

Overview on BRESOV and INCREASE projects

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UNIVERSITÀ
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DELLE MARCHE



ForEVA project meeting

10-11 October 2023, Bucharest, Romania

NATURE SUSTAINABILITY

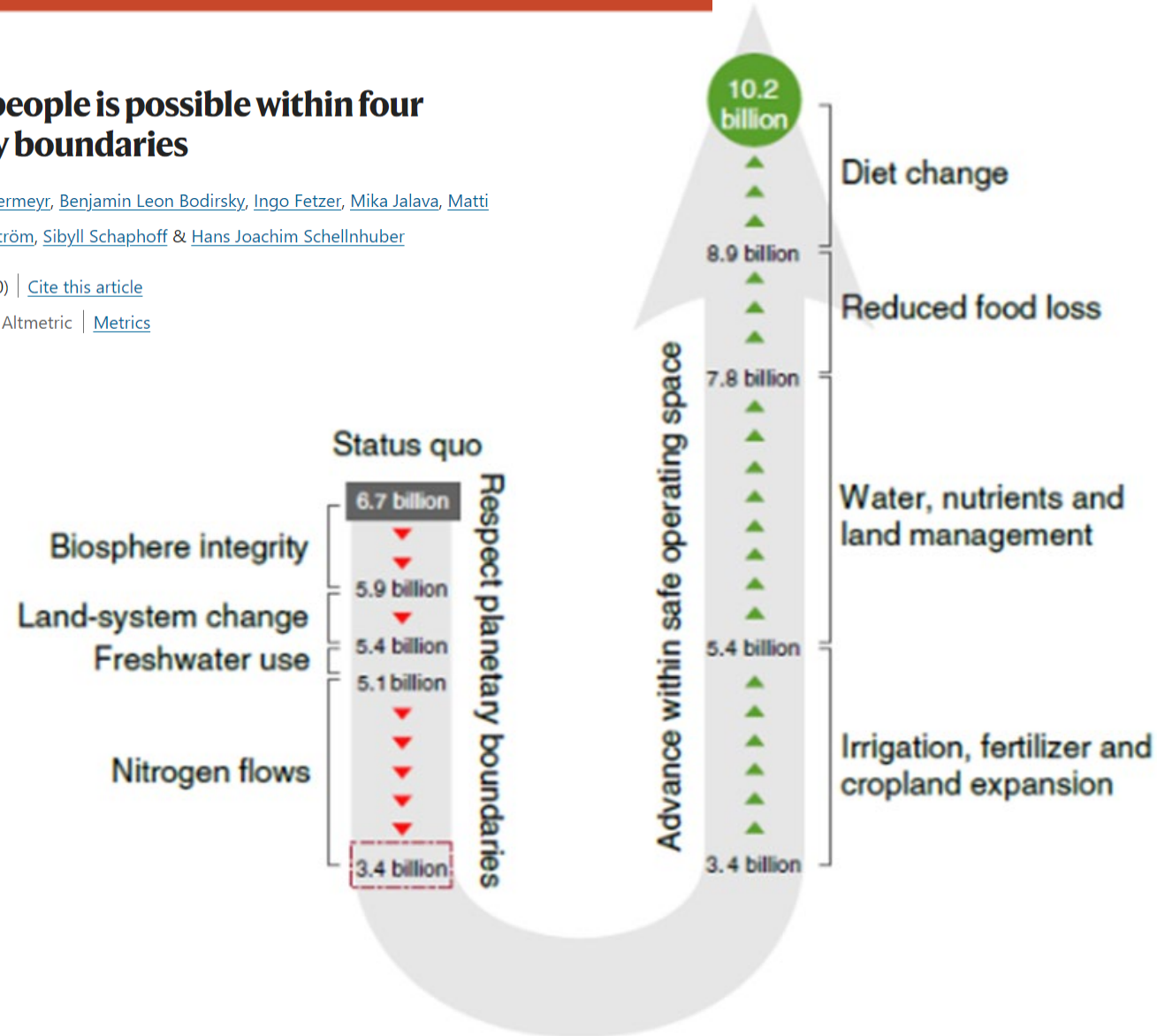
Article | [Published: 20 January 2020](#)

Feeding ten billion people is possible within four terrestrial planetary boundaries

[Dieter Gerten](#), [Vera Heck](#), [Jonas Jägermeyr](#), [Benjamin Leon Bodirsky](#), [Ingo Fetzer](#), [Mika Jalava](#), [Matti Kummu](#), [Wolfgang Lucht](#), [Johan Rockström](#), [Sibyll Schaphoff](#) & [Hans Joachim Schellnhuber](#)

[Nature Sustainability](#) **3**, 200–208 (2020) | [Cite this article](#)

10k Accesses | 133 Citations | 653 Altmetric | [Metrics](#)





BRESOV

Breeding for Resilient, Efficient and Sustainable Organic Vegetable Production



The BRESOV project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774244



BRESOV

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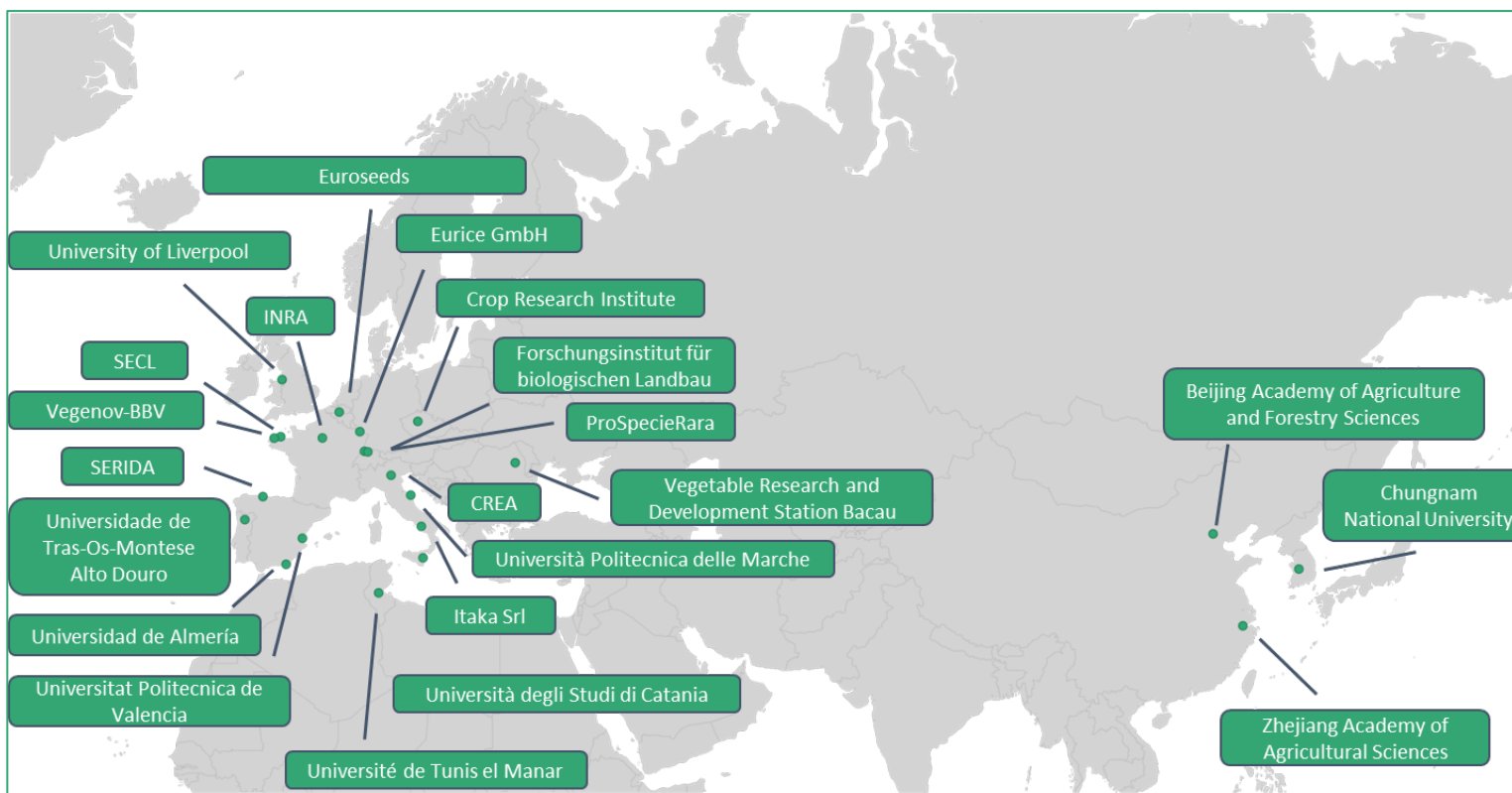
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SHAPING THE FUTURE OF ORGANIC BREEDING & FARMING

Three crops: broccoli, snap bean and tomato



- 5 years (1 May 2018 - 30 April 2023)
- 22 partners
- 9 EU28 countries (IT, BE, ES, PT, CZ, FR, UK, RO, GER)
- 2 Associated countries (Switzerland, Tunisia)
- 2 Third countries (China, South Korea)





BRESOV aimed to

The project was based on the **urgent need to provide climate-resilient cultivars addressed to organic vegetable production systems.**

Exploitation of **genetic resources**, in terms of formulating **climate-resilient** cultivars addressed to **vegetable organic production** systems under current and future scenarios of climate change

Common bean activities

WP2/WP3



BRESOV







➤ **Single Seed Descent (SSD) lines**

HYPER-CORE COLLECTION (HCC) 82 lines

SNAP BEAN PANEL (SBP) 311 lines

TUM (160 $F_{2:6}$ lines)

INTROGRESSION LINES (ILs) 905 lines +2 parents

SNAP BEAN BREEDING LINES (SBBLs) 22 lines

➤ **Single Seed Descent (SSD) lines**
(great efforts for seed increase were done!)

➤ **DOI number assigned**
(with the exception of TUM)

Hyper Core Collection (HCC)

82 *P. vulgaris* SSD lines (wild, landraces, breeding lines, elite varieties, snap and dry bean)



BRESOV



HCC67/ SBP113



HCC57/ SBP010



HCC79/ SBP279



HCC80/ SBP014



HCC56/ SBP011



HCC82/ SBP007



HCC78/ SBP026



HCC81/ SBP150



✓ **Whole Genome Sequencing (WGS)**

> 8,968,390 filtered SNPs

✓ **Resistance to diseases tests (WGS)**

> Anthracnose, powdery mildew, white mold and *Phytophthora*



✓ **Quality traits of fresh pods**

> Proximate composition & metabolites

✓ **Root traits**

Snap bean panel (SBP) - 311 *P. vulgaris* SSD lines



BRESOV



✓ Genotyping by Sequencing (GBS)

> 121,356 filtered SNPs



✓ Pod morphology (image analysis)



✓ Quality traits of fresh pods

✓ Multi-location field trials in organic farming

✓ Resistance to diseases tests

> Anthracnose, powdery mildew, white mold and *Phytophthora*

➤ Genetic characterization of materials

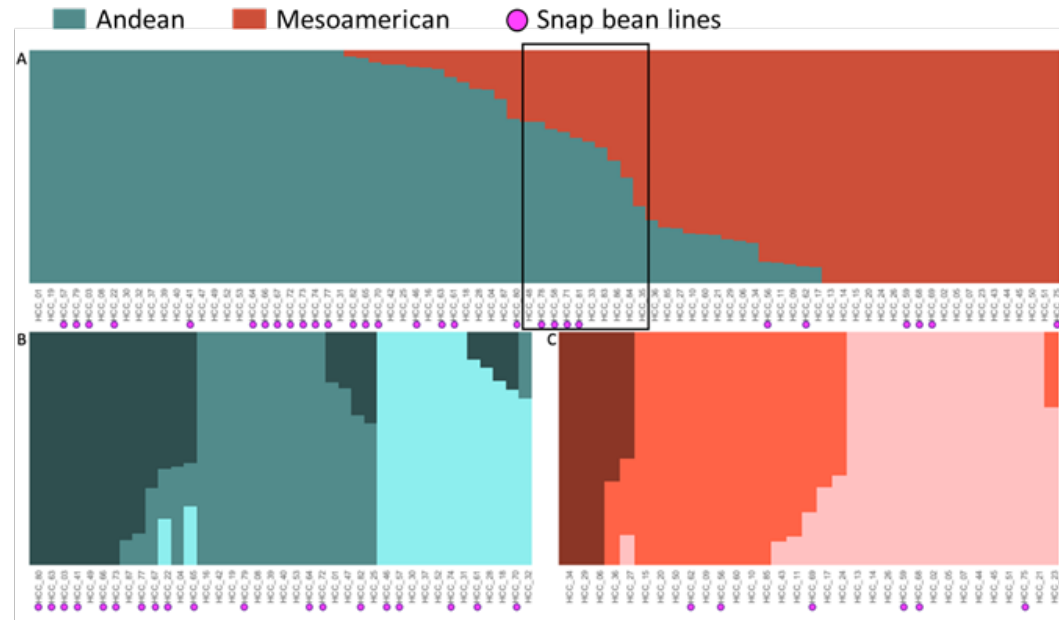


BRESOV



Whole Genome Sequencing (WGS)

> 8,968,390 filtered SNPs



ADMIXTURE ver. 1.22 (Alexander et al. 2009)

