



## DRY FORESTS

Guide to inputting dry forest tree data  
into ForestPlots.net

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# Background

The ForestPlots.net field and database protocols for dry tropical vegetation have been developed with the support of the Nordeste project (NERC Newton funding, 2016-2019).

Field protocols were developed collaboratively with research partners from Brazil and elsewhere who are experienced in plot sampling of Caatinga, dry forest, and Cerrado vegetation, also bearing in mind recommendations from colleagues who have worked across Africa, Australia, and South America in tropical dry vegetation. A key aim was to maximise comparability with other tropical dry and humid vegetation sites in South America, Africa, Asia, and Australasia. As always the conventions adopted are a balance between measuring vegetation and installing permanent plot infrastructure as completely as possible, while measuring sufficient stems, area, biomass, and diversity within the time and budget constraints of most plot-based field campaigns.

We worked at the Morro de Chapéu site (Bahia, Brazil), which has a range of dry vegetation types characterized by low canopies and dominance and high-density of often multiple-stemmed woody plants, as part of the Nordeste field campaign and training workshop in March 2017.

We recommend 0.5-ha plots (=100\*50m plots, with 10\*10m subplots). The high stem density and small size of trees made this a more practical option than attempting 1-ha plots, but clearly other plot sizes may be practical elsewhere.

We measure all stems >5cm diameter. The high stem density and small size of trees make this a more practical option than just sampling stems >10cm dbh, which would miss a large fraction of the woody diversity and biomass.

We measure stems at two POMs: at 1300mm and at 300mm to maximise comparability with other sites. With the data collected this way, eventually users will be able to apply plot-view routines to select by POM.

All stems that meet the >5cm criterion at EITHER height are measured. Thus, most stems are measured at both heights. Those stems >5cm at 0.3m but <5.0cm at 1.3m are only measured at the lower POM. We use standard RAINFOR protocols to adjust POM if the point was deformed. All POMs are marked with spray paint.

We aim to record diameters, POMs, and flag1 codes at the tree and stem level. X/Y coordinates, height, liana infestation index and canopy illumination index are only recorded at the tree level but clearly height, LII and CI could be recorded at stem level if time permits.

Trees branching below 0.3m are treated as having two or more stems (code 'h'), this provides a single 'stem tag group' for us in the database protocol (see next section)

Trees branching below 1.3m but above 0.3m are not coded 'h', but rather each such branch is measured at 1.3m. Thus, we flag stems as 'h' only if branching below 30cm.

# Overview

Dry Forests typically contain many multi-stemmed trees and stem diameters are measured at 1.3m and can also be measured at an 'extra' point of measure (0.3m), depending on the field protocol adopted. Additional fields have been created in ForestPlot.net to support the upload of dry forest stem by stem data.

Additional fields for 'Dry Forest' plots:

Header	Description	Unit /Format
New stem grouping	For multi-stemmed trees. Although developed specifically for dry forests, the 'New stem grouping' can also be used for multi-stemmed trees of any forest type.	Use a unique identifier for multiple stems of the same tree
Extra D	Refers to Extra diameter measurements Eg basal measurements (usually at POM=300mm). For Dry Forests only.	(mm) May be left blank
Extra POM:	Extra Point of Measure for Extra D eg basal measurements (usually at POM=300mm). For Dry Forests only.	(mm) Integer. May be left blank
CD1 & CD2 (Crown diameter – orthogonal):	Crown diameter 1 (CD1 is measured orthogonal to CD2, i.e. at a direction this is at right-angles to CD2). For Dry Forests only.	(m) Optional measurement

## Key Steps

This section highlights the key steps needed to upload dry forest data into ForestPlots.net and should be used together with our videos and guides on uploading a new plot or a new tree census from any forest type to ForestPlots.net:

- ForestPlots Upload Training Videos available at: <http://www.forestplots.net/en/resources/upload>
- ForestPlots Manual, Section 5.13 Import Plot (p151-171) [http://www.forestplots.net/upload/ManualsEnglish/ForestPlotsManualApril112016\\_sm.pdf](http://www.forestplots.net/upload/ManualsEnglish/ForestPlotsManualApril112016_sm.pdf) ,

## STEP 1 – Tick 'Is Dry Forest'

To upload dry forest data, make sure 'Is Dry Forest' is ticked in the 'Forest Type' panel during data import. This will 'activate' the additional dry forest fields.



