



CAPFITOGEN tools

Regional training workshop
'In situ conservation of CWR including diversity assessment techniques'
Le Meridien Ile Maurice, Mauritius, 10th –13th November 2014



UNIVERSITY OF
BIRMINGHAM





Programme to **strengthen national plant genetic resources capacities** in Latin Americas
<http://www.capfitogen.net/en/> <http://www.planttreaty.org/capfitogen>



Tools

Ecogeographical applications to facilitate germplasm conservation and use where resources for traditional characterization and evaluation are limited

CAPFITOGEN

Programme to Strengthen
National Plant Genetic
Resource Capacities
in Latin America

Version 1.2



What is Ecogeography?

The study of the adaptive scenario of a given individual, population or species through the analysis of biotic and abiotic factors that affect survival.

The study of environmental effects on the distribution of living organisms

Genet Resour Crop Evol
DOI 10.1007/s10722-011-9676-7

RESEARCH ARTICLE

Ecogeographical land characterization maps as a tool for assessing plant adaptation and their implications in agrobiodiversity studies

Mauricio Parra-Quijano · José M. Iriondo · Elena Torres

Theor Appl Genet (1990) 80:110–112

The use of ecogeographical data in the exploitation of variation from gene banks

J. P. Peeters¹, H. G. Wilkes^{1,*} and N. W. Galwey²

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Received November 25, 1989; Accepted February 9, 1990

Communicated by P.M.A. Tigerstedt

List of possible applications in PGR

COLLECTION

1. Optimized germplasm collecting
2. Detection of potential bias in previous collecting activities

IN-SITU CONSERVATION

3. Identification and evaluation of protected areas for in-situ conservation
4. Identification of suitable areas to establish genetic reserves
5. Identification of appropriate sites for “on farm” conservation

EX-SITU CONSERVATION, CHARACTERIZATION AND EVALUATION

6. Identification of appropriate sites for PGR regeneration/multiplication
7. Ecogeographical characterization of collecting sites
8. Maps of genotypic, phenotypic and/or eco-geographical diversity
9. Studies of the ecogeographical representativeness of the germplasm collections
10. Establishment of ecogeographical core collections
11. Environmental description of the germplasm characterization/evaluation sites
12. Enhancement of phenotypic and genotypic germplasm analysis

DOCUMENTATION AND IMPLEMENTATION

13. Improvement of documentation particularly regarding the georeferencing of collecting sites
14. Facilitate the use of germplasm through eco-geographical information systems, which provide useful information for the parental selection
15. Optimized utilization of germplasm. Focused Identification Germplasm Strategy (FIGS)



[NEWS](#) [PROGRAM](#) [TOOLS](#) [ACCESS](#) [WORKSHOPS](#) [CONTACT](#) [FORUM](#)

DOWNLOAD FROM INTERNET

CAPFITOGEN tools (latest update) available through an internet download

For any interested in use the CAPFITOGEN tools (completely in english), the latest version can be downloaded from Google Drive service.

The available version has the following improvements in addition to features included in version 1.0 (released in March 2013):

- Easier system installation

 Search

OUR LATEST NEWS

- CAPFITOGEN user's website: Opening!
10/20/2014
- New site for CAPFITOGEN tools
09/29/2014
- TesTable, new tool of CAPFITOGEN family
09/29/2014

Name	Date modified	Type	Size
4EF8F6D4	11/5/2014 12:16 PM	File	0 KB
testable1.RData	8/25/2014 11:02 AM	R Workspace	1 KB
tablaORIGCTY.RData	8/22/2014 2:17 PM	R Workspace	2 KB
copia.bat	4/22/2014 1:02 PM	Windows Batch File	1 KB
CAPFITOGEN.exe	4/22/2014 12:50 PM	Application	80 KB
Available cell size per workframe.xls	4/2/2014 5:36 PM	Microsoft Excel 97...	38 KB
lista.países.RData	3/31/2014 12:02 PM	R Workspace	3 KB
figvartotal.RData	2/6/2014 7:11 PM	R Workspace	4 KB
resol.RData	11/8/2013 11:55 AM	R Workspace	1 KB
puntos.RData	8/2/2013 1:06 AM	R Workspace	2,336 KB
tablavar.RData	5/28/2013 2:34 AM	R Workspace	1 KB
tablaGRIDres.RData	5/22/2013 1:42 PM	R Workspace	1 KB
edaph.RData	4/11/2013 11:47 AM	R Workspace	2 KB
mapamarlr.RData	3/1/2013 3:59 PM	R Workspace	108,928 KB
ID0.RData	2/26/2013 1:31 PM	R Workspace	118,881 KB
ListaPaísesMar.txt	2/26/2013 1:33 AM	Text Document	2 KB
bioclim.RData	2/23/2013 4:14 AM	R Workspace	2 KB
geophys.RData	2/23/2013 4:14 AM	R Workspace	1 KB
R-2.15.2-win.exe	2/9/2013 1:47 PM	Application	48,194 KB
jdk-7u13-windows-i586.exe	2/9/2013 1:09 PM	Application	90,875 KB
gadm2.txt	1/23/2013 2:52 PM	Text Document	28,261 KB
ADMlevel.txt	1/21/2013 10:51 AM	Text Document	7 KB
SUITQUALtableGLC2000.txt	1/20/2013 11:34 PM	Text Document	2 KB
glc2000.asc	1/20/2013 1:37 PM	ASC File	1,873,754 KB

39 items

Computer, Microsoft Excel 2010, SafeSync Folder, cover_opti..., Structure 2.3.4, Recycle Bin, Microsoft Outlook 2010, Skype, Dropbox, Trend..., ALZip, Microsoft PowerPoint, Software! 64bit F..., epon3275, vcl5, DiVa, Microsoft Word 2010, borIndmm..., HR4U, Google Earth, Mozilla Firefox, cc3250mt.dll, PPT for comunic..., InfoStat, R i386 3.0.2, CONVERT..., Predictive caracteriz..., Mendele Desktop, R x64 3.0.2, Copy of Export.xls, RStudio, CAPFITOGE... - Shortcut

CAPFITOGEN



The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



Herramientas
Tools
Outils

CAPFITOGEN v 1.2

Ejecutar / Launch / Exécuter

Salir / Exit / Sortir



MINISTERIO DE ASUNTOS EXTERIORES Y COOPERACION



Aecid



MINISTERIO DE ECONOMIA Y COMPETITIVIDAD



INIA
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria



GOBIERNO DE ESPAÑA



MINISTERIO DE AGRICULTURA, ALIMENTACION Y MEDIO RURAL

Windows taskbar icons: Start button, Internet Explorer, File Explorer, Microsoft Office Word, Microsoft Office Excel, Skype, a blank window icon, and Microsoft Office PowerPoint.

System tray icons: Network, Volume, Safely Remove Hardware, Windows Firewall, Windows Defender, Windows Update, and System Clock.