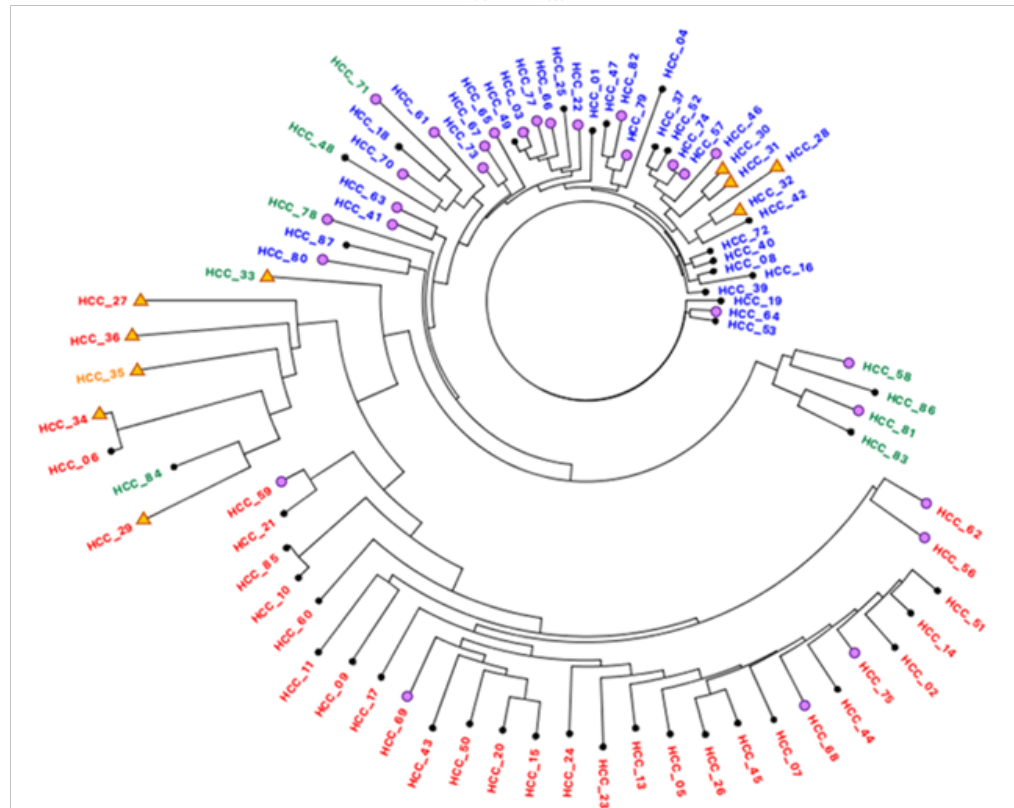
Mesoamerican ($q_M > 0.70$)

Andean ($q_A > 0.70$)

Admixed ($0.30 < q_A$ or $q_M < 0.70$)

● Snap bean lines

▲ Wild



➤ Phenotypic characterization of materials

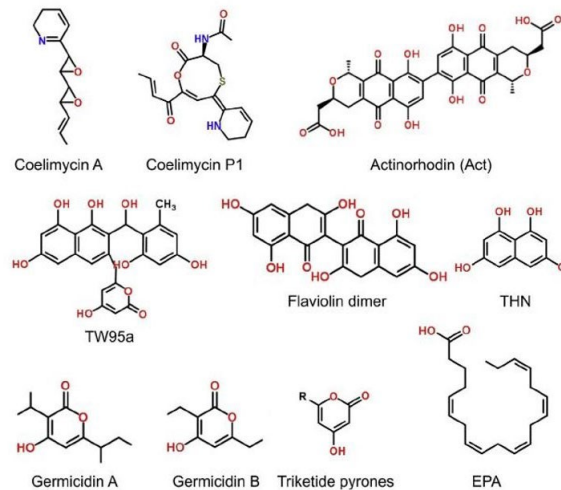
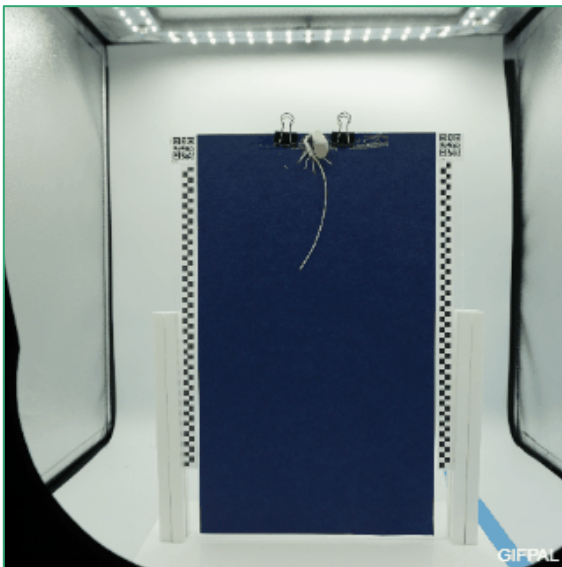
Spain – P16SERIDA



Italy – P7UNIVPM



Romania – P11VRDS




Resistant Plants



Susceptible Plants

Results/ (Key) Achievements

➔  Identification of interesting lines resistant/ tolerant to tested pathogens

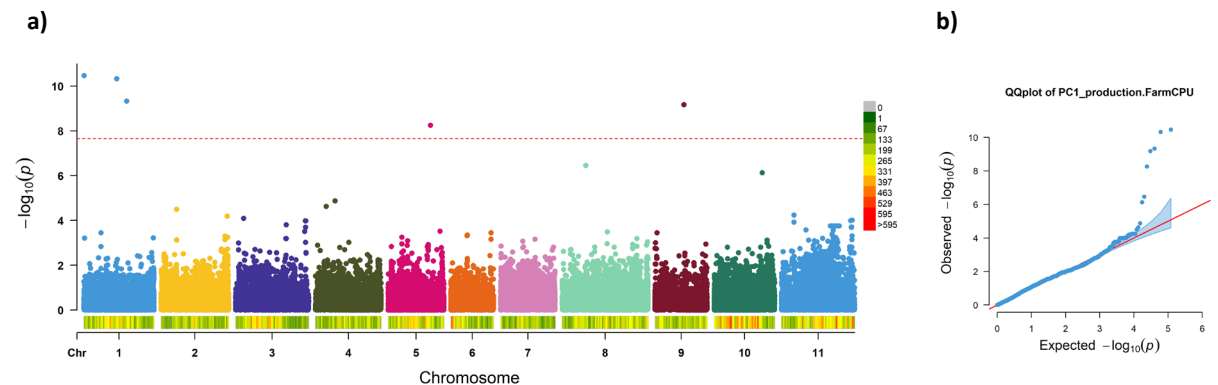
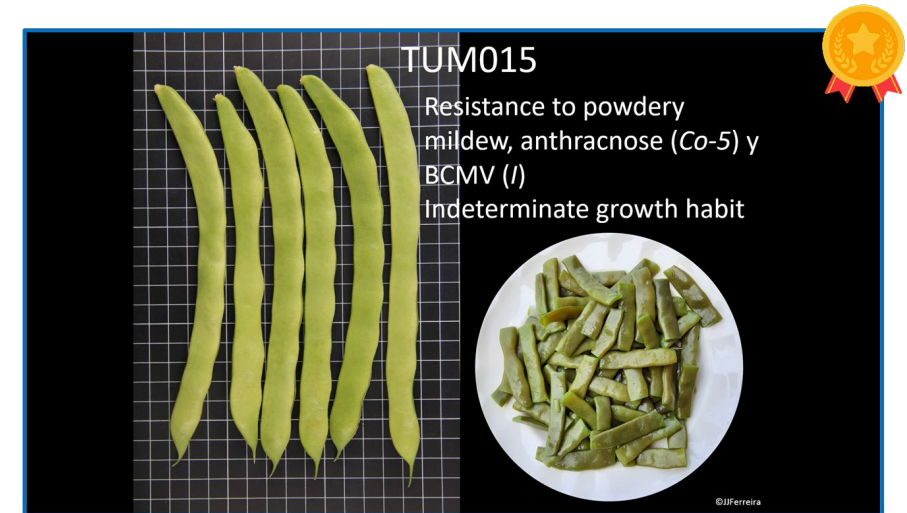
➔  Identification of interesting lines for agronomic characteristics (e.g. stability for yield and yield components)

➔  Identification of interesting lines for quality traits

➔ Pyramiding of resistance genes

➔ Development of new cultivars

➔ Identification of QTL for different traits



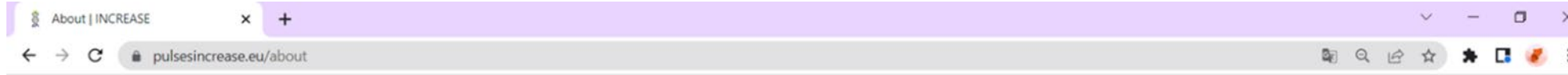
INCREASE



Intelligent Collections of Food Legumes Genetic Resources for
European Agrofood Systems



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



INCREASE – Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems



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Increasing Agricultural Biodiversity in Europe



DURATION
6 Years



FUNDING
7 Million €



26 PARTNERS
13 Countries

In alphabetic order:

BRGV-Suceava - Banca de Resurse genetice vegetale Mihai Cristea Suceava (RO)

CNRS - Le Moulon - Centre National de la Recherche Scientifique (FR)

CREA - Consiglio per la Ricerca in Agricoltura e l'Analisi Dell'Economia Agraria (IT)

EURICE - European Research and Project Office GmbH (DE)

FAO - Food and Agriculture Organization of the United Nations (IT)

ICARDA - International Centre for Agricultural Research in the Dry Areas (LB)

ICRISAT - International Crops Research Institute for the semi-arid Tropics (IN)

IGR-PAN - Instytut Genetyki Roslin Polskiej Akademi Nauk (PL)

IHAR-PIB - Instytut Hodowli i Aklimatyzacji Roslin – Państwowy Instytut Badawczy (PL)

INIA - Instituto Nacional de Investigación in Tecnología Agraria y Alimentaria OA MP (SP)

INRAE-IPSS2 - Institut Nationale de la Recherche Agronomique, l'alimentation et l'environnement-INRAE (FR)

IPK - Leibnitz-Institut für Pflanzengenetik und Kulturpflanzenforschung (DE)

ISEA SRL (IT)

KIS - Kmetški Institut Slovenije – Agricultural Institute of Slovenia (SI)

MASP - Comunità del Mais Spinato di Gandino (IT)

MPG - Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (DE)

NDSU - North Dakota State University (US)

SDL-BACAU - Statiunea de Cercetare Dezvoltare Pentru Legumicultura Bacau (RO)

SERIDA - Servicio Regional de Investigación y Desarrollo Agroalimentario del Principa (ES)

TERRES INOVIA (FR)

UC Davis – University of California, Davis (US)

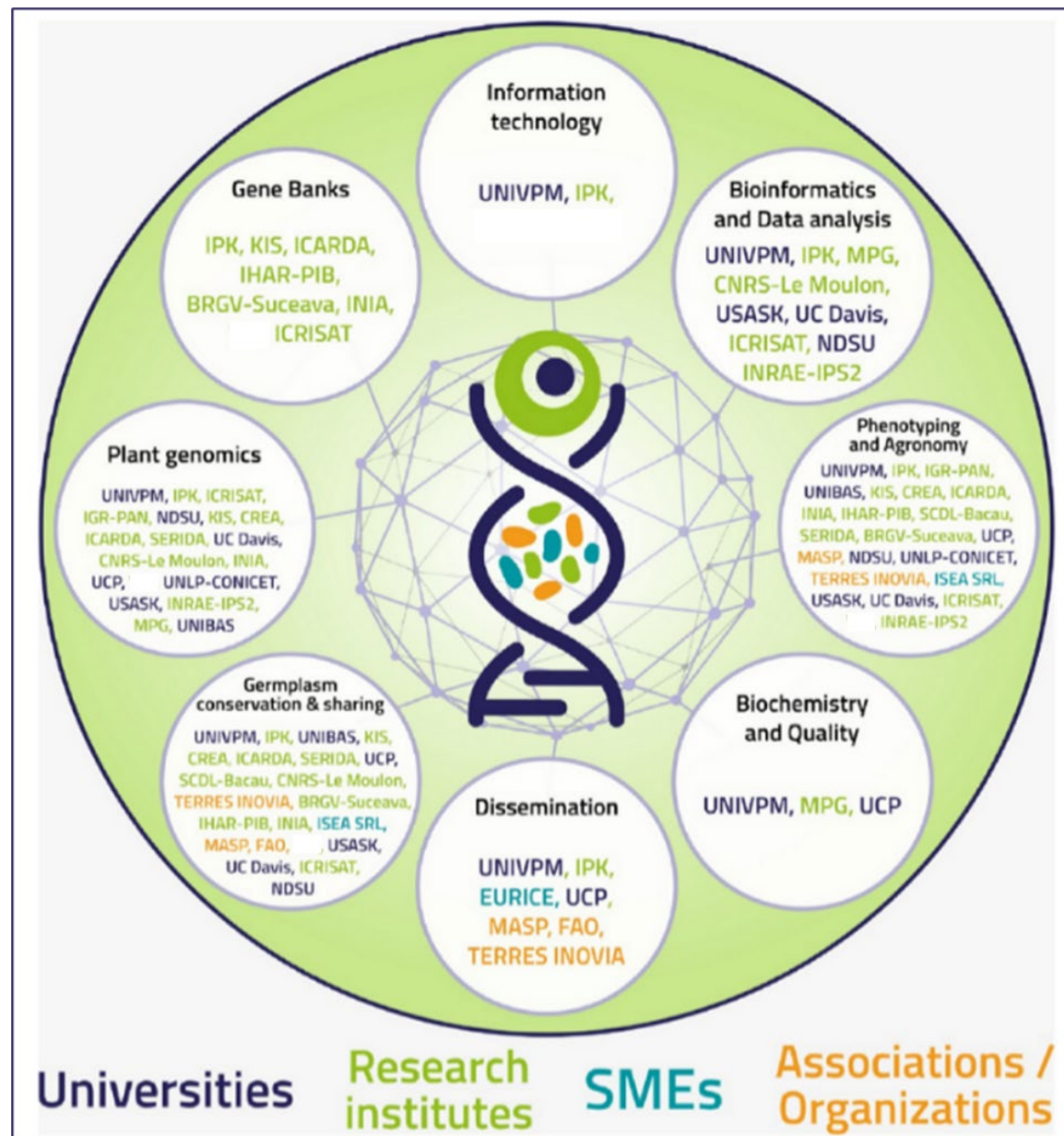
UCP - Universidade Catolica Portuguesa (PT)

UNIBAS - Università Degli Studi Della Basilicata (IT)

UNIVPM - Università Politecnica delle Marche (IT)

UNLP - CONICET - Universidad Nacional de La Plata (AR)

USASK - University of Saskatchewan (CA)



PERSPECTIVES

The INCREASE project: Intelligent Collections of food-legume genetic resources for European agrofood systems

