

Advanced Data Management in Transgenic Breeding using

CASSbase

Lukas Müller – BTI Ithaca
Mercedes Thieme – FAU Erlangen

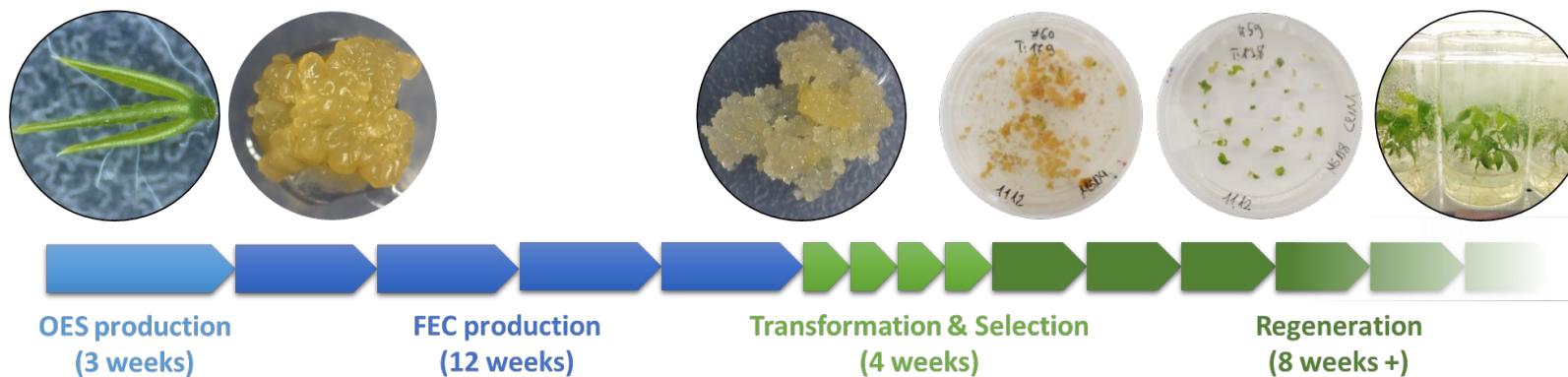


New Features

Transformation Tool



Lab

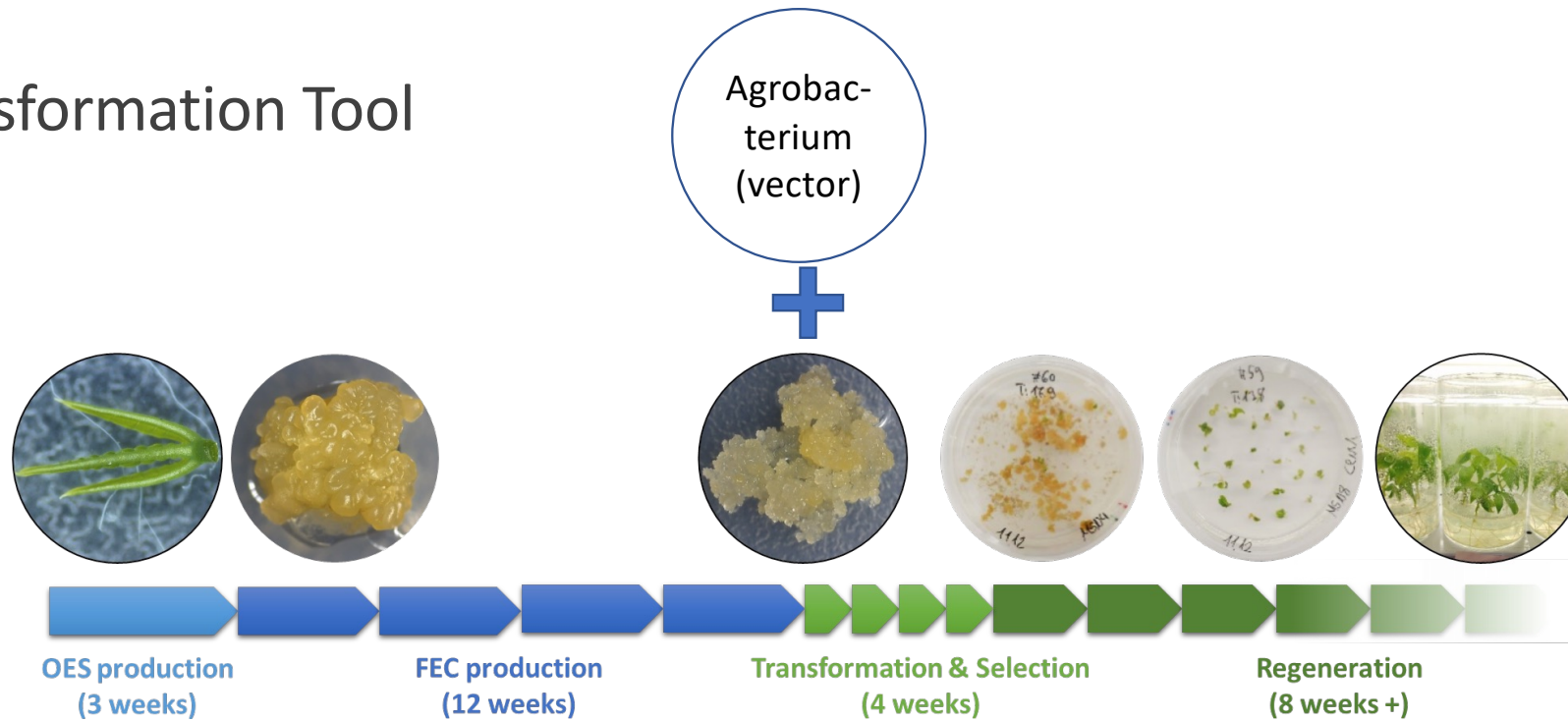


OES, organized embryogenic structures
FEC, friable embryogenic callus

Detailed protocol see Segatto *et al.*, 2022

Transformation Tool

