



## **The national program for the evaluation of genetic resources in cereals (EVAII) – a blueprint for a public private partnership**

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# Development of EVA II

**In 2001 launch of EVA II, the National Evaluation Program for Cereal Plant Genetic Resources, with the following objective:**

- **Establishment of an institutional network for the evaluation of wheat and barley PGR**
- **Generation of scientifically more meaningful resistance data by**
  - **Evaluation of identical sets of germplasm at different locations**
  - **Use of standard methods and standard genotypes**
- *Composition of catch assortments of genotypes with defined resistances and integration into the network to facilitate virulence analysis of the main air-borne pathogens*
- *Integration of molecular genetic markers linked with resistance genes into the evaluation program*
- **Development of a dynamic information system for recording, analysis and provision of the data generated by the network**

# Development of EVA II

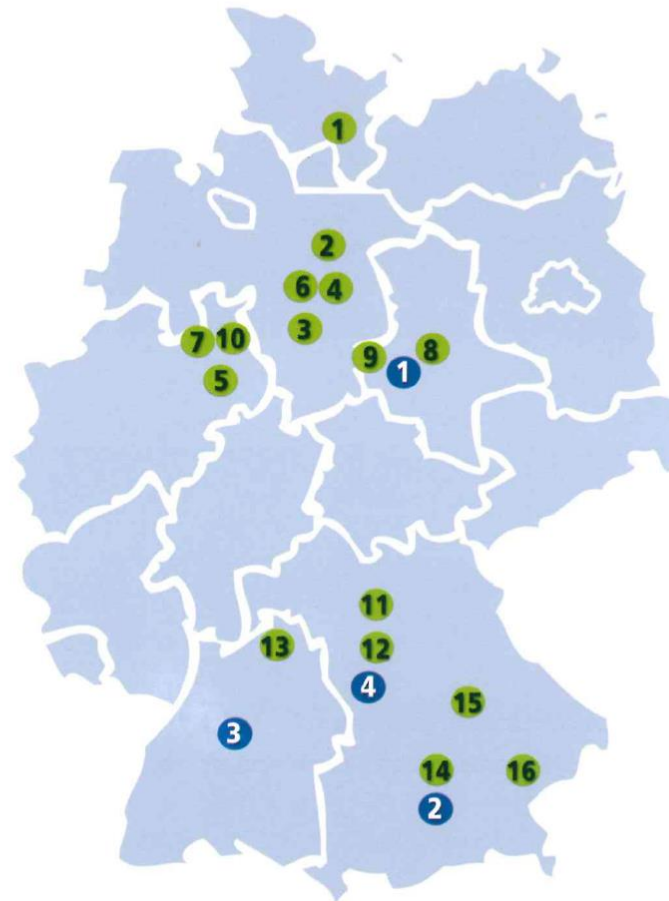
## **EVA II agreement negotiated in 2001 and signed by 20 partners**

- Content in alia
  - § 1 Indefinite duration, self-sustained network after a funding period of 3 years
  - § 2 Tasks of the partners and mode of operation
  - § 3 Coordination
  - § 4 Evaluation data delivery, public access embargo limited to three years
  - § 5 Public access via BIG (still under construction)
  - § 6 Extinction of use rights
  - § 7 IP
  - § 8 Non-disclosure
  - § 9 Affiliation of new partners (significant add on value required)
  - § 10 Liabilities
  - § 12 Duration
  - § 13 Final clause