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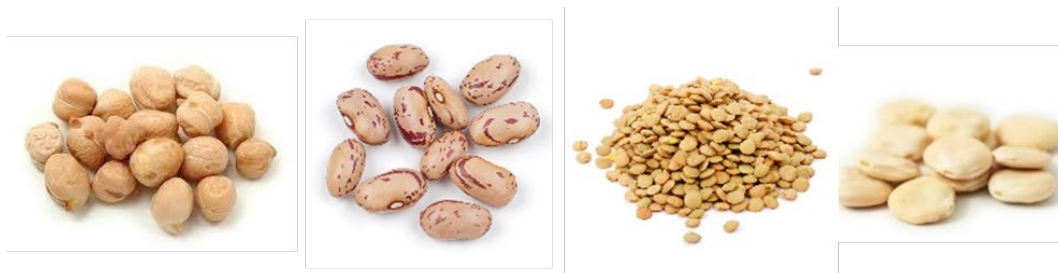
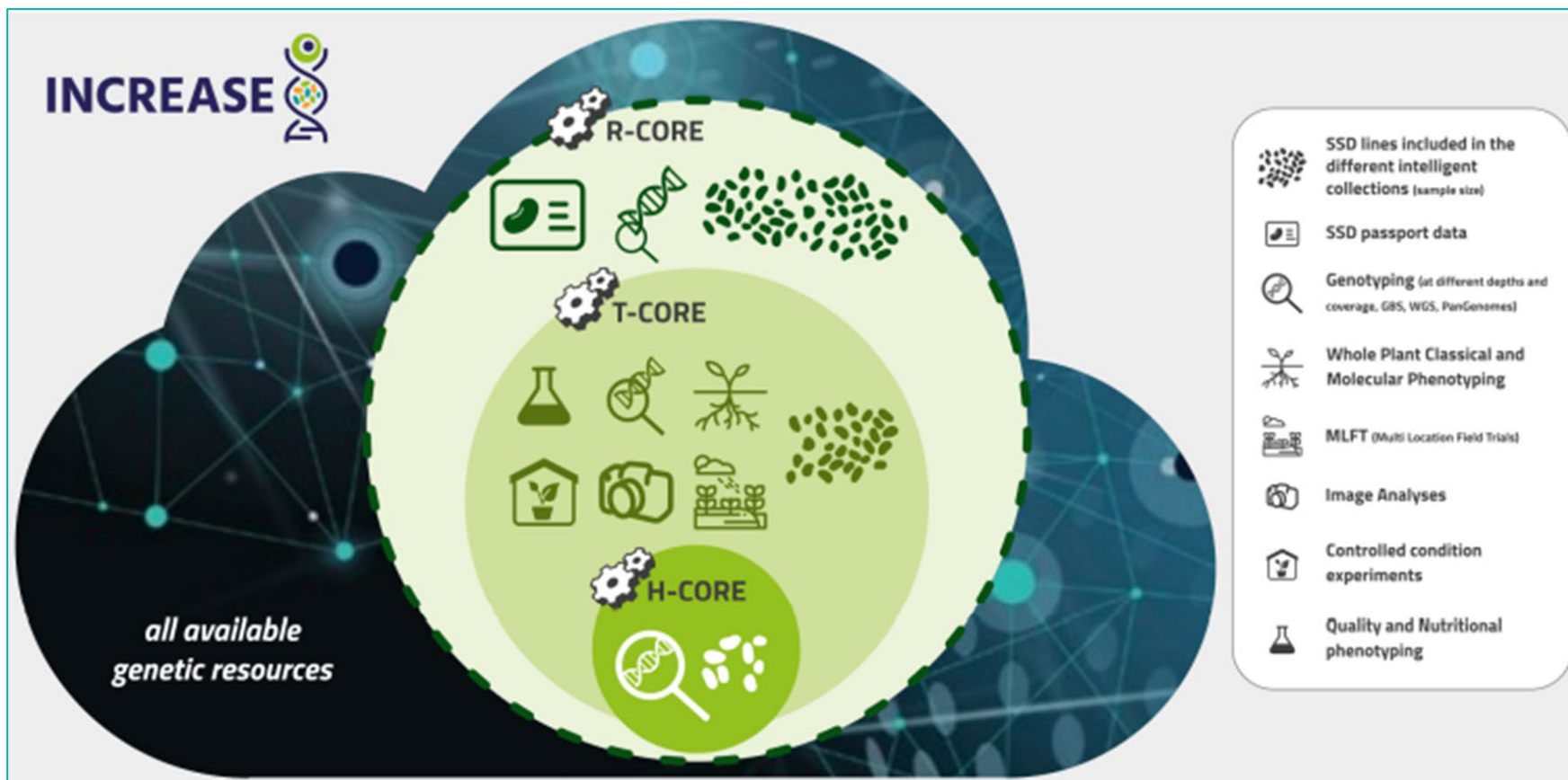
³⁰Council for Agricultural Research and Economics, Research Centre for Vegetable and Ornamental Crops, Via Cavalleggeri 25, Pontecagnano-Falano, SA 84098, Italy,

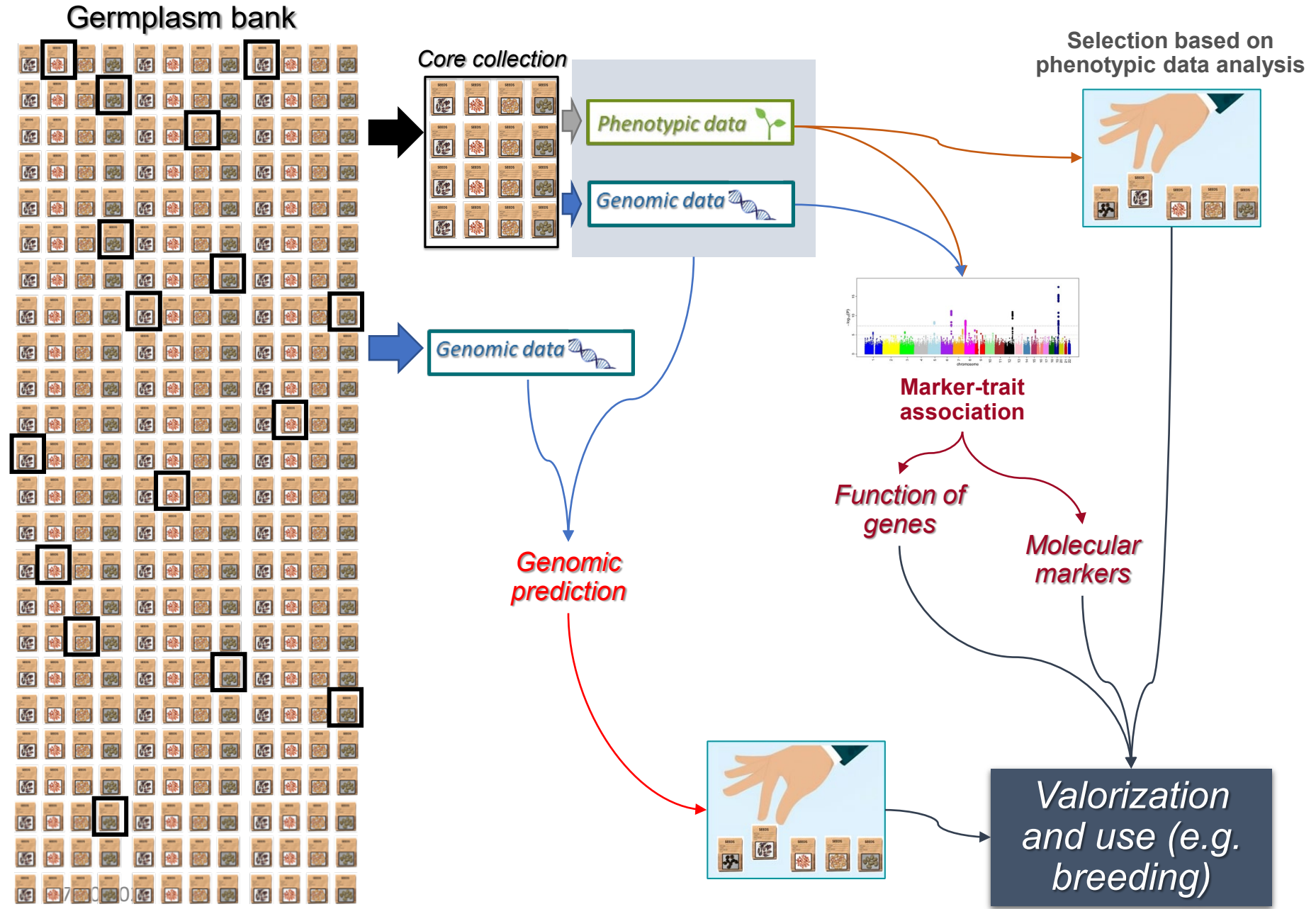


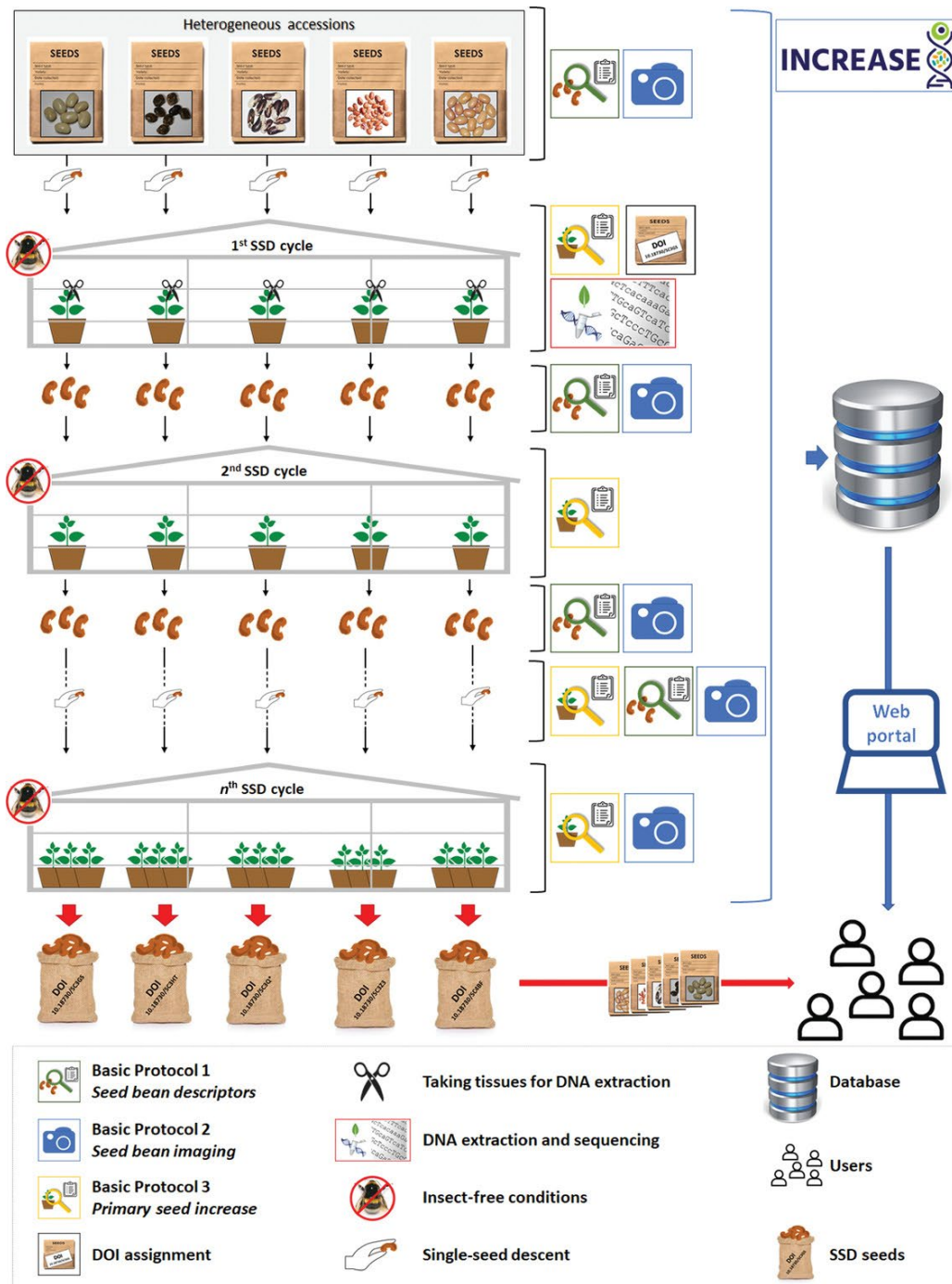


Implementation of a *new approach to conserve, manage and characterise genetic resources* through participatory research.

INCREASE Intelligent Collections







CURRENT PROTOCOLS

PROTOCOL | Open Access | CC BY

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

First published: 18 May 2021 | <https://doi.org/10.1002/cpz1.133> | Citations: 1

CURRENT PROTOCOLS

PROTOCOL | Open Access | CC BY

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 ... See all authors

First published: 09 July 2021 | <https://doi.org/10.1002/cpz1.191>

CURRENT PROTOCOLS

PROTOCOL | Open Access | CC BY

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

First published: 18 May 2021 | <https://doi.org/10.1002/cpz1.134>

CURRENT PROTOCOLS
A Wiley Brand

ARTICLE TITLE: Towards the Development, Maintenance and Standardised Phenotypic Characterisation of Single-Seed-Descent Genetic Resources for Chickpea

AUTHOR(S) AND CONTACT INFORMATION:

Lorenzo Rocchetti¹, Tania Gioia², Giuseppina Logozzo², Creola Brezeanu³, Luis Guasch Pereira⁴, Lucia De la Rosa⁴, Stefania Marzario², Alice Pieri¹, Alisdair R. Fernie⁵, Saleh Alseekh⁶, Karolina Susek⁶, Douglas R. Cook⁷, Rajeev K. Varshney⁸, Shiv Kumar Agrawal⁹, Aladdin Hamwieh⁹, Elena Bitocchi¹, Roberto Papa^{1,*}




PSI (Primary Seed Increase) and SSI (Secondary Seed Increase) experiments in INCREASE






Partners | INCREASE x The INCREASE project: Intelligent x The INCREASE project: Intelligent x International Treaty on Plant Gen x exchange of seeds - Ricerca Goo x +

m.s.planttreaty.org/itt/index.php



The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE



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Main menu

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- Statistics
- Charts
- Maps
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Easy-SMTA Homepage

Welcome to the homepage of Easy-SMTA, the Information Technology System developed in support of the users of the Multilateral System of Access and Benefit-sharing of the International Treaty on Plant Genetic Resources for Food and Agriculture ([ITPGRFA](#)).

The Standard Material Transfer Agreement ([SMTA](#)) is a private contract with standard terms and conditions that ensures that the relevant provisions of the International Treaty are followed by individual providers and recipients of plant genetic material. This System has been developed by the Secretariat of the International Treaty to assist users with:

1. compiling and generating SMTAs in the six official languages of the International Treaty;
2. reporting on SMTAs concluded in accordance with the instructions made by the Governing Body of the International Treaty.