The screenshot shows the 'Import Plot: New Plot Details' form. The 'Forest Type' section is highlighted in blue and contains several dropdown menus: Forest Moisture, Forest Elevation, Forest Edaphic Type, Forest Composition, Substrate Geology, Forest Status, and Savannah Status. The 'Is Dry Forest' checkbox is checked, and a blue question mark icon is visible next to it. A 'NEXT' button is located at the bottom of the form.

Fig1: Ticking 'Is Dry Forest' will 'activate' the dry forest fields for upload.

## STEP 2 – New Stem Grouping:

Use a unique identifier for multiple stems of the same tree on your upload excel sheet. Each row represents a single stem. All stems from the same tree are given the same 'stem tag grouping' code (this can be anything you like, eg numbers, letters or combination of numbers and letters).

When the excel sheet is uploaded, the system will link all stems with the same 'Stem tag grouping' and when a new field sheet is generated or plot dump created, this column will be allocated the tag number of the largest stem (largest DBH) from all the linked stems. The allocated 'stem tag grouping' after upload will therefore differ from that originally uploaded.

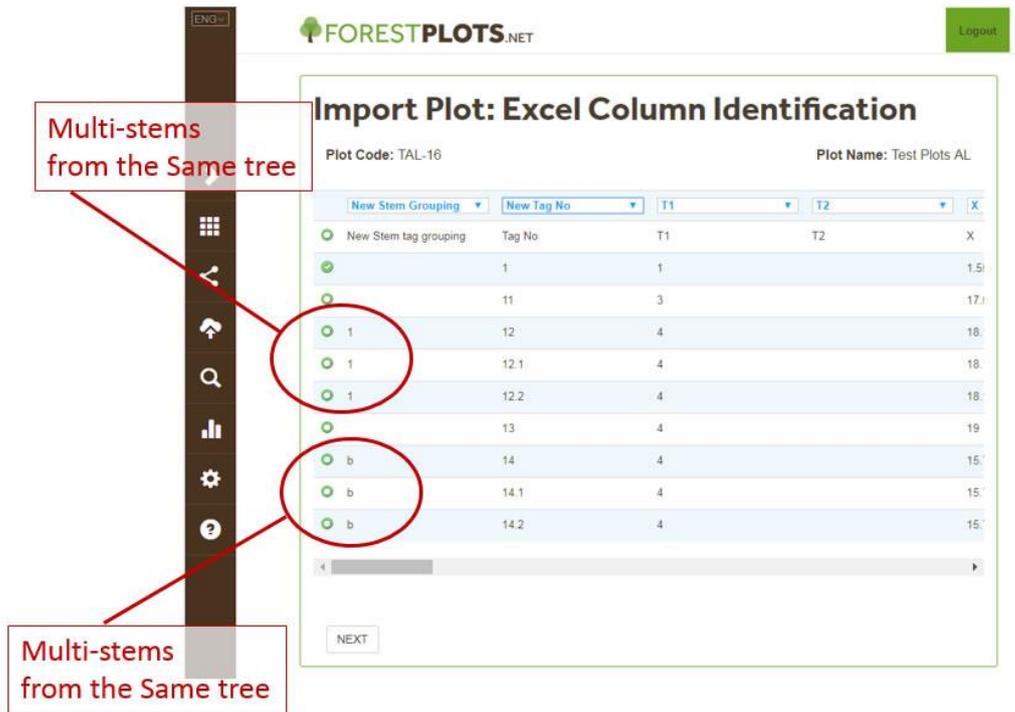


Fig 2: **Data Upload:** Stem Tag Grouping code on data import can be anything (eg number(s) or/& letter(s))

