From Cereal Populations to Organic Heterogeneous Material: success stories and lessons learned in Italy

Remote, 26th August 2021

BREEDING: THE KEY TO INNOVATIVE SOLUTIONS

EUCARPIA 21st GENERAL CONGRESS 22-27th AUGUST 2021 ROTTERDAM/THE NETHERLANDS

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LIVESEED

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Outline of today's presentation

Introduction to cereal populations and organic heterogeneous material

Practical examples of OHM research and use in Italy: bread wheat, barley and tomato

Lessons learned and future perspectives

Organic Heterogeneous Material: 10 years of European research projects…and continuing

LIVESEED

2017 -2021

Toolbox for OHM

DIVERSIFOOD

2015 -2018

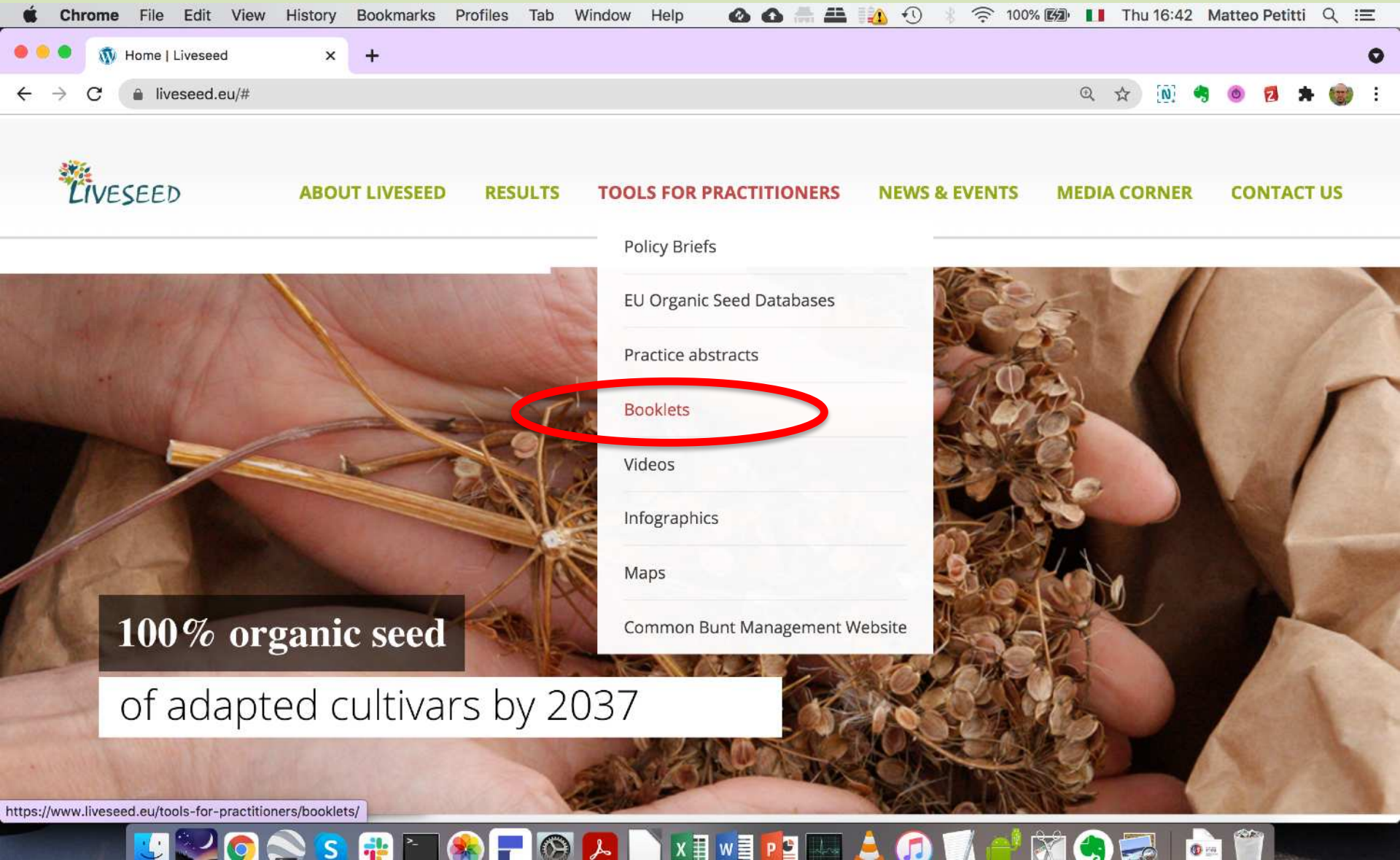
Dynamic management of agro-biodiversity

Solibam

2010 -2014

Generating new diversity

Organic Heterogeneous Material: 10 years of European research projects…and continuing



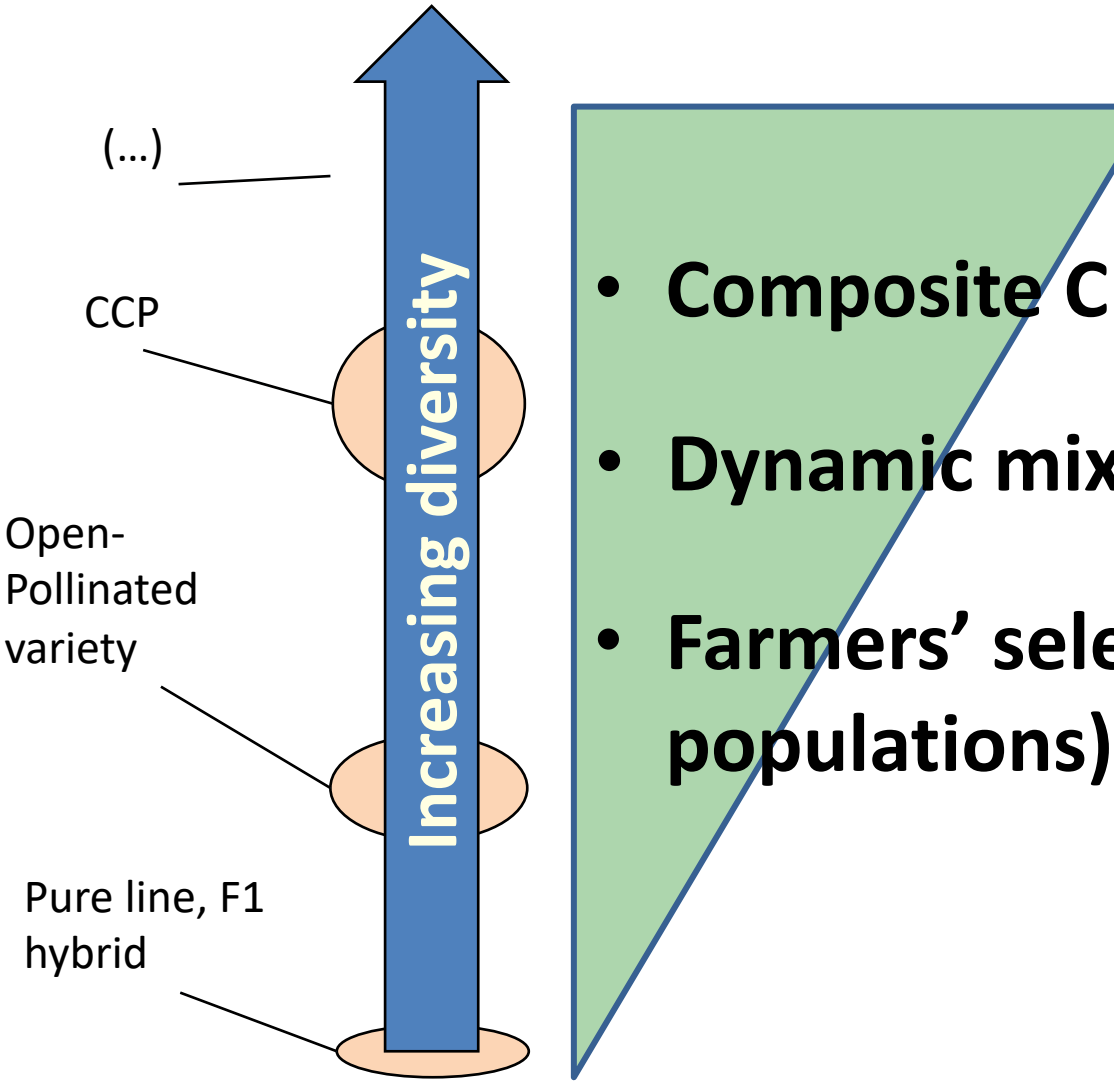
What is OHM? Legal definition

New organic regulation (EU) 2018/848 starting in January 2022

Article 3 Definitions

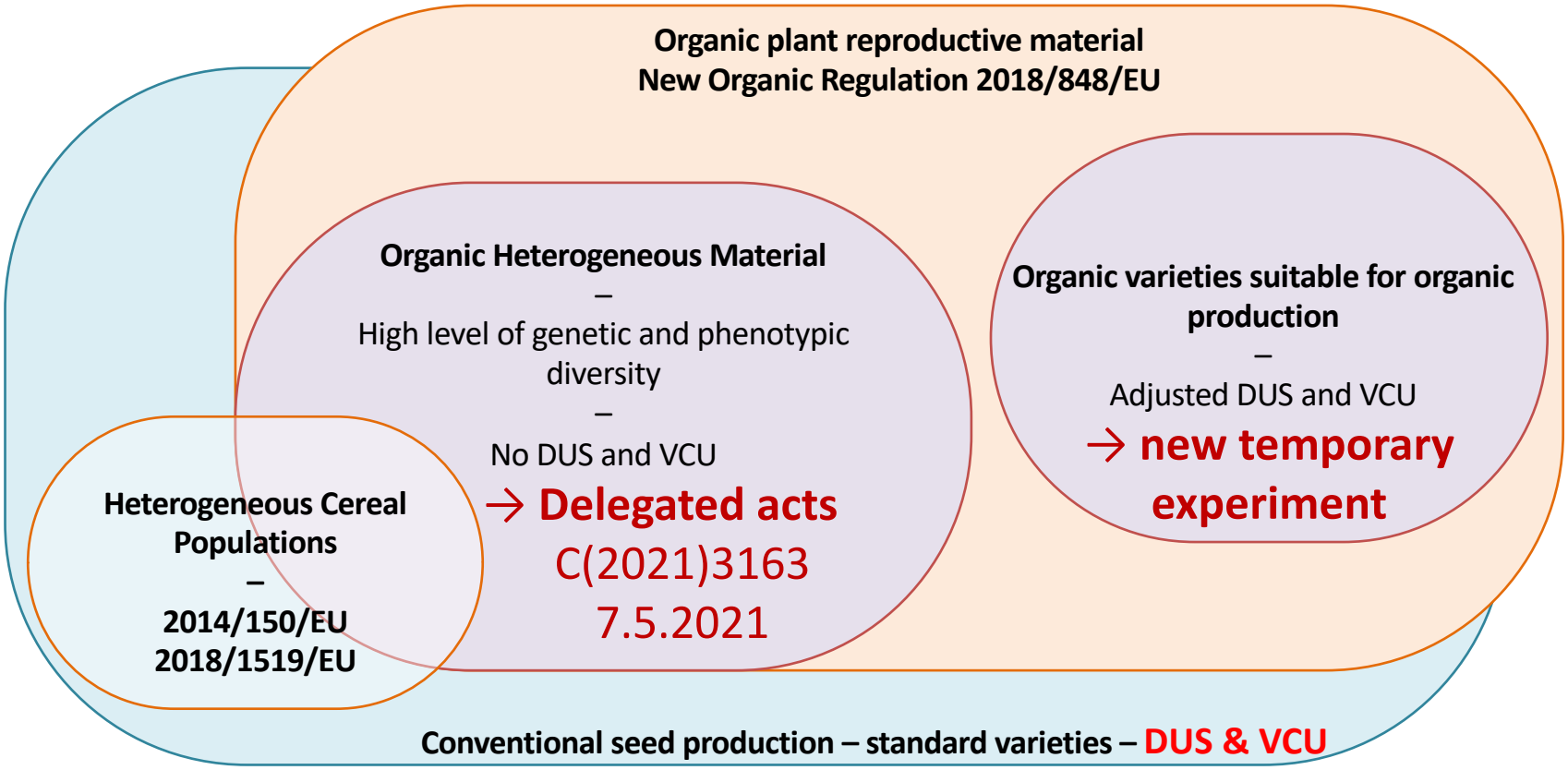
- (18) '**organic heterogeneous material**' means a plant grouping within a single botanical taxon of the lowest known rank which:
- (a) presents common phenotypic characteristics;
- (b) is characterised by a **high level of genetic and phenotypic diversity** between individual reproductive units, so that that plant grouping is **represented by the material as a whole**, and not by a small number of units;
- (c) **is not a variety** within the meaning of Article 5(2) of Council Regulation (EC) No 2100/94 (1);
- (d) is **not a mixture of varieties**; and
- (e) has been **produced in accordance with this Regulation**

