INCREASE

Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems

«Scienza partecipata, scienza dei cittadini e conservazione decentralizzata dell'agro-biodiversità»

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The INCREASE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862862.

Scan the QRcode for more information!

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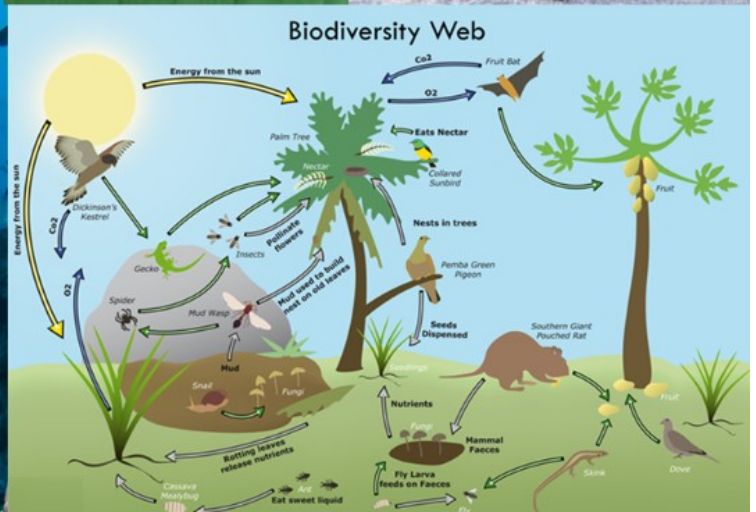
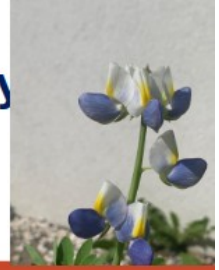

Biodiversity Web
Energy from the sun
Co2
Fruit Bat
O2
Eats Nectar
Palm Tree
Nectar
Collared Sunbird
Fruit
Dickinson's Kestrel
Energy from the sun
Co2
O2
Nests in trees
Pollinate flowers
Insects
Gecko
Pemba Green Pigeon
Spider
Mud Wasp
Mud used to build nest on old leaves
Seeds Dispensed
Southern Giant Pouched Rat
Mud
Snail
Fungi
Seedlings
Fruit
Nutrients
Fungi
Mammal Faeces
Rotting leaves release nutrients
Fly Larva feeds on Faeces
Skink
Dove
Cassava Mealybug
Ant
Eat sweet liquid