7:33 PM
11/12/2014



The International Treaty

ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



SELECCIONE SU IDIOMA
SELECT YOUR LANGUAGE
CHOISISSEZ VOTRE LANGUE
SELECCIONE SUA LÍNGUA



Español



English



Français



Portugués



The International Treaty

ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



SELECCIONE UNA HERRAMIENTA
SELECT A TOOL
SÉLECTIONNEZ UN OUTIL
SELECCIONE UMA FERRAMENTA

[TesTable](#)

[GEOQUAL](#)

[ELCmapas](#)

[ECO GEO](#)

[Representa](#)

[DIVmapas](#)

[CoINucleo](#)

[FIGS_R](#)

TestTable detects (and optionally corrects) problems and errors in your income tables, before using CAPFITOGEN tools.

Testable detects the following types of error:

- not matching fields
- Fields in wrong locations
- Empty cells
- "Ghost" columns and rows
- Incorrect date formats
- Incorrect format of decimal and sexagesimal coordinates
- Specific code format of passport data FAO-Bioversity 2012 (multi-crop passport descriptor)

Returns a file called TestTableAnalysis.txt

Note: does not improve the quality of your data

http://localhost:8080/TesTable/?locale=en

File Edit View Favorites Tools Help


Suggested Sites German English dictionar... Import to Mendeley Outlook Web App

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Tratado internacional

SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA



Tes Table

This is a tool to detect (and optionally to correct) problems and errors in your income tables, before using CAPFITOGEN tools. Author of the tool: Mauricio Parra Quijano, capfitogen@fao.org. International Treaty on Plant Genetic Resources for Food and Agriculture, 2014.

[User manual](#)

Path where the CAPFITOGEN tools are located. Note: use/ instead of . For example F:/, C:/CAPFITOGEN, D:/mytools/CAPFITOGEN, etc.

Passport Type of table to be analyzed

Type the name of the file containing the passport table in text format without forgetting to include the file extension (.txt). For example, if the file is named 'table', you should write 'table.txt'. Please remember that this file must first be saved in the "Pasaporte" folder, which is part of the set of folders of CAPFITOGEN tools.

1 How many accessions should have your table? (this question does not apply for 'VariableType' table)

Select this option if your table has previously been analyzed by GEOQUAL tool, therefore it includes five additional columns (COORQUAL, LOCALQUAL, SUITQUAL, TOTALQUAL and TOTALQUAL100). Only applies for 'Passport' type tables.

http://www.capfitogen.net/en/MCDpassportFormat_FAO_Bioversity_2012_modified.xls

GEOQUAL

Evaluates the quality of the geo-referencing at a given collecting site indicated in passport data

- Assigns a **quality value** to the passport data of a germplasm collection that include coordinates.
- User enters the passport data in **FAO-Bioversity MCPD** format.



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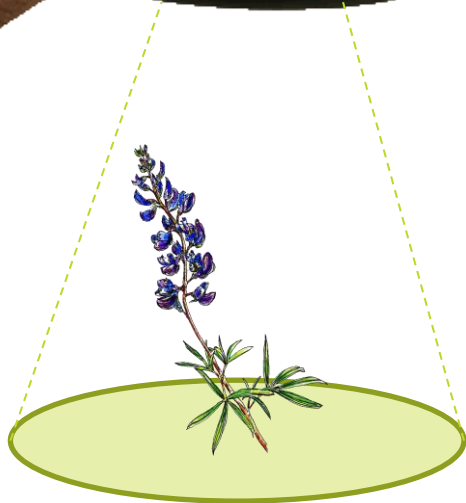
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SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA



GEOQUAL – quality of passport data

40° 20' 33.4" N
03° 11' 52.1" W





GEOQUAL

This application performs an evaluation of the quality of geo-referencing of the collecting sites described in the passport data. This means evaluating both the locations description and its coordinates. The passport data must be in the same format as FAO/Bioversity 2012 (which is very similar to FAO IPGRI 2001). You may use an Excel format which is to be found in the folder TablaPasaporteModelo. The assessment is carried out by determining three quality parameters (LOCALQUAL, COORQUAL and SUITQUAL), which are combined to give a single quality value called TOTQUAL100. TOTQUAL100 quality values range from 0 to 100, where 0 corresponds to cases with neither coordinates nor a location description (zero quality) and 100 is the optimum value. Author of the tool: Mauricio Parra Quijano, mauricio.parra@fao.org. International Treaty on Plant Genetic Resources for Food and Agriculture, 2013.

[Manual](#)

Path where the CAPFITOGEN tools are located. Note: use / instead of \. For example F:/, C:/CAPFITOGEN, D:/mytools/CAPFITOGEN, etc.

Type the name of the file containing the passport table in text format without forgetting to include the file extension (.txt). For example, if the file is named 'table', you should write 'table.txt'. Please remember that this file must first be saved in the "Pasaporte" folder, which is part of the set of folders of CAPFITOGEN tools.

You may choose whether to use high or low resolution maps to determine whether the coordinates for a collection site are in the sea and, if so, at what distance. High resolution may slow the process down in very large databases (over 15,000 accessions with coordinates).

Please indicate if you wish to use the LOCALQUAL parameter to evaluate georeferencing quality. LOCALQUAL is a parameter used to compare a locations description with the location drawn by GIS. If your data includes no location description or the description is only contained in the COLLSITE field, it is better to use this option.

Insert the path to the folder where the results of the analysis will be saved. Note: use / instead of \. For example C:/CAPFITOGEN, D:/mytools/CAPFITOGEN, etc.

Analyze

ELC maps

It allows the user to create eco-geographical land characterization maps (ELC), that reflect adaptive scenarios for a given species (or species groups) and a specific country or region



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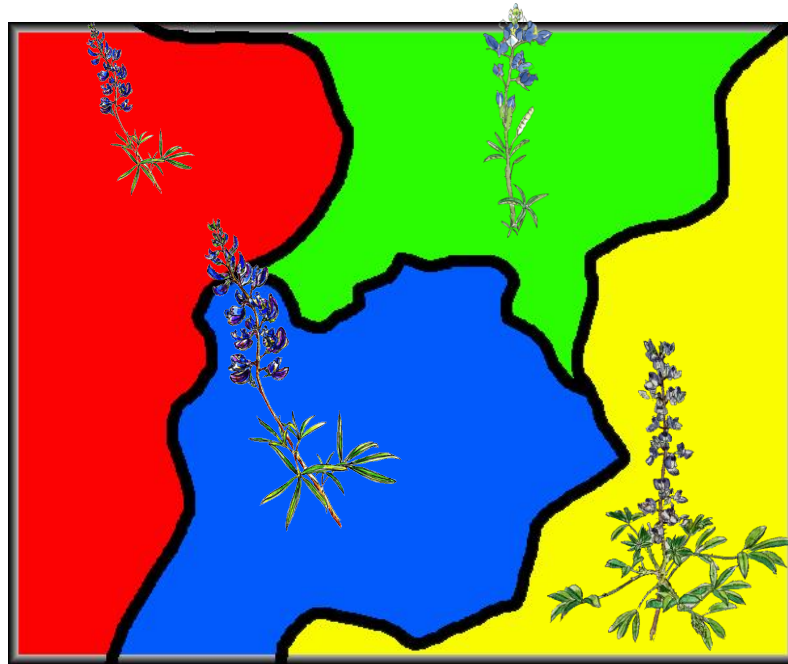