Largest Stem

Stem Tag Grouping = Tag number of the largest linked stem

Tree ID	stem tag	Tag No	T1	T2	X	Y	Family	Species	DBH0	DBH1	DP
1890109	1	1			1.55	2.35	Olacaceae	Heisteria indet	999	100	
1890118	11	3			17.55	1.45	Annonaceae	Trigynaea duc	111	111	
1890120	12.1	4			18.12	2.2	Olacaceae	Heisteria indet	131	131	
1890121	12.1	4			18.12	2.2	Olacaceae	Heisteria indet	201	201	
1890123	12.1	4			18.12	2.2	Olacaceae	Heisteria indet	102	102	
1890123	13	4			19	7.4	Meliaceae	Guarea glabra	118	118	
1890124	14	4			15.7	12.8	Urticaceae	Pourouma gui	405	405	
1890125	14	4			15.7	12.8	Fabaceae	Inga tessmann	185	185	
1890126	14	4			15.7	12.8	Urticaceae	Pourouma gui	101	101	
1890127	14	4			15.7	12.8	Urticaceae	Pourouma gui	201	201	
1890128	14	4			15.7	12.8	Urticaceae	Pourouma gui	191	191	
1890129	15	4			20	12	Sapotaceae	Pouteria torta	145	145	
1890131	17	5			18.6	16.55	Arecaceae	Euterpe precal	131	131	
1890132	18	5			15.6	16.3	Arecaceae	Euterpe precal	131	131	
1890133	18	5			14.25	18.2	Arecaceae	Oenocarpus bi	131	131	
1890137	2	6			2.35	3.4	Apocynaceae	Aspidosperma	131	131	
1890138	21	6			8.3	14.6	Fabaceae	Apuleia leiocar	353	353	
1890139	22	6			8.3	14.95	Fabaceae	Tachigali poly	105	105	
1890119	25	3			1	2	Nyctaginaceae	Neea indet	229	229	
1890130	21	4			3.5	4.5	Ulmaceae	Ampelocera ve	267	267	
1890134	27	5					Indet	Indet indet	115	115	
1890115	454	2					Fabaceae	Apuleia leiocar	115	115	

Fig 3. **Plot Dump:** The system redefines the Stem Tag Grouping code as the tag number of the largest stem (largest DBH) from all the linked stems

## STEP 3 – D, POM, Extra D and Extra POM

- **NB: D and POM cannot = NULL**
- D and POM refer to the measurement at 1300mm (or moved for deformity/buttress, standard RAINFOR protocol).
- Extra D and Extra POM refer to Extra diameter measurements Eg basal measurements (usually at POM=300mm).
- Enter POM=0 if POM is not recorded or if the tree is dead. Enter POM=9999 if POM is not recorded but certainly >1300mm.

### **If the field protocol uses a single POM:**

- If the field protocol calls for measurements at POM ~ 1300 only, then use D and POM only and leave Extra D and Extra POM blank.
- If the field protocol calls for measurements at POM ~ 300 only, then enter the measurements in Extra D and Extra POM columns and enter 0 for D and POM.