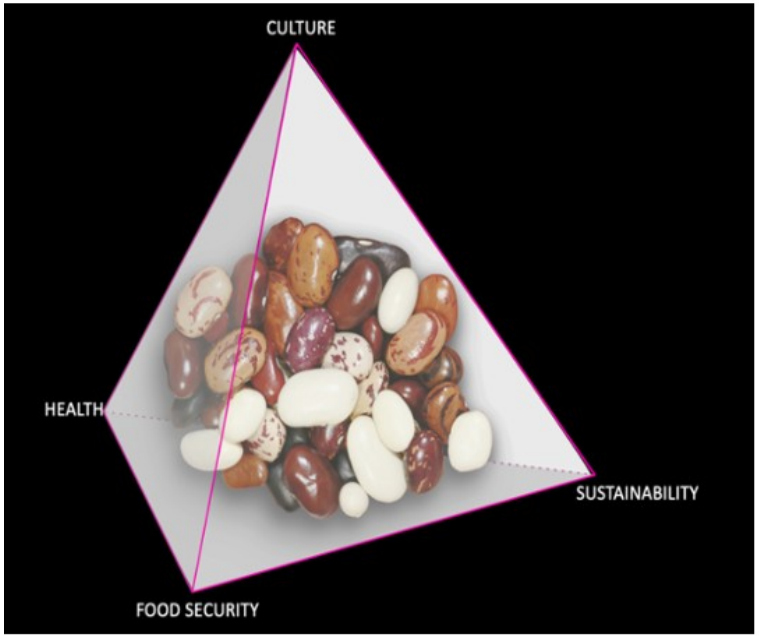
Svalbard Global Seed Vault

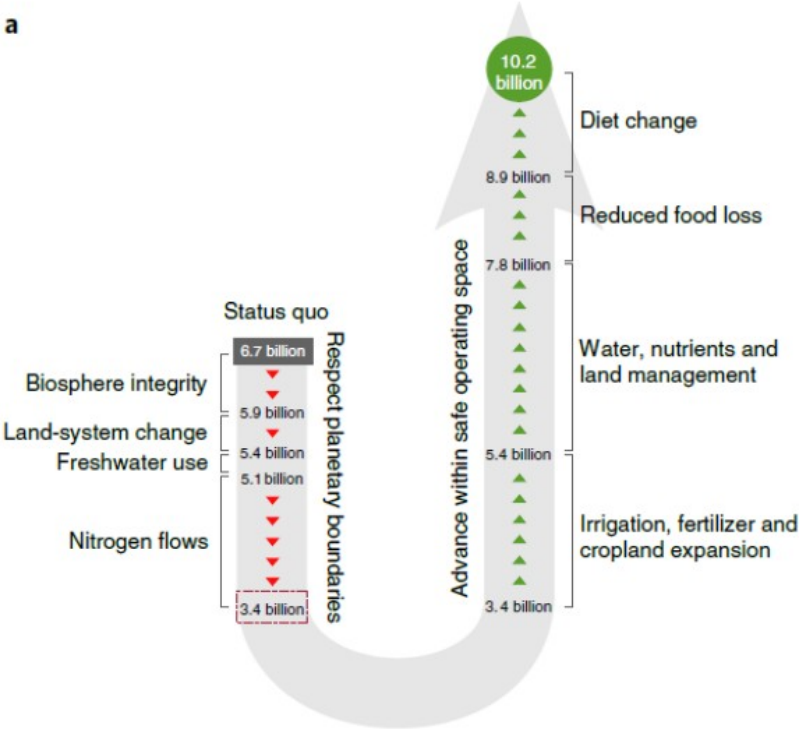
Valutazione di varietà di fagiolo in Kashmir, India

FOOD LEGUMES:
Feeding the growing population respecting planetary boundaries



NATURE SUSTAINABILITY





Garten et al 2020

INCREASE

Chickpea
Cicer arietinum
(2n=2x=16; ~740Mbp)

Common bean
Phaseolus vulgaris
(2n=2x=22; ~520Mbp)

Lentil
Lens culinaris
(2n = 14, ~4Gb)

White Lupin
Lupinus albus
(2n=50; ~450Mbp)

L. mutabilis (2n=48; ~930 Mbp)

CURRENT PROTOCOLS

PROTOCOL | Open Access

Towards the Development, Maintenance, and Standardized Phenotypic Characterization of Single-Seed-Descent Genetic Resources for Common Bean

Gaia Cortinovis, Markus Oppermann, Kerstin Neumann, Andreas Graner, Tania Gioia, Marco Marsella, Saleh Alseekh, Alisdair R. Fernie, Roberto Papa, Elisa Bellucci, Elena Bitocchi

CURRENT PROTOCOLS

PROTOCOL | Open Access

Intelligent Characterization of Lentil Genetic Resources: Evolutionary History, Genetic Diversity of Germplasm, and the Need for Well-Represented Collections

Azalea Guerra-García, Tania Gioia, Eric von Wettberg, Giuseppina Logozzo, Roberto Papa, Elena Bitocchi, Kirstin E Bett

CURRENT PROTOCOLS

PROTOCOL | Open Access

Towards Development, Maintenance, and Standardized Phenotypic Characterization of Single-Seed-Descent Genetic Resources for Lupins

Magdalena Kroc, Magdalena Tomaszewska, Katarzyna Czepiel, Elena Bitocchi, Markus Oppermann, Kerstin Neumann, Luis Guasch, Elisa Bellucci, Saleh Alseekh, Andreas Graner, Alisdair R. Fernie, Roberto Papa, Karolina Susek ... See fewer authors

CURRENT PROTOCOLS

PROTOCOL | Open Access

Towards the Development, Maintenance and Standardized Phenotypic Characterization of Single-Seed-Descent Genetic Resources for Chickpea