You need to [log in](#) to be able to use the system. Please [register](#) to create a new account if you do not have one

[User Manual](#) ©2022 International Treaty on Plant Genetic Resources for Food and Agriculture - FAO [Terms of Use](#)

<https://m.s.planttreaty.org/itt/index.php>

DOI numbers



SMTA number: JSRGB-KIS2021-002

STANDARD MATERIAL TRANSFER AGREEMENT*

PREAMBLE

WHEREAS

The International Treaty on Plant Genetic Resources for Food and Agriculture (hereinafter referred to as "the Treaty") was adopted by the Thirty-first session of the FAO Conference on 3 November 2001 and entered into force on 29 June 2004;

The objectives of the Treaty are the conservation and sustainable use of **Plant Genetic Resources for Food and Agriculture** and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security;

The Contracting Parties to the Treaty, in the exercise of their sovereign rights over their **Plant Genetic Resources for Food and Agriculture**, have established a **Multilateral System** both to facilitate access to **Plant Genetic Resources for Food and Agriculture** and to share, in a fair and equitable way, the benefits arising from the utilization of these resources, on a complementary and mutually reinforcing basis;

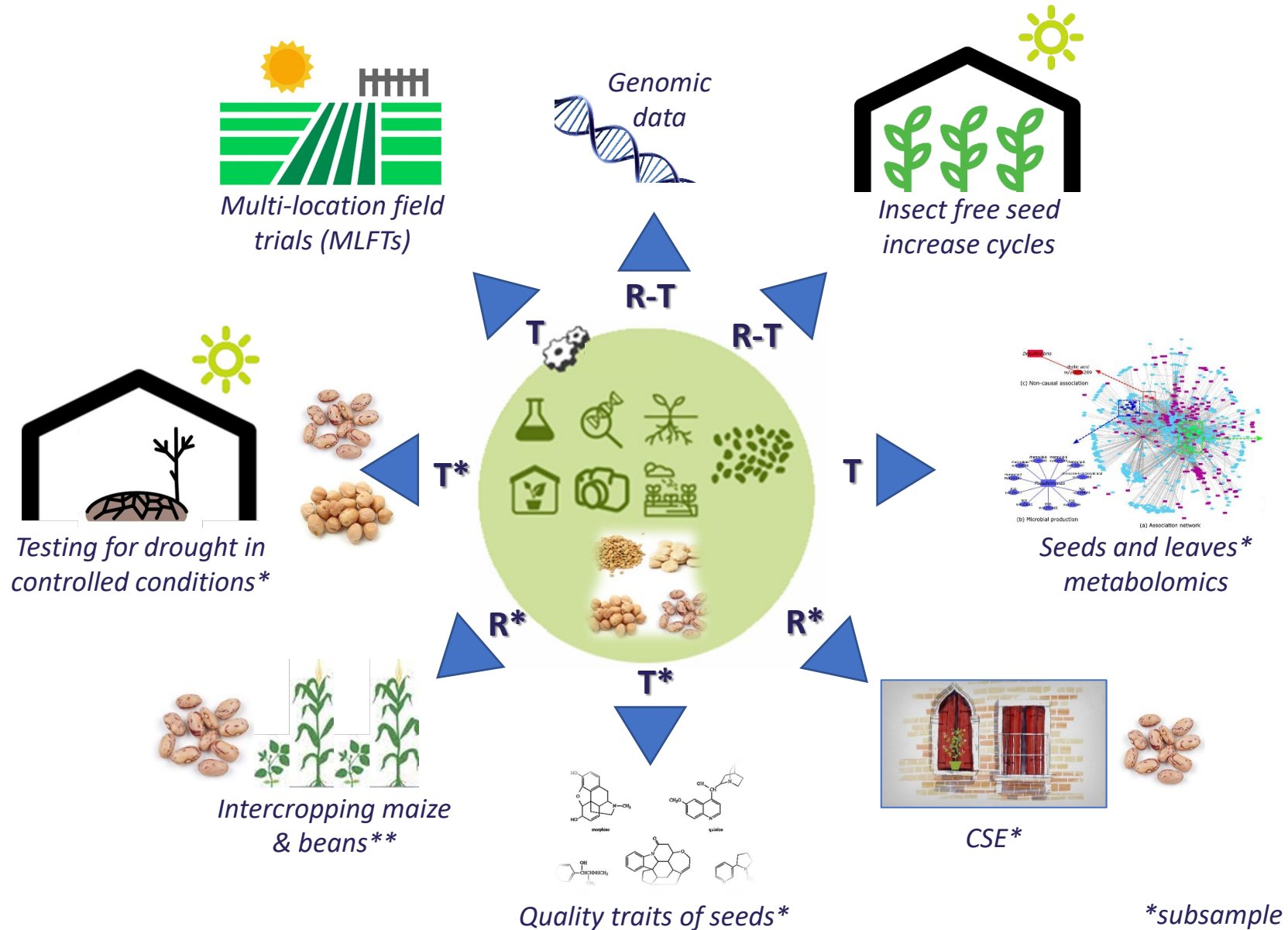
Articles 4, 11, 12.4 and 12.5 of the Treaty are borne in mind;

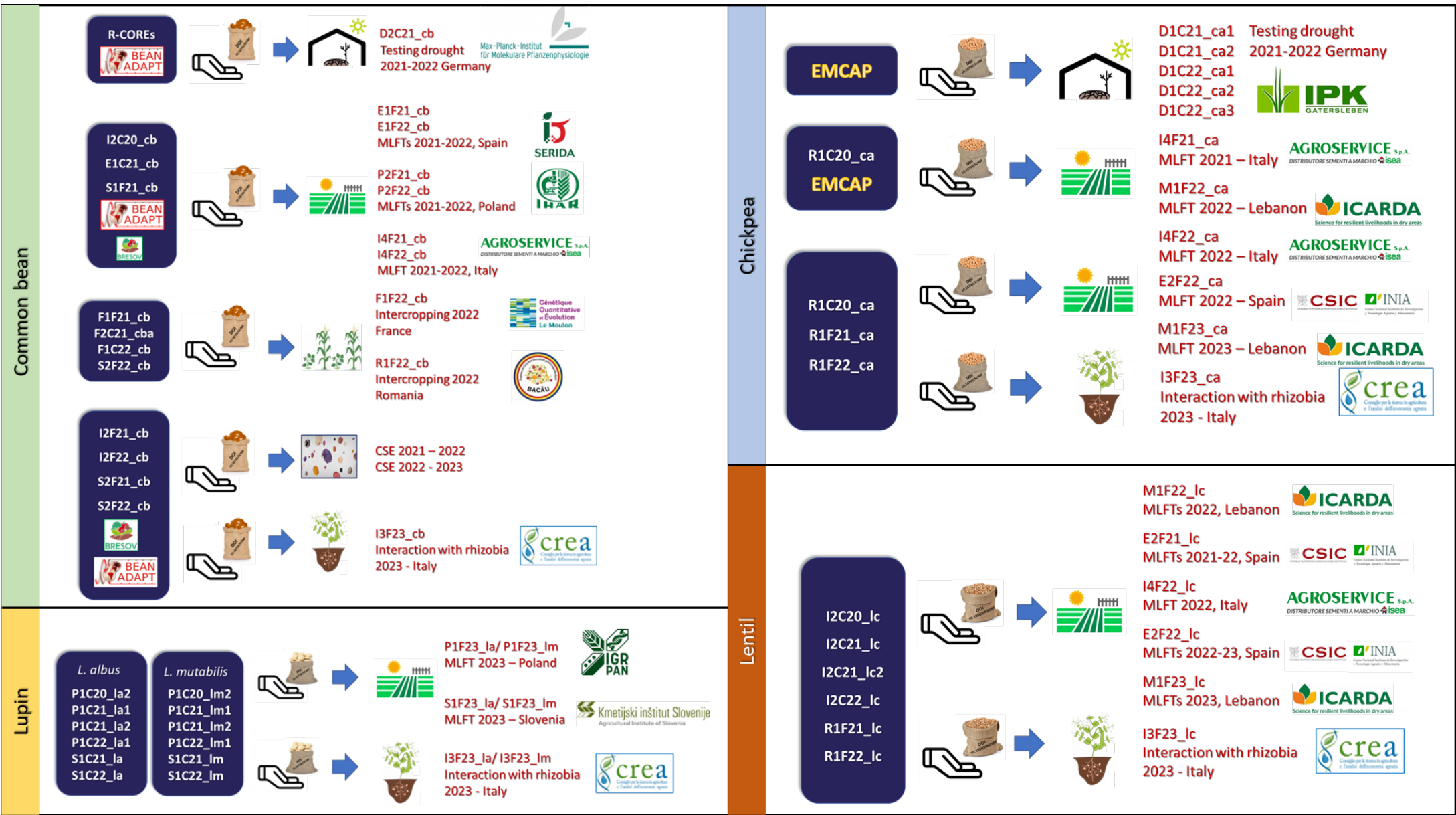
The diversity of the legal systems of the Contracting Parties with respect to their national procedural rules governing access to courts and to arbitration, and the obligations arising from international and regional conventions applicable to these procedural rules, are recognized;

Article 12.4 of the Treaty provides that facilitated access under the **Multilateral System** shall be provided pursuant to a Standard Material Transfer Agreement, and the **Governing Body** of the Treaty, in its Resolution 1/2006 of 16 June 2006, adopted the Standard Material Transfer Agreement.



R-COREs (2000-4000 SSD lines; > 10,000 for common bean)
 T-COREs (450 SSD lines)





Summary: experiments have been carried out+ ongoing

Crop	Experiment	INCREASE Partner	Location	Experiment CODE	Lines	Date of sowing	Date of harvesting
Common bean	MLFT 1st year	SERIDA	Spain	E1F21_cb	~450 T-CORE lines	May -21	Oct-21
Common bean	MLFT 2st year	SERIDA	Spain	E1F22_cb	~450 T-CORE lines	May-22	Oct-22
Common bean	MLFT 1st year	IHAR	Poland	P2F21_cb	~450 T-CORE lines	May-21	Nov-21
Common bean	MLFT 2st year	IHAR	Poland	P2F22_cb	~450 T-CORE lines	May -22	Oct-22
Common bean	MLFT 1st year	ISEA	Italy	I4F21_cb	~450 T-CORE lines	Jun-21	Nov-21
Common bean	MLFT 2st year	ISEA	Italy	I4F22_cb	~450 T-CORE lines	Jun-22	Oct-22
Common bean	Intercropping	SCDL	Romania	R1F22_cb	200 T-CORE lines	May -22	Nov-22
Common bean	Intercropping	CNRS - INRAE	France	F1F22_cb	200 T-CORE lines	May -22	Nov-22
Common bean	Rhizobia interactions	CREA	Italy	I3F23_cb	30 T-CORE lines	Apr-23	ongoing
Chickpea	MLFT 1st year	ISEA	Italy	I4F21_ca	~450 T-CORE lines	Apr-21	Jul-21
Chickpea	MLFT 2nd year	ISEA	Italy	I4F22_ca	~450 T-CORE lines	Apr-22	Jul-22
Chickpea	MLFT 1st year	CSIC	Spain	E2F2022_ca	~450 T-CORE lines	Apr-22	Jul-22
Chickpea	MLFT 1st year	ICARDA	Lebanon	M1F22_ca	~450 T-CORE lines	Dec-21	June-22
Chickpea	MLFT 2nd year	ICARDA	Lebanon	M1F23_ca	~450 T-CORE lines	Dec-22	ongoing
Chickpea	Drought	IPK	Germany	D1C21_ca	200 T-CORE lines	2021	2021
Chickpea	Drought	IPK	Germany	D1C22_ca	200 T-CORE lines	2022	2022
Chickpea	Rhizobia interactions	CREA	Italy	I3F23_ca	30 T-CORE lines	Apr-23	ongoing
Lentil	MLFT 1st year	CSIC	Spain	E2F22_lc	~450 T-CORE lines	Dec-21	Jun-22
Lentil	MLFT 2nd year	CSIC	Spain	E2F23_lc	~450 T-CORE lines	Dec-22	ongoing
Lentil	MLFT 1st year	ICARDA	Lebanon	M1F22_lc	~450 T-CORE lines	Dec-21	Jun-22
Lentil	MLFT 2nd year	ICARDA	Lebanon	M1F23_lc	~450 T-CORE lines	Dec-22	ongoing
Lentil	MLFT 1st year	ISEA	Italy	I4F22_lc	~450 T-CORE lines	Feb-22	Jun-22
Lentil	Rhizobia interactions	CREA	Italy	I3F23_lc	34 T-CORE lines	Apr-23	ongoing
Lupin	Pilot field trial	ISEA	Italy		5 T-CORE lines	Mar-22	Sep-22
Lupin	Pilot field trial	KIS	Slovenia		5 T-CORE lines	Mar-22	Sep-22
Lupin	Pilot field trial	IGR-PAN	Poland		5 T-CORE lines	Mar-22	Sep-22
Lupin albus	MLFT 1st year	KIS	Slovenia	S1F23_la	247 T-CORE lines	Mar-23	ongoing
Lupin mutabilis	MLFT 1st year	KIS	Slovenia	S1F23_lm	17 T-CORE lines	Mar-23	ongoing
Lupin albus	MLFT 1st year	IGR-PAN	Poland	P1F23_la	247 T-CORE lines	Mar-23	ongoing
Lupin mutabilis	MLFT 1st year	IGR-PAN	Poland	P1F23_lm	17 T-CORE lines	Mar-23	ongoing
Lupin albus	Rhizobia interactions	CREA	Italy	I3F23_la	30 T-CORE lines	Apr-23	ongoing
Lupin mutabilis	Rhizobia interactions	CREA	Italy	I3F23_lm	10 T-CORE lines	Apr-23	ongoing

- 30 experiments have been carried out, most of them multi-location field trials (MLFTs)

Three locations for two years



In addition,

- Drought experiments
- Rhizobia interaction experiments



Multi-location field trials (MLFTs)

LEBANON, Chickpea 2022



ITALY, Common bean 2021



POLAND, Common bean 2021



ITALY, Chickpea 2022, sowing



SPAIN, Common bean 2021





Testing for drought in controlled conditions

GERMANY,
Chickpea 2021

Vegetative drought tolerance in INCREASE chickpea PGR lines

← Impressions from 1st experiment

Images analysed with IAP (Klukas et al. 2014) →

Control Stress Control Stress



GERMANY,
Common bean 2021



Intercropping maize & beans

FRANCE, Intercropping maize-bean





Data analysis

- Pan-genome development and genotyping
- Genetic diversity and management of *in-situ* and *ex-situ* germplasm
- Genotype × Environment interactions and genomic predictions
- Allele discovery (e.g. GWAS, population genomics, landscape genomics)



Germplasm management

Evaluation of current data management and implementation of guidelines for best practices of data generation and handling

