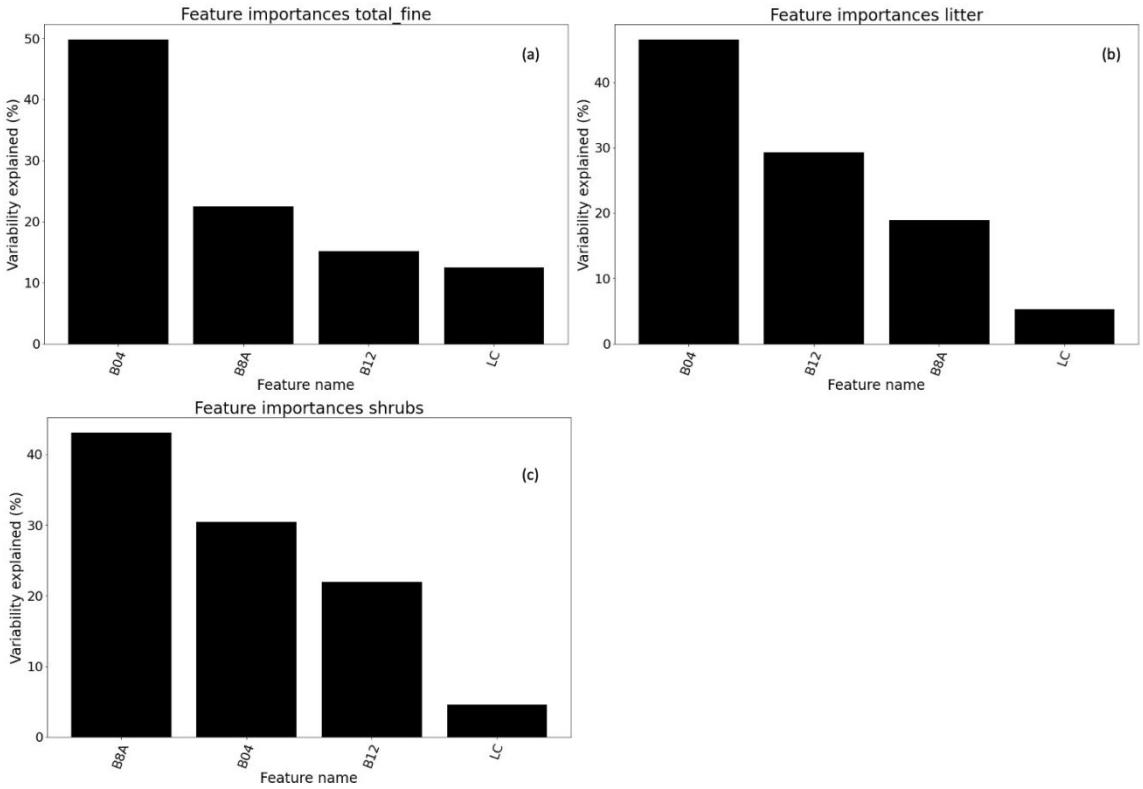
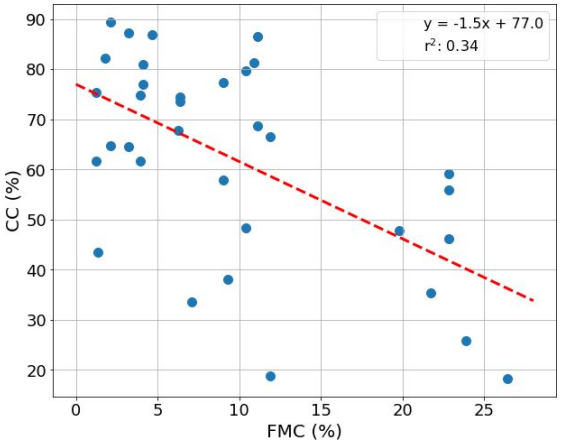


Figure S6. Relationship between fuel moisture content (FMC) and combustion completeness (CC) measurements for total fine fuel per plot in Zambian field measurements. Linear relationship and r^2 values are displayed in the top right corner.



Supplementary Material S5. Australian plots

Fuel load measurements from savanna regions in (semi-)arid northern Australia that were also included in the biomass model are shown in Fig. S7. Fuel load transects in this region were 100 m. This difference in length reflects the greater sparsity of vegetation in Australian study areas and should not affect the outcomes significantly as transect features used were whole-transect averages or single figures for the transect area. There were 66 transects laid in Australia, 37 in the EDS and 29 in the LDS in 2022.

Figure S7. Distribution of plots in northern Australia across study sites in Lajamanu (Northern Territory) and the Great Sandy Desert (Western Australia). Early dry season plots have blue markers, and late dry season plots have red. All plots in Australian study sites were laid in 2022.