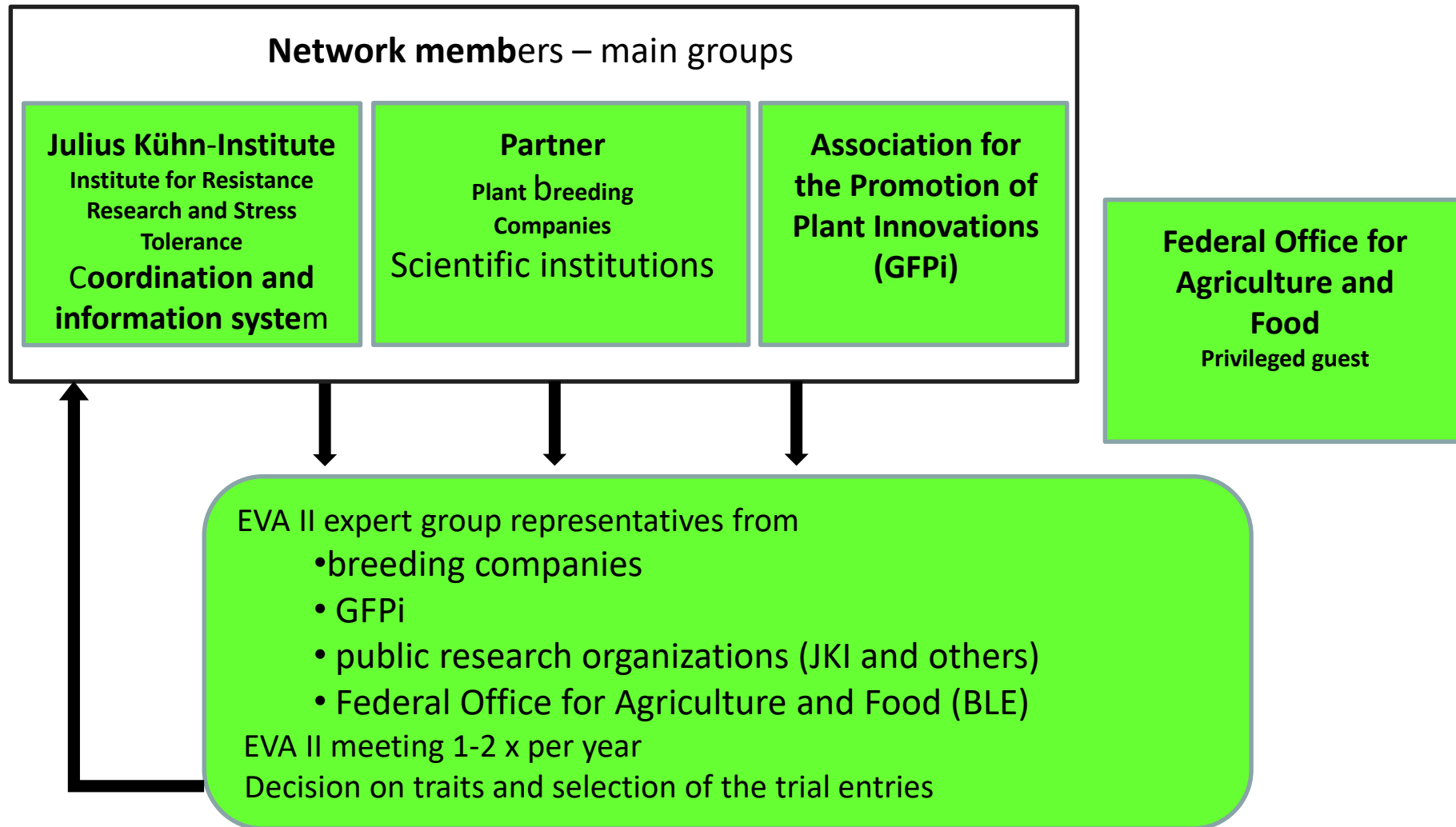
# EVAll partners

- 1** Pflanzenzucht SaKa GmbH & Co. KG
- 2** KWS LOCHOW GMBH
- 3** Saaten-Union GmbH
- 4** Limagrain GmbH
- 5** Syngenta Seeds GmbH
- 6** Strube Research GmbH & Co. KG
- 7** W. von Borries-Eckendorf GmbH & Co. KG
- 8** RAGT 2N
- 9** Nordsaat Saatuchtgesellschaft mbH
- 10** Deutsche Saatveredelung AG
- 11** Saatucht Streng-Engelen GmbH & Co. KG
- 12** Saatucht Josef Breun GmbH & Co. KG
- 13** Pflanzenzucht Oberlimpurg Dr. Peter Franck
- 14** SECOBRA Saatucht GmbH
- 15** Saatucht Bauer GmbH & Co. KG
- 16** Ackermann Saatucht GmbH & Co. KG