- *Use of historical data sets*
- *Implement a unified evaluation–multiplication approach Guidelines for harmonised conservation management Long-term storage*
- *Active maintenance and seed distribution of Intelligent Collections*

Article

Engaging Precision Phenotyping to Scrutinize Vegetative Drought Tolerance and Recovery in Chickpea Plant Genetic Resources

Madita Lauterberg ¹, Henning Tschiersch ¹, Roberto Papa ², Elena Bitocchi ² and Kerstin Neumann ^{1,*}

the plant journal



The Plant Journal (2023)

doi: 10.1111/tpj.16329

RESOURCE

A comprehensive metabolomics and lipidomics atlas for the legumes common bean, chickpea, lentil and lupin

Mustafa Bulut ¹, Regina Wendenburg ¹, Elena Bitocchi ², Elisa Bellucci ², Magdalena Kroc ³, Tania Gioia ⁴, Karolina Susek ³, Roberto Papa ², Alisdair R. Fernie ^{1,5,*} and Saleh Alseikh ^{1,5,*}



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ScienceDirect



Clustered regularly interspaced short palindromic repeats/CRISPR-associated protein and hairy roots: a perfect match for gene functional analysis and crop improvement

Josefa M Alamillo ¹, Cristina M López ¹, Félix J Martínez Rivas ², Fernando Torralbo ¹, Mustafa Bulut ² and Saleh Alseikh ^{2,3}



Available online at www.sciencedirect.com

ScienceDirect



Expanding our coverage: Strategies to detect a greater range of metabolites

Saleh Alseikh ^{1,2} and Alisdair R. Fernie ^{1,2}

Article

CRISPR/Cas9-Mediated Enrichment Coupled to Nanopore Sequencing Provides a Valuable Tool for the Precise Reconstruction of Large Genomic Target Regions

Giulia Lopatriello ^{1,1}, Simone Maestri ^{1,1}, Massimiliano Alfano ¹, Roberto Papa ², Valerio Di Vittori ², Luca De Antoni ¹, Elisa Bellucci ², Alice Pieri ², Elena Bitocchi ², Massimo Delledonne ^{1,3,*} and Marzia Rossato ^{1,3,*}

nature communications



Article

<https://doi.org/10.1038/s41467-023-37332-z>

Selection and adaptive introgression guided the complex evolutionary history of the European common bean

Received: 1 June 2022

Accepted: 14 March 2023

Published online: 05 April 2023

Check for updates

Elisa Bellucci ^{1,14}, Andrea Benazzo ^{2,14}, Chunming Xu ^{3,14}, Elena Bitocchi ^{1,14}, Monica Rodriguez ^{4,5,14}, Saleh Alseikh ^{6,7,14}, Valerio Di Vittori ^{16,14}, Tania Gioia ⁸, Kerstin Neumann ⁹, Gaia Cortinovis ¹, Giulia Frascarelli ¹, Ester Munube ¹, Emiliano Trucchi ^{2,10}, Laura Nanni ¹, Andrea Ariani ¹¹, Giuseppina Logozzo ⁸, Jin Hee Shin ³, Chaochih Liu ¹², Liang Jiang ⁸, Juan José Ferreira ¹³, Ana Campa ¹³, Giovanna Attene ^{4,5}, Peter L. Morrell ¹², Giorgio Bertorelle ², Andreas Graner ^{8,15}, Paul Gepts ^{11,15}, Alisdair R. Fernie ^{6,7,8}, Scott A. Jackson ^{3,15} & Roberto Papa ^{1,14,15}

DOI: 10.1111/1541-4337.13137

COMPREHENSIVE REVIEW



Legume byproducts as ingredients for food applications: Preparation, nutrition, bioactivity, and techno-functional properties

Ancuta Nartea ¹ | Anastasiya Kuhalskaya ¹ | Benedetta Fanesi ¹ | Oghenetega Lois Orhotohwo ¹ | Karolina Susek ² | Lorenzo Rocchetti ¹ | Valerio Di Vittori ¹ | Elena Bitocchi ¹ | Deborah Pacetti ¹ | Roberto Papa ¹



CRISPR/Cas9-based repeat depletion for the high-throughput genotyping of complex plant genomes

Marzia Rossato, Luca Marcolungo, Luca De Antoni, Giulia Lopatriello, Elisa Bellucci, Gaia Cortinovis, Giulia Frascarelli, Laura Nanni, Elena Bitocchi, Valerio Di Vittori, Leonardo Vincenzi, Filippo Lucchini, Kirstin E. Bett, Larissa Ramsay, David James Konkin, Massimo Delledonne, Roberto Papa




Sort by countries

Sort by main area of interest

Stakeholder consortium

Agricultural production

-  Cibo 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
-  Vallesina Bio
-  Agrovegetal
-  Comizio Agrario

Culture and education

-  Tamara Urbančič / Izobraževanje Tamara Urbančič s.p
-  COMUNE DI VALDAGNO (per Museo Civico D. Dal lago e Biblioteca Civica Villa Valle)
-  Jose 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
-  Fenster zum Guten Leben e.V.
-  Colegio Aljarafe SCA
-  Istituto Omnicomprensivo di Alanno
-  Istituto di Istruzione Superiore "Galileo Galilei"
-  Istituto di Istruzione Superiore "Achille Mepelli"- sezione Agraria/Agroalimentare
-  Fondazione Alessio Tavecchio Onlus
-  Istituto di Istruzione Superiore "Domenico Sartor"
-  Istituto di Istruzione Superiore Bruno Munari - Istituto Professionale per L'agricoltura e L'ambiente E
-  Istituto di Istruzione Superiore "VERGANI - NAVARRA"
-  Istituto Tecnico Agrario "Dionisio Anzilotti"
-  Instituto de Educación Secundaria El Tablero
-  Colegio Aljarafe SCA
-  Struttura Comprensoriale Ancescao di Parma APS

Environment & agrobiodiversity

-  Roberto Piaggese
-  Adelina Sousa
-  CRBA - Centre de Ressources de Botanique Allpiquée
-  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)
-  Roman Rachkov / Bulgarian association for biological plant protection
-  ECPGR
-  Fundacija alter eko
-  Royal Botanic Gardens Kew
-  Ökostation Freiburg
-  Associazione Solidarietà Campagna Italiana (ASCI)
-  Fundacija Alter Eko (FAE)

Food culture / production / processing

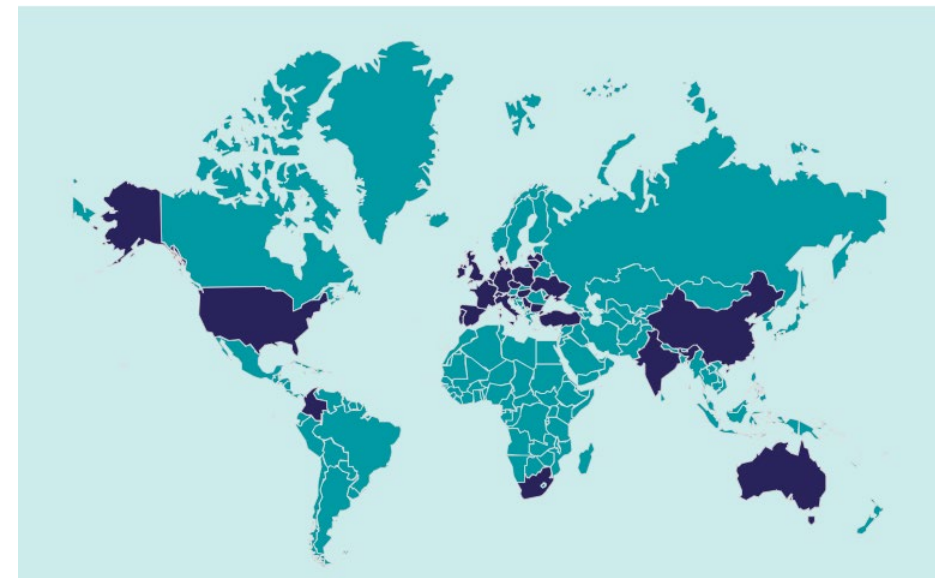
-  Legumology Limited
-  Andrea Bertocco / Herbalife Nutrition
-  Agata Szczebylo
-  Hof Sprenker / Benedikt Sprenker
-  Società Agricola Monte Monaco srl
-  Laboratorio Marchigiano Del Gusto S.r.l.s.
-  Pro Loco Appignano A.P.S
-  ECPARTNERS

Gardening

-  Kleingarten - Verein Hockstein Möbert

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 S
-  Semences de Provence
-  Istituto di Istruzione Superiore "Arrigo Serpieri"
-  PlantiCo – Hodowla i Nasiennictwo Ogrodnicze Zielonki Sp. z o.o.
-  VIVOSEM Srl
-  gzpk
-  Cérence
-  Agrovegetal S.a.
-  Tiny Farms Leiber & Fels GbR
-  Terre Paduli Azienda Agricola di Gianni Casaluca
-  Pulsbio



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
-  ILVO
-  Dr. Sumita Acharjee
-  Institute for Crop Science and Plant Breeding - Bavarian State Research Center for Agriculture (LfL)
-  Forschungszentrum Jülich Plant Sciences
-  Institute of Field and Vegetable Crops - National Research Institute of Republic of Serbia
-  University of Nottingham
-  Institute of Crop Science and Resource Conservation, University of Bonn
-  Lithuanian Research Centre for Agriculture and Forestry
-  Istituto di Istruzione Superiore "Enrico Mattei"
-  Jieshun Lin
-  Maria Chiara Fontanella





Special aim: Prebreeding in genetic resources of Common bean

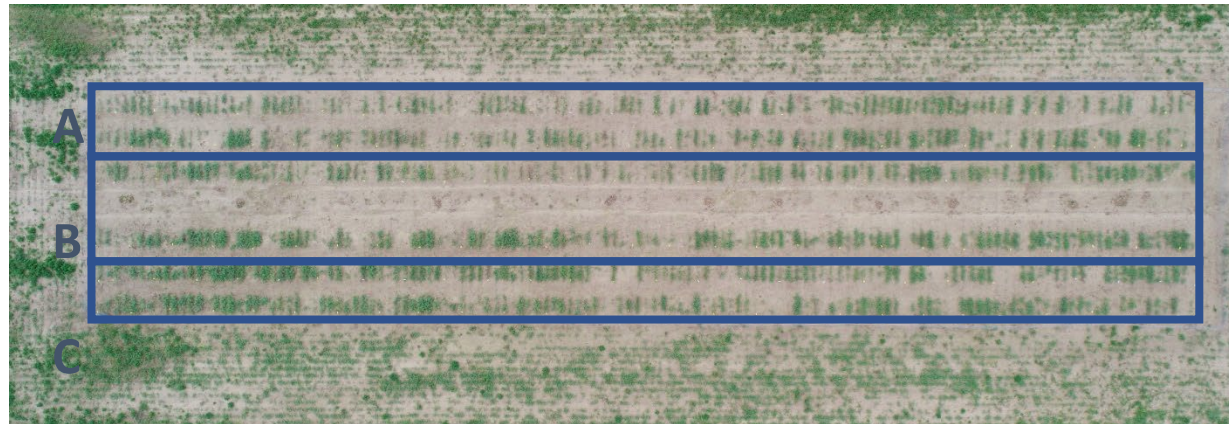
Breeding trial with INCREASE accessions



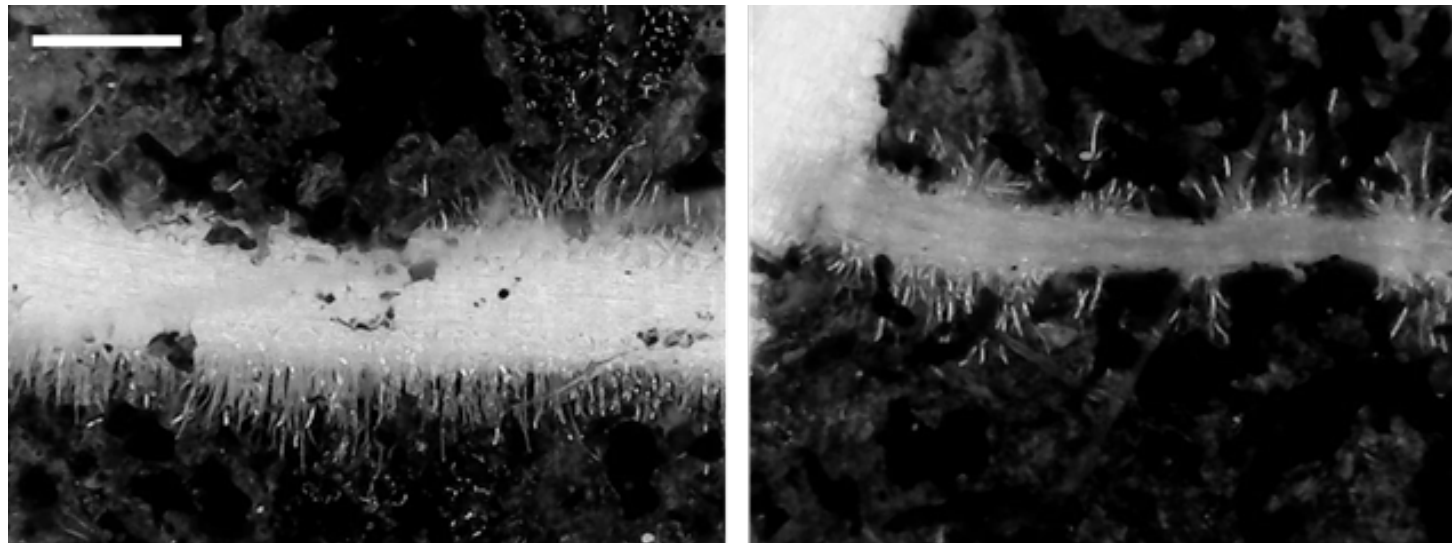
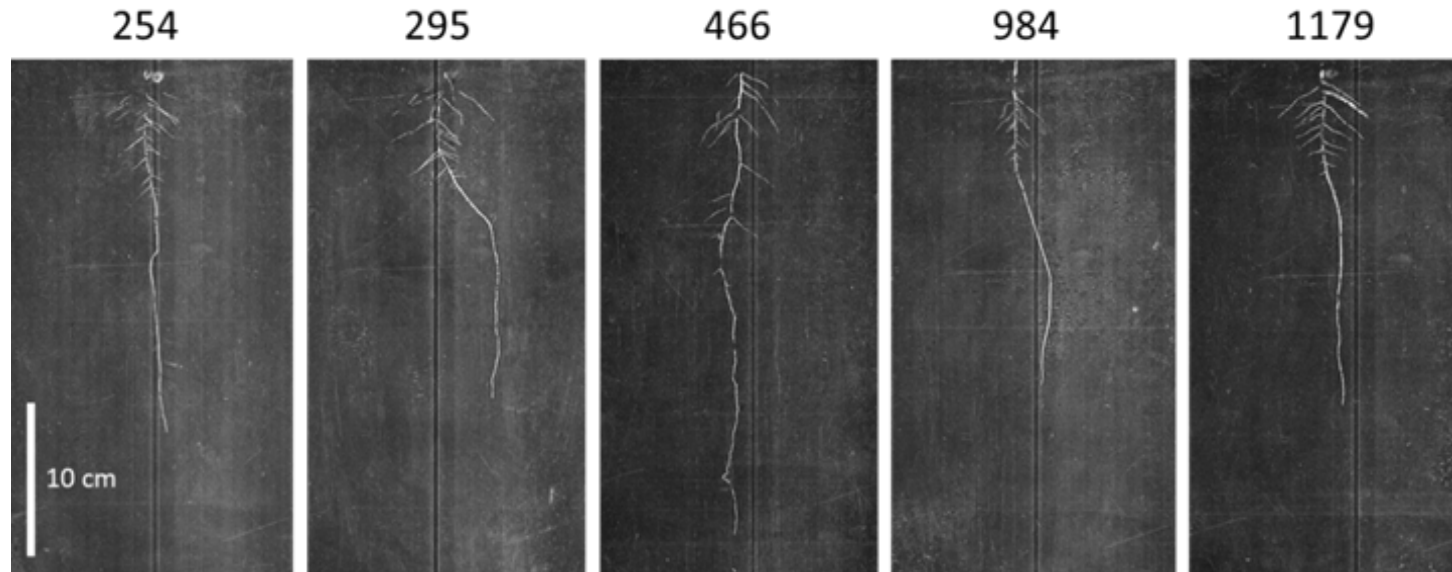
Tim Vleugels
Aurélie Tredé