What is OHM? Practical examples



- **Composite Cross Population**
- **Dynamic mixture / population**
- **Farmers' selection (of landraces / populations)**

OHM: a Novel Cultivar Type



Organic Heterogeneous Material: Exploiting natural evolutionary dynamics

Harry Harlan - 1929

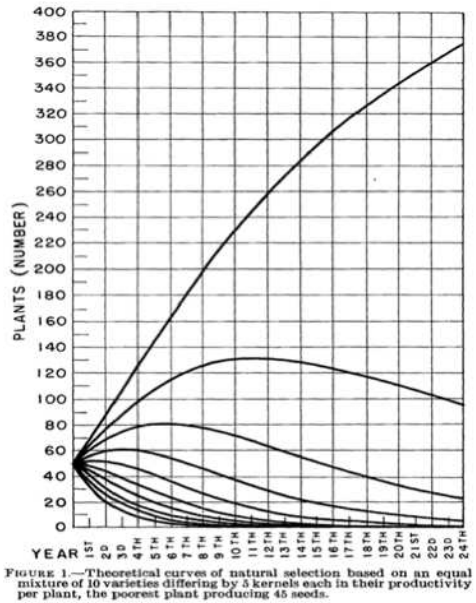
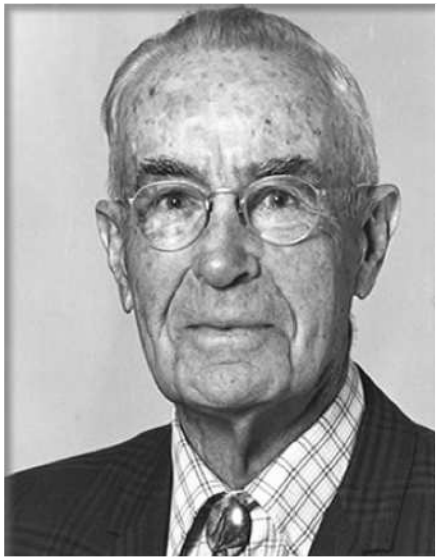


FIGURE 1.—Theoretical curves of natural selection based on an equal mixture of 10 varieties differing by 5 kernels each in their productivity per plant, the poorest plant producing 45 seeds.



Coit Suneson - 1956

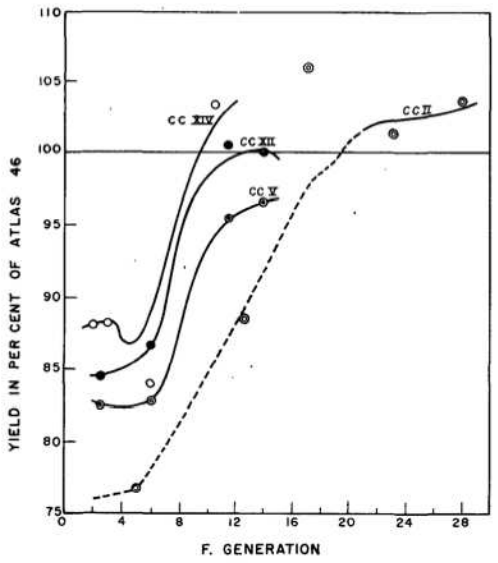
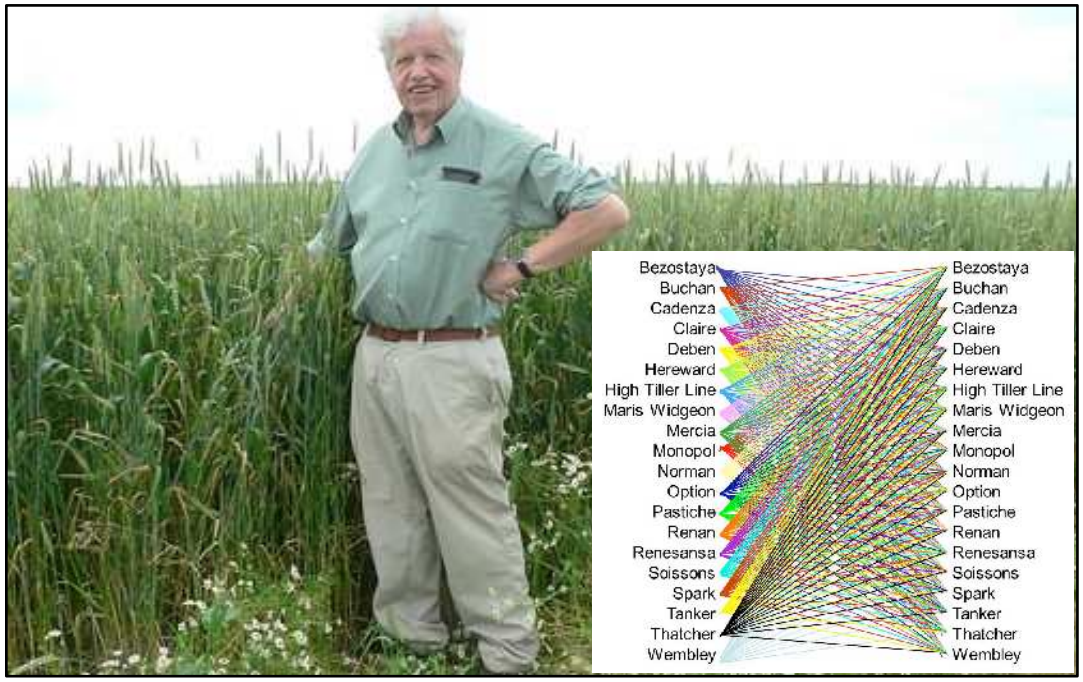


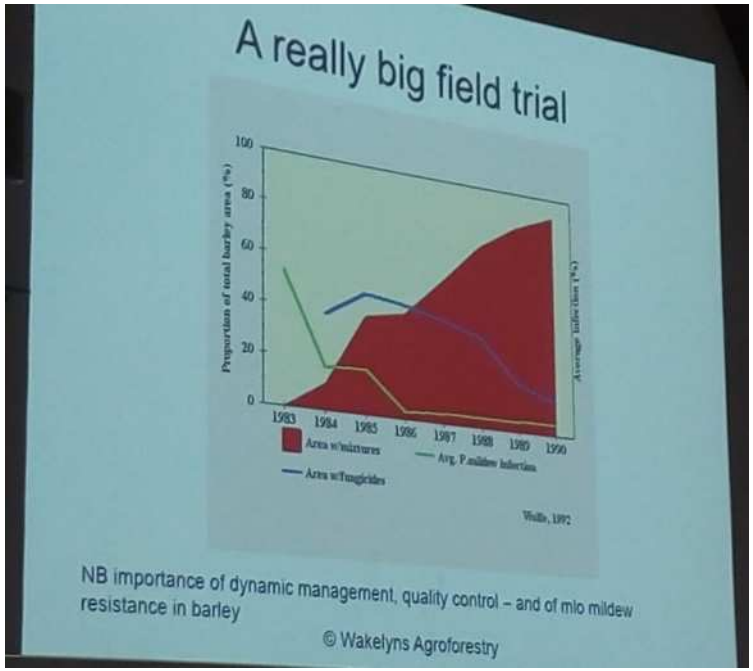
FIG. 1.—Yields of 4 composite crosses compared with each other and Atlas 46 in successive generations.

"This **inexpensive and easily executed method** [...] being proposed has been neglected or overlooked by many plant breeders focusing on techniques for improving man's [sic] selecting and testing efficiency, rather than on **evolutionary fitness** as determined by survival" (Suneson, 1956)

"**A pure-line mentality**, convinced that **variation was bad, uniformity was good** and off-types in the field somehow immoral, developed [...] Thus it was that we laid ourselves open to **epiphytotics of serious dimensions**" (Harry Harland - cited by Martin Wolfe, 1985).

Organic Heterogeneous Material: First deployments in Europe



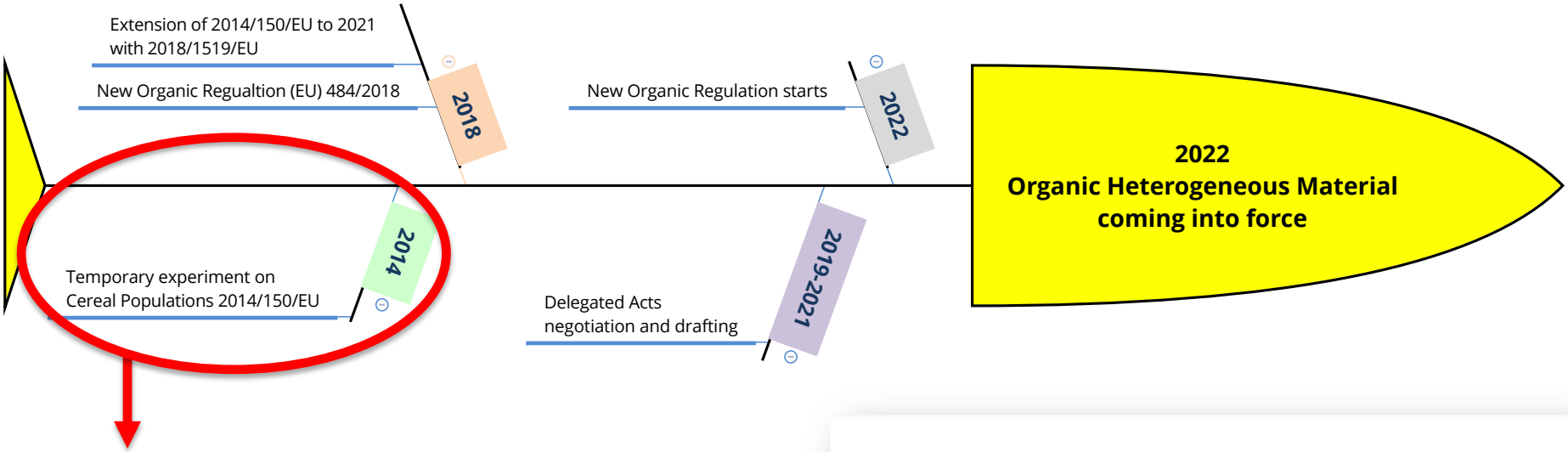


Martin Wolfe as a plant pathologist discovered that barley populations sported much higher mildew resistance than pure lines.

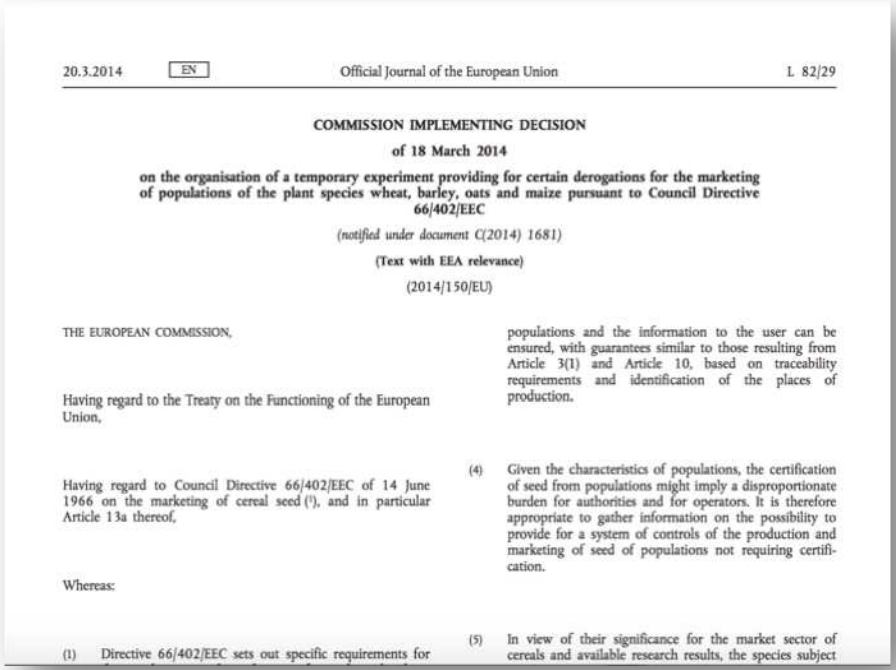
- Wolfe's idea on barley population was adopted at large scale in 1980's East Germany (GDR), **reaching ~90% of malting barley** cultivated area with **drastic drop in fungicides use**.
- Wolfe's **bread wheat CCP** (Wakelyns YQ) developed in 2002 at JIC and ORC was the first cereal population registered for seed marketing under temporary experiment **2014/150/EU**

Wolfe, M. S. (1985). The current status and prospects of multiline cultivars and variety mixtures for disease resistance. Annual Review of Phytopathology, 23, 251–273. doi:10.1146/annurev.py.23.090185.001343.