Tratado internacional

SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA

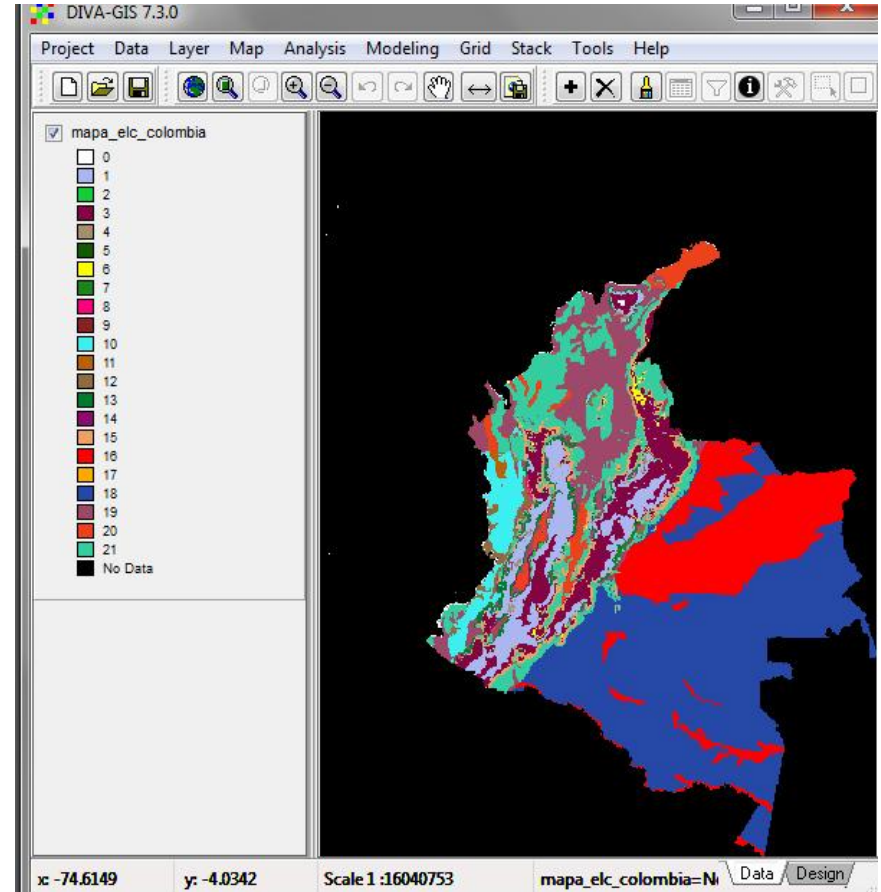
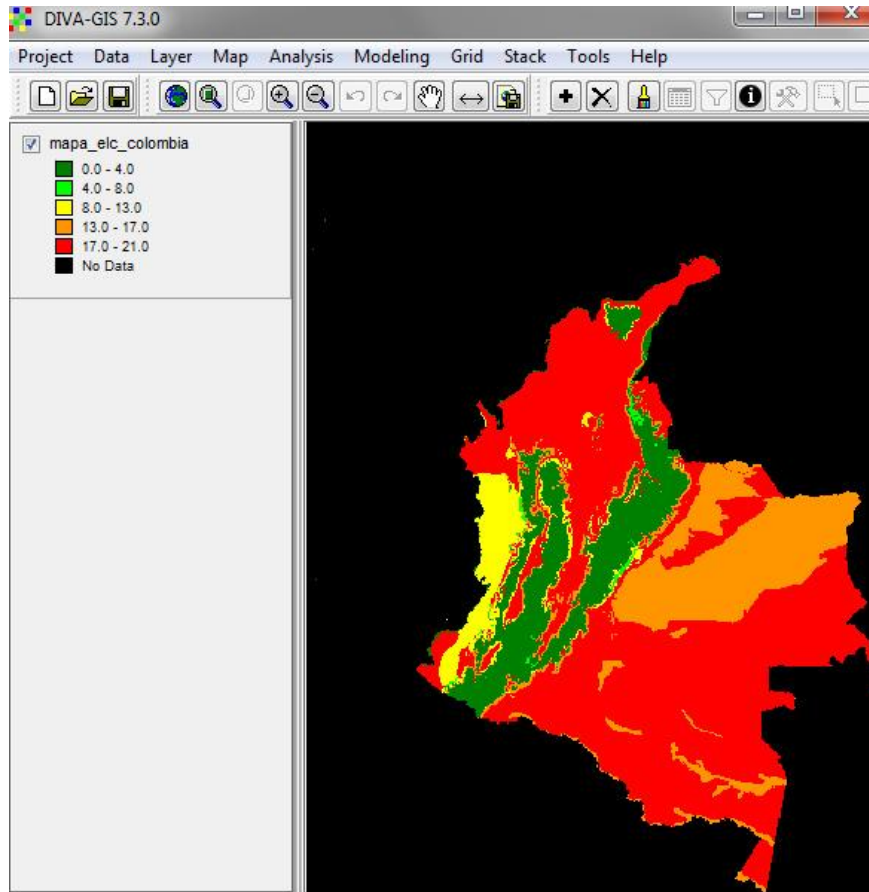


Characterization of a territory



ELC mapas tool results

- Maps (which can be opened with DIVA-GIS) and tables describing each category.



ECOGEO

It allows to perform eco-geographical characterization of the geo-referenced collecting sites



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SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA



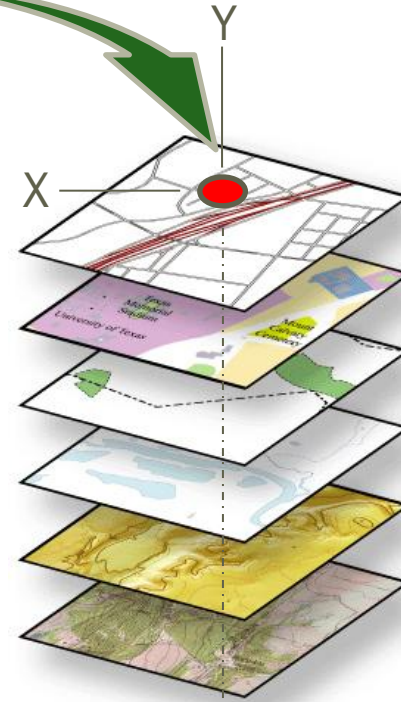
ECOGEO



Process of ecogeographical characterization

A	B	C	D	E	F
INSTCODE	ACCNUMB	...	COLLSITE	DECLATITUDE	DECLONGITUDE
NA	261-05		NA	19.1	-95.9666667
NA	262-05		Presidio	19.06944	-96.9722222
NA	263-05		Presidio	19.06944	-96.9722222
NA	264-05		El Rincón		-95.9666667
NA	265-05		Campo Gran	18.82361111	-97.01388889
NA	266-05		Tuxpanguillc	18.78194444	-97.01388889
NA	267-05		Campo Gran	18.82361111	-97.01388889
NA	268-05		NA	19.53333333	-96.9166667
NA	269-05		Campo Gran	18.82361111	-97.01388889
NA	270-05		Capoluca	18.80277778	-97.02638889
NA	271-05		Capoluca	18.80277778	-97.02638889
NA	272-05		Capoluca	18.80277778	-97.02638889
NA	273-05		Capoluca	18.80277778	-97.02638889
NA	274-05		Rincón Gran	18.85	-97.1
NA	275-05		NA	18.81666667	-97.06666667
NA	276-05		NA	18.31666667	-97.06666667
NA	277-05		Rincón Gran	18.31666667	-97.06666667
NA	279-05		NA	19.56666667	-98.81666667
NA	280-05		NA	18.83333333	-98

passport
Data (including
coordinates)



Elevation
Average Annual Temp
Soil Organic Carbon
Soil pH
.....
.....

