

Table S1: Measurement parameters and devices for field data collection

Parameter	Equipment/ Method
Hyperspectral data	ASD FieldSpec / SpectralEvolution
Aerosol optical thickness	Sun photometer
Column of water vapor	Sun photometer
Cloud coverage	Digital camera
Landscape photos	Digital camera
Fractional vegetation cover	Digital camera
Prop. of senescent material	Digital camera
Fractional vegetation cover	Estimate
Prop. of senescent material	Estimate
Canopy height	Folding ruler / Photo with board
Leaf Area Index	LI-COR LAI-2200
Biomass (all)	Gravimetical
Leaf chlorophyll content	SPAD-502Plus
Soil moisture	HH2 moisture meter
Soil moisture	Gravimetical
Soil roughness	Pin profiler
Orientation of planting rows	Compass
Row spacing	Folding ruler
Stems per plant	Counting
Phenology	BBCH-scale

Table S2: Data fields and formats of collected parameters in ESRI Survey123. Following types in alphabetic order are used: **dateTime** uses automatic calculation of recent date and time; **decimal** represents floating number inputs; **file** enables users to upload a local file to the survey; **hidden** type is for internal use, meaning content is not presented to the end-user; **image** connects ESRI survey123 with device internal camera; **integer** limits input to integer numbers; **note** represents a message to the user that is not modifiable; **select_one** type is a customized single choice list; **text** enable the input of single words and phrases.

label	type
Field Number	select_one Field
ESU	select_one ESU
SSU [Letter or Number]	select_one SSU
Latitude [Decimal Degrees]	decimal
Longitude [Decimal Degrees]	decimal
Horizontal Accuracy [Meters]	hidden
Planting Direction [Degrees]	decimal
Campaign Informations	
Crop Type	select_one CropType
Custom crop type	text
Campaign Number	integer
University Name	select_one UniversityName
Shortcut	text
Photo North	image
Photo East	image
Photo South	image
Photo West	image
Sky Photo	image
Pin Profiler	
Photo with plant orientation	image
Photo orthogonal to plant orientation	image
Date and Time [Start]	dateTime
Fractional Vegetation Cover (FVC) + Proportion of senescent Material (PSM)	
Number of present students	select_one FVCPSMStudentsNumber
FVC [1] - estimation by 1st Student [%]	integer
PSM [1] - estimation by 1st Student [%]	integer
FVC [2] - estimation by 2nd Student [%]	integer
PSM [2] - estimation by 2nd Student [%]	integer
FVC [3] - estimation by 3rd Student [%]	integer

PSM [3] - estimation by 3rd Student [%]	integer
FVC [4] - estimation by 4th Student [%]	integer
PSM [4] - estimation by 4th Student [%]	integer
FVC [5] - estimation by 5th Student [%]	integer
PSM [5] - estimation by 5th Student [%]	integer
FVC [Advisor] - estimation by advisor [%] [optional]	integer
PSM [Advisor] - estimation by advisor [%] [optional]	integer
FVC final [%]:	note
PSM final [%]:	note
Photo Nadir	image
Phenology	
Number of present students	select_one BBCHStudentsNumber
BBCH - 1st Student	integer
BBCH - 2nd Student	integer
BBCH - 3rd Student	integer
BBCH - 4th Student	integer
BBCH - 5th Student	integer
BBCH - Advisor	integer
BBCH - Minimum	integer
BBCH - Median	decimal
BBCH - Maximum	integer
BBCH - Final	integer
Canopy Height	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [Canopy]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [Canopy]	hidden
M1 - Canopy Height [cm]	integer
M2 - Canopy Height [cm]	integer
M3 - Canopy Height [cm]	integer
M4 - Canopy Height [cm]	integer
Canopy Height - average [cm]:	note
Measuring Tool available?	select_one Measuringboard
Canopy Height Photo 1	image
Canopy Height Photo 2	image
Fresh Biomass	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [wetbio]	hidden

Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [wetbio]	hidden
Amount of stems in the frame	decimal
Number of rows in the frame	decimal
Number of rows in 1 meter	decimal
Number of stems harvested	decimal
ID of bag	text
Weight biomass field	decimal
Chlorophyll Content (10 Measurements)	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [Chlorophyll]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [Chlorophyll]	hidden
M1 - Chlorophyll Content [SPAD]	decimal
M2 - Chlorophyll Content [SPAD]	decimal
M3 - Chlorophyll Content [SPAD]	decimal
M4 - Chlorophyll Content [SPAD]	decimal
Average (Top) - Chlorophyll Content	note
M5 - Chlorophyll Content [SPAD]	decimal
M6 - Chlorophyll Content [SPAD]	decimal
M7 - Chlorophyll Content [SPAD]	decimal
Average (Middle) - Chlorophyll Content	note
M8 - Chlorophyll Content [SPAD]	decimal
M9 - Chlorophyll Content [SPAD]	decimal
M10 - Chlorophyll Content [SPAD]	decimal
Average (Low) - Chlorophyll Content	note
Chlorophyll Content- average [SPAD]:	note
Device name	select_one DeviceNameChloro
Soil & LAI survey	
Soil Moisture	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [Soil Moisture]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [Soil Moisture]	hidden
Number of measurements	select_one soilmoistmeasurements
Soil Moisture Sampling	

[1] - Voltage [mV]	decimal
[1] - Soil Moisture [%Vol]	decimal
[2] - Voltage [mV]	decimal
[2] - Soil Moisture [%Vol]	decimal
[3] - Voltage [mV]	decimal
[3] - Soil Moisture [%Vol]	decimal
[4] - Voltage [mV]	decimal
[4] - Soil Moisture [%Vol]	decimal
[5] - Voltage [mV]	decimal
[5] - Soil Moisture [%Vol]	decimal
Voltage - average [mV]:	note
Volumetric water content - average [%Vol]:	note
select measurement for cylinder probe	select_one soilvaluecheck
Device Name	select_one DeviceNameSoil
Dry Cracks	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [Dry Cracks]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [DryCracks]	hidden
Maximum Widths [mm]	integer
Soil Sample Field (Cylinder)	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [Soil sample Field]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP
Minute Taker [Soil Sample Field]	hidden
Time	time
Estimated Plant Wetness	select_one plantwetness
Samplename	text
Moisture [mV]	note
Moisture [%]	note
Sample Ring Volume [cm³]	integer
Leaf Area Index (LAI)	
Select type of Measuring Person	select_one MPtype
Measuring Person [Name]	select_one_external MP
Measuring Person [LAI]	hidden
Select type of Minute Taker	select_one MPtype
Minute Taker [Name]	select_one_external MP

Minute Taker [LAI]	hidden
Sun exposure	select_one LAISun
Device Name	select_one DeviceNameLAI
Filename	text
LAI value	decimal
SEL-Value (Standard Error of LAI)	decimal
Spectrometry survey	
Spectrometer (SSU 1,3,5,7,9)	
Device Name	select_one DeviceNameSpectral
Selected Foreoptic	select_one SpectralForeOptics
Measurement type	select_one SpectralMeasurementType
White Reference 1	text
Upload White Reference 1	file
Filename 1 - 10	text
Upload File 1 - 10	file
White Reference 2	text
Upload White Reference 2	file
Comments	text
Photometer SSU5	
Device Name	select_one DeviceNameSunPhoto
Water Column [cm]	decimal
Sun-Distance Correction	decimal
Sun Zenith Angle	decimal
Pressure [mbar]	decimal
Air Mass	decimal
Temperature	decimal
AOT 340 [nm]	text
AOT 380 [nm]	text
AOT 440 [nm]	text
AOT 500 [nm]	text
AOT 675 [nm]	text
AOT 870 [nm]	text
AOT 936 [nm]	text
AOT 1020 [nm]	text
AOT 1640 [nm]	text