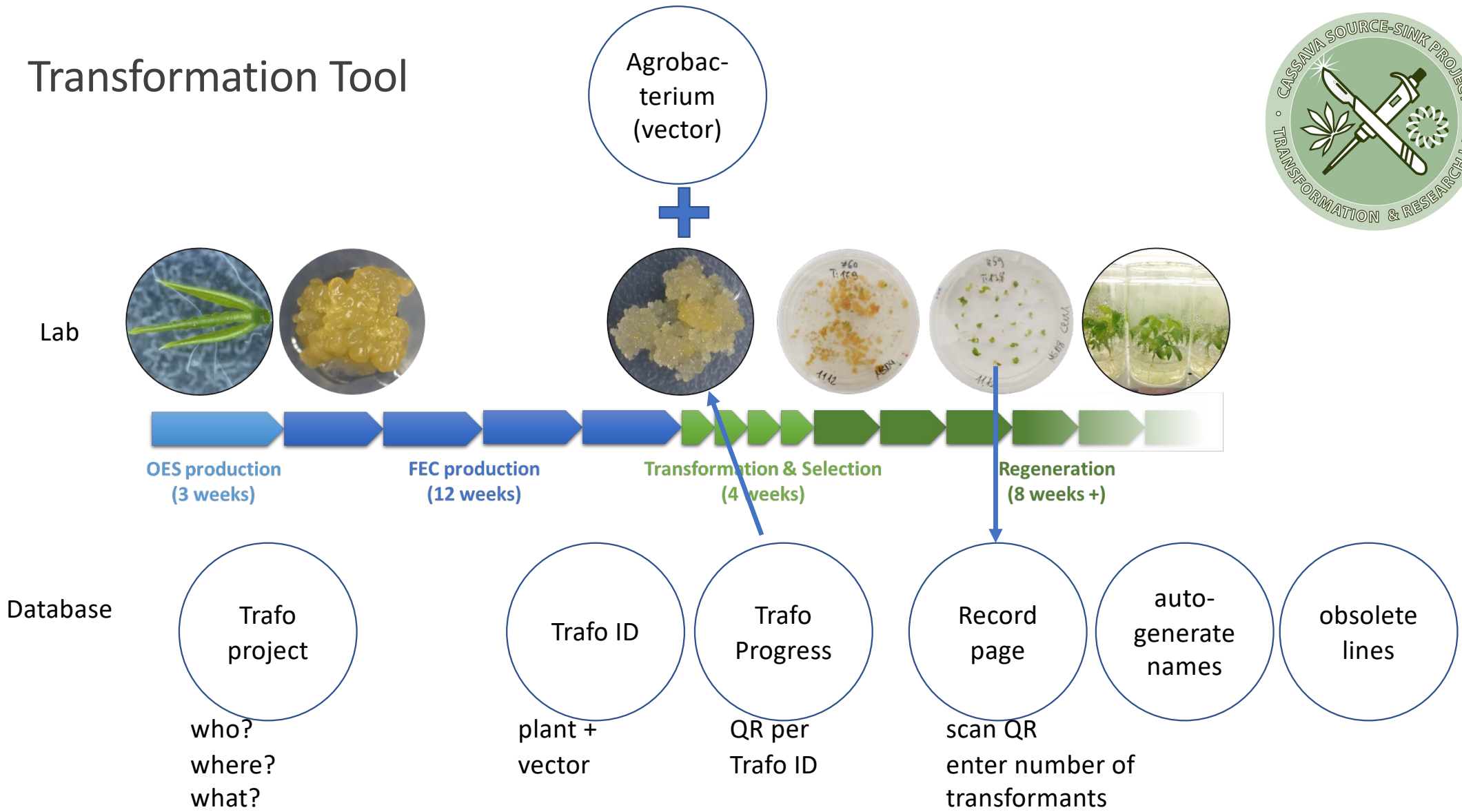
Lab



OES, organized embryogenic structures
FEC, friable embryogenic callus

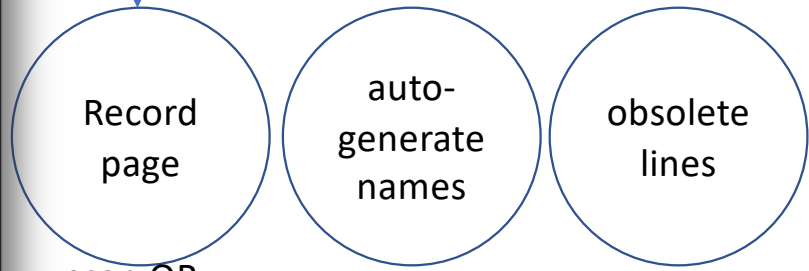
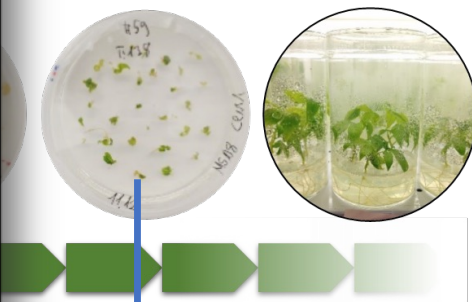
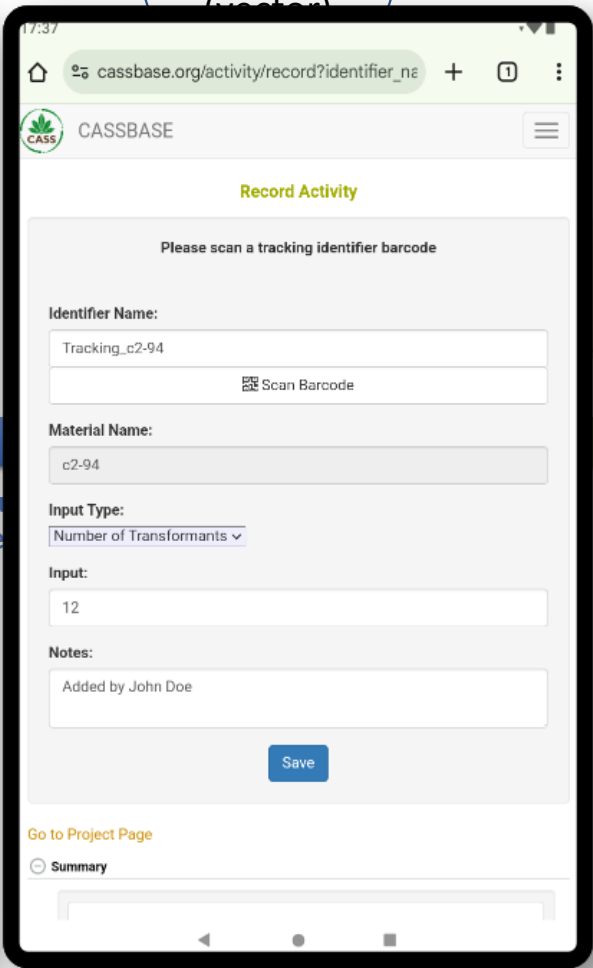
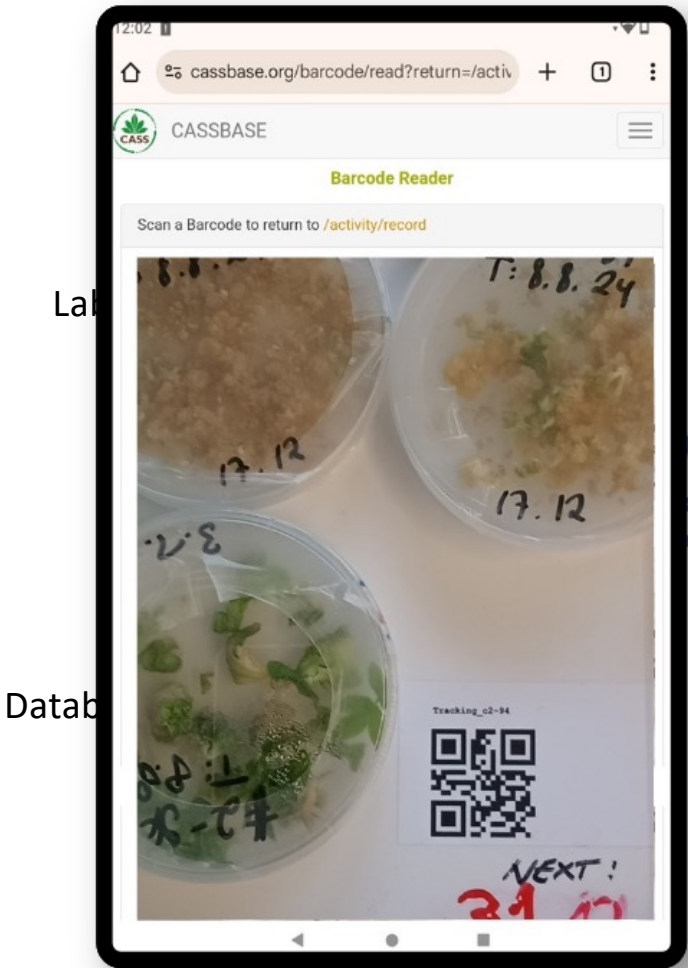
Detailed protocol see Segatto *et al.*, 2022

Transformation Tool



Transformation Tool

Agrobacterium (vector)



scan QR
enter number of
transformants

Transformation Tool

- define & link transformants with controls
- track transformation progress
- print QR codes
- automatic creation of transgenic lines in the database
- upload of historic transformation data

Search Manage Analyze Maps About

Mercedes Lists Datasets

Welcome back Mercedes!

Your status is currently "curator".