GIS

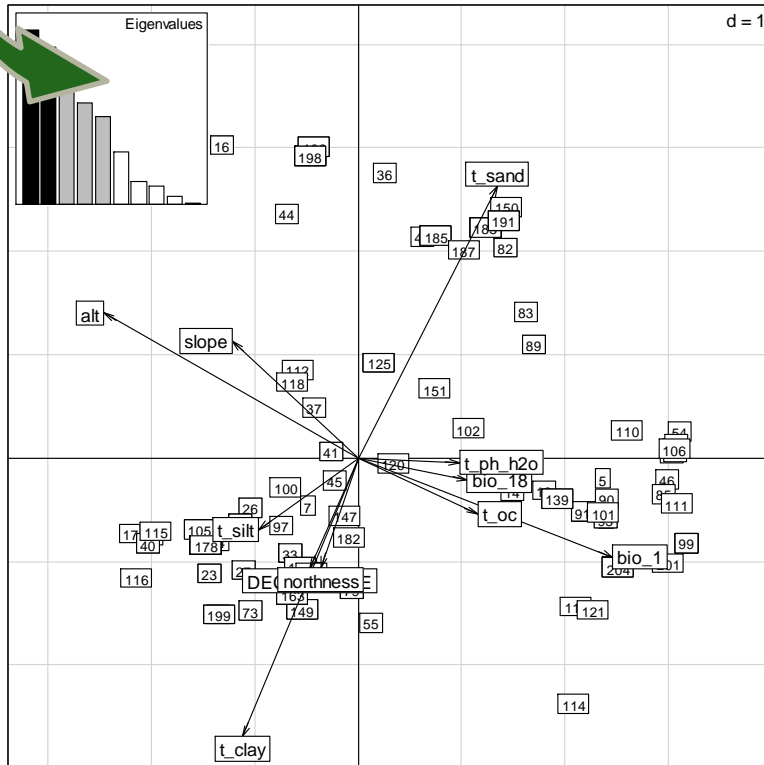
Characterization
matrix :
Rows: Germplasm
identifier
Columns:
Ecogeographical
descriptors

A	B	C	D	E
ACCNUMB	ELEVACION	TEMP PROM ANUAL	CARBON ORG SUELO	pH SUELO
262-05	1379.75	18.375	0.95	4.70
263-05	1379.75	18.375	0.95	4.70
265-05	799.25	21.575	14.00	7.70
266-05	845.75	21.475	14.00	7.70
267-05	799.25	21.575	14.00	7.70
268-05	1416.25	18.075	0.95	4.70
269-05	799.25	21.575	14.00	7.70
270-05	853.5	21.525	14.00	7.70
271-05	853.5	21.525	14.00	7.70
272-05	853.5	21.525	14.00	7.70
273-05	853.5	21.525	14.00	7.70
274-05	1236.75	19.5	14.00	7.70
275-05	1179.25	19.8	14.00	7.70
276-05	2537.25	13	0.41	6.00
277-05	2537.25	13	0.41	6.00
279-05	2329.25	14.825	2.74	6.40
280-05	1923.75	18.85	2.74	6.40
281-05	2268	15.325	2.74	6.40
282-05	1961	13.875	14.00	7.70

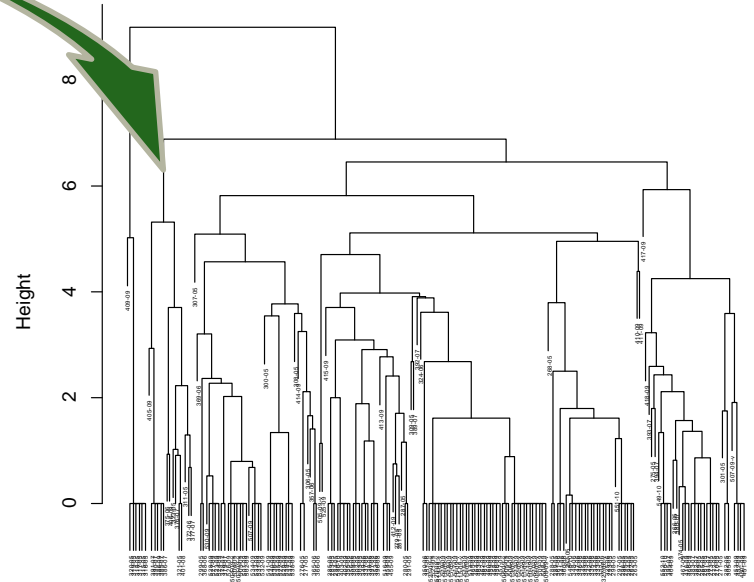
Data analysis

A	B	C	D	E
ACCENUMB	ELEVACION	TEMP PROM ANUAL	CARBON ORG SUELO	pH SUELO
262-05	1379.75	18.375	0.95	4.70
263-05	1379.75	18.375	0.95	4.70
265-05	799.25	21.575	14.00	7.70
266-05	845.75	21.475	14.00	7.70
267-05	799.25	21.575	14.00	7.70
268-05	1416.25	18.075	0.95	4.70
269-05	799.25	21.575	14.00	7.70
270-05	853.5	21.525	14.00	7.70
271-05	853.5	21.525	14.00	7.70
272-05	851	21.525	14.00	7.70
273-05	799.25	21.525	14.00	7.70
274-05	19.5	14.00	7.70	
275-05	19.8	14.00	7.70	
276-05	17.25	13	0.41	6.00
277-05	2537.25	13	0.41	6.00
279-05	2329.25	14.825	2.74	6.40
280-05	1923.75	18.85	2.74	6.40
281-05	2268	15.325	2.74	6.40
282-05	1961	13.875	14.00	7.70

Characterization matrix



Cluster analysis - Ecogeographic characterization



ecogeodist
hclust (*, "average")

Representa

Evaluates the genetic or ecogeographical representativeness of germplasm collections



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SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA

