Appendix S1: Supporting information for the method section (Tables S1, S2, S3, S4; Figures S1, S2, S3)

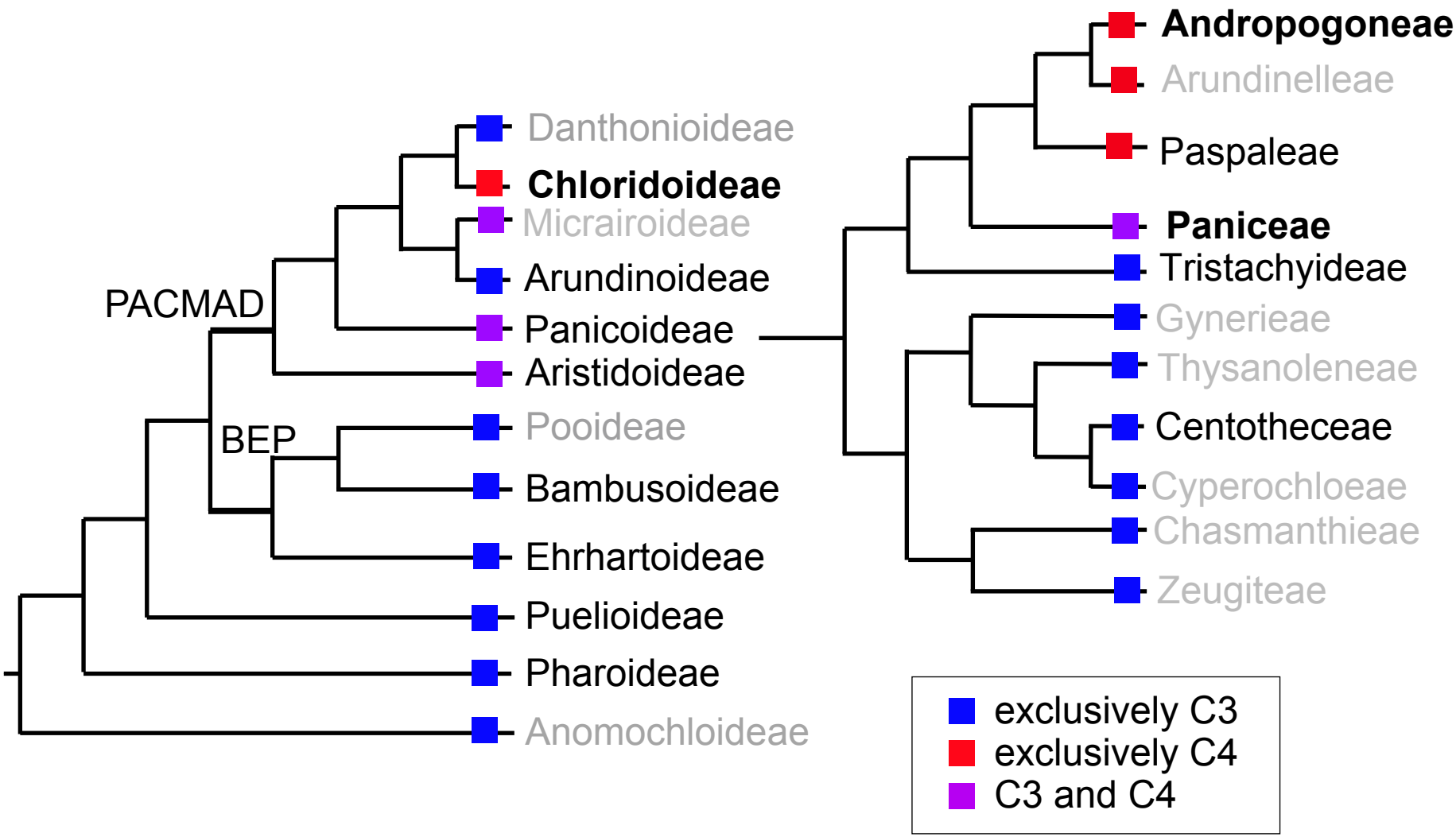


Figure S1. Cladogram of the phylogenetic relationship between the subfamilies of Poaceae and the tribes within Panicoideae. Subfamilies in black are present in our dataset, in grey are absent. In bold are highlighted the groups examined more in details. The coloured squares indicate the photosynthetic pathway present within the lineage. The subfamilies relationships are derived from the Angiosperm Phylogeny website (ww.mobot.org/MOBOT/research/APweb/). The tribal relationships within Panicoideae and the photosynthetic types are derived from Morrone et al (2012) and Sanchez-Ken & Clark (2010).