Continue where you left off

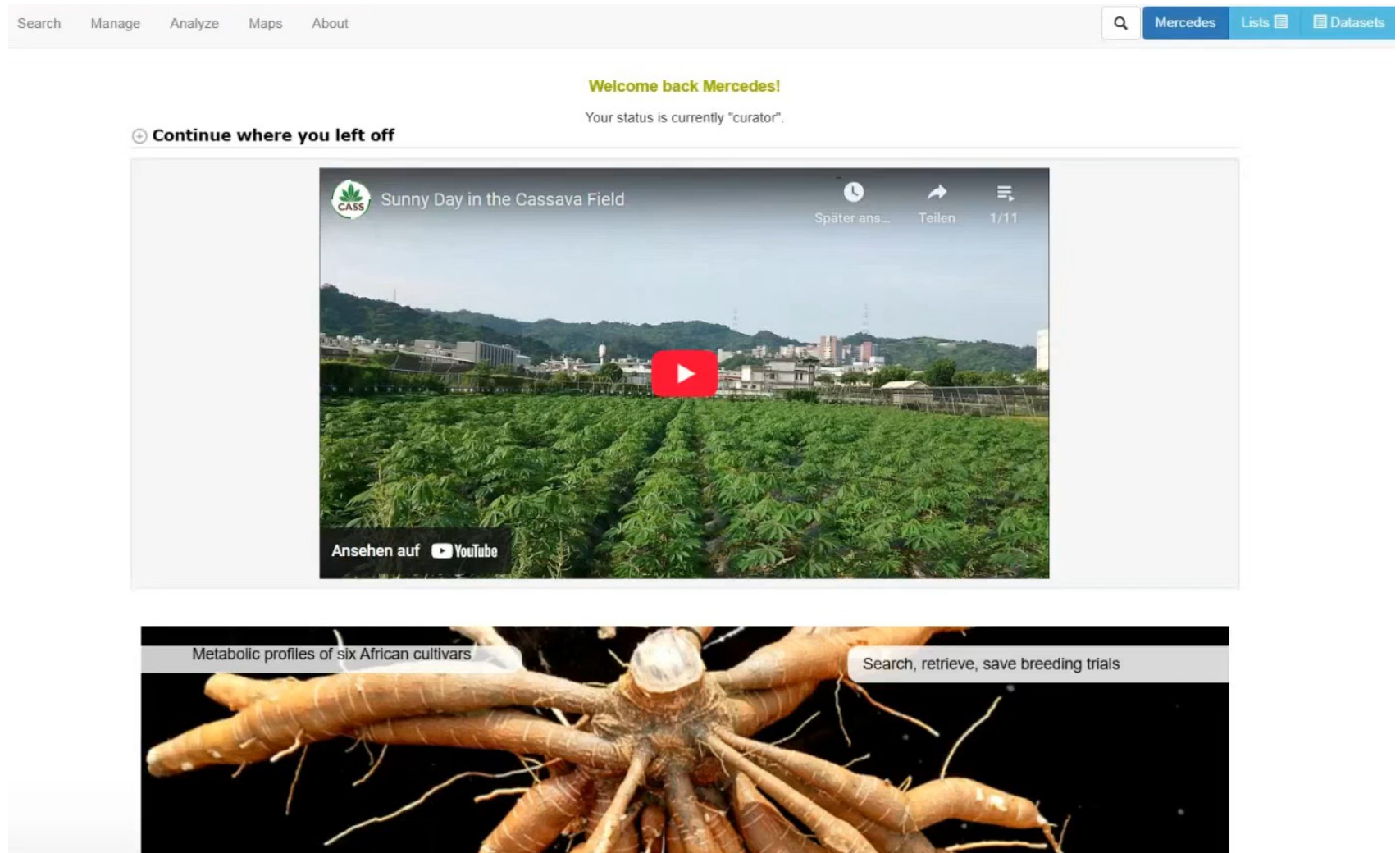
Sunny Day in the Cassava Field

Später ans... Teilen 1/11

Ansehen auf YouTube

Metabolic profiles of six African cultivars

Search, retrieve, save breeding trials

The image is a screenshot of a web application titled "Transformation Tool". At the top, there is a navigation bar with links for "Search", "Manage", "Analyze", "Maps", and "About". On the right side of this bar are buttons for "Mercedes", "Lists", and "Datasets". Below the navigation bar, a welcome message "Welcome back Mercedes!" is displayed, followed by the text "Your status is currently 'curator'". A section titled "Continue where you left off" contains a video player. The video is titled "Sunny Day in the Cassava Field" and features a CASS logo in the top left corner. The video player includes standard controls like a play button, a progress bar, and a "Teilen" (Share) button. Below the video player, there is a link to "Ansehen auf YouTube". At the bottom of the screenshot, there is a section titled "Metabolic profiles of six African cultivars" which includes a search bar with the text "Search, retrieve, save breeding trials" and a background image of cassava roots.

Insertion number

- number of insertions per line shown on vector page

Search Manage Analyze Maps About

Mercedes Lists Datasets

Welcome back Mercedes!

Your status is currently "curator".