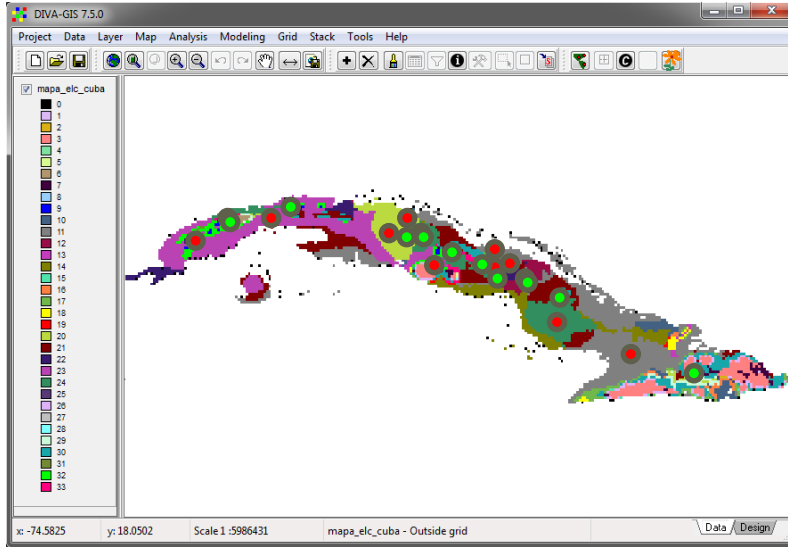


Representa

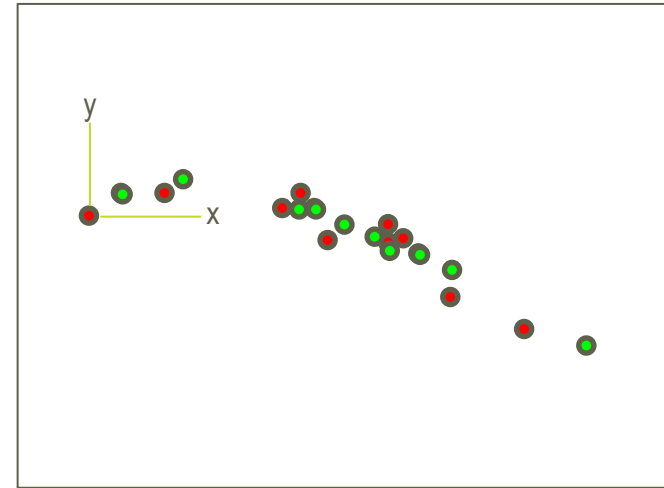


Representativeness based on ELC maps

ELC map of Cuba (from ELC mapas tool)



Coordinates of passport data

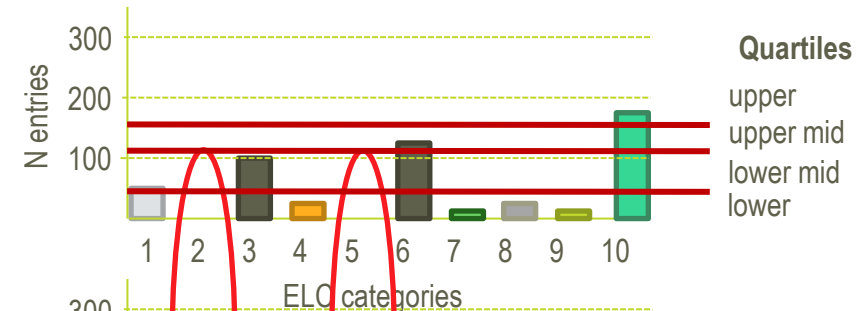


Sites with species' occurrences

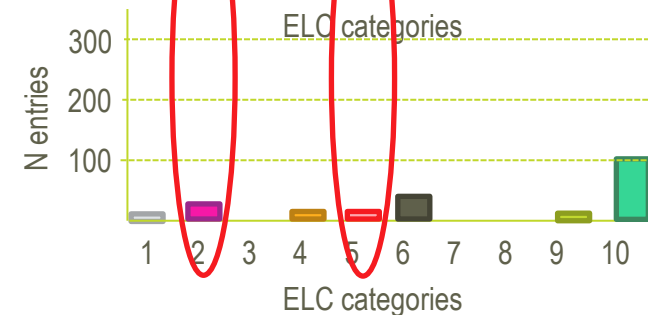
Overall distribution
Categories of the map



Genebank set



External sources set



Quartiles
upper
upper mid
lower mid
lower

DIVmapas

This application generates maps showing areas of high ecogeographic, phenotypic or genotypic diversity.



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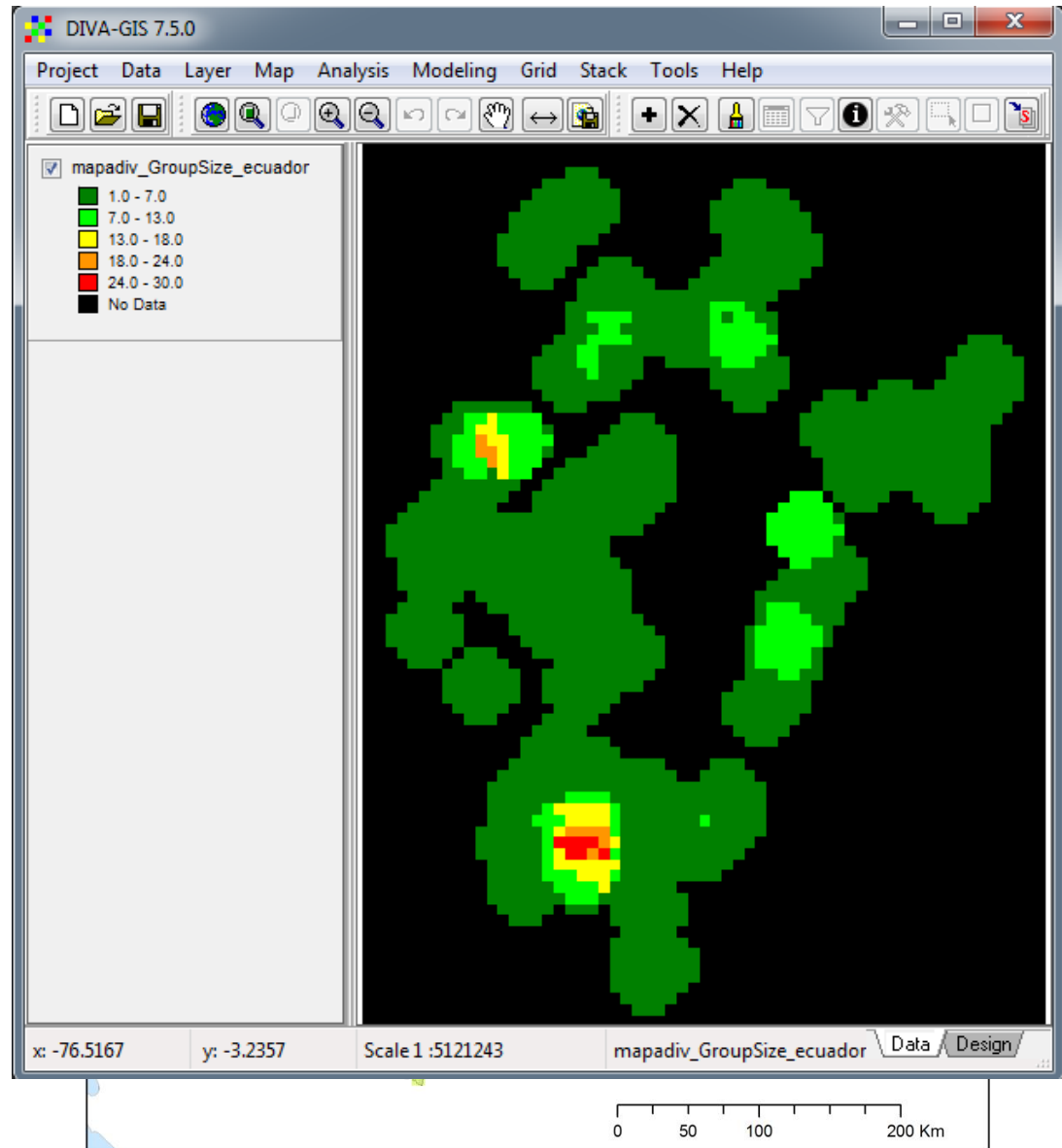