Table S1: Ecoregions of Olson *et al.* (2001) including biome and realm names. The first column correspond to the classes used in the study.

New ecosystem class description (see Fig. 1)	Olson (2011)					
	ECO_ID	ECO_NAME	BIOME_ID	BIOME_NAME	REALM	REALM_NAME
Desert	80905	Saharan halophytics	9	Tropical Flooded Grasslands and Savannas	PA	Palearctic
Desert	81304	Atlantic coastal desert	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Desert	81321	North Saharan steppe and woodlands	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Desert	81327	Sahara desert	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Desert	81329	South Saharan steppe and woodlands	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Desert	81331	Tibesti-Jebel Uweinat montane xeric woodlands	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Desert	81332	West Saharan montane xeric woodlands	13	Tropical Deserts and Xeric Shrublands	PA	Palearctic
Sahelian savanna	30713	Sahelian Acacia savanna	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Sudanian savanna	30705	East Sudanian savanna	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Sudanian savanna	30722	West Sudanian savanna	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Forest-savanna mosaic	30707	Guinean forest-savanna mosaic	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Forest-savanna mosaic	30710	Mandara Plateau mosaic	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Forest-savanna mosaic	30712	Northern Congolian forest-savanna mosaic	7	Tropical and subtropical grasslands, savannas, and shrublands	AT	Afrotropic
Forest-savanna mosaic	31010	Jos Plateau forest-grassland mosaic	10	Tropical Montane Grasslands and Shrublands	AT	Afrotropic
Forest	30102	Atlantic Equatorial coastal forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30103	Cameroonian Highlands forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30106	Cross-Niger transition forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30107	Cross-Sanaga-Bioko coastal forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30111	Eastern Guinean forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30114	Guinean montane forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30121	Mount Cameroon and Bioko montane forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30122	Niger Delta swamp forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30123	Nigerian lowland forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30124	Northeastern Congolian lowland forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30126	Northwestern Congolian lowland forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	30130	Western Guinean lowland forests	1	Tropical and Subtropical Moist Broadleaf Forests	AT	Afrotropic
Forest	31401	Central African mangroves	14	Mangroves	AT	Afrotropic
Forest	31403	Guinean mangroves	14	Mangroves	AT	Afrotropic
N/A	30903	Inner Niger Delta flooded savanna	9	Tropical Flooded Grasslands and Savannas	AT	Afrotropic
N/A	30904	Lake Chad flooded savanna	9	Tropical Flooded Grasslands and Savannas	AT	Afrotropic

Table S2. Acronyms of the environmental layers.

Acronyms	Names
AI	Global aridity index (mean annual precipitation - mean annual PET)
alt	Altitude
bio1	Annual mean temperature
bio2	Mean diurnal range (mean of monthly (max temp - min temp))
bio3	Isothermality (P2/P7)(*100)
bio4	Temperature seasonality (standard deviation *100)
bio5	Max temperature of warmest month
bio6	Min temperature of coldest month
bio7	Temperature annual range (P5-P6)
bio8	Mean temperature of wettest quarter
bio10	Mean temperature of warmest quarter
bio11	Mean temperature of coldest quarter
bio12	Annual precipitation
bio13	Precipitation of wettest month
bio14	Precipitation of driest month
bio16	Precipitation of wettest quarter
bio17	Precipitation of driest quarter
bio19	Precipitation of coldest quarter
PET	Global potential evapo-transpiration
Tcov	Tree cover continuous fields
Note: bio9, bio15 and bio18 were discarded due to their abnormal patterns in our study region	
bio9	Mean temperature of driest quarter
bio15	Precipitation seasonality (Coefficient of variation)
bio18	Precipitation of warmest quarter