### **If the field protocol uses 2 POMs (eg at POM=1300 and Extra POM=300):**

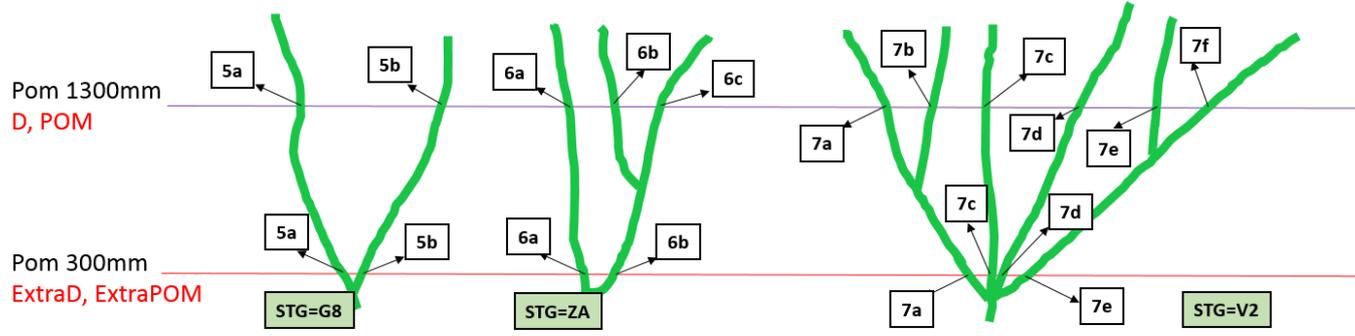
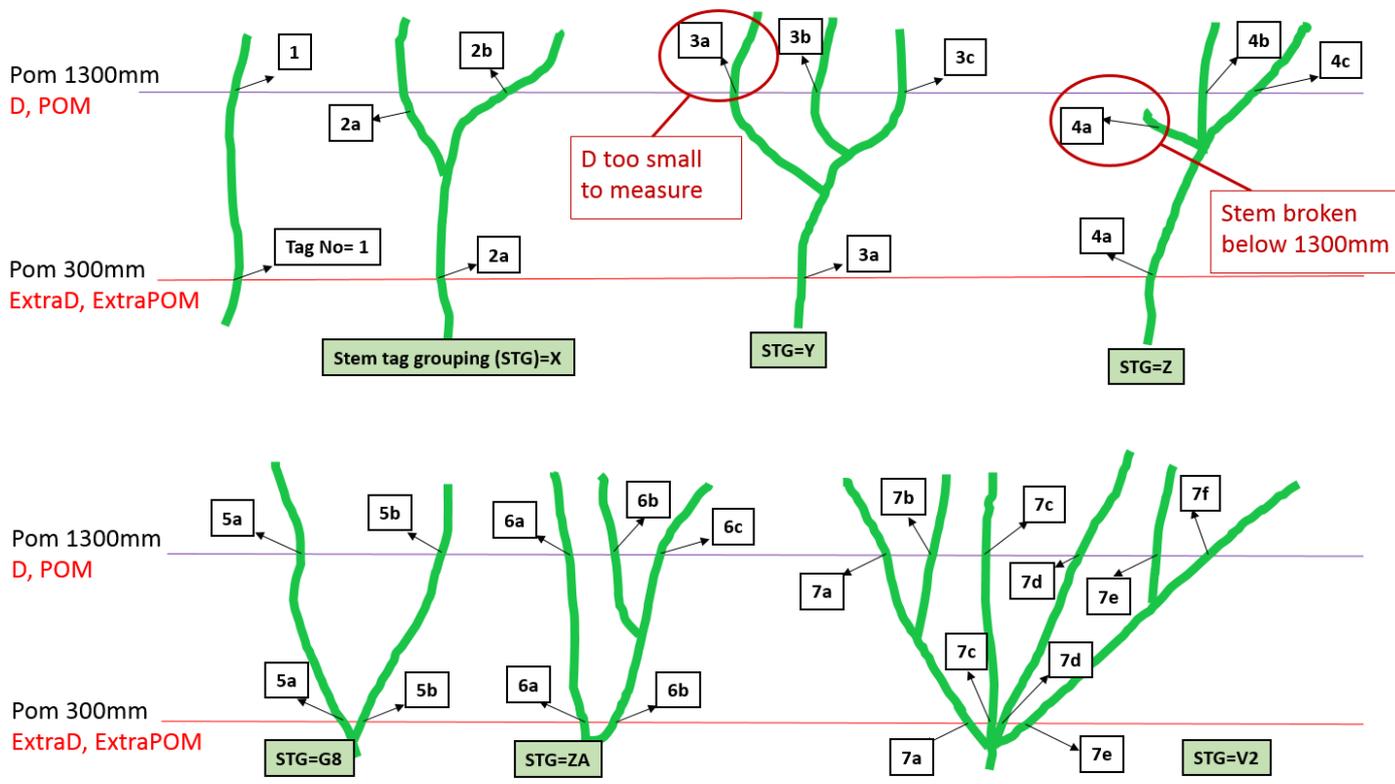
Enter any D= NULL values as 0.

- These will be stems that are too small to measure at POM=1300 but were large enough to measure at Extra POM=300, (see Fig 4, Tag No=3a below as an example)
- or stems that have snapped below POM=1300, if so then please use flag1=k (see Fig 4, Tag No=4a below as an example)

Leave any Extra D and Extra POM NULL values as blank

- These will be stems that have branched above Extra POM=300

**Fig 4.** Diagrammatic representation of different multiple stemmed trees showing position of POM, D, Extra POM, Extra D. Stem Tag Grouping (STG) and Tag Number. Please see the table below for an example of the tree data represented in the diagram.



Stem tag grouping	Tag No	T1	T2	X	Y	D	POM	Extra D	Extra POM
	1					100	1300	122	300
X	2a					100	1300	100	300
X	2b					100	1300		
Y	3a					0	0	120	300
Y	3b					125	1300		
Y	3c					102	1300		
Z	4a					0	0	249	300
Z	4b					201	1300		
Z	4c					199	1300		
G8	5a					156	1300	160	300
G8	5b					136	1300	142	300
ZA	6a					201	1300	220	300
ZA	6b					100	1300	109	300
ZA	6c					100	1300		
V2	7a					150	1300	158	300
V2	7b					147	1300		
V2	7c					162	1300	165	300
V2	7d					128	1300	152	300
V2	7e					132	1300	142	300
V2	7f					129	1300		

## STEP 4- CD1 & CD2

CD1 & CD2 (Crown diameter -orthogonal): Crown diameter 1 (CD1 is measured orthogonal to CD2, i.e. at a direction this is at right-angles to CD2).

## STEP 5- Flag 1

Please note that for alive normal multi-stemmed trees, Flag 1=ah