- 1** Julius Kühn-Institut, Quedlinburg
- 2** Bayerische Landesanstalt für Landwirtschaft, Institut für Pflanzenbau und Pflanzenzüchtung, Freising
- 3** Landessaatzuchtanstalt der Universität Hohenheim
- 4** Landwirtschaftliche Lehranstalten Triesdorf



# Development of EVA II



# Workflow: evaluation & documentation

- Selection of interesting diseases by the EVA II expert group
- Selection, ordering, multiplication and primary evaluation of the genotypes (coordinator)
- Dispatch of the composed trial entries along with the SMTA to partners
- Coordinator generates, database assisted, list for evaluation data recording and provides partners with the lists
- Assessment of the susceptibility on small-scale plots (1 plot x n locations)
- Import into the database, plausibility control by the coordinator and release of the results



# Information system for EVA II

## Support functions









- Facilitates the information flow between partners within the network
- Partners can search information by year, crop, disease or location or a combination thereof
- Facilitates sharing of results among network partners and allows immediate use of those data relevant to the specific program of a breeding company
- After 3 years, the data get part of the public domain









Subprojects Templates Evaluation

Assortment list winterwheat\_16 - PROPOSAL | Type: Proposal | Current state: Open

	Name s	Accession number	Institute s	Quantity	Proposed by	Proposed on	Reason	Ø - Mark	SMTA	
	CIMMYT_2015_38	STEMRRSN_6021_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_117	STEMRRSN_6104_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_64	STEMRRSN_6048_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_93	STEMRRSN_6078_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_129	STEMRRSN_6116_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_138	STEMRRSN_6126_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_7	SEPTON_6261_12	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06		0 (Keine Benotungen)		
	CIMMYT_2015_25	STEMRRSN_6007_2014	Centro Internacional de ...		eva2coordinator (eva2 c...	2015-07-08T11:09:06				

 Delete
  Move
  Invite partners
  Import

MCPD	Zusatzattribute	Meine Begründung	Alle Bewertungen	Erweitern
<p>Accession Name:</p> <p>CIMMYT_2015_38</p> <p>Genus:</p> <p>Triticum</p> <p>Species:</p> <p>aestivum</p> <p>Subtaxa:</p> <p>Institut:</p> <p>Centro Internacional de</p>		<p>Accession number:</p> <p>STEMRRSN_6021_2C</p> <p>Collecting number:</p> <p>Collecting Institute:</p> <p>Common crop name:</p> <p>winter wheat</p> <p>Country of origin:</p> <p>ME</p>		

**Scoring lists are generated, can be downloaded and later be imported into the database via a web-interface.**





# Workflow : evaluation & documentation

Year	Wheat	Barley
2005	Drechslera tritici-repentis (DTR); Septoria; Fusarium	Physiological leaf spots
2007	Leaf rust	Rhynchosporium
2009	DTR (tan blotch)	Barley yellow dwarf virus (BYDV)
2010	Septoria; DTR	Leaf rust; Rhynchosporium
2011	Septoria; DTR	Leaf rust; Rhynchosporium
2012	Stripe rust	BYDV; Rhynchosporium; net blotch

### Rhynchosporium secalis \_ SB

spring barley

 Rhynchosporium Blattflecken  
 scald

**Testdesign:** micro plots

The screening for resistance is achieved by field experiments in micro plots or hill plots without replications. For the common diseases standard comparators are included. Inoculation, data collection and data processing are carried out as described below.

**Inoculation:** Inoculation stage:

**standard method:** natural infection

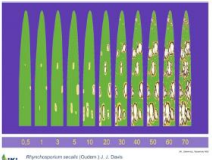
**alternative:**  
At EC-stage 37 – 39 a suspension of conidia (4.000 to 6.000 conidia/ml) with detergent (0,05% Tween 20) is applied to the plants, which are then protected overnight (10 to 12 h) with a plastic sheet to maintain optimal infection conditions (100 % rh).

**Rating**  
**rating date:** At heading (BBCH 37) Repeated estimations of infested leaf area are carried out weekly over the complete disease period. Three estimations at weekly intervals might be the minimum.