Organic Heterogeneous Material: The legal framework



- **Participating Member States:**
  - Denmark
  - France
  - Germany
  - Latvia
  - Italy
  - The Netherlands
  - UK



20.3.2014 EN Official Journal of the European Union L 82/29

COMMISSION IMPLEMENTING DECISION

of 18 March 2014

on the organisation of a temporary experiment providing for certain derogations for the marketing of populations of the plant species wheat, barley, oats and maize pursuant to Council Directive 66/402/EEC

(notified under document C(2014) 1681)

(Text with EEA relevance)

(2014/150/EU)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Council Directive 66/402/EEC of 14 June 1966 on the marketing of cereal seed [1], and in particular Article 13a thereof,

Whereas:

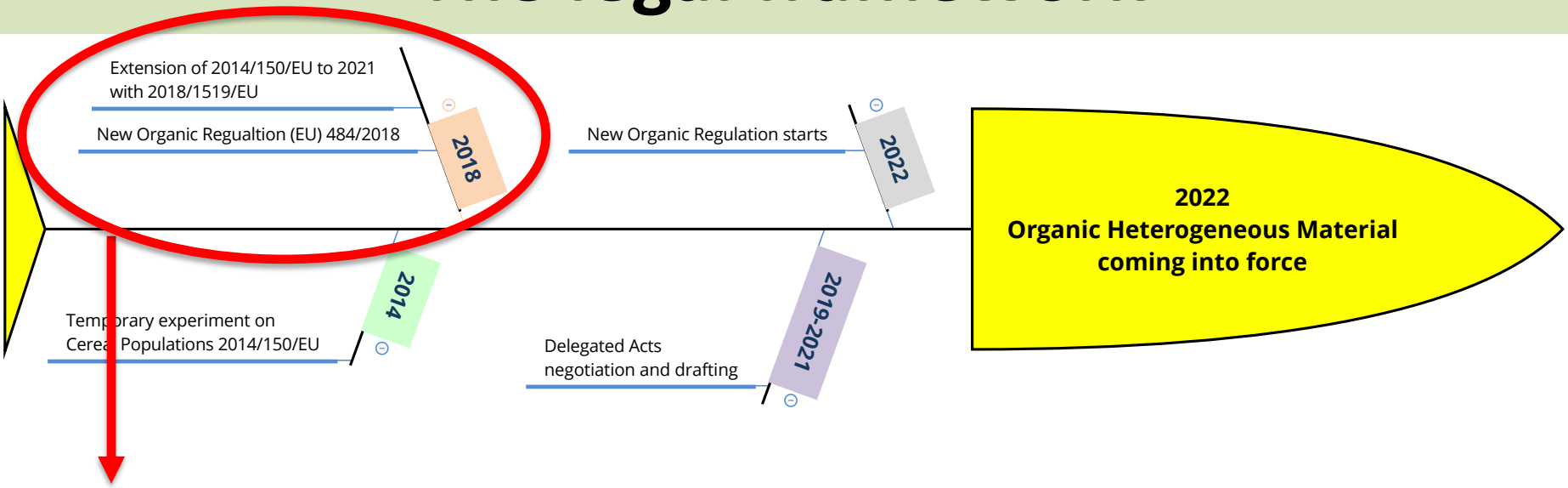
(1) Directive 66/402/EEC sets out specific requirements for

populations and the information to the user can be ensured, with guarantees similar to those resulting from Article 3(1) and Article 10, based on traceability requirements and identification of the places of production.

(4) Given the characteristics of populations, the certification of seed from populations might imply a disproportionate burden for authorities and for operators. It is therefore appropriate to gather information on the possibility to provide for a system of controls of the production and marketing of seed of populations not requiring certification.

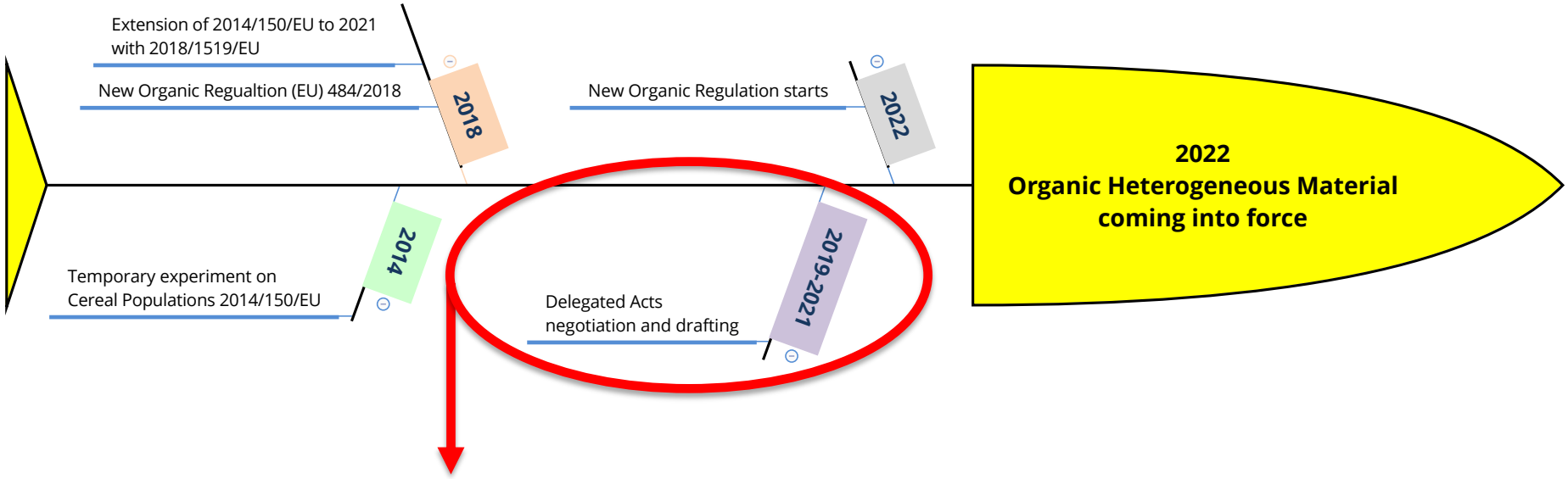
(5) In view of their significance for the market sector of cereals and available research results, the species subject

Organic Heterogeneous Material: The legal framework



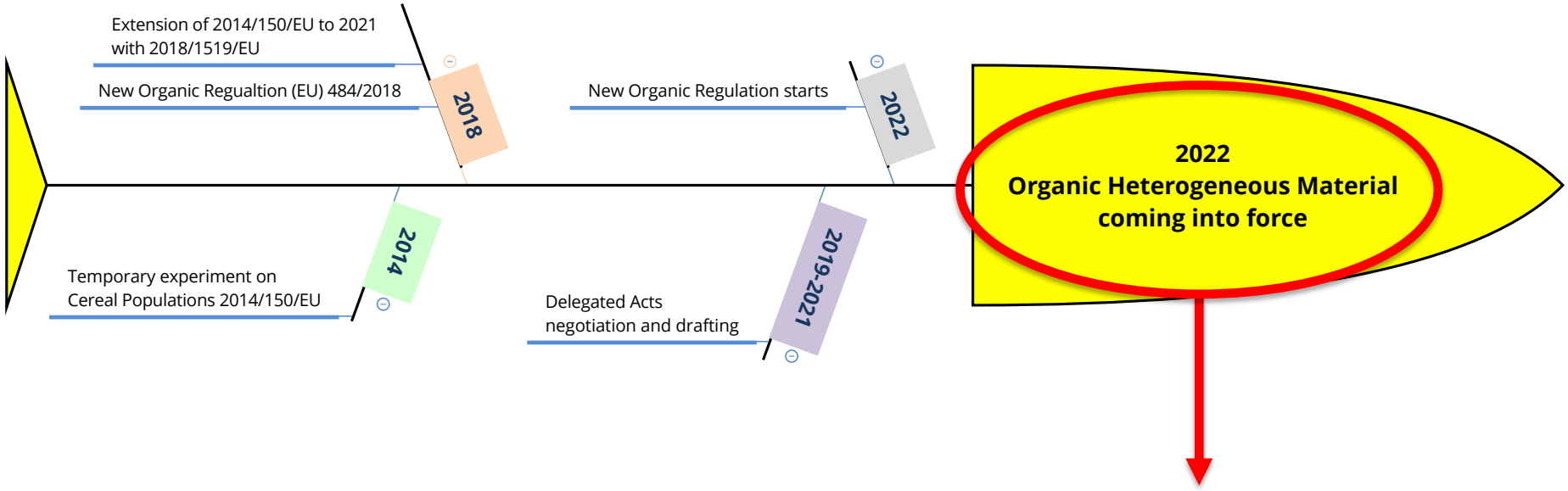
- **2018: Organic Heterogenous Material is introduced as a new seed category by the New Organic Regulation (art. 3 & 13) approved by the European Parliament**
- **2019: Hungary joins the Temporary Experiment**

Organic Heterogeneous Material: The legal framework



- **The results of the Temporary Experiment have been informing the Commission in drafting the Delegated Acts regulating OHM seed registration and certification**
- **Negotiation between Commission and all actors involved (IFOAM-EU, ECO-PB, Arche Noah & Seed Savers groups)**
- **Delegated acts published on 7.5.2021 C(2021) 3163**

Organic Heterogeneous Material: The legal framework



- **OHM registration through a simple notification process**
- **Seed health and quality must meet existing seed directives' standards**
- **Emphasis on traceability (record keeping for at least 5 years for maintenance and seed production)**

Italian cereal populations

Registered Italian populations as of 31 December 2019

- **Soft (bread) wheat: 8**
- **Durum wheat: 6**
- **Barley: 1**

- Emilia-Romagna: Bioadapt/Oroset, Bio^2, Appenbio
- Tuscany: ICARDA-SOLIBAM tenero Floriddia, Mix tenero Toscana Pa1, Mix tenero Toscana 1, Evoldur, Mix duro Toscana Pa1, ICARDA-SOLIBAM duro Floriddia
- Umbria: Barley Mix 48
- Molise: ICARDA-SOLIBAM duro Petacciato
- Basilicata: Carosella, ICARDA-SOLIBAM duro Recchia
- Sicily: ICARDA-SOLIBAM tenero Li Rosi, Angelo

Italian cereal populations

Certified seed produced in 2020

BREAD WHEAT	ORGANIC (KG)	NON-ORGANIC (KG)
MIX TOSCANA PA1		26,700.00
MIX TOSCANA 1	18,247.00	6,990.00
BIOADAPT	14,968.00	
BIO2	1,395.00	
APPENBIO		379
ICARDA-SOLIBAM LI ROSI	17,000.00	
ICARDA-SOLIBAM FLORIDDIA	18,700.00	
CAROSELLA (ALSIA BASILICATA)	4,150.00	6,050.00
PEOPLE		3,600.00
TOTAL BREAD WHEAT	**74,460.00**	**43,719.00**
DURUM WHEAT		
ICARDA-SOLIBAM PETACCIATO	366.00	
EVOLDUR13A	8,728.00	
MIX TOSCANA PA1	2,624.00	
TOTAL DURUM WHEAT	**11,718.00**	
BARLEY		
MIX48 (UNIVERSITY OF PERUGIA)		1,300.00