Lorenzo Rocchetti, Tania Gioia, Giuseppina Logozzo, Cristia Brezeanu, Luis Guasch Pereira, Lucia De la Rosa, Stefania Manzano, Alice Pieri, Alisdair R. Fernie, Saleh Alseekh, Karolina Susek, Douglas R. Cook, Rajeev K. Varshney, Shiv Kumar Agrawal, Aladdin Hamwieh, Elena Bitocchi, Roberto Papa ... See fewer authors

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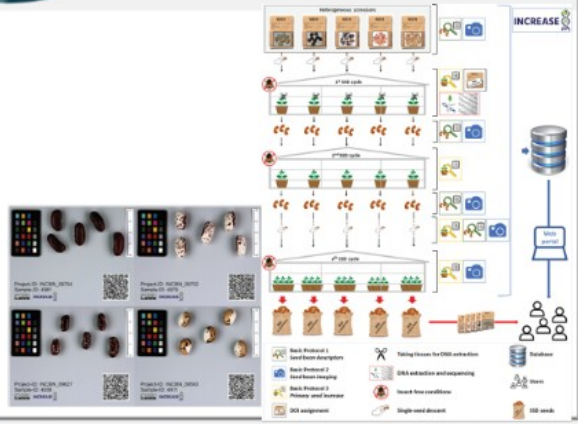



Multilocation field trials (MLFTs)
GWAS for Intercropping maize & beans focusing on bean mixing ability
FRANCE, ITALY, ROMANIA, Intercropping maize-bean

Ricerca partecipativa

Consorzio Stakeholder

Agricultural production
- Ccibo Maremma-APS Comunità del cibo e della biodiversità agricola e alimentare della Maremma
- Fundació Miquel Agustí
- ALFASEED Kft
- Arca srl Benefit
- Valdibella Cooperativa Agricola
- Francesco d'Assisi Soc. Coop. Soc.
- Karl Kunert

Agricultural production; Food culture / production / processing
- Società Agricola Monte Monaco srl

Culture and education
- Tamara Urbanšič / Izobraževanje Tamara Urbanšič s.p
- COMUNE DI VALDAGNO (per Museo Civico D. Dal'Lago e Biblioteca Civica Villa Valle)
- José Manuel Rodrigues Crispim Romao
- Istituto di Istruzione Superiore "Caravaggio"
- LEGUMI CHE PASSIONE
- L'orto di Mendel
- Orto Botanico di Bergamo "Lorenzo Rota"
- ASD CALICANTO ONLUS
- We are here Venice

Environment & agrobiodiversity
- Roberto Piaggesi
- Adelina Sousa
- CRBA - Centre de Ressources de Botanique Allpliquée
- The James Hutton Institute
- Olha Vazhenina / Plant Production Institute named after V.Ya. Yuriev of NAAS
- Natalia Andrea Spinelli
- Cristina Muñoz Blanco
- Federazione delle Associazioni Rurali Italiane (FARI)

Food culture / production / processing
- Legumology Limited
- Andrea Bertocco / Herbalife Nutrition
- Agata Szczebyło
- Hof Sprenker / Benedikt Sprenker

Plant breeding & seed production
- Agricultural Research, Ltd.
- Avinash Chandra Pandey
- ALPAD-Association Landaise Pour la Promotion de l'Agriculture Durable
- Brendan Hallahan
- Università degli Studi di Udine - Department of Agricultural, Food, Environmental and Animal Sciences
- Semences de Provence
- Istituto di Istruzione Superiore "Arrigo Serpieri"
- PlantiCo – Hodowla i Nasiennictwo Ogrodnicze Zielonki Sp. z o.o.
- VIVOSEM Srl

Research & academic
- Institute of Agricultural Biology and Biotechnology (IBBA) - CNR
- Miguel López-Gómez/University of Granada
- Meise Botanic Garden
- Aysen Yumurtaci
- Institute of Oilseed Crops of the National Academy Agrarian Sciences
- Debarati Chakraborty
- Professor David Edwards - University of Western Australia
- Inagro
- Christine Helen Foyer
- Eric von Wettberg, University of Vermont
- Raffaella Maria Balestrini
- Fardous Mohammad Safiul Azam / Neijiang Normal University
- Latvia University of Life Sciences and Technologies
- Universidad de la Amazonia

www.pulsesincrease.eu


Phenotyping by drone
plus
conventional measurements
plus
yield
Dji.com
Henrik Schumann
Sept 13

NordGen

- Regional genebank covering five countries, three self governing areas, eight timezones and roughly 25 latitude degrees
- Financed by the Nordic Council of Ministers and external projects
- Material of Nordic origin or relevance

graphical foci of Nordregio

Towards SSD lines...