DIVmapas



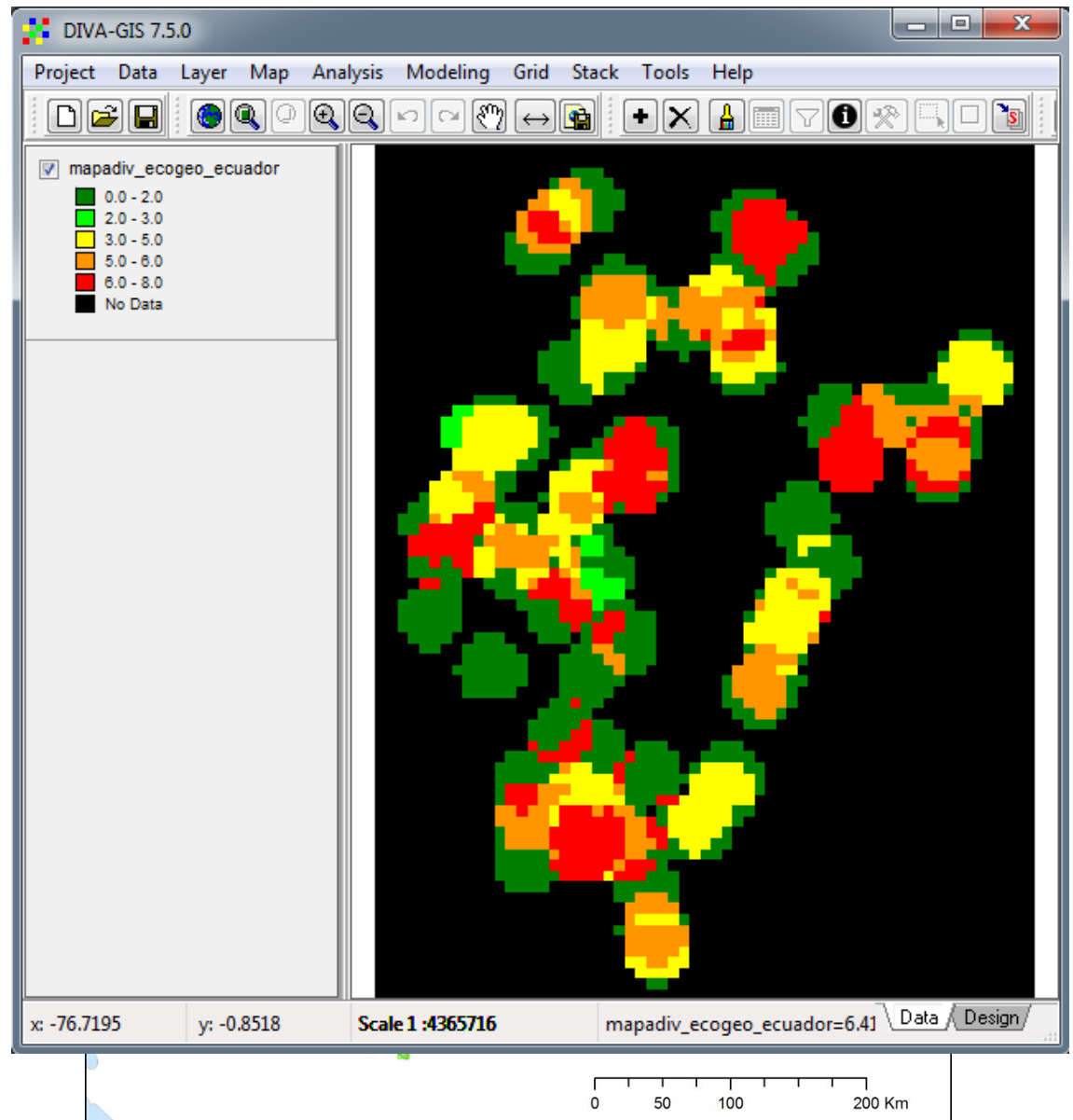
Applied DIVmapas

Number of collecting sites per cell



Applied DIVmapas

Map of
ecogeographic
diversity



Obtaining ecogeographical core collections based on ELC maps



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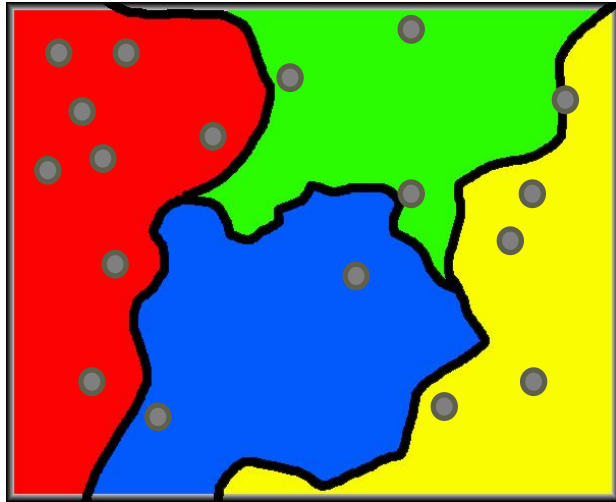
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SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA



What does ColNucleo offer?

Starting with an ELC map
(from ELC mapas tool)