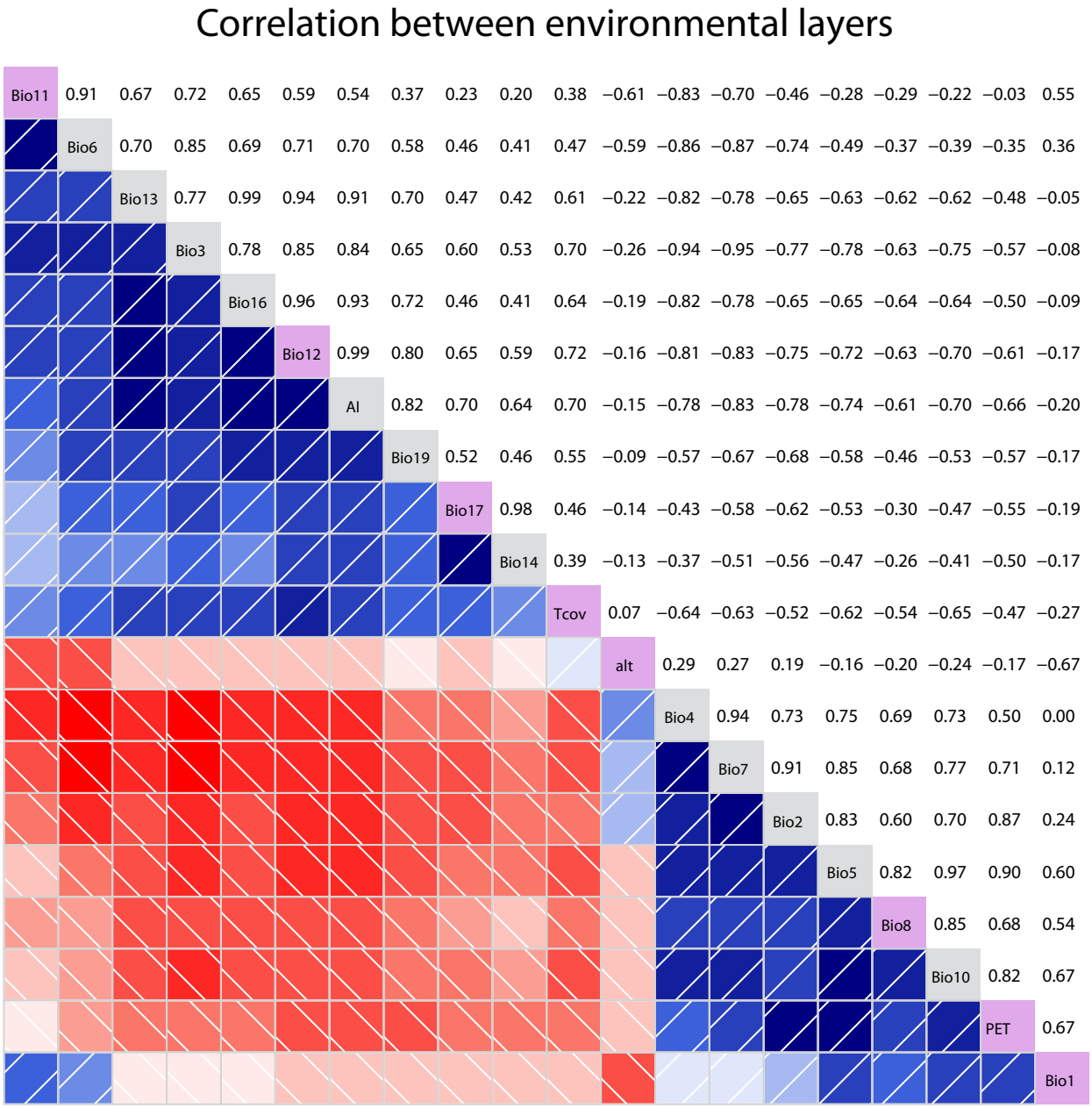
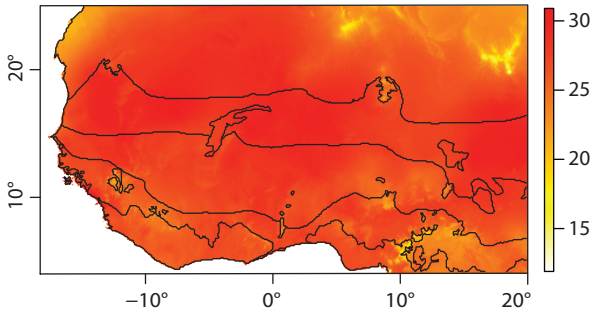
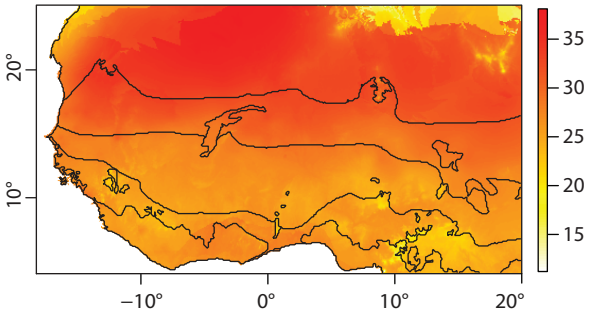