Continue where you left off

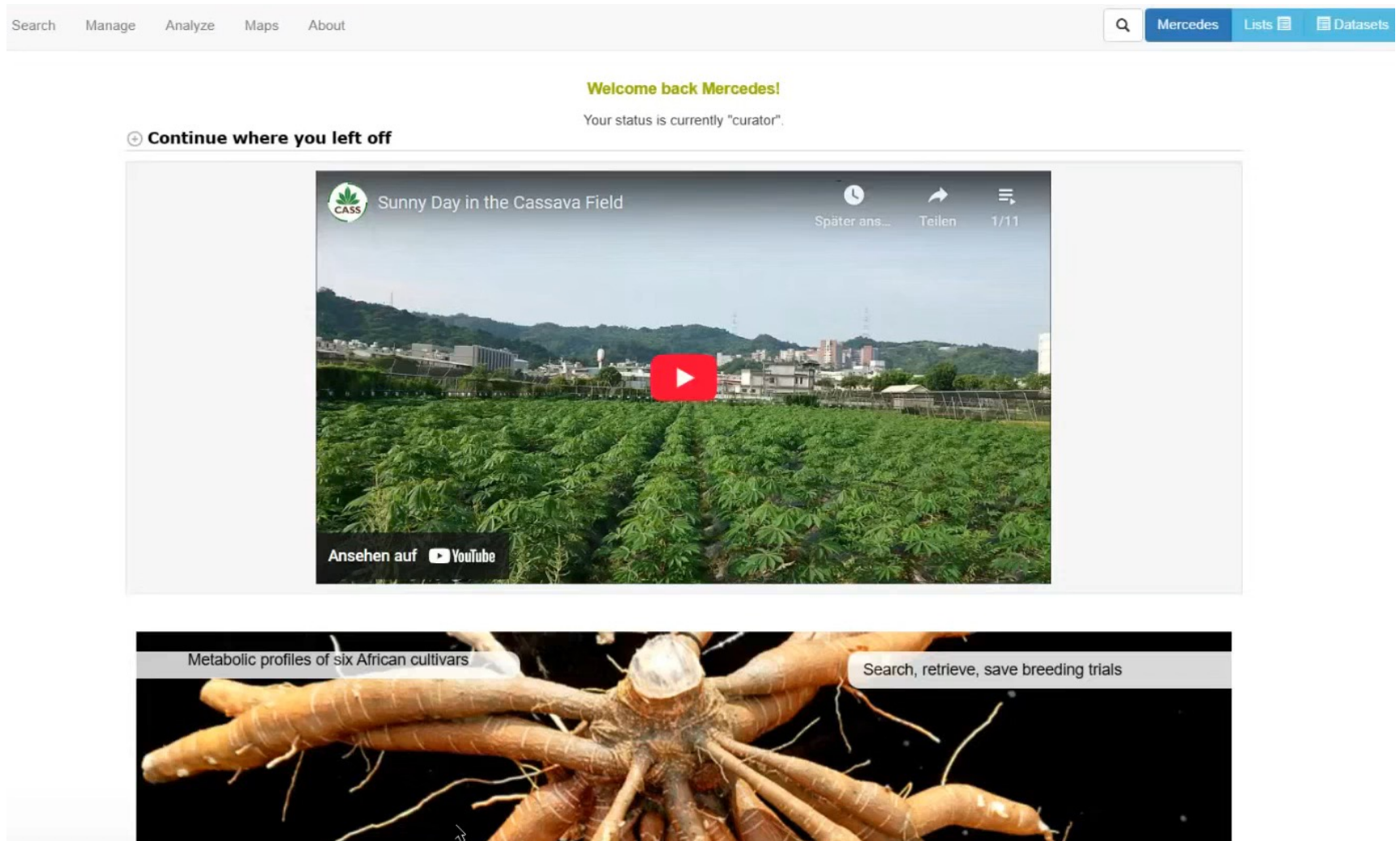
Sunny Day in the Cassava Field

Später ans... Teilen 1/11

Ansehen auf YouTube

Metabolic profiles of six African cultivars

Search, retrieve, save breeding trials

The image is a screenshot of a web application interface. At the top, there is a navigation bar with links for 'Search', 'Manage', 'Analyze', 'Maps', and 'About'. On the right side of this bar are buttons for 'Mercedes', 'Lists', and 'Datasets'. Below the navigation bar, a green message says 'Welcome back Mercedes!' followed by 'Your status is currently "curator"'. A section titled 'Continue where you left off' contains a video player. The video player shows a field of green cassava plants with a city and hills in the background. The video title is 'Sunny Day in the Cassava Field' and it has a CASS logo. Below the video player is a banner image of several orange cassava roots. The banner has the text 'Metabolic profiles of six African cultivars' on the left and 'Search, retrieve, save breeding trials' on the right.

Expression Viewer

- single/multi gene search
- correlated genes
- expression cube
- heatmap

cassea.sgn.cornell.edu



- cass
- sugarrush!

Overview Expression Viewer Anatomy Viewer

Expression Viewer

By Gene ID ⓘ Click here

By BLAST Search ⓘ

By Custom List ⓘ

Define Expression Parameters ⓘ

Projects [more info](#)