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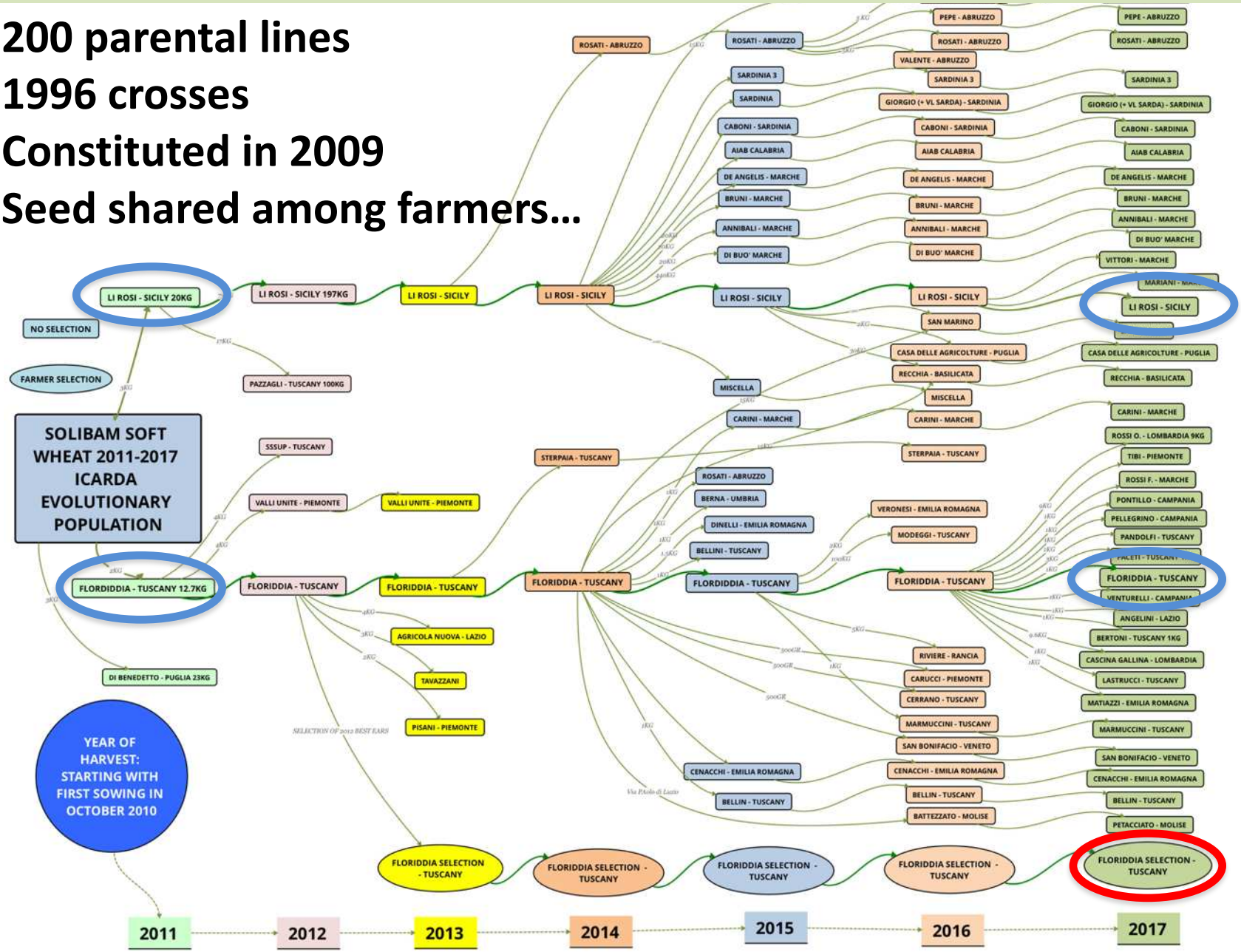
ICARDA-SOLIBAM Bread Wheat CCP

The original evolutionary population (EP) was created in 2009 at ICARDA, Syria by Salvatore Ceccarelli and Stefania Grando mixing **1996 crosses** (F2, F3 and F4).

In Italy it has been cultivated in **2 organic farms** continuously since 2010-2011 evolving in 2 distinct EPs: **ICARDA-SOLIBAM Floriddia** in Tuscany and **ICARDA-SOLIBAM Li Rosi** in Sicily.

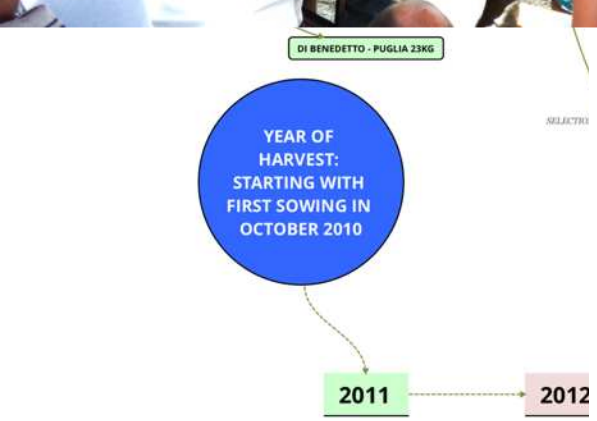
ICARDA-SOLIBAM Bread Wheat CCP

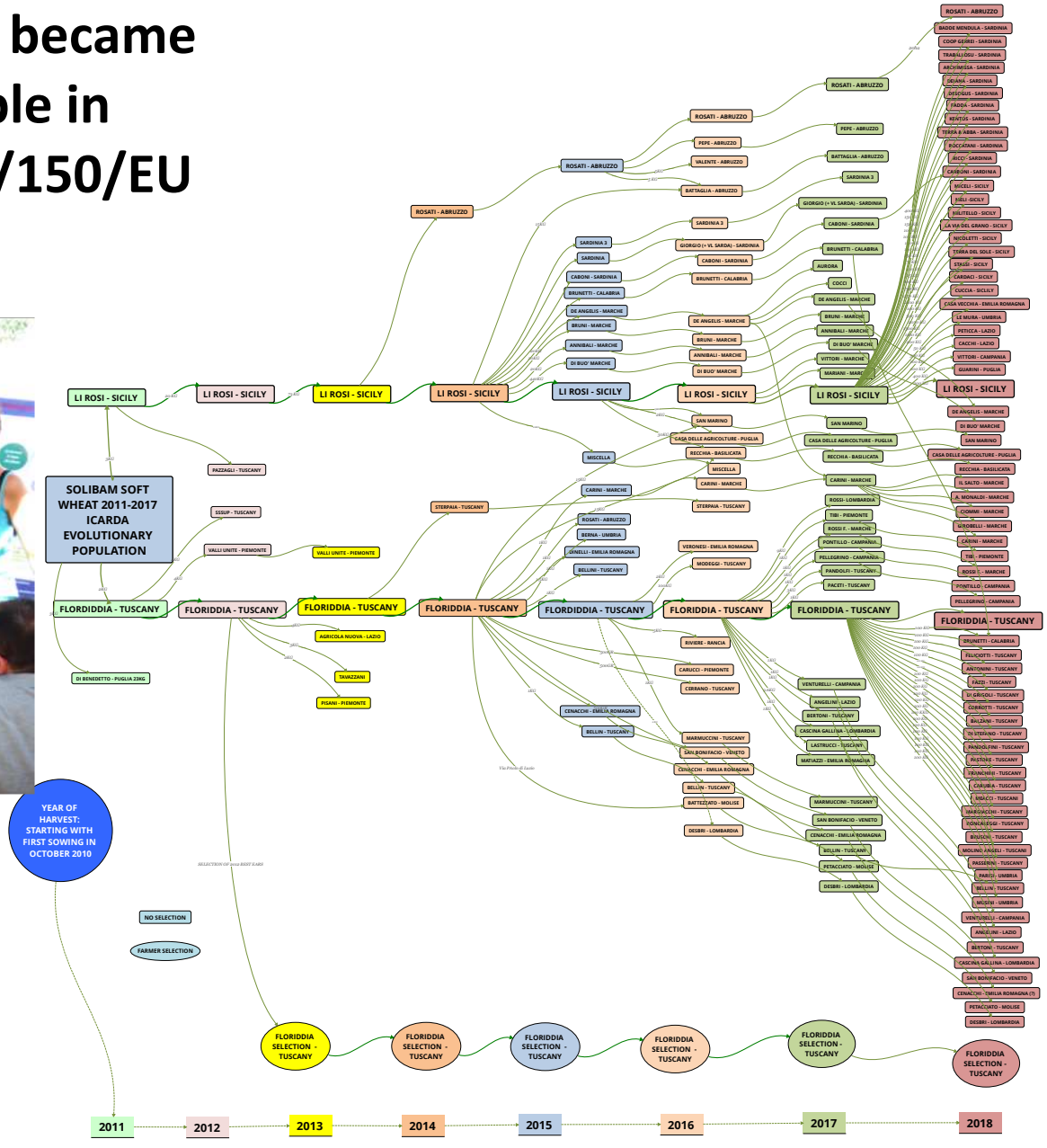
- 200 parental lines
- 1996 crosses
- Constituted in 2009
- Seed shared among farmers…



ICARDA-SOLIBAM Bread Wheat

…until certified seed became commercially available in 2017 thanks to 2014/150/EU



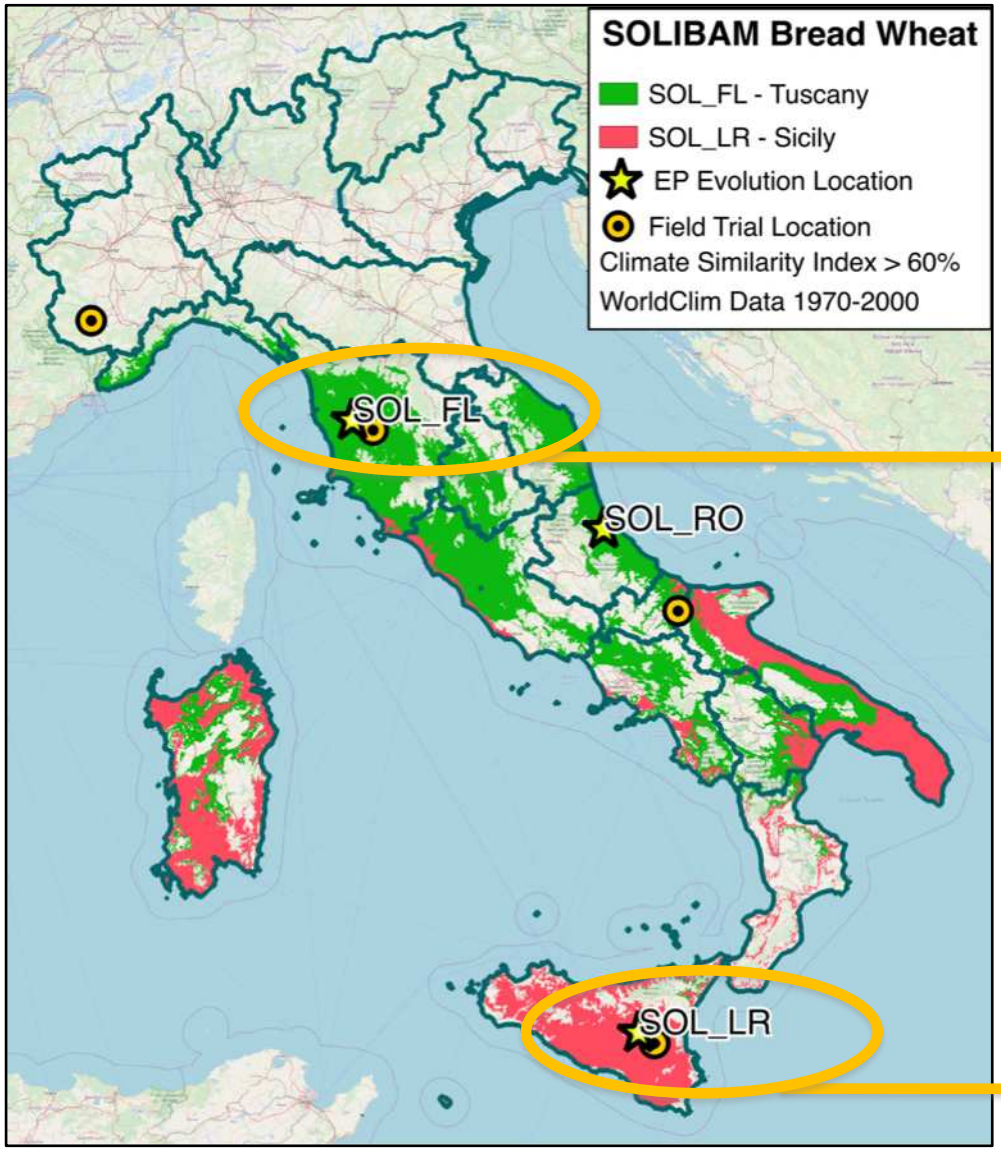


ICARDA-SOLIBAM bread wheat seed sales

- 2017 ☞ 2 tonnes
- 2018 ☞ 2.4 tonnes
- 2019 ☞ 6 tonnes
- 2020 ☞ 18.6 tonnes

- 2017 ☞ 11.4 tonnes
- 2018 ☞ 15.2 tonnes
- 2019 ☞ 23.7 tonnes
- 2020 ☞ 17 tonnes