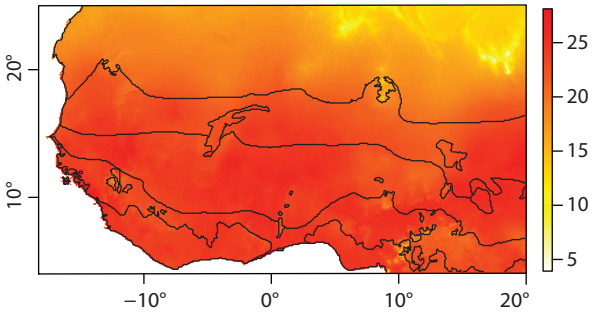
Figure S2. Pairwise Pearson's correlation coefficients (*r*) for the 20 environmental layers listed in Table S2. Colours indicate the direction (blue: positive; red: negative) and the intensity (dark: high; light: low) of the correlation. Eight variables (highlighted in pink) with low pairwise correlation (Pearson's r <= 0.72) were chosen for the niche modelling analyses. Those variables are: alt - Altitude, Bio1 - mean annual temperature, Bio8 - mean temperature of wettest quarter, Bio11 - mean temperature of coldest quarter, Bio12 - mean annual precipitation, Bio17 - mean precipitation of driest quarter, PET - global potential evapo-transpiration, Tcov - tree cover.



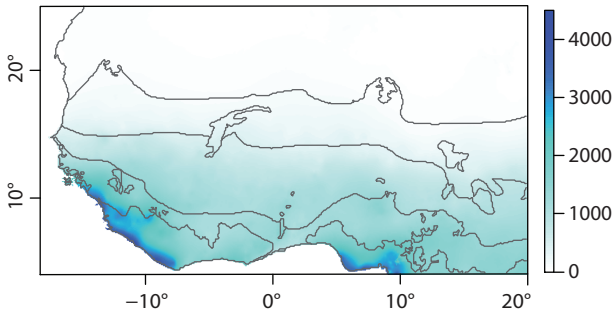
Bio1 - Mean annual temperature [°C]



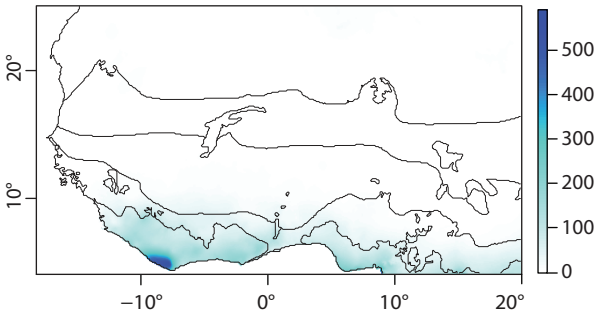
Bio8 - Mean temperature of the wettest quarter [°C]



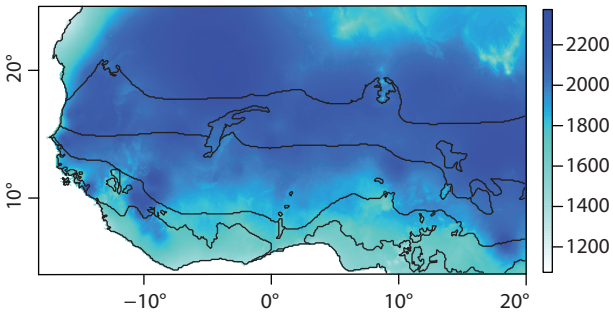
Bio11 - Mean temperature of the coldest quarter [°C]



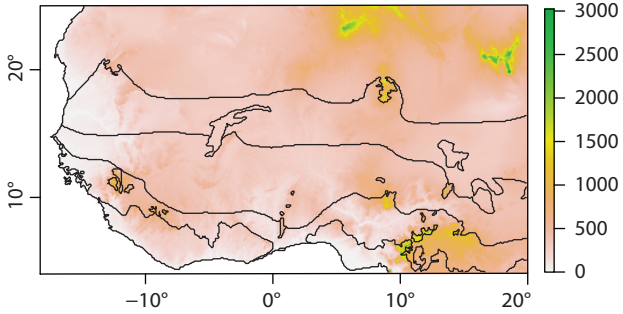
Bio12 - Mean annual precipitation [mm]



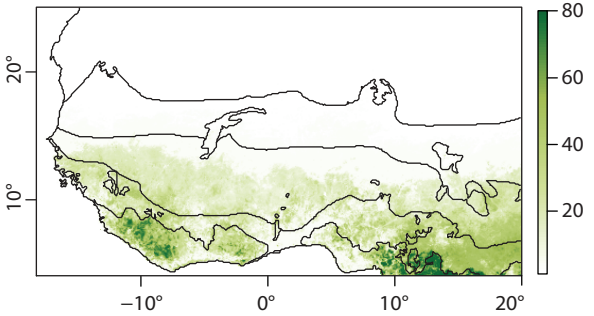
Bio17 - Precipitation of the driest quarter [mm]



PET - Potential evapo-transpiration [mm]



ALT - Altitude [m]



Tcov - Continuous tree cover [%]

Figure S3. Geographic patterns of the eight environmental layers used to model species distributions.