ILVO

Flanders research institute for
agriculture, fisheries and food



Root architecture in chickpea





NordGen



Ulrika Carlson-Nilsson





INCREASE – Intelligent Collections of Food Legumes Genetic Resources for European Agrofood Systems



[ABOUT](#) [RESEARCH](#) [PARTNERS](#) [CROPS](#) [CITIZEN SCIENCE](#) [NEWS & EVENTS](#) [MEDIA](#) [PUBLICATIONS](#) [JOIN INCREASE](#)

 DEUTSCH  FRANÇAIS  ITALIANO  PORTUGUÊS  ESPAÑOL  POLSKI

Stakeholder Registration

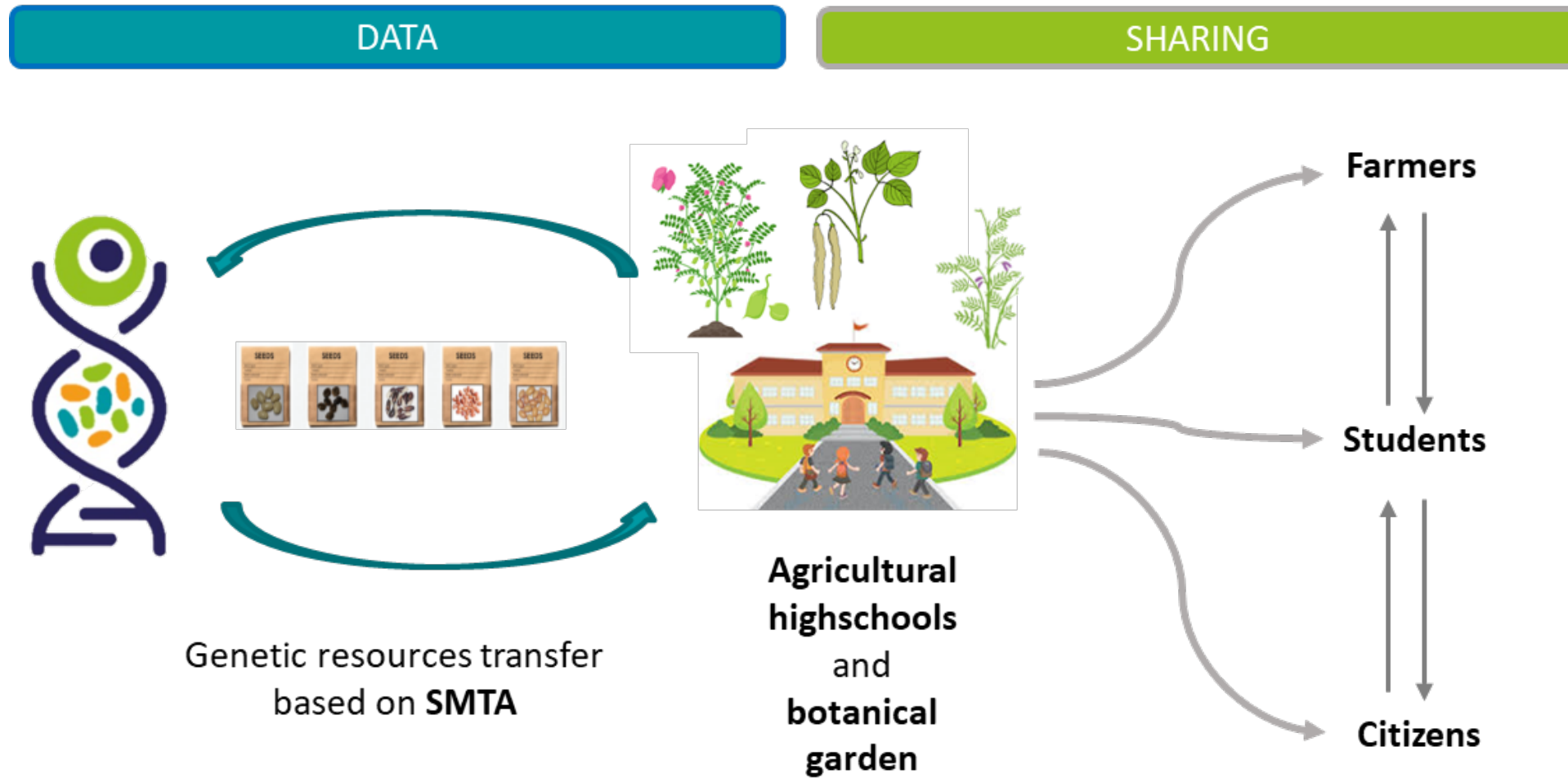
Please consider that this section is dedicated to the INCREASE Stakeholder Consortium. If you are interested in the INCREASE Citizen Science Experiment, please click [here](#).

Stakeholder consortium

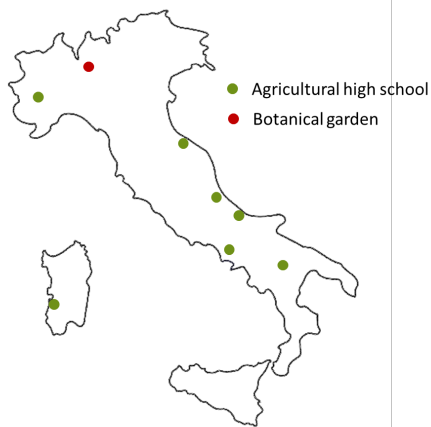
INCREASE		Your potential contribution and access			INCREASE	
Database establishment and data integration	Definition of phenotypic traits	Scientific contribution	Germplasm characterisation: To contribute set up a list of traits. A workshop for each species organized within the first 12 months of INCREASE (plant traits, seed traits)	Test and validation of the procedures	Evaluation of current data management and implementation of guidelines	Germplasm management
	Development of a data management application	Test of Data management app		Test of the web-browser portal Prototype	INCREASE intelligent collections conservation and best practices of germplasm management	
	Data collection and curation	Training workshop	Germplasm management: Participation in the germplasm multiplication and distribution. Get access to tools to select genetic material. Organise through a selected number of germplasm field show to highlight the germplasm diversity	Management practices assessment	Germplasm management	
	Development of a web-based portal	Test of portal applicability		participation and sharing know-how	Citizen science and decentralised conservation testing tools	
	Nutritional and Technological quality	Validation for adoption	Germplasm exploitation: Organisation of field network to assess the germplasm suitability (agronomy and quality), and evaluation of advanced lines potentially for variety registration. Multiplication of selected germplasm for end use assessment	Field show, conferences	Project Communication - Outreach Activities	
Data analysis and knowledge exploitation	Allele discoveries	Access and test of breeding tools		e-newsletter contribution (science translated in practice)	Dissemination	
	Genotype x Environment interactions and genomic predictions			Training activities (webinars, workshop, courses and visit)	Capacity building and training	
		Access to genetic resources	Sustainability Planning Workshop	IP and exploitation management		

Participatory research approach

Network of agricultural high schools, botanical gardens and farmers



Agricultural high-schools in Italy growing INCREASE lines in 2021



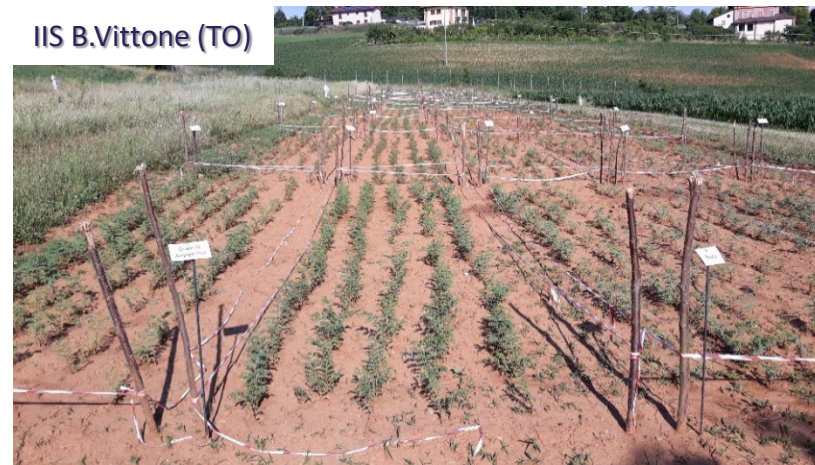
IIS Salvati (PE)



IIS Einaudi (CA)



IIS B.Vittone (TO)



IIS Fortunato (PZ)



IIS Caravaggio (NA)



IIS Sartor (TV)



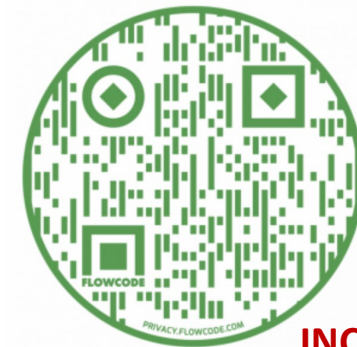


Participatory research approach to promote genetic resources of food legumes

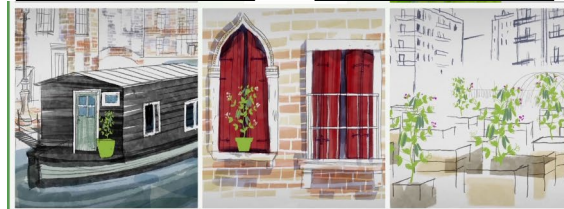
Citizen Science Experiment



OUT RESEARCH PARTNERS CROPS EXPERIMENT JOIN INCREASE NEWS & EVENTS MEDIA



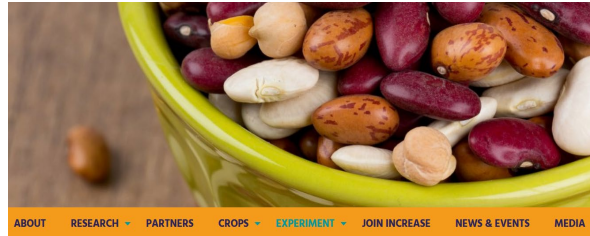
INCREASE CSA



Citizen Science Experiment



www.pulsesincrease.eu



- Decentralized approach for the conservation, maintenance and use of PGRs
- Started in 2021 (... planned for subsequent years)
- 1,000 diverse lines of common bean (mostly landraces)
- Distribution to citizens, farmers, European researchers...
- Evaluation in field, greenhouses, terraces, balconies, orchards, gardens ...
- Active involvement in the evaluation and conservation of biodiversity, exchange of materials and information, promoting the use and valorization of PGRs

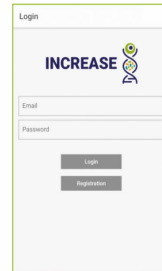


The INCREASE Citizen Science app

This is the central feature for the success of the experiment – everything revolves around it.

You can use it for

- your registration to participate in the experiment
- sending information on the common bean plant you grow
- recording data, e.g. about flowering time, seed size etc.
- taking pictures to document plant traits such as flower, seed and pod colours and shapes, plant growth habit, shapes of leaves all the way to images of the food you prepare with your harvest
- presenting your own favourite common beans
- access information on the European origin of the beans you will be growing based on geographical coordinates and other information associated to the original collection sites, such as altitudes etc. You will be able to find out based on DNA data from which location in America your accessions have most likely been introduced to Europe.
- search for a specific trait and make a request to other EU citizens to obtain their beans

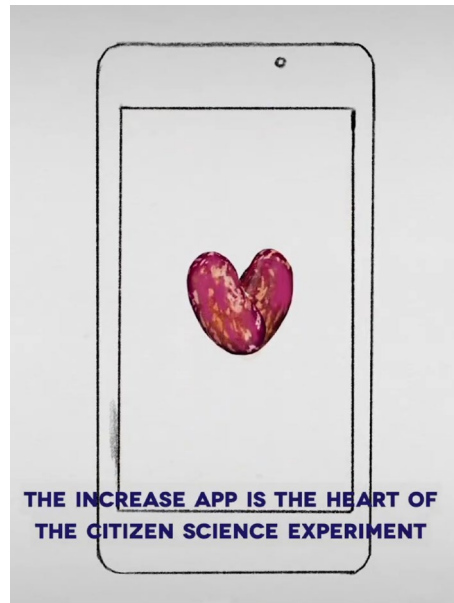


Register now!

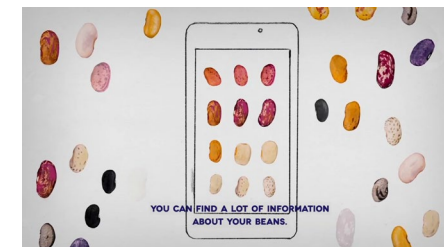
Download the INCREASE app from the [Google Play Store](#) or the [App Store](#). Come with us and spill the beans!