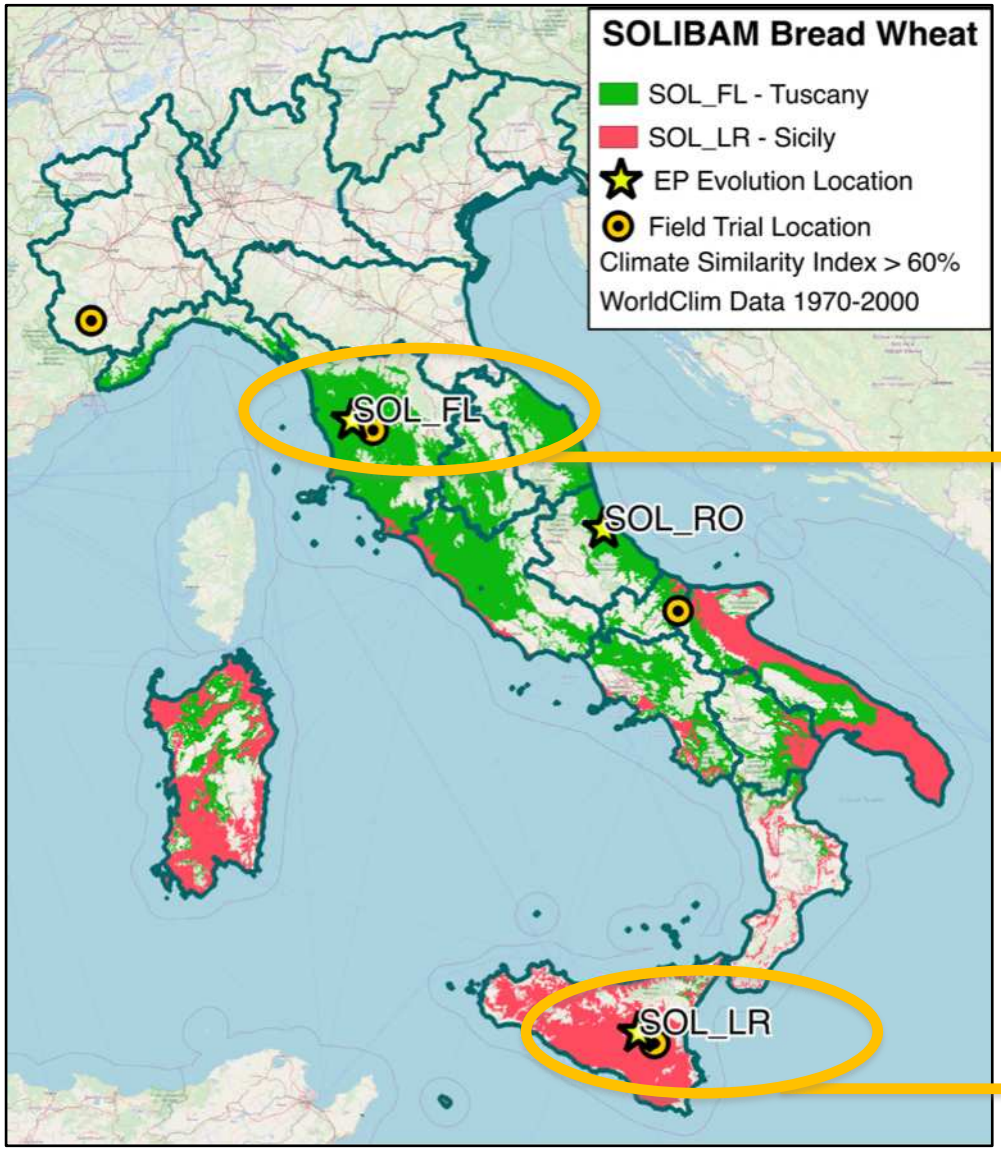
Climate, OHM and Specific Adaptation



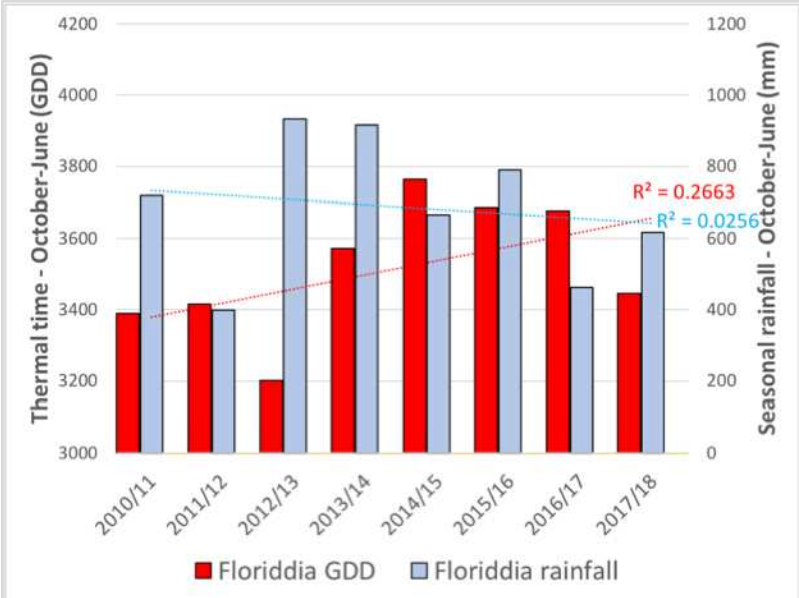
ICARDA-SOLIBAM FLORIDDIA (SOL_FL)

ICARDA-SOLIBAM LI ROSI (SOL_LR)

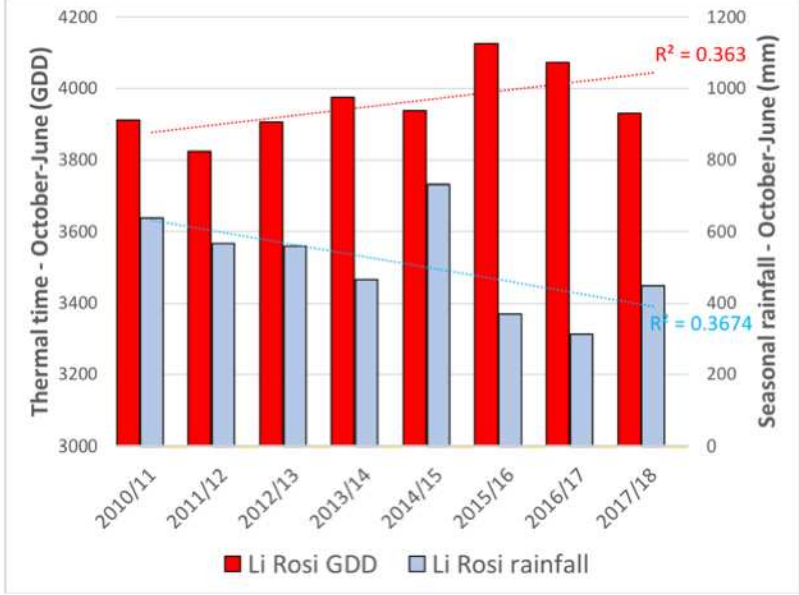
Climate, OHM and Specific Adaptation



Tuscany

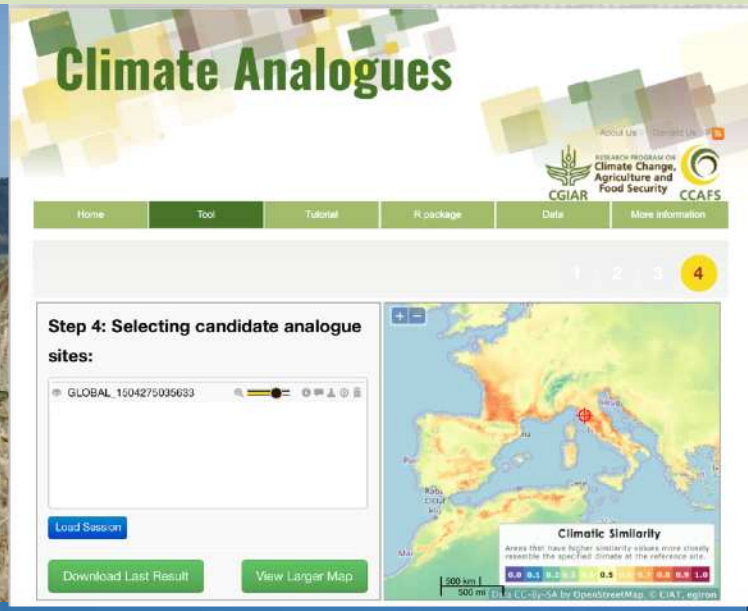


Sicily



Materials and Methods

- 14 entries
- 4 locations
- 4 years
- 336 evaluators
- Spatial analysis
- GGE Biplot



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Yield, yield stability and farmers' preferences of evolutionary populations of bread wheat: A dynamic solution to climate change

Riccardo Bocci [a], Bettina Bussi [a], Matteo Petitti [a], Riccardo Franciolini [a], Virginia Altavilla [a], Gea Galluzzi [a], Paolo Di Luzio [b], Paola Migliorini [c], Sandra Spagnolo [d], Rosario Floriddia [e], Giuseppe Li Rosi [f], Modesto Petacciato [g], Vincenzo Battezzato [h], Andrea Albino [i], Giovanni Faggio [j], Carlo Arcostanzo [j], Salvatore Ceccarelli [a,*]

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ARTICLE INFO

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Evolutionary plant breeding
Heterogeneous plant populations
Climate change
Landraces
Local adaptation
Biodiversity
Farmers' preferences
Directional selection

ABSTRACT

The role of biodiversity in plant breeding needs to be reconsidered to cope with the complexity, location specificity and combined challenges of climate change, human population increase, human health and food security, safety and sovereignty. From a biological viewpoint, heterogeneous plant populations derived from evolutionary plant breeding may address most of these grand challenges. Field trials were conducted over four years and four locations under organic farming conditions to test the hypothesis that evolutionary populations planted in contrasting locations, evolve adapting to the local conditions and becoming distinct from one another. The experiment also included mixtures, landraces and a modern variety of bread wheat. The results show evidence of divergent selection for grain yield under the sole effect of natural selection by which the best performing evolutionary populations yielded as much or more than the commercial variety. Farmers' selection within one of the evolutionary populations was effective in improving yield and yield stability above those of the original population across years and locations. Farmers' preference was not always associated with grain yield and was not gender dependent. We conclude that evolutionary populations are able to gradually evolve, adapting to each environment in which their seed is multiplied, reaching high and stable yield levels thus ensuring income to farmers, both as seed and as grain.

Barley CCP ‘Mix 48’

University of Perugia

- 2018 ☞ 1.1 tonnes
- 2019 ☞ 2.75 tonnes
- 2020 ☞ 1.3 tonnes

Orzo «MIX48 popolazione»

PER AGRICOLTURA A BASSI INPUT

DIPARTIMENTO DI SCIENZE AGRARIE, ALIMENTARI E AMBIENTALI (dsa3)
UNIVERSITÀ DEGLI STUDI DI PERUGIA

- *DA MIGLIORAMENTO GENETICO EVOLUTIVO*
- *ELEVATO LIVELLO DI DIVERSITÀ INTRASPECIFICA*
- *MESCOLANZA DI LINEE DISTICHE E POLISTICHE*
- *BASSO IMPIEGO DI FATTORI DI PRODUZIONE*
- *ELEVATA PRODUZIONE E STABILITÀ DELLA PRODUZIONE**

Caratteristiche principali	
❶ Epoca di spigatura media	maggio
❷ Altezza media	72.5 cm
❸ Produzione media (50 unità azoto/ettaro)	3.86 t/ettaro
❹ Resistenza allettamento media	buona
❺ PESO 1000 semi medio	34 g
❻ Proteine totali	11.2 %ss
❼ Setacciatura >2.8 mm	38.4%

CONSIGLI GESTIONE AGRONOMICA	
❶ Areale di coltivazione	Centro e Sud Italia
❷ Epoca di semina	Fine ottobre-novembre
❸ Densità di semina	200 kg/ettaro
❹ Concimazione	50 unità azoto/ettaro
❺ Gestione erbe infestanti	NESSUN INTERVENTO
❻ Trattamenti fito-sanitari	NESSUN INTERVENTO

PER LO SVILUPPO DELLA MIX48 SONO STATI INIZIALMENTE INCROCIATI GENOTIPI PARENTALI CON ORIGINI E CARATTERISTICHE MORFO-FISIOLOGICHE DIVERSE (TABELLA).
LA POPOLAZIONE È STATA COLTIVATA IN CONDIZIONI DI BASSI INPUT E SOGGETTA ALLA SOLA SELEZIONE NATURALE PER 9 ANNI POI SOTTOPOSTA A 3 CICLI DI SELEZIONE MIRATI AD INCREMENTARE LA SUA PRODUZIONE MANTENENDO ELEVATA VARIABILITÀ PER CARATTERI DI INTERESSE AGRONOMICO.