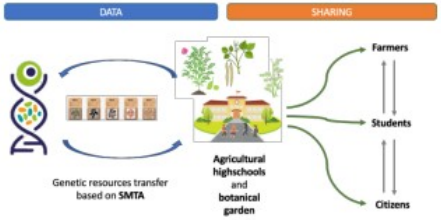
INCREASE

- 144 accessions of *Phaseolus vulgaris*
- 1st SSD development cycle
- Mandatory phenotypic characterization according to the protocol (Cortinovis et al., 2021)

Botanic Garden
Meise

BERG

Orto Botanico
di Bergamo
Lorenzo Rota


DATA
SHARING
Farmers
Students
Citizens
Genetic resources transfer based on SMTA
Agricultural highschools and botanical garden


IIS Salvati (PE)


IIS Einaudi (CA)


IIS B.Vittone (TO)


IIS Sartor (TV)

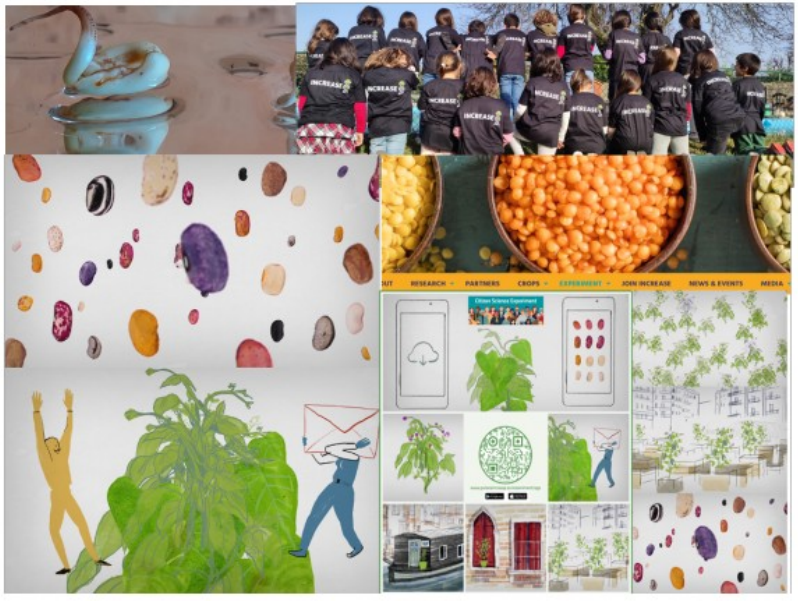

IIS Caravaggio (NA)


IIS Fortunato (PZ)

Esperimento di scienza dei cittadini

Contribuire ad aumentare la consapevolezza dei cittadini sulle PGR
Valutare I caratteri di oltre 1000 linee SSD di P. vulgaris in più ambienti
Testare la fattibilità di un approccio di conservazione decentralizzato

La scienza partecipativa è al centro del progetto. INCREASE coinvolge stakeholder e cittadini nello sviluppo di un nuovo modello e strategia per la conservazione e l'uso dei PGR.
Il coinvolgimento dei cittadini è fondamentale per favorire l'accesso alle risorse genetiche e moltiplicarne le potenzialità di utilizzo nei sistemi agroalimentari