App INCREASE CSA



Registration now open! Download the app and register [here!](#)





Standard Material Transfer Agreement (SMTA)

The "Treaty on Plant Genetic Resources for Food and Agriculture" (ITPGRFA; "Treaty") has been in force since 2004. A Multilateral System of Access and Benefit Sharing (MLS) facilitates access to plant genetic resources for food and agriculture (PGRFA) and associated information for 64 agricultural crop and forage species. The MLS was created to facilitate exchange of material and information while ensuring appropriate sharing of benefits derived from the use of PGRFA.

To access material made available under the MLS, a "Standard Material Transfer Agreement" (SMTA) was developed to ensure that the principles of the Treaty are upheld. The SMTA provides a standardised, mutually agreed way to facilitate access to and fair use of PGRFA for conservation, development and training to promote sustainable agricultural development. Without the SMTA, anyone could claim ownership of the PGRFA material and information received, apply for patents, or assert other forms of intellectual property rights. Additionally, at each transfer, potentially lengthy negotiations would be required to define the terms of the transfer.

The text of the SMTA is fixed by the Treaty and cannot be changed: the SMTA has to be accepted as it is. It is a private contract between the provider and the recipient and is legally binding regardless of their status or the countries in which they reside. Among other obligations, the recipient can transfer the material received to third parties only under a new SMTA. Recipients have no financial obligations if they directly consume the harvested seed (also, the harvested beans can be sold as vegetables for consumption). The PGRFA material can be used or redistributed free of charge for research and breeding purposes. Farmers are actually invited to request and farm with PGRFA. They can grow and sell the products commercially just as they would with any other variety. They just can't patent them. However, use for chemical, pharmaceutical or other industrial purposes other than food or feed production is expressly prohibited.

Easy-SMTA is the IT System developed to support the MLS of the Treaty. This System has been developed by the Secretariat of the Treaty. [The Food and Agriculture Organization of the United Nations \(FAO\)](#) is the institution hosting this Secretariat and, as designated Third Party Beneficiary, monitors the execution of SMTAs. However, up to now this has never been implemented into an App. Therefore, the FAO is on board of the INCREASE project and has supported the development of this application. The INCREASE easy-SMTA App paves the way for future Citizen Science Projects with PGRFA that require such a process.

Want to read more?

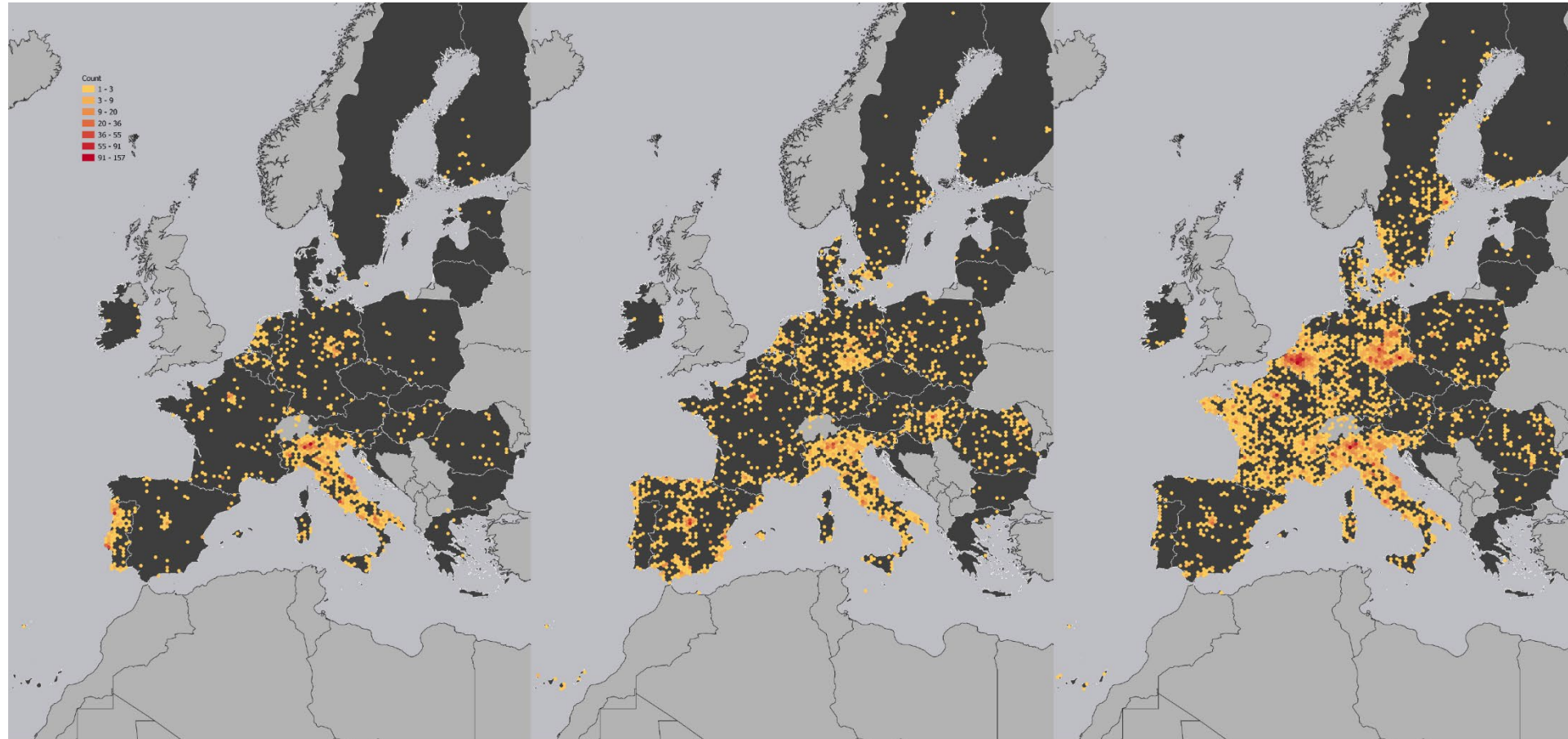
- Full details on the [Treaty on Plant Genetic Resources for Food and Agriculture \("Treaty"\)](#)
- Full details on the [Multilateral System of Access and Benefit Sharing \(MLS\)](#)
- Full details on the [Standard Material Transfer Agreement \(SMTA\)](#)

INCREASE CSE is spreading around Europe

2021

2022

2023



3450

4055

9293

Maps: Markus Oppermann


Flyers



Stay with us!

You participated in growing season 2021 and/or 2022?
Register now for growing season 2023 until 31st December 2022!

Continue your Citizen Science Experiment with your own seed harvest or request seeds from other participants via the INCREASE CSA app.



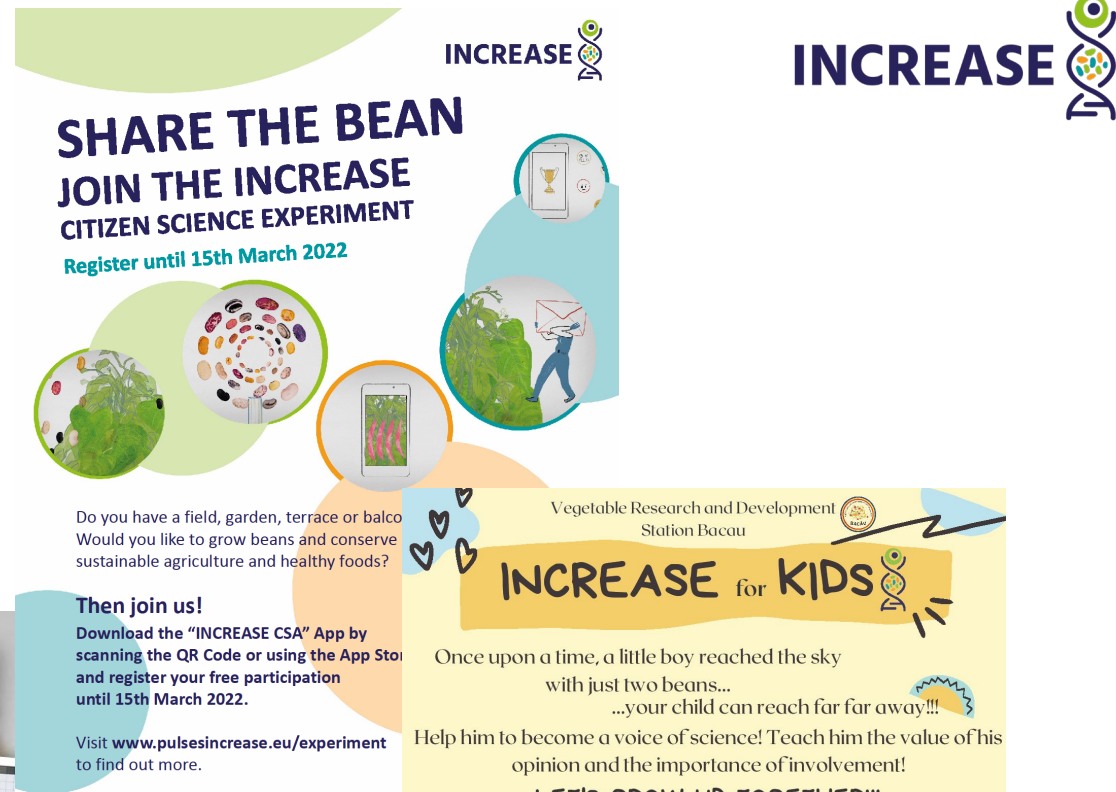
INCREASE

Register now!

3rd round of the INCREASE Citizen Science Experiment
Registration exclusively via the "INCREASE CSA" App.
More info: www.pulsesincrease.eu/de/experiment

Registration deadlines:
New participants:
28. February 2023
Participants of previous round:
31 December 2022

Be part of a community of > 7000 citizens from all over Europe who stand up for **agrobiodiversity** and grow forgotten varieties of **common bean** with us!





INCREASE

SHARE THE BEAN
JOIN THE INCREASE
CITIZEN SCIENCE EXPERIMENT
Register until 15th March 2022

Do you have a field, garden, terrace or balcony? Would you like to grow beans and conserve sustainable agriculture and healthy foods?

Then join us!
Download the "INCREASE CSA" App by scanning the QR Code or using the App Store and register your free participation until 15th March 2022.

Visit www.pulsesincrease.eu/experiment to find out more.



 The INCREASE project has received funding from the European Union's Horizon research and innovation programme under grant agreement No 101017774



Vegetable Research and Development Station Bacau

INCREASE for KIDS

Once upon a time, a little boy reached the sky with just two beans...
...your child can reach far far away!!!

Help him to become a voice of science! Teach him the value of his opinion and the importance of involvement!

LET'S GROW UP TOGETHER!!!

Download the "INCREASE CSA" application for free.

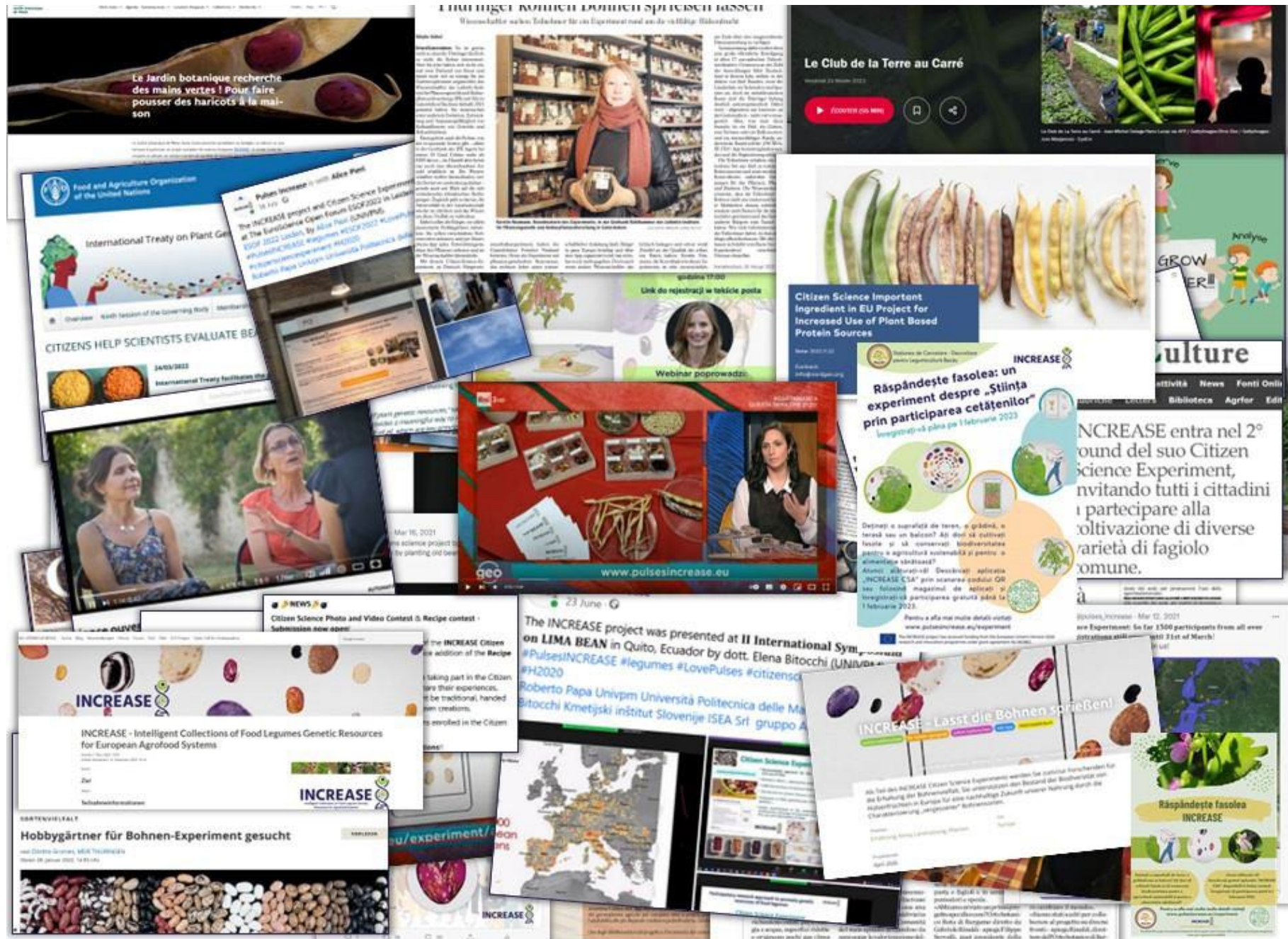
We send you bean seeds and a guide to sow them and watch them grow!!!