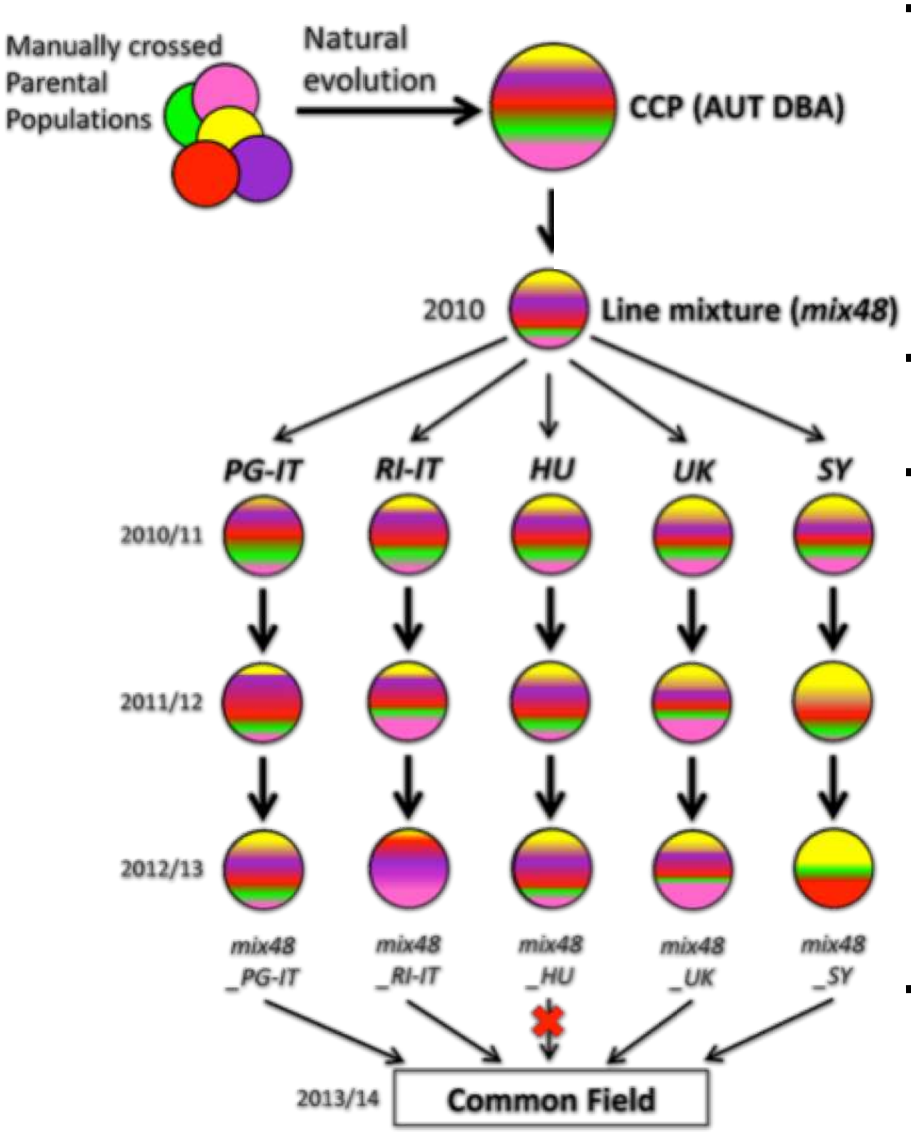
Acquistabile presso il dsa3

***La popolazione MIX48 è stata sottoposta a prove agronomiche in ambienti diversi ed in anni successivi assieme a diverse varietà commerciali. Le prove sono state condotte in biologico e in regimi di bassi input. La popolazione è risultata caratterizzata da produttività pari a quella dei migliori controlli e da elevata stabilità produttiva, sia statica che dinamica.**

PER INFORMAZIONI: 075 5856218 valeria.negri@unipg.it - 075 5856212 lorenzo.raggi@unipg.it

Genetic diversity of EBP materials

EVOLUTIONARY BREEDING PROGRAM



Initial population (AUT DBA & *mix48*) genetic diversity

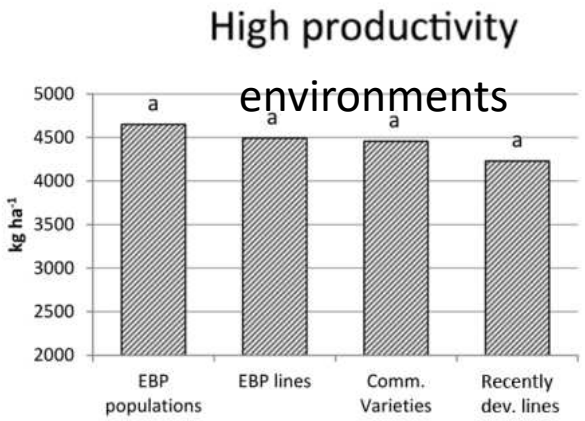
mix48 evolution under contrasting conditions (PG-IT, RI-IT, HU, UK & SY) genetic changes

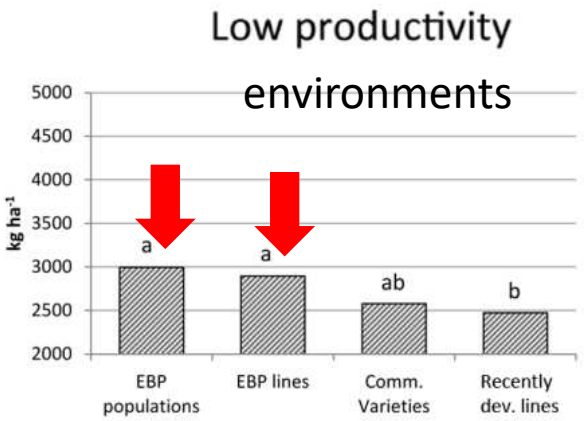
Agronomic evaluation of EBP materials: YIELD

- **Multi-environmental trials (4 years, 3 different locations)**
- **2 populations : AUT DBA and *mix48***
- **13 EBP pure lines: selected from the EBP populations**
- **9 controls: commercial varieties & recently developed lines selected through conventional breeding programs**

EBP populations and EBP pure lines characterised by HIGH YIELD

Controls characterized by lower yield
in "low productivity" environments ($P \leq 0.05$)





Raggi, et al., 2017. Evolutionary breeding for sustainable agriculture: Selection and multi-environmental evaluation of barley populations and lines. *Field Crops Research*

Agronomic evaluation of EBP materials: YIELD

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Field Crops Research 204 (2017) 76–88

Contents lists available at ScienceDirect

Field Crops Research

journal homepage: www.elsevier.com/locate/fcr

Original Paper

Evolutionary breeding for sustainable agriculture: Selection and multi-environmental evaluation of barley populations and lines

Lorenzo Raggi [a], Simona Ciancaleoni [a], Renzo Torricelli [a], Valeria Terzi [b], Salvatore Ceccarelli [c], Valeria Negri [a,*]

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GxE interaction

ABSTRACT

Varieties specifically bred for organic and low-input agriculture are presently lacking. A strategy to develop them is evolutionary breeding that relies on a combination of natural and artificial selection. This study investigated the ability of an evolutionary breeding program, carried out over 24 years, to select barley (*Hordeum vulgare* L.) heterogeneous populations and lines characterized by high grain yield and yield stability across different environments under organic and low-input conditions. A Composite Cross population (named AUT DBA) was initially developed by crossing Parental Populations highly productive under low-input conditions in Central Italy and diverse for several morpho-phenological traits. The AUT DBA was then multiplied for nine years under a low-input management system without any artificial selection.

Three cycles of artificial selection (from 2007/08 to 2009/10) were conducted by selecting within the AUT DBA plants characterized by high grain yield potential and a favourable combination of traits relevant for organic and low-input agriculture.

A new population (a lines mixture named *mix48*) was then developed by mixing the highest yielding and the most diverse lines; 13 lines were also selected. AUT DBA, *mix48* and the 13 lines were evaluated for four successive years in multi-environmental trials carried out under different pedo-climatic conditions and management systems (organic and low-input) and using nine different lines, selected under high input conditions, as controls.

For each of the 24 entries (i.e. the two populations, the 13 selected lines and the nine controls) grain yield was recorded, and yield stability evaluated by using AMMI analysis, Shukla's stability variance and Environmental variance. Average yield and yield stability indexes were calculated over all Environments and for low and high productive Environments, respectively. Finally, the effects on yield of climatic and soil characteristics were evaluated by using a reduced rank factorial regression analysis.

The grain yield of the AUT DBA and *mix48* populations were significantly higher than four of the nine

Raggi, et al., 2017. Evolutionary breeding for sustainable agriculture: Selection and multi-environmental evaluation of barley populations and lines. *Field Crops Research*

Moving forward…more crop diversity

- 1 ox-heart **tomato** composite cross **population**
- 4 locations
- 2 years **participatory** selection
- 1 year comparative trials

		CdB8-Allongée d'Alicante	CdB1-Muchamiel	CdB4-Cuor di bue	CdB3-Cœur de Bœuf
	Country	Spain	Spain	Italy	France
Plant	Cycle	Long	Medium	Short	Medium
	Strength	3	4	1	3
	Fruit Load	5	4	3	2
	Growth	Indeterminatrd	Determinated	Indeterminatrd	Indeterminatrd
	Other	Regular truss			
Fruit	Shape	Rectangular	CdBP c4	CdBP c1	CdBC
	Average Weight	150-190	190-250	190-250	190-250
	Green shoulder	Yes	Yes	Yes	Yes
	Coloration	Red	Light red	Light red	Light red
	Other	Homogeneity	Firmness	Shape	Shape

LIVESEED tomato – RSR

Starting material: tomato CCP obtained by crossing four local varieties selected for suitability under organic management

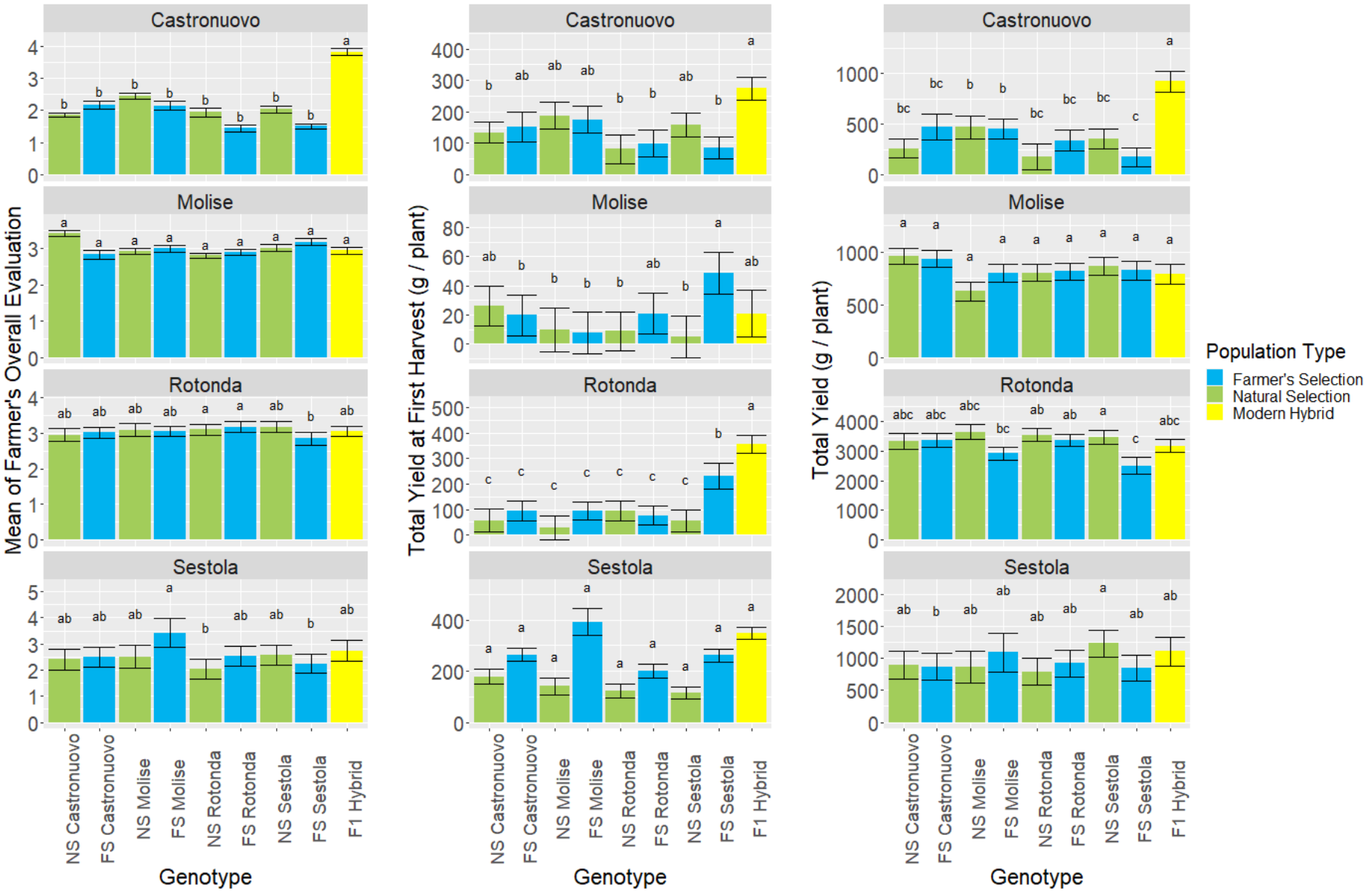
Legend

Abreviations
- **MCH :** Muchamiel
- **ALL :** Allungato de Alicante
- **CBI :** Cour di Bue - Italy
- **CBF :** Coeur de Bouef - France
- **FS:** Farmer's Selection
- **NS:** Natural Selection