https://youtu.be/vj_l0K3gTdM

The CSE in a nutshell

INCREASE

https://www.pulsesincrease.eu/experiment/app

Download of the INCREASE CSE App (INCREASE CSA) and citizens registration

More than 1,000 common bean landraces in INCREASE CSE

DOI and eSMTA

SEEDS

Control variety

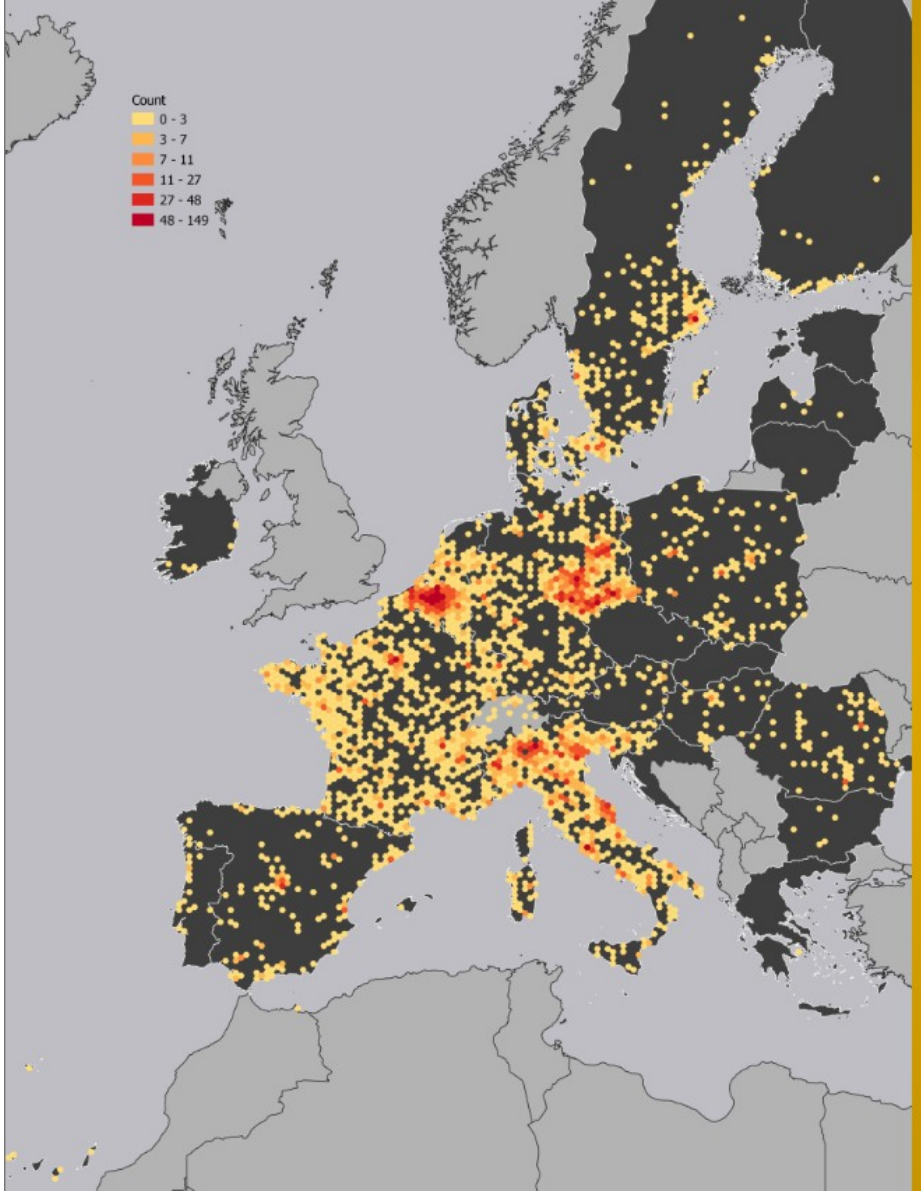
Each participant receives five different landraces + one control variety, common among all citizens

Citizens grow and evaluate the common bean CSE lines in plots or pots in fields, gardens, terraces, balconies, etc...

Through the App, citizens collect and record information on the common bean CSE lines they are nurturing, and share their experiences, uses, photos, opinions

All interested citizens can voluntarily contribute and test a decentralised approach to seed conservation, multiplication and sharing in order to conserve and valorize agro-biodiversity

