**Supporting Figures**

**Supporting Figure S1** (not shown, see attached file “FigS1”).Palmspecies accumulation curves per transect, shown for all nine regions in the western Amazon basin.

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**Supporting Figure S2.** Relationships between other soil variables and exchangeable bases (Ca+Mg+K) in 96 transects in the western Amazon basin. Colours refer to the nine different regions shown in Figure 1.

**Supporting Figure S3** (not shown, see attached file “FigS3”)**.** Responses of 61 palm taxa to exchangeable bases (Ca+Mg+K), phosphorus, and boron, fitted using extended Huisman-Olff-Fresco models: (II) monotonic (red), (III) plateau (green), (IV) symmetric (blue), (V) unimodal skewed (brown), (VI) bimodal with two equal optima (magenta), (VII) bimodal with unequal optima (pink). No species fit best to eHOF model I (no response). The lower horizontal boxplot (y=0) represents absences and the upper boxplot represents occurrences of the respective species along the gradient. Roman numerals in parenthesis and colour of the fitted line indicate the most appropriate eHOF model selected according to the Akaike Information Criterion corrected for small sample sizes and a bootstrap approach (999 permutations).

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**Supporting Figure S4.** (a) Optimum response of 61 palm taxa to exchangeable bases in the western Amazon basin. Orange dots show species with a unimodal negative skewed response to exchangeable bases (eHOF model V; n=11); grey dots show species with no skew (eHOF models II, III, IV, VI, and VII; n=32); dark cyan dots show species with a unimodal positive skewed response (eHOF model V; n=18). (b) Box-and-whisker plots showing the median (thick line), distributional quartiles and distributional ranges along the exchangeable bases gradient for species with a negative skew (n=11), no skew (n=32), and positive skew (n=18). Groups with different letters are statistically different according to Welch's *t*-test comparisons for unpaired samples. For unabbreviated species names, see Table S9 in Supporting Information.

**Supporting Figure S5** (not shown, see attached file “FigS5”)**.** Palm abundance as a function of the concentration of exchangeable bases in the soil, for species found in less than half of the regions. Note log-transformed x axis.

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**Supporting Figure S6.** Soil cation concentration in 96 transects in the western Amazon basin. Soils with a Calcium (Ca) concentration < 1 cmol(+)/kg were classified as poor, those with Ca concentration ≥1 cmol(+)/kg as rich.