Through the application you can show the world the result of your work, you can tell what you want to put on your plate.

www.pulsesincrease.eu/experiment/app



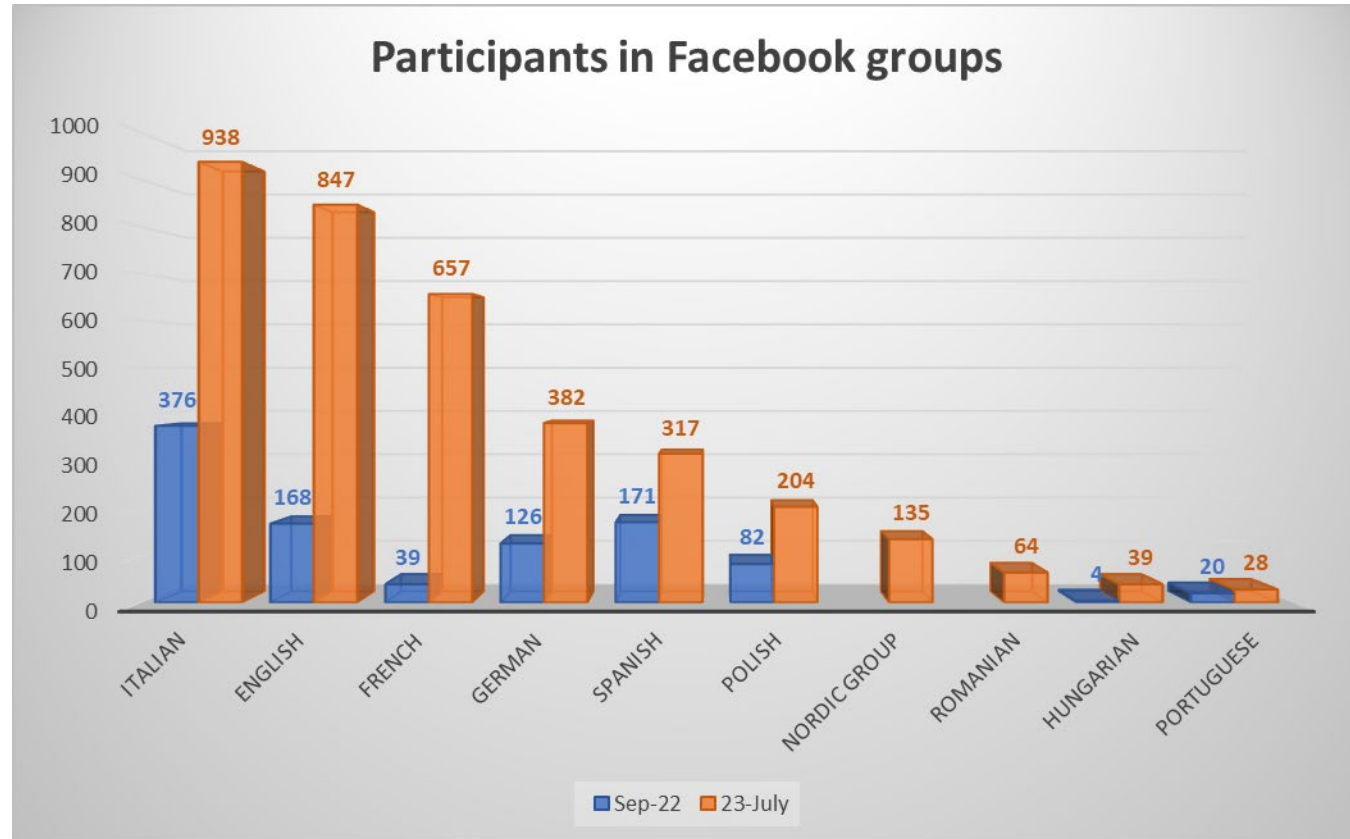
Examples of dissemination campaigns



Impressions 2022



Number of members in facebook groups



15/09/2022: **986** at time of annual meeting

06/07/2023: 3611

Hi everybody, I cannot find the seeds' list ... can you help?
tks!!!

1 · 2 Kommentare · Gefällt mir · Kommentieren · Senden

Verfasse eine Antwort ...

Here you find the list.
<https://www.pulsesincrease.eu/expe.../info-on-cse-bean-lines>

PULSESINCREASE.EU
Info on CSE bean lines | INCREASE

Gefällt mir · Antworten · 2 Wo. · Antwort ansehen

Ja jak zwykle z pytaniami.
Techniczne:
1. Przeczytałem instrukcję. Rozumiem że zżłacie notmiertziacze wchody nie musi huć zrobinne ze

INCREASE Nauka Obywatelska - POLSKA



1 · Von 82 gesehen

Hello, I'm writing from Portugal, Vidais, Caldas da Rainha.
My beans have been growing steadily but this week they are suffering under a heat wave.
Thermometers have risen up to 42°...
I water them daily, but I don't know if they will survive this heat wave...



Du, Roberto Papa und 12 weitere Personen · 6 Kommentare · Castelfidardo (AN) - Marche seminati il 13 aprile 2023

Kerstin Neumann · Mitglied mit Top-Beteiligung · +1 · ...
And France is going strong after a radio interview on Friday, we sure also crack the 7000 until end of the deadline! 🎉
At beginning of March we will send the acceptance mails and further information about the next steps.

INCREASE Citizen Science Experiment - ENGLISH

>6000!

Registrations for Citizen Science Experiment still open until 28 February 2023!

Pulses Increase · Record number – 3rd round of Citizen Science Experiment registers more participants than ever before!
To date, more than 6.000 citizens from all over Europe, 6... Mehr anzeigen

15 · 2 Kommentare

Kerstin Neumann · Mitglied mit Top-Beteiligung · +1 · ...
Today we want to give a short update on status of round 3:

We are right in the middle of SMTA phase, we have to supply 9000 citizens with seeds. So far >4000 SMTAs have been activated (focusing on Southern Europe, only few from Northern Europe could be activated already), >2700 have already accepted the SMTA and for them >1800 envelopes were already send on their way from UNIVPM-Team in Ancona. Keep it packed, bean team!

We will do our best to activate the waiting citizens ... Mehr anzeigen

40



Du und 4 weitere Personen · 1 Kommentar

Gefällt mir · Kommentieren · Senden







CSE levels of participation



Basic

Medium

Expert

CSE levels of participation

Basic



FLOWERING

Day of beginning of flowering

Medium



FLOWERING

Day of beginning of flowering

Flower: colour of standard and wings

Expert



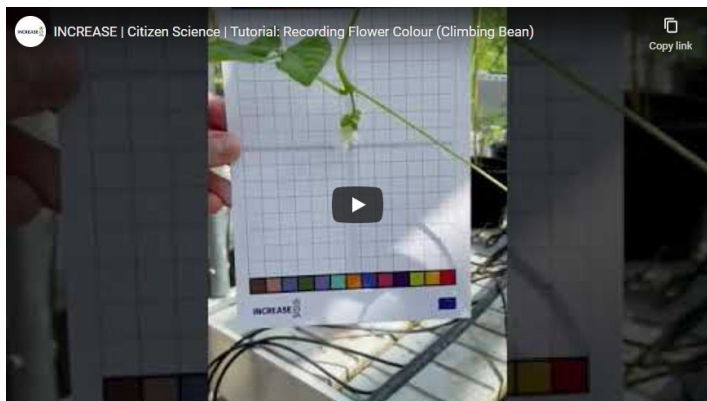
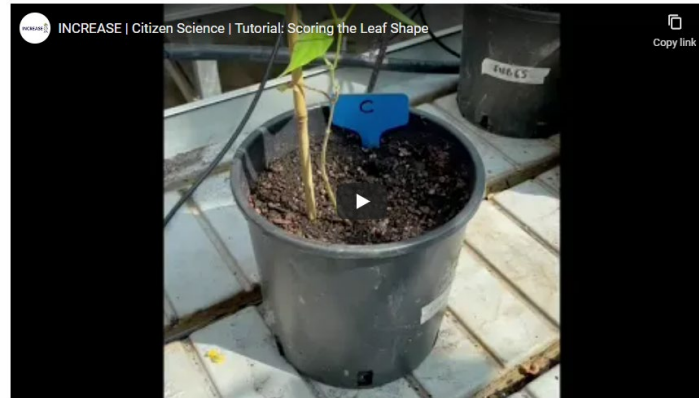
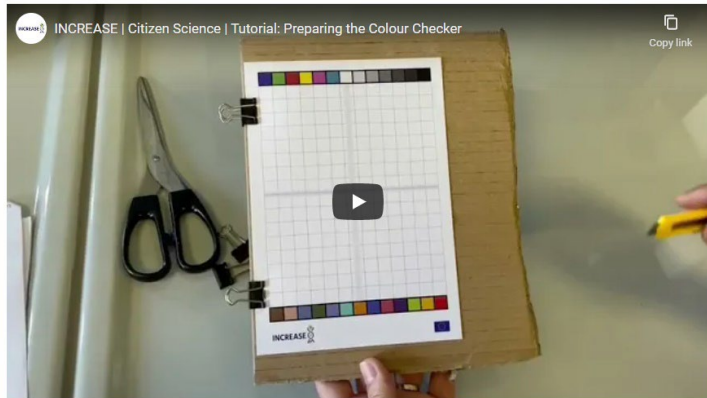
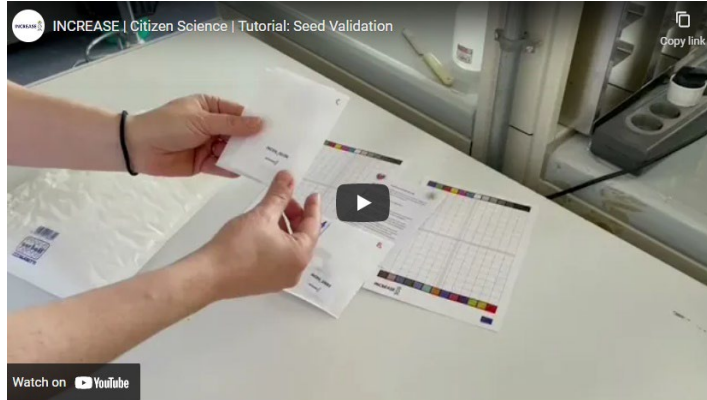
FLOWERING

Day of beginning of flowering

Day of maximum flowering

Flower: colour of standard and wings

CSE guidelines, tutorials





1 - Whitish



2 - Pink



3 - Purple



1 = Pale green

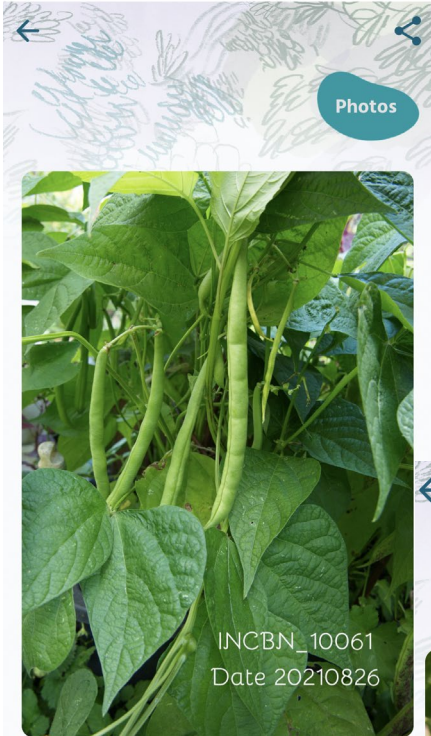


2 = Medium green



3 = Dark green





INCBN_10061
Date 20210826

Beans

03/09/2021

#Common bean (Phaseolus vulgaris)

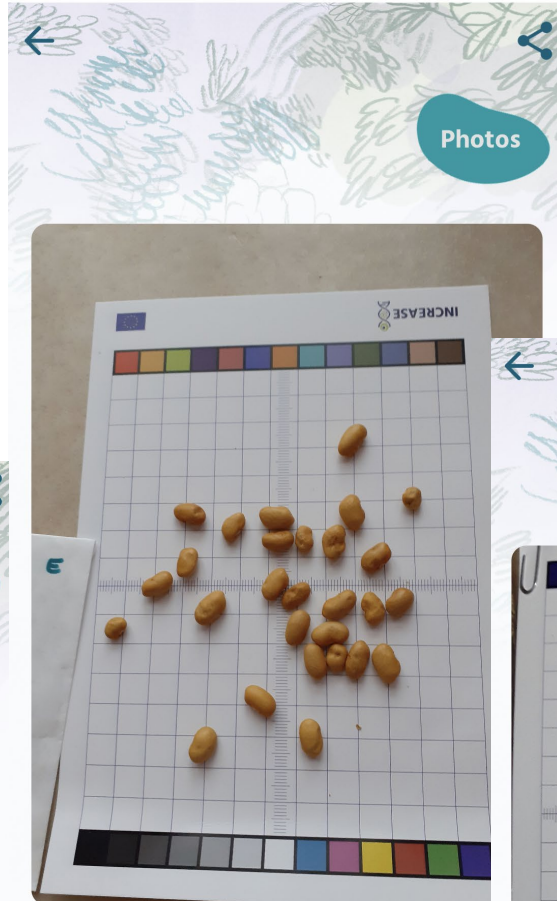


INCBN_02736
Date 20210826

Beans

03/09/2021

#Common bean (Phaseolus vulgaris)



INCBN_06657

05/09/2021

-Seed

-Dry



E 02170 Calciate (Bg)

02/09/2021

-Food product

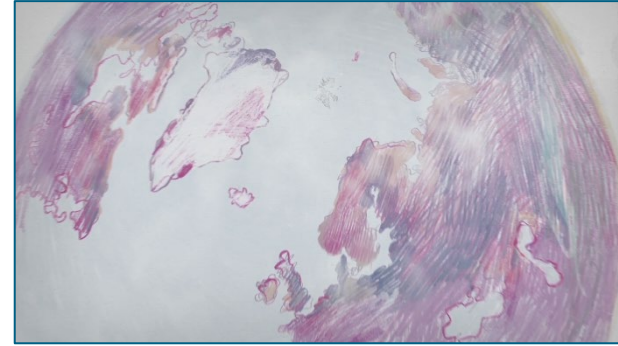
-semi e baccelli



Pulses Increase







Thanks for your attention!



www.pulsesincrease.eu



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[Pulses Increase](https://www.facebook.com/PulsesIncrease)



[PulsesINCREASE](https://www.instagram.com/PulsesINCREASE) or [pulsesincrease](https://www.instagram.com/pulsesincrease)



HASHTAG: pulsesINCREASE



YouTube INCREASE YouTube channel