INCREASE Citizen Science Experiment - ITALIANO



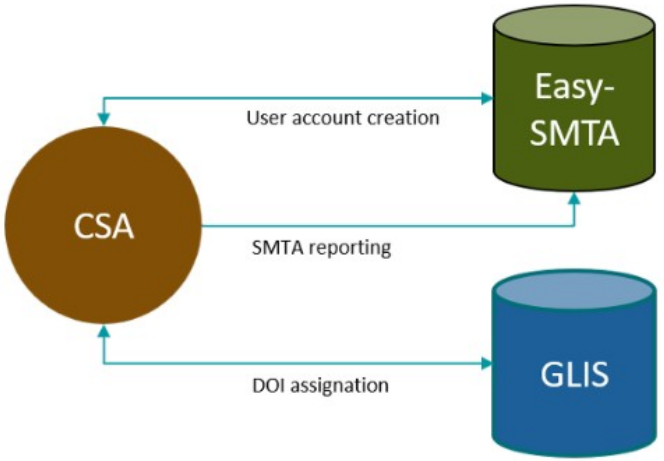
2023:
9293 registered citizens from 29 countries

2021-2023
16799 citizens

+ 270% compared to 2021

„INCREASE CSA“ SMTA step to receive seeds

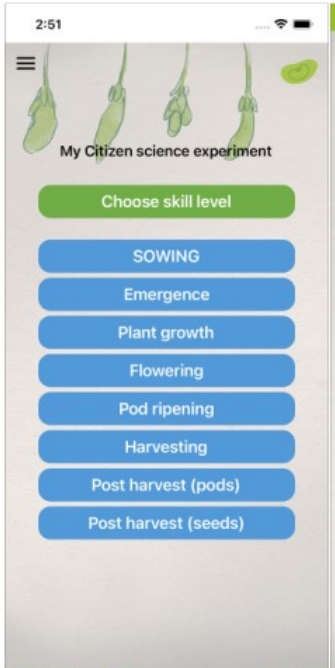
- PGR requires Standard material transfer agreement (SMTA) according to the Treaty, with FAO integration of the easy SMTA into App
- DOI Registration Module of the Global Information System (GLIS), seed exchange integrated with FAO APIs, Process Certification), Blockchain infrastructure
- Only after SMTA acceptance, seeds send via mail
- Seed exchange with SMTA between citizens possible since 2022

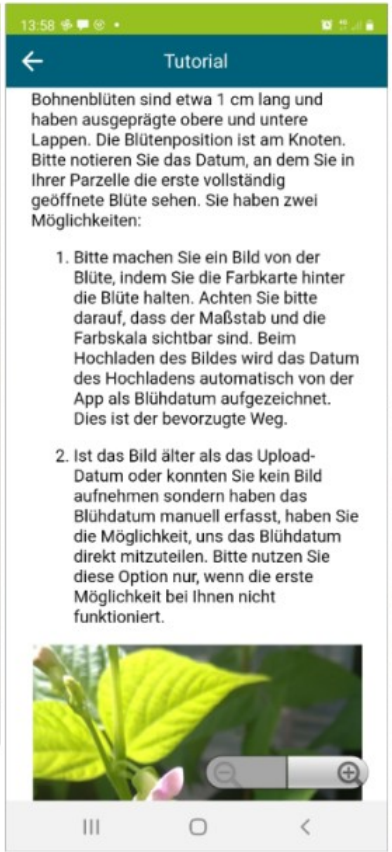


SMTA & DOIs: **Marco Marsella, Emanuele Frontoni, Tommaso Pantaloni, Markus Oppermann**

Seed packing and sending:
Elisa Bellucci, Abdalhadi MS Abulebda, Alice Pieri and many students (!)