Shapes
- Local Variety
- Crossing and Generation Advances.
- Farmer's Selection
- Natural Selection

Colors
- Castronuovo
- Molise
- Rotonda
- Sestola
- Other environments

LIVESEED tomato – RSR

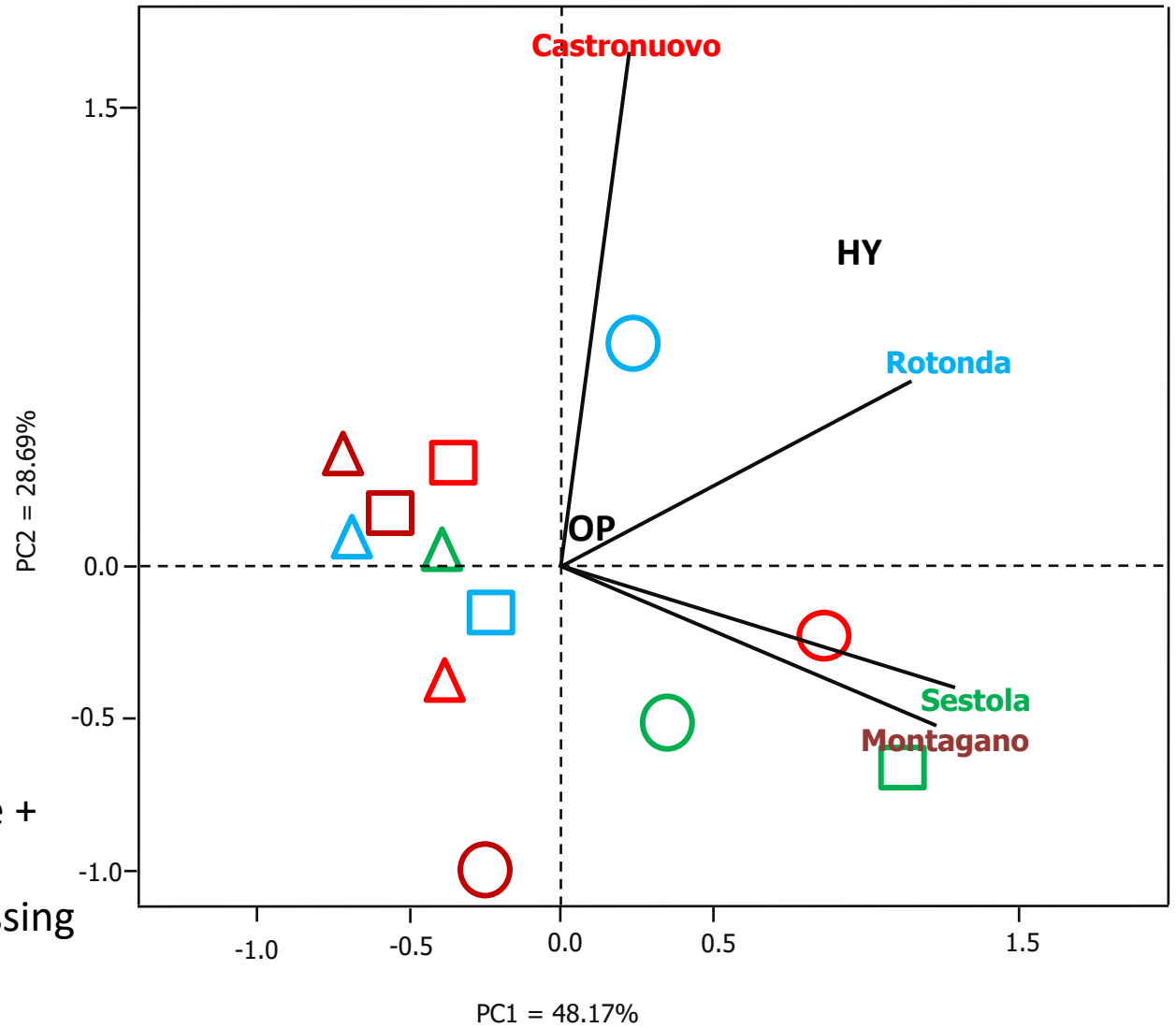


LIVESEED tomato – RSR

First harvest* (adjusted for missing plants)**

Random
Farmer Selection
Local Check
OP Open Pollinated
HY F1 Hybrid

Rotonda
Sestola
Montagano
Castronuovo



*__Total production__ (marketable + non marketable yield)
**Combined ANOVA using missing plants as co-variate

LIVESEED tomato – RSR

First harvest* (adjusted for missing plants)**

Random
Farmer Selection
Local Check
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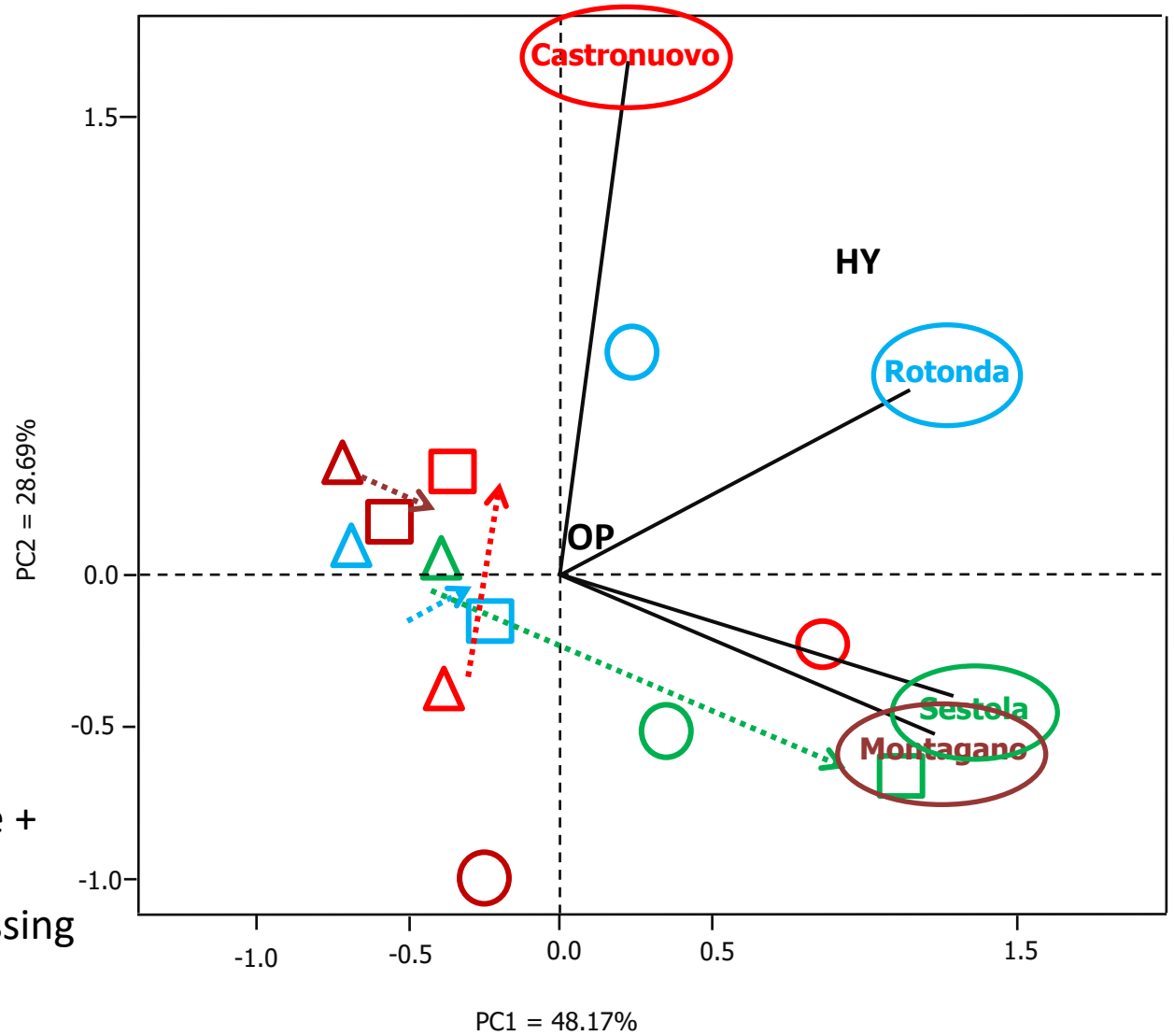

*__Total production__ (marketable + non marketable yield)
**Combined ANOVA using missing plants as co-variate

LIVESEED tomato – CREA-OF

- **MAGIC tomato population derived from eight parental lines (ISI sementi)**
- **Participatory selection in 3 Organic farms**

LIVESEED tomato – CREA-OF

- MAGIC … d from eight pa…
- Particip… ic farms

agronomy

MDPI

Article

Multi-Parental Advances Generation Inter-Cross Population, to Develop Organic Tomato Genotypes by Participatory Plant Breeding

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check for updates

Abstract: A Multi-parent Advanced Generation Intercross (MAGIC) tomato population was developed by crossing eight founder lines chosen to include a wide range of variability. The lines were previously genotyped by a genotyping by sequencing approach. The MAGIC population was used to develop genotypes with important agronomic traits and to perform the Participatory Plant Breeding (PPB). Among the 400 plants of generation 4 (G4) of the MAGIC population cultivated in an organic field experiment, 22 individuals were phenotypically selected and a molecular analysis was done for both presence of resistance genes and fruit shape (marker assisted selection) on G5 seedlings. Three selected plants showed both the pyramiding gene of resistance to the main diseases and the *ovate* gene for pear shape typology. The 400 G10 stable lines that obtained from single seed descent will represent an important genetic resource for the tomato scientific community. The MAGIC population G4 was also cultivated in three organic farms located in North, Central and South Italy to carry out the PPB. The plants showed significant phenotypic differences in development, productivity and fruit color. This variability was used to select families of tomato adapted to low input crop management, different environments, agricultural practices and market conditions.