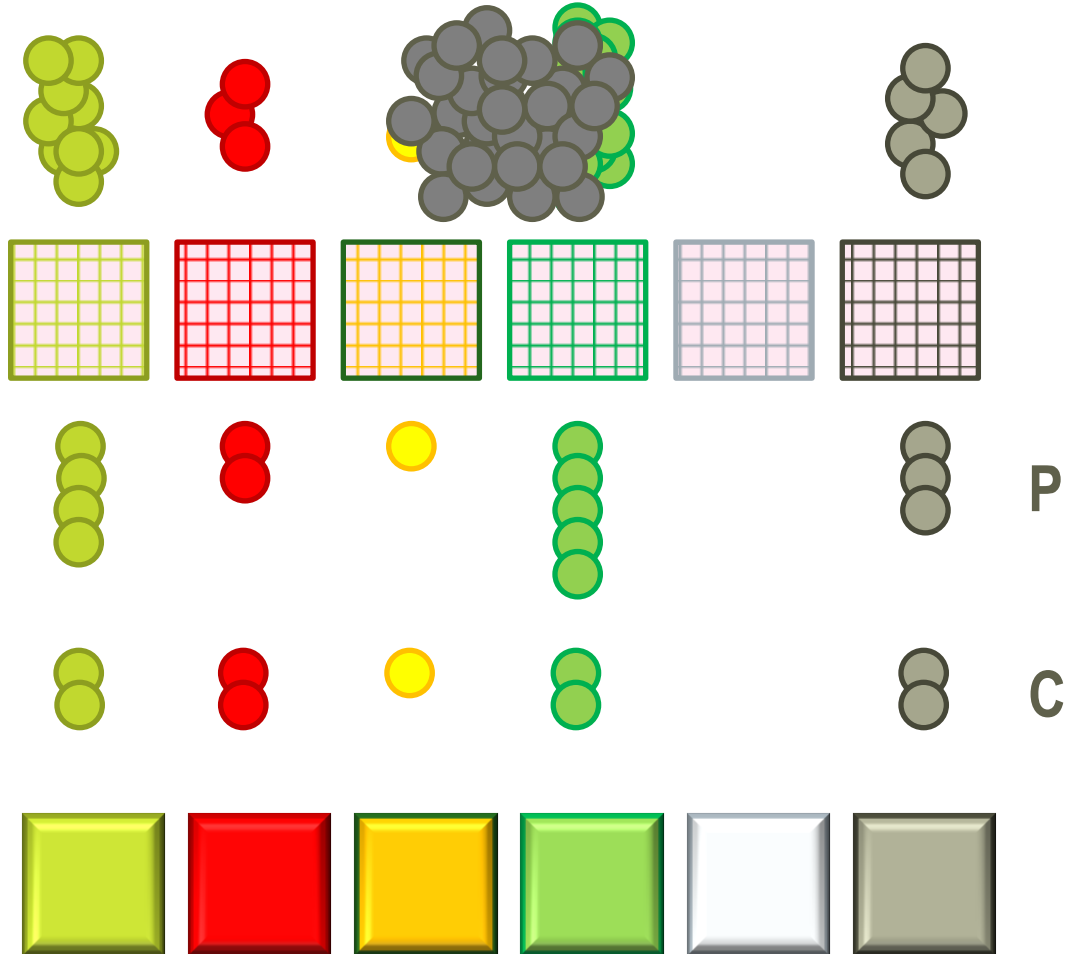
Sampling intensity

10%

15%

20%

...



Determination of subsets focused on traits of interest for breeders (Focused Identification of Germplasm Strategy)



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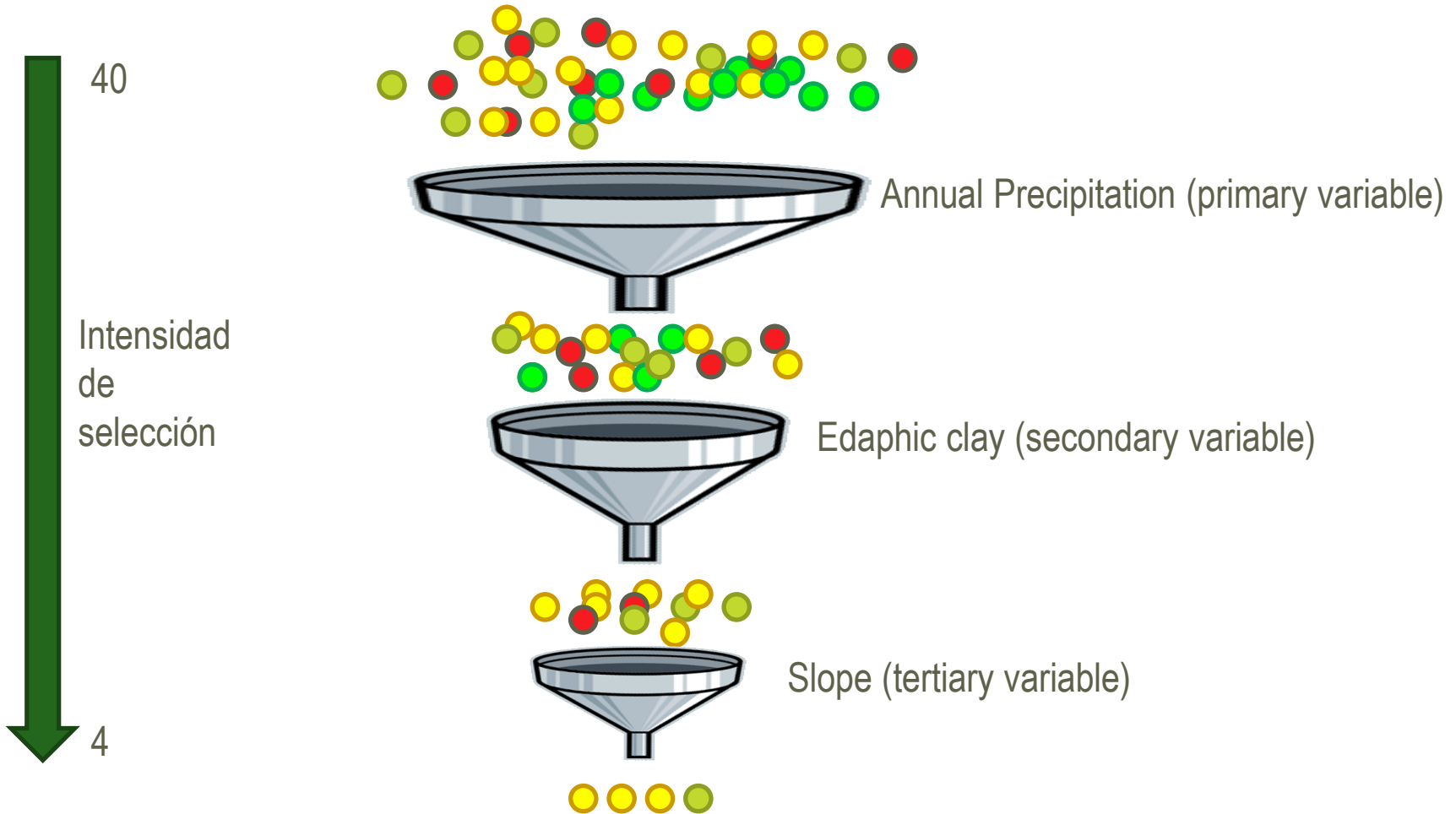
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SOBRE LOS RECURSOS FITOGENÉTICOS PARA LA ALIMENTACIÓN Y LA AGRICULTURA



What does FIGS_R offer?

FIGS_R characterizes ecogeographically the collection using the selected variables (ECOGEO)
It uses up to three ecogeographical variables and performs a stepwise selection



FIGS_R characterizes ecogeographically the collection using the selected variables (ECOGEO)

It uses up to three eco-geographical variables and performs a stepwise selection

It selects entries from a range of values for each variable or a proportion of the distribution of values (e.g. lower 30%), in separate processes for each variable.