Phenotyping beans with help of App **INCREASE CSA**





The CSE core team

INCREASE

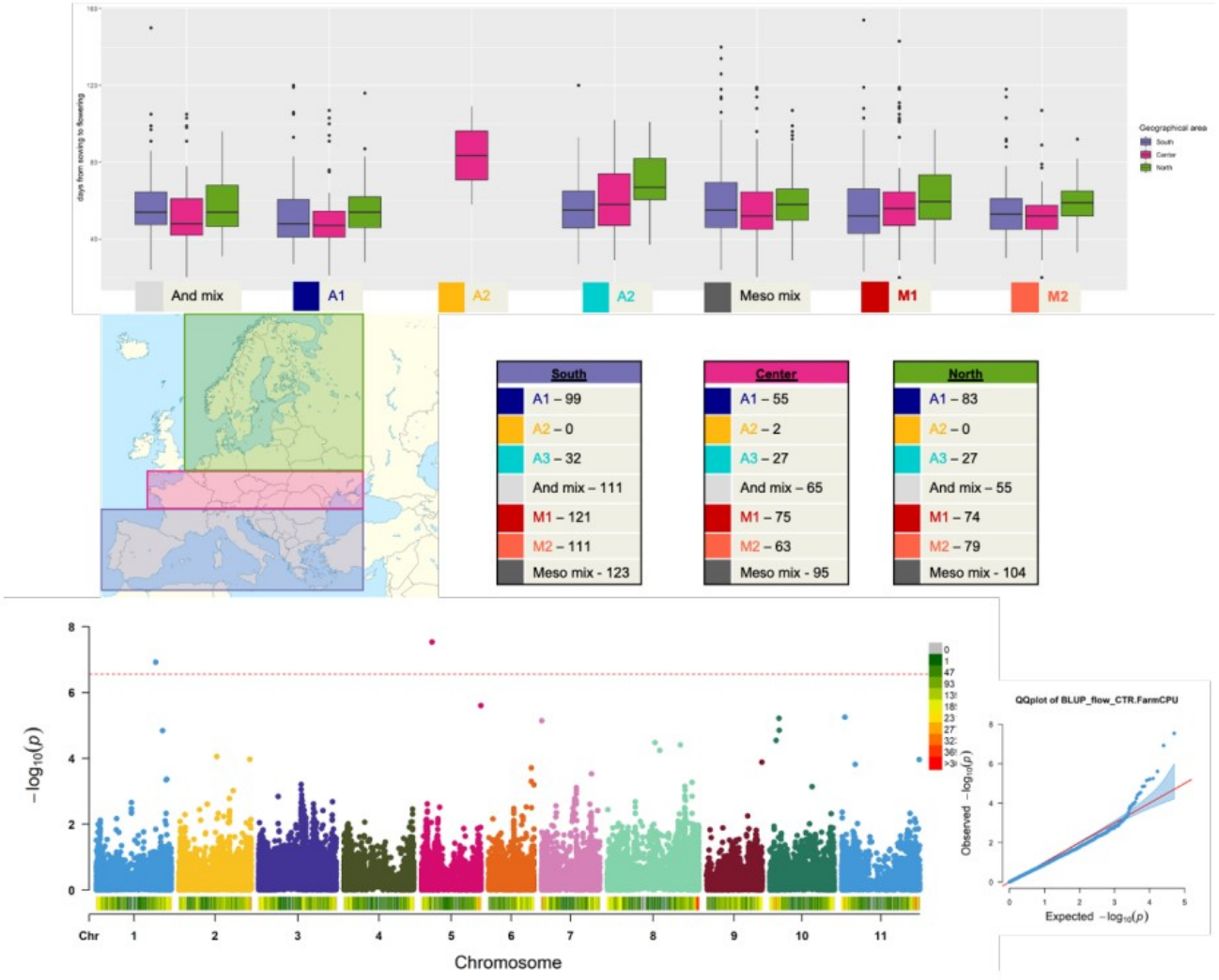
Weekly online organisation meetings

- App: Emanuele Frontoni & Tommaso Pantaloni (UNIVPM)
- Coordination, dissemination, plant material, descriptors, seed sending: Roberto Papa, Elisa Bellucci, Abdalhadi MS Abulebda, Alice Pieri (UNIVPM)
- Coordination, CSE email account, dissemination, App schemes, randomizations: Kerstin Neumann, Madita Lauterberg, Markus Oppermann, Franziska Keller (IPK)
- Coordination, dissemination, website content: Tamara Messer, Lena Prochnow, Nina Baltes (Eurice)
- Occasional member: Marco Marsella (FAO)

CSE success depends on:

1) Team work of all INCREASE partners (!)
2) High motivation of INCREASE partners
3) Constant organisation discussions
4) Decentralised dissemination to win participants
5) Enthusiasm of participants (!)

Distribution of **days from sowing to FLOWERING** of the different Gene pools **across European Geographical Areas**



Bellucci, *et al.* Selection and adaptive introgression guided the complex evolutionary history of the European common bean. *Nature Communications* **14**, 1908 (2023).

- https://www.pulsesincrease.eu/user/pages/08.media/01.clips/07._clips/Citizens%20for%20agrobiodiversity.mp4