**rating trait**  
1. Symptom expression as percentage of infected leaf area

**alternatively:** Symptom expression as score

**additional traits:**  
2. Date  
3. Developmental Stage (average/plot – min and max)



**Standards:**  
resistant: Westminster  
susceptible: Lenka

## Standardized evaluation methods

### Puccinia hordei-WB

*Puccinia hordei* - leaf rust  
winter barley

**Testdesign:** micro plots

The screening for resistance is achieved by field experiments in micro plots or hill plots without replications. For the common diseases standard comparators are included. Inoculation, data collection and data processing are carried out as described below.

**Inoculation:** Natural occurrence

**artificially:**  
A suspension of spores in oil (Isopar M from Solitrol) is sprayed with a micro sprayer over the spreader rows (80-100 mg spores in 30 ml oil for 100m) on a cloudy day and high atmospheric humidity at beginning of May (BBCH 29-30) at temperatures from 10° to 15°C. The plant leaves need to be dry.

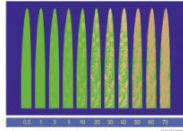
**Inoculation stage:** BBCH 25-29

**Rating**  
**rating date:** BBCH 51-55

**parameter to assess:**  
1. Symptom expression as percentage of infected leaf area

**alternatively:** Symptom expression as score

**additional traits:**  
2. Date  
3. Developmental stage average/plot – min - max



**resistant standard variety:** Merlot  
**susceptible standard variety:** Candesse

# Workflow : evaluation & documentation



Browser address bar: [eva2.jki.bund.de/evaluationrelease/index](http://eva2.jki.bund.de/evaluationrelease/index)

JKI Julius Kühn-Institut  
Bundesforschungsinstitut für Kulturpflanzen

Informationssystem für Evaluierung pflanzengenetischer Ressourcen

## Evaluationreleases

**1a Sortiment auswählen**

keine Auswahl

- oder -

**1b Akzession(en) auswählen**

☒ Akzessionsname ☐ Akzessionsnummer

Akzession(en) auswählen

**2 Merkmal auswählen**

Erst Sortiment/Akzession wählen

Note:  >=

Prozent:  1 - 9  0 - 100

**3 Ort(e) auswählen** ☐ Alle Orte auswählen

Erst Sortiment/Akzession wählen

**4 Jahr(e) auswählen** ☐ Alle Jahre auswählen

Erst Sortiment/Akzession wählen

Nur die Filter in dieser Liste werden in den Auswertungen berücksichtigt.

SORTIMENT / AKZESSION(EN)	MERKMAL	Ort(e)	Jahr(e)
Sommergerste	Mehltau_WB [Note <= 5]	Dyngby	2006
<input checked="" type="checkbox"/> GRUPPIEREN		<input checked="" type="checkbox"/> GRUPPIEREN	<input checked="" type="checkbox"/> GRUPPIEREN

Zeige 1-32 von 32 Einträgen.

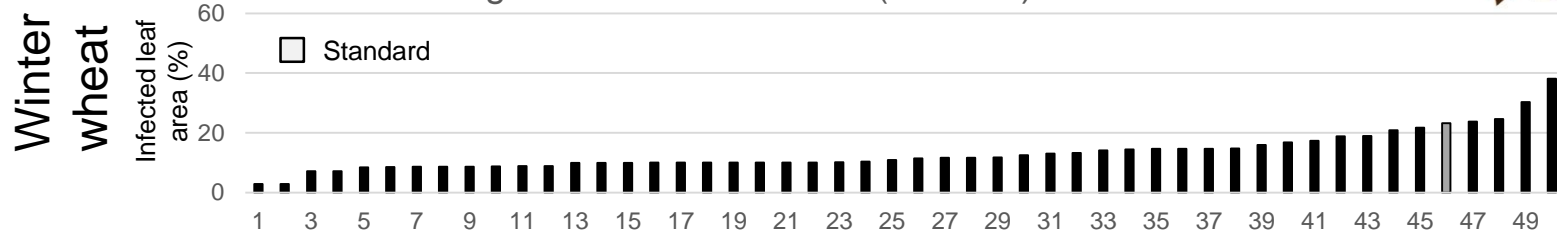
Akzessionsname	Akzessionsnummer	Sortiment	Ort(e)	Jahr(e)	Mehltau Avg Note	Mehltau Min Note	Mehltau Max Note	Mehltau Anzahl
ALEXIS	ALEXIS	Sommergerste	Dyngby	2006	1.0	1.0	1.0	1
AMALFI	AMALFI	Sommergerste	Dyngby	2006	1.0	1.0	1.0	1
ANNABELL	ANNABELL	Sommergerste	Dyngby	2006	5.0	5.0	5.0	1
APEX	APEX	Sommergerste	Dyngby	2006	1.0	1.0	1.0	1
				2006	3.0	3.0	3.0	1
				2006	1.0	1.0	1.0	1