Table S3: Origin and number of the occurrence points. Emphasizing the importance of each database and herbarium. The colum "Records" shows all available data, the column "Used records" shows the number of records that were subsequently used in the species distribution modelling.

	Institution	Dataset/Institution code	Records	Used records**
Own data	CIRAD	Flotrop	76 751	27 588
	Senckenberg Research Institute	West African vegetation database	17 675	2574
	Senckenberg Research Institute	FR (SeSam)	2750	1233
	Conservatoire et Jardin botaniques de la Ville de Genève	SIG-Ivoire	5498	2252
	Université de Ouagadougou	OUA	2442	1226
	Royal Botanic Gardens Kew, Museum national d'Histoire naturelle Paris	K, P	271	208
	TOTAL		**105 387**	**35 081**
GBIF*	Netherlands Centre for Biodiversity Naturalis section National Herbarium of the Netherlands	L	3970	1389
	Museum national d'histoire naturelle et Reseau des Herbiers de France	MNHN	1530	1033
	Herbarium of the University of Aarhus	AAU	1709	783
	Bioversity International	ETH013, GBR016, IND002, PHL001	526	399
	US National Plant Germplasm System	USA016, USA020, USA029, USA970	275	96
	Missouri Botanical Garden	MO	75	63
	Conservation International	Conservation International	56	46
	GBIF-Spain	MA	8	7
	Royal Botanic Gardens Kew	K	8	7
	GBIF-Sweden	S, UPS	3	3
	Botanic Garden and Botanical Museum Berlin-Dahlem	BGBM	2	1
	Herbier National de Mauritanie	ENS	8	2
	Australian National Herbarium	CANB	1	1
	Natural History Museum Vienna - Herbarium W	W	2	1
	TOTAL		**8173**	**3831**
	TOTAL		**113 560**	**38 912**

* Accessed trough the GBIF Data Portal, data.gbif.org, 2010-12-09

** Keeping only 1 record per species per grid cell, and species with a minimum of 10 records

Table S4. Species numbers in the different taxonomic and functional groups. Highlighted in bold are the three taxonomic groups focused on in this study.

			Phothosynthesis							**Life Cycle**			**Height [cm]**	
Subfamily	**Tribe**	**Species number**	**C3**	**C4**	**NADP-ME**	**NAD-ME**	**NAD-ME or PCK**	**PCK**	**No Data**	**Annual**	**Perennial**	**Am-biguous**	**Short**	**Tall**
Aristidoideae	Aristideae	13		4	9					5	7	1	12	1
Arundinoideae	Arundineae	3	3							1	2		1	2
Bambusoideae	Bambuseae	1	1								1			1
Bambusoideae	Olyreae	1	1								1			1
Chloridoideae	**Chlorideae**	**34**		**18**		**8**		**8**		**21**	**10**	**3**	**31**	**3**
Chloridoideae	**Eragrostideae**	**24**		**13**		**7**		**4**		**15**	**7**	**2**	**21**	**3**
Chloridoideae	**Zoysieae**	**14**				**3**	**1**	**5**	**5**	**7**	**7**		**12**	**2**
Centropodia clade		1		1							1		1	
Ehrhartoideae	Oryzeae	7	7							4	2	1	5	2
Ehrhartoideae	Streptogyneae	1	1								1			1
Panicoideae	**Andropogoneae**	**90**			**90**					**32**	**57**	**1**	**30**	**60**
Panicoideae	Centotheceae	1	1								1		1	
Panicoideae	**Paniceae**	**92**	**13**		**38**	**3**	**5**	**19**	**14**	**45**	**39**	**8**	**63**	**29**
Panicoideae	Paspaleae	5			5						5		4	1
Panicoideae	Tristachyideae	13		7	6					4	9		4	9
Pharoideae	Phareae	1	1								1		1	
Puelioideae	Guaduelleae	1	1								1		1	
Total		302	29	43	148	21	6	36	19	134	152	16	187	115