Genus	Identified abiotic trait	Identified variable(s)	Threshold value
<i>Avena</i>	Aluminum toxicity	Soil pH; Soil organic carbon content T_OC	< pH 5.5 < 1,2% T_OC
<i>Beta</i>	Drought	De Martonne aridity index (De Martonne, 1926), calculated based on temperature and precipitation of the three driest months (July, August, September).	< 10
<i>Brassica</i>	Drought Salinity	De Martonne aridity index Top soil salinity (TSS) measured as electrical conductivity in dS/m (deciSiemens/meter) Mean temperature values for the driest months	< 10 > 4 dS/m Highest values in records with TSS > 4
<i>Medicago</i>	Frost	BIOCLIM 11	< -2 c

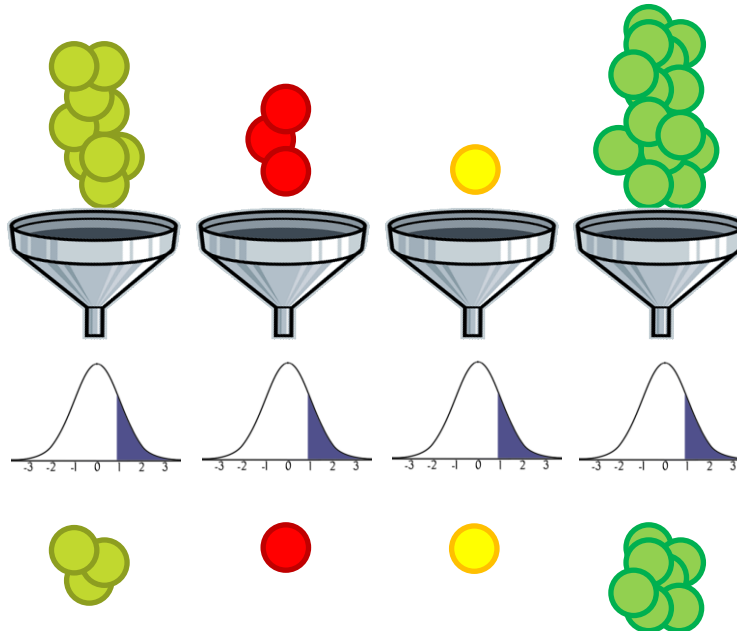
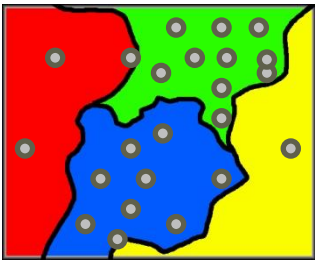
What does FIGS_R offer?

FIGS_R characterizes ecogeographically the collection using the selected variables (ECOGEO)

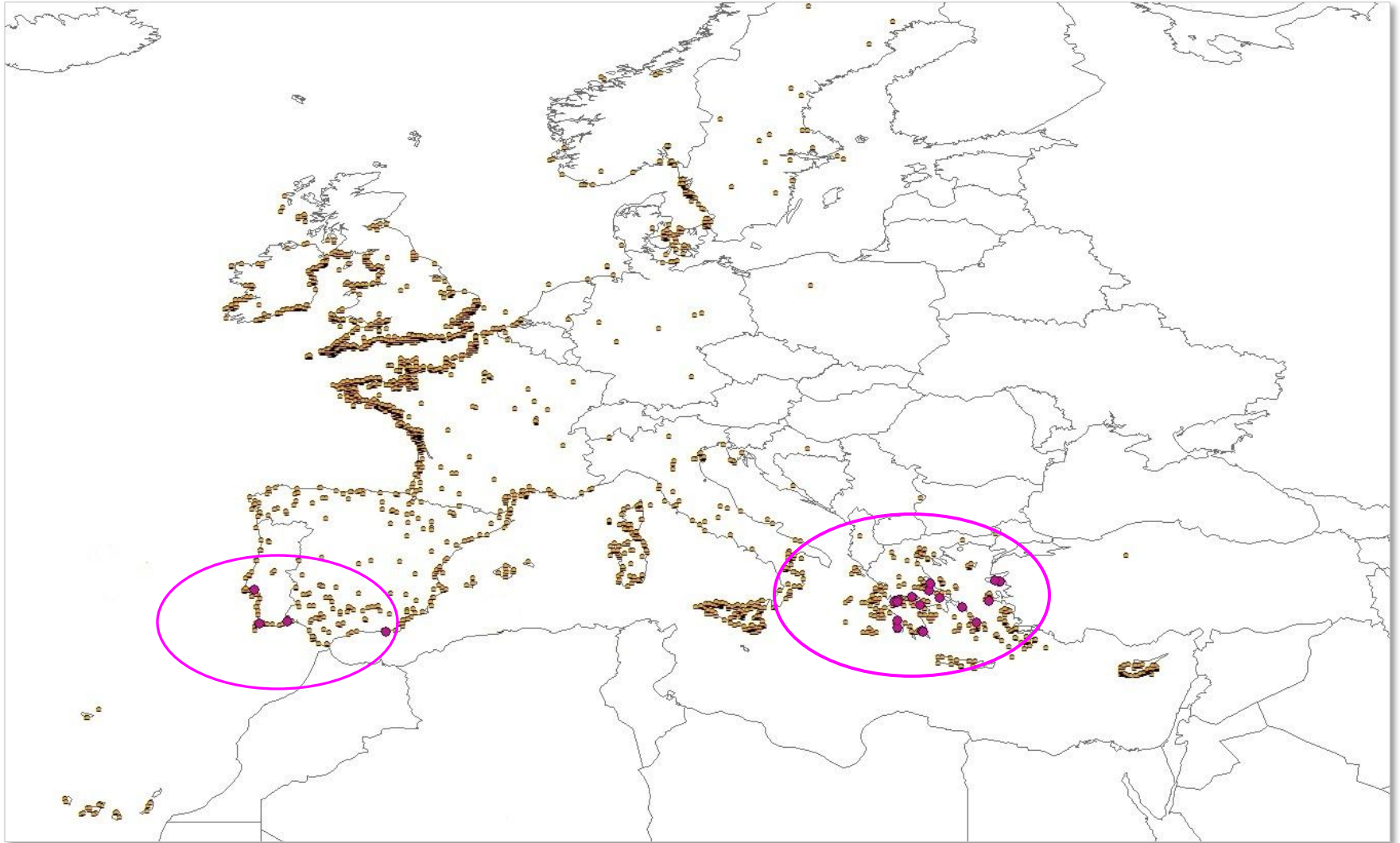
It uses up to three eco-geographical variables and performs a stepwise selection

It selects entries from a range of values for each variable or a proportion of the distribution of values (e.g. lower 30%), in separate processes for each variable.

It can use an ELC map to try to balance the selection of accessions, taking the fraction of the distribution from each category



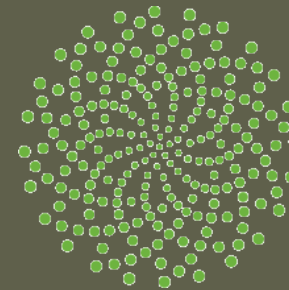
Result of predictive characterization



Thank you



Science for a food secure future



UiO : Natural History Museum
University of Oslo