☐ Trans_2024_TME7(Transport)_GH-FAU_root

☒ Trans_2024_AtLBD11-OE(C2-37)_GH-FAU_r

Correlation filter: 0.70

Expression color scale: 0 - 500

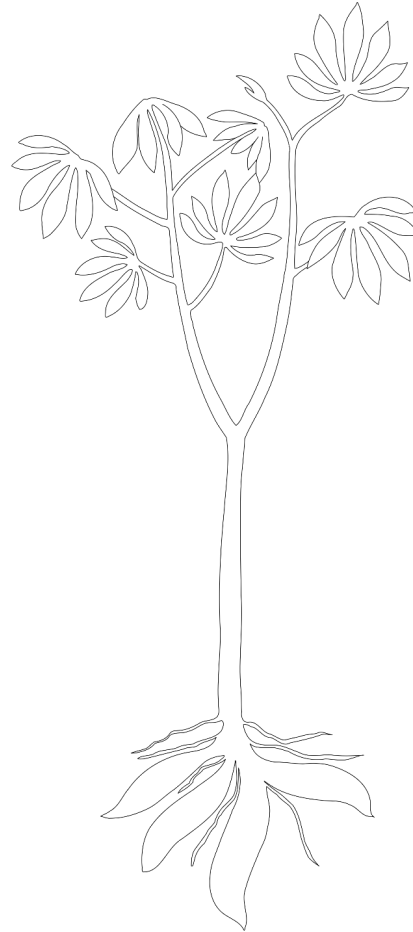
Developmental Stages	Organs	Tissues/Cell types	Treatments
C2-37 FAU368 C2-37 FAU387 C2-37 FAU390 C2-37 FAU397 VC FAU347 TMS60444		SR LS	

Select All Unselect Select All Unselect Select All Unselect Select All Unselect

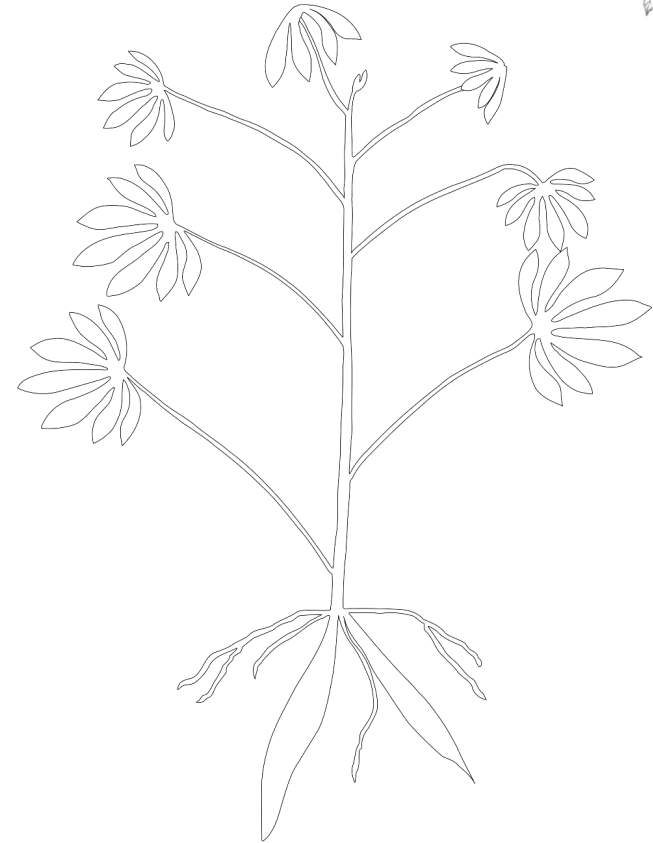
[Get Expression](#)

Idealized Cassava Plant

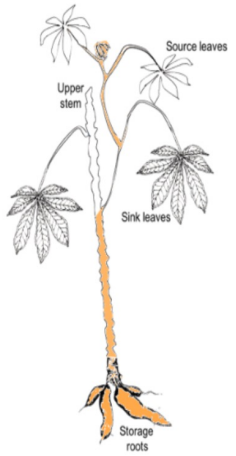
- different habitus in greenhouse & field
- contains all common tissues
- use case: Expression Viewer & phenotyping helper sheet/SOPs