Keywords: MAGIC development; organic agriculture; participatory plant breeding; tomato selection and seed production; biotic stress tolerance; marker assisted selection

1. Introduction

In the last years, the application both of intensive agronomical practices and cropping systems contributed to the progressive worsening of environmental conditions, induced by large application of deep soil tillage, inappropriate utilization of inorganic fertilizers and single-crop farming, especially of horticultural plants. Consequently, phenomena of soil fertility deterioration, nitrate losses, water pollution and soil compaction have often been observed. On this matter, there are many studies assessing the environmental sustainability of different cropping systems [1–3]. To overcome these problems a combination of good agricultural practices (GAP) and innovative plant breeding is needed. Particularly, the organic agriculture production, which is increasing both in term of cultivation area and economic importance, is an example of GAP. It is based on conservative techniques that increase the soil organic matter and environmental sustainability and reduces the ecological risks, due to a lower use of synthetic products [2]. On the other hand, the plant breeding, that essentially relies on the utilization

Courgette population – CREA-OF

- **Cross Composite Population** created by Gabreile Camapelli of CREA-OF (Monsampolo del Tronto, Italy)
- Grown as a population with success by organic farmers in the Marche region

Courgette population – CREA-OF

- **Participatory selection** of lines within the populations in an organic farm
- Well adapted to organic and no-tillage system

Dark green fruit selection

Light green fruit selection

Dwarf bean population – CREA-OF

- Population (dynmaic mixture) of common bean (dwarf) created by mixing 70 cultivars
- Selection within the dwarf bean population according to seed size

2016 S1

2018 S4 large seed (sub population)

2018 S4 small seed (sub popolation)

Chickpea population – CREA-OF

- **Chickpea Population (Dynamic mixture created by mixing 45 cultivars)**

MAIZE

- In partnership with **CREA-CI Bergamo** (2016 to 2020)
- **Participatory evaluation** of 17 local vatieties and resulting half-dialled crosses (171 F2 and F3)
- Costitution of **RSR MAIZE CCP** using 17 crosses chosen by farmers. Locally adapted to two Italian regions (NE and South)

OAT

Initiative of **CREA-CI Bergamo** in collaboration with RSR (2019-20)

- **Hulled oat CCP (36 parental lines)**
- **Hulless oat CCP (17 parental lines)**

Currently in multiplication under organic conditions

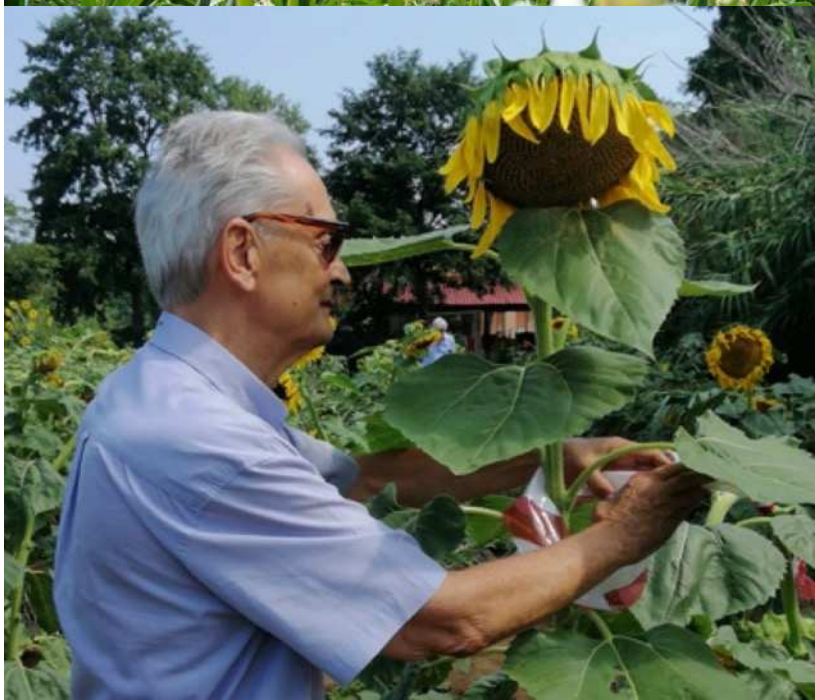
In the pipeline…

- **LENTIL** in cooperation with Scuola Superiore Sant'Anna of Pisa. Starting from **63 local varieties** of CNR genebank of Bari
- **RICE** in cooperation with CARIPLO foundation. Starting from **246 Italian accessions** from CREA Vercelli and IRRI. Three dynamic mixtures in multiplication.

In the pipeline…

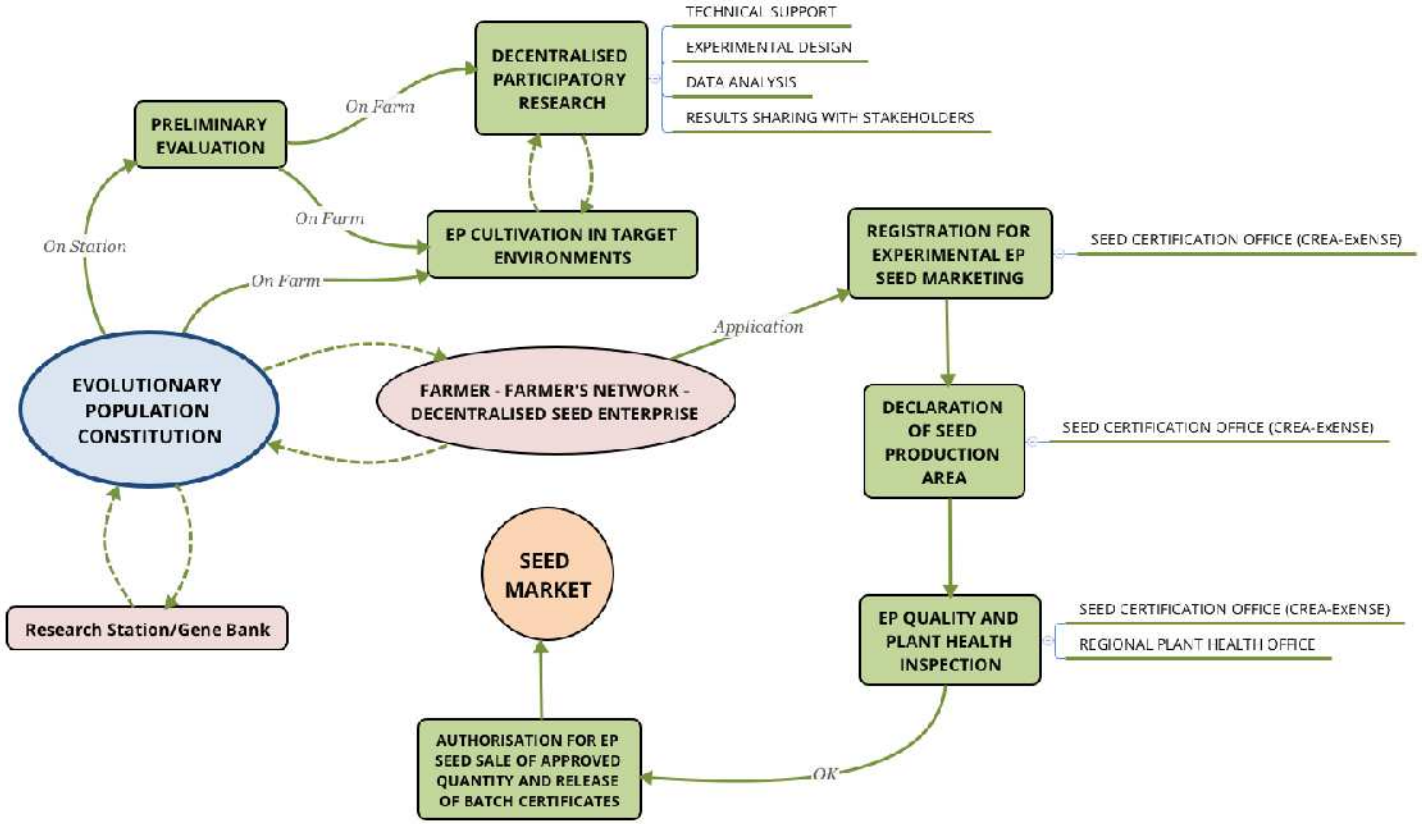
- **WHITE LUPIN** in cooperation with CREA-ZA. Sweet white lupin CCP with potential drought and alcaline soil tollerance

- **SUNFLOWER** starting from existing open pollinated and local varieties. Initiated by EIP project Selianthus of Umbria region.



Innovative seed systems for OHM

- Close cooperation with **Ministry of Agriculture** and **CREA-DC** during registration and certification process
- **Participatory** breeding with farmers through networks key to **high adoption** rates of OHM



From seed to produce

- **Farmers' involvement and empowerment**
- **OSS seed label & pledge**

Queste sementi non sono protette da proprietà intellettuale, acquisendole hai il privilegio di utilizzarle in piena autonomia, con alcune limitazioni.

Questa semente è il risultato di anni di ricerca partecipata.

SOLIBAM
TENERO FLORIDDIA POPOLAZIONE

Il nucleo iniziale è stato costituito nel 2009 all'ICARDA (Centro di ricerca agricola in Siria) su indicazione di Salvatore Ceccarelli mescolando il seme di 2000 linee provenienti da tutto il mondo. Nel 2010 è arrivato in Italia nell'ambito del progetto di ricerca europeo SOLIBAM (2010-2014), grazie ad AIAB partner del progetto. Negli anni successivi, un numero crescente di agricoltori, in collaborazione con Rete Semi Rurali, lo ha coltivato e riprodotto, partecipando alle sperimentazioni volte a valutarne la capacità di adattamento nell'ambito del progetto europeo DIVERSIFOOD (2014-2019), di cui Rete Semi Rurali è partner. La semente SOLIBAM Tenero Floriddia Popolazione è coltivata dal 2010 sulle colline centrali della Toscana, su terreni argillosi.

La commercializzazione di questa popolazione non omogenea è possibile grazie alla Decisione della Commissione Europea 2014/150/EU che permette in via sperimentale la commercializzazione delle sementi di "materiale eterogeneo" di alcuni cereali. Si tratta di una rivoluzione nel settore sementiero perché per la prima volta viene consentita la vendita di sementi di varietà non omogenee, con procedure fitosanitarie adattate a questo nuovo contesto.

IN PARTICOLARE HAI:

1. la libertà di riseminare le sementi in azienda;
2. la libertà di condividere o vendere le sementi ad altri con procedure di certificazione adattate a questo nuovo contesto;
3. la libertà di sperimentare e studiare le popolazioni e di condividere o pubblicare informazioni a loro relative;
4. la libertà di selezionare o adattare le popolazioni, fare incroci con esse o usarle per costituire nuove linee e varietà.

IN CAMBIO, TI IMPEGNI A:

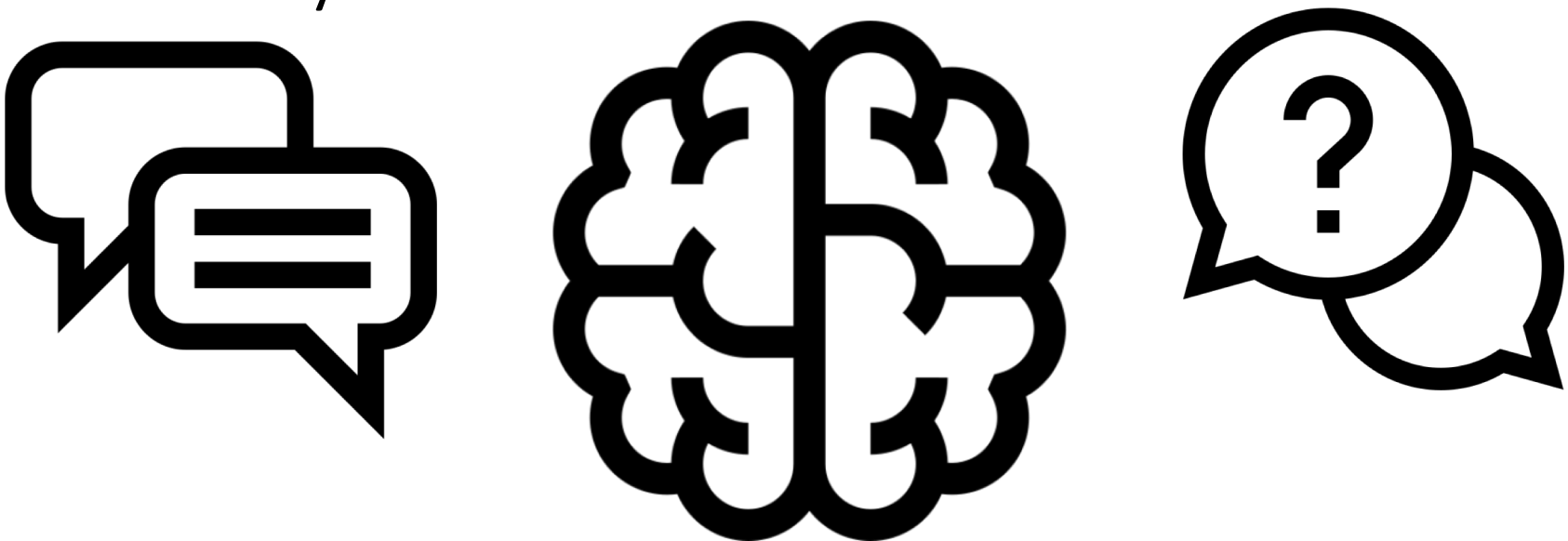
1. non limitare l'uso di queste sementi o dei loro derivati con brevetti o altri strumenti di proprietà intellettuale,
2. ad includere questa dichiarazione in ogni trasferimento di queste sementi o dei loro derivati;
3. a rendere disponibili i prodotti della ricerca fatta a partire da questa popolazione.

SOLIBAM TENERO FLORIDDIA POPOLAZIONE

- **Evolutionary Populations enter the seed market and the product value chain**

Points for discussion…

- Innovative decentralised seed-systems integrated in different types of value-chains
- Seed quality and health
- Benefit sharing - financing research and breeding
- Tools to facilitate traceability and increase transparency
- Naming OHM cultivars and communicating the value of biodiversity to citizens and consumers



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- Alessandra Sommovigo (CREA-DC)
- Antonio lo Fiego (Arcoiris sementi)
- All the farmers hosting and participating to PPB trials

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Rete Semi Rurali

ARCOIRIS

www.liveseed.eu
LIVESEED

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Thank you for your attention!