<http://eva2.jki.bund.de/site/index>  
Export to Excel

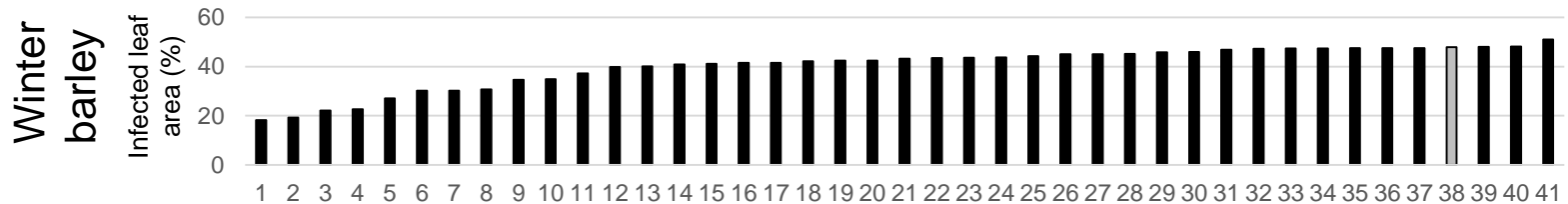
# Some of the evaluation results in 2019



Average of infected leaf area (leaf rust) from seven locations



Average of infected leaf area (leaf rust) from two locations



Average of infected leaf area (leaf rust) from two locations



Average of infected leaf area (leaf rust) from two locations



# Data available from evaluations

Data and genotypes evaluated as resistant are available for partners and are usable for breeding activities.

- Data from 2001 to 2019 available
- Up to 12 locations per year and field crop
- Up to six different diseases per field crop from every year of investigation are available
- All available data can be exported to Excel files
- Seeds of genotypes are increased and stored and available for further breeding activities



winter barley



winter wheat



different accessions



Field trial at QLB

# Why EVAII as a blue print ?



Eva II fulfills the basic demands for an evaluation system and does not put too much additional work for the private partners

The infrastructure is in place and working, and can be easily transferred to different crops

## New features needed and challenges

Implement molecular data (GBS, Chip data etc.)

Implement screening protocols for more complex traits

Implement tools for genome wide association studies (GWAS)

Implement tools for marker development



# Activities in the Frame of the Preparation of the European Evaluation program

Preparation of SSD in greenhouse



Harvest of SSD in greenhouse



Preparation of distribution



Multiplication and first evaluation in the field



# Multiplication of genebank material

-The following amounts of seeds will be multiplied in field trials in 2019

Winter wheat: 187

-will/ can be increased to  
200 genotypes

## Material from

IPK Gatersleben Germany (102)  
DEFR Schweiz (50)  
AGES Austria (37)  
Suceava genebank Romania (30)  
IPGR Bulgaria (20)  
VURV Piestany, Slovakia (2)

**Sum: 241**

Winter barley: 303

## Material from

IPK Gatersleben Germany (204)  
DEFR Schweiz (70)  
CRI Prague (70)  
VURV Piestany Slovakia (62)  
AGES Austria (42)  
IPGR Bulgaria (20)  
Suceava genebank Romania (8)

**Sum: 476**

Spring wheat: 144

-will/ can be increased to  
200 genotypes

## Material from

GRU John Innes Center (UK)  
Paragon x Watkins (147)

**Sum: 147**

Spring barley: 60

-will/ can be increased to  
128 genotypes

## Material from

Agricultural Research Institute Kromeriz Czech (70)  
VURV Piestany Slovakia (58)

**Sum: 128**



## Progress of multiplication in the field (Quedlinburg)

Winter barley



Spring barley



Winter wheat



Spring wheat