Field



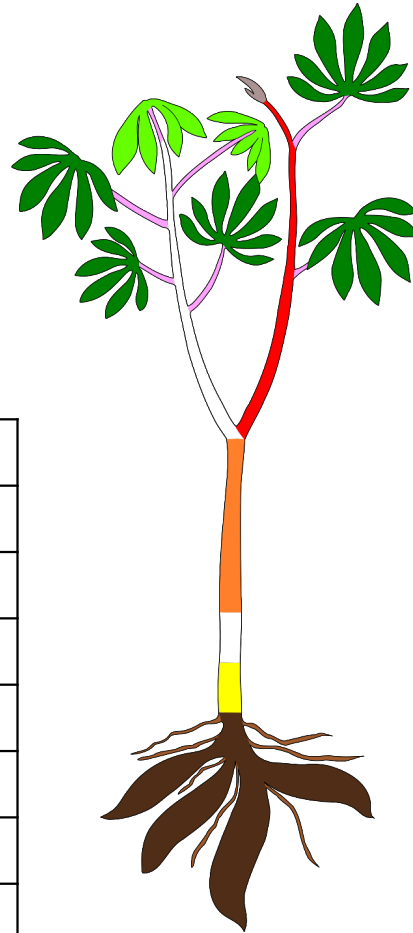
Greenhouse



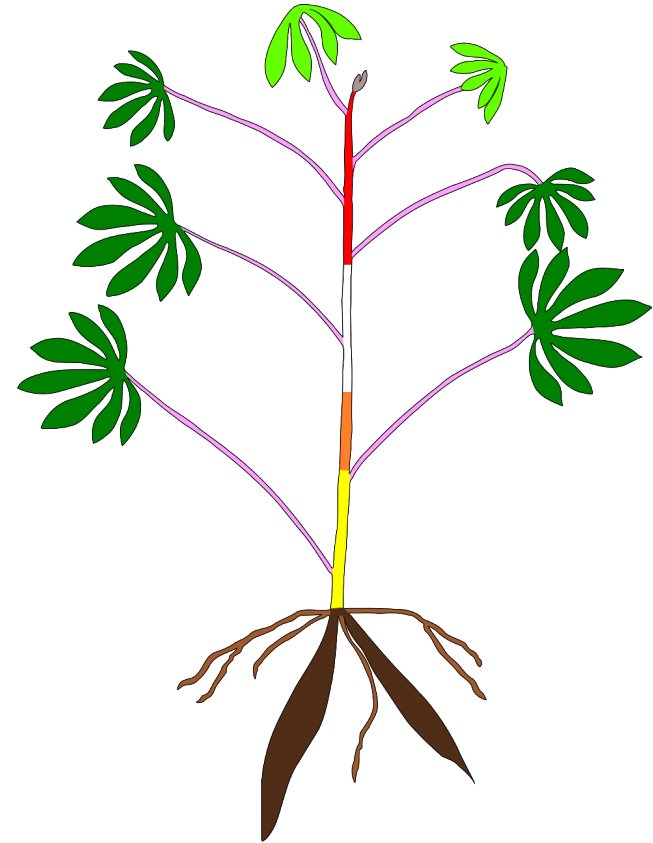
Idealized Cassava Plant

- different habitus in greenhouse & field
- contains all common tissues
- use case: Expression Viewer & phenotyping helper sheet/SOPs

	Storage root
	Fibrous root
	Lower stem
	Middle stem
	Upper stem
	Petiole
	Apex
	Source leaf
	Sink leaf



Field



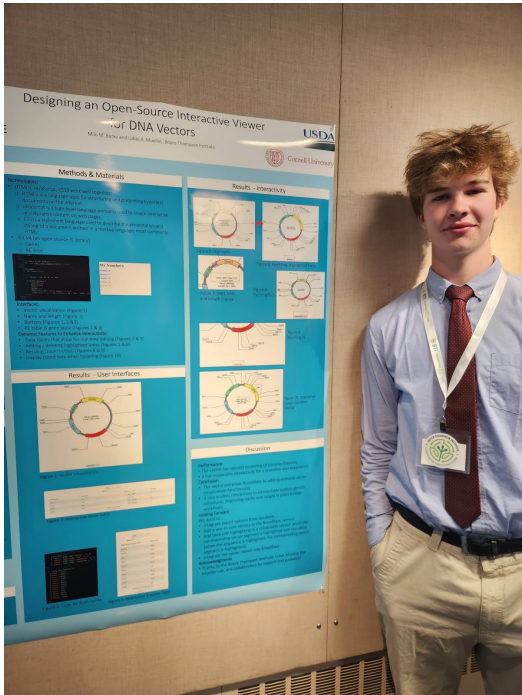
Greenhouse

Summary

- transformation tool -> automatic naming of tracked lines & historic data upload
- insertion number
- tracking of phenotypes digitally (test-run lab, next field)
- expression viewer: first transcriptome datasets available, proteome & metabolome will follow

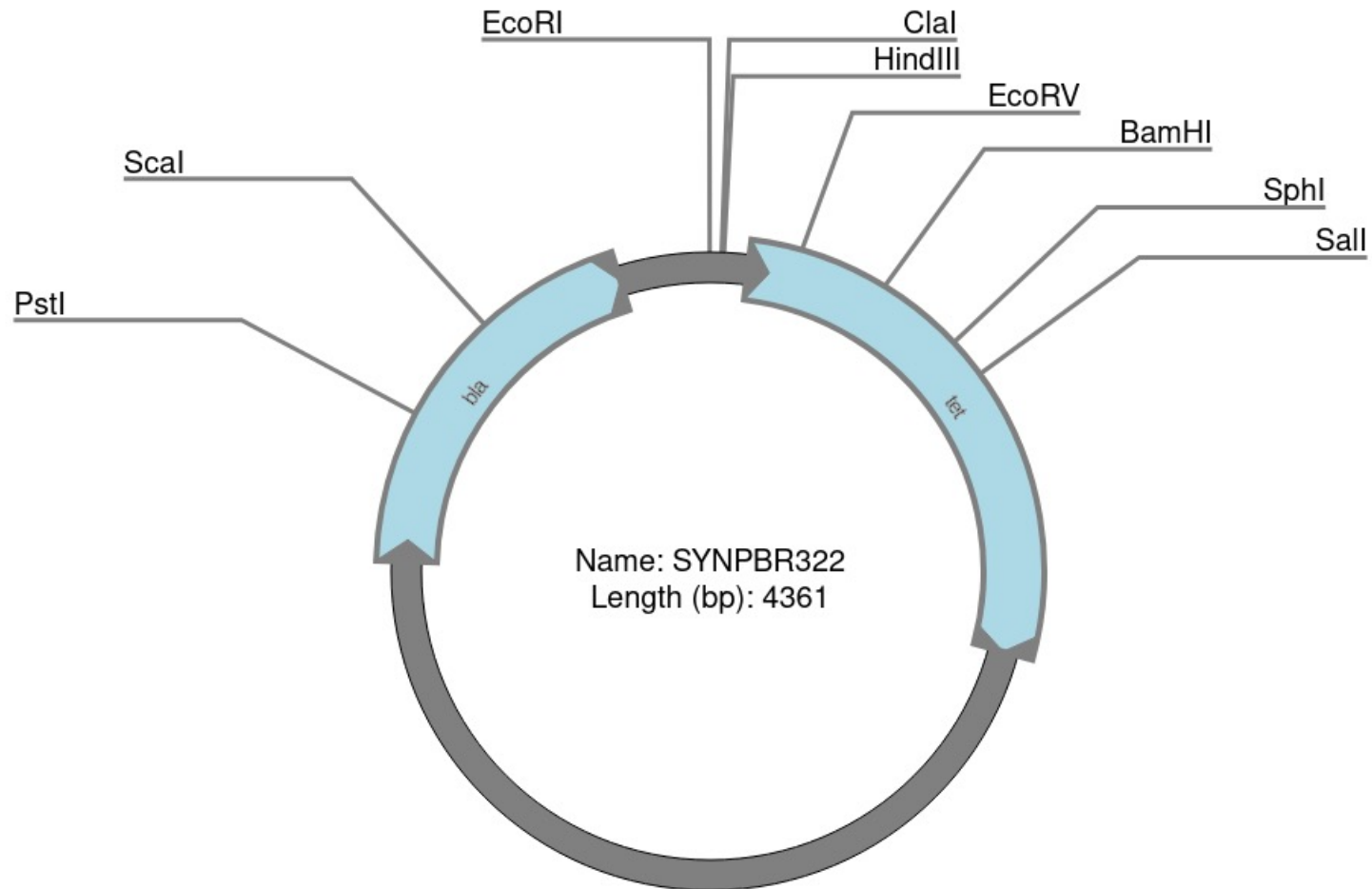
Upcoming Features

Vector Viewer



- Need a better tool to visualize (and edit?) vector constructs
- BTI Summer Internship Program
- Milo Burke, Ithaca HS student
- D3-based viewer

Vector Viewer



Vector Viewer

Save Vector

Load Vector

Update/Reset

+

-

Add Feature

Show 10 entries

Search:

Feature Name	Start Coord	End Coord	Color	Orientation	Actions
bla	3293	4153	red	R	Edit Delete
tet	86	1276	red	F	Edit Delete

Showing 1 to 2 of 2 entries

Previous

1

Next

Add restriction enzyme site

Show 10 entries

Search:

Restriction Enzyme Site	Cut Coord	Actions
BamHI	376	Edit Delete
Clal	25	Edit Delete
EcoRI	4360	Edit Delete
EcoRV	188	Edit Delete

Linking Images to Observation Units



Before

- Fieldbook file export: By filename
- Fieldbook: By BrAPI

Now

- Fieldbook: By embedded EXIF data
- By QRCode in the picture

Other Ongoing Work

- qPCR results
- Field management events
- Treatment factors (subplot based)
- High dimensionality Phenotypes
- Automated Image Analysis

Acknowledgement

BTI

Naama Menda
Isaak Tecle
Titima
Tantikanjana
Chris Simoes
Amber Lockrow
Ryan Preble
Ben Maza

Graduate students:

Christine Nyaga
Srikanth Karaikal

BTI BCBC

Adrian Powell
Jing Zhang

Cornell

Jannink Lab
Jean-Luc
Jannink
David Waring
Clay Birkett

BrAPI

Peter Selby

CASS

Uwe Sonnewald
Uwe Rascher
Wolfgang Zierer
Mercedes Thieme
Christian Lamm
Samuel Zeeman
Simon Bull
And many more...

Clemson U

Rife Lab
Trevor Rife
Chaney Courtney
Bryan Ellerbrock

Hershberger Lab
Jenna Hershberger
McKena Wilson

CropOntology

Elizabeth Arnaud
Marie-Angelique
Laporte

BTI outreach programs

Delanie Sickler

CGIAR RTB & National Programs & Partners

Chedozie Egesi
Rony Swennen
Maria Andrade
Asrat Amele
Pradad Peteti
Craig Yencho
Xiaofei Zhang
And many, many more...

Funding

NSF, USDA,
BGF, AgOne

Thank you for your attention



CASSAVA SOURCE-SINK INNOVATION



Trials

- trial metadata
- label designer
- download phenotype data
- phenotype summary statistics

Search Manage Analyze Maps About

Mercedes Lists Datasets

Welcome back Mercedes!
Your status is currently "curator".

Continue where you left off

Sunny Day in the Cassava Field

Später ans... Teilen 1/11

Ansehen auf YouTube

Cassava Source-Sink Project
Information and Goals

Trials



12:59 Fri, 8 Dec 62%

←

?

🔍

📄

🔒

field_name: fieldbook_layout_2024-09-04_11_28_25_20240821...

plant_name: 20240821_C2-8_Immunolocalization_C2-8_ETH42...

plant_id: 461449

plant height measurement in cm

ICO_334:0

Measured as height from ground level to the top of canopy at harvest

accessi: C2-8_ETH4255

plant_n: 1

;	1	2	3
+	4	5	6
-	7	8	9
*	.	0	✖

SearchManageAnalyzeMapsAbout

MercedesListsDatasets

Welcome back Mercedes!

Your status is currently "curator".

Continue where you left off

Sunny Day in the Cassava Field

Später ans...Teilen1/11

Ansehen auf YouTube

Cassava Source-Sink Project

Information and Goals

A group of diverse people, including men and women of various ages, are smiling and waving at the camera. They are standing outdoors in front of a building with a corrugated metal roof. Some are wearing casual clothing, while others are in more formal attire. The group appears to be a mix of local community members and project staff.