

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



**H.-U. Leistner<sup>1</sup> , E. Schliephake<sup>1</sup>, A. Serfling<sup>1</sup>, L. Frese<sup>2</sup>, F. Ordon<sup>1</sup>**

<sup>1</sup> Institute for Resistance Research and Stress Tolerance, Quedlinburg, Germany

<sup>2</sup> Institute for Breeding Research on Agricultural Crops, Quedlinburg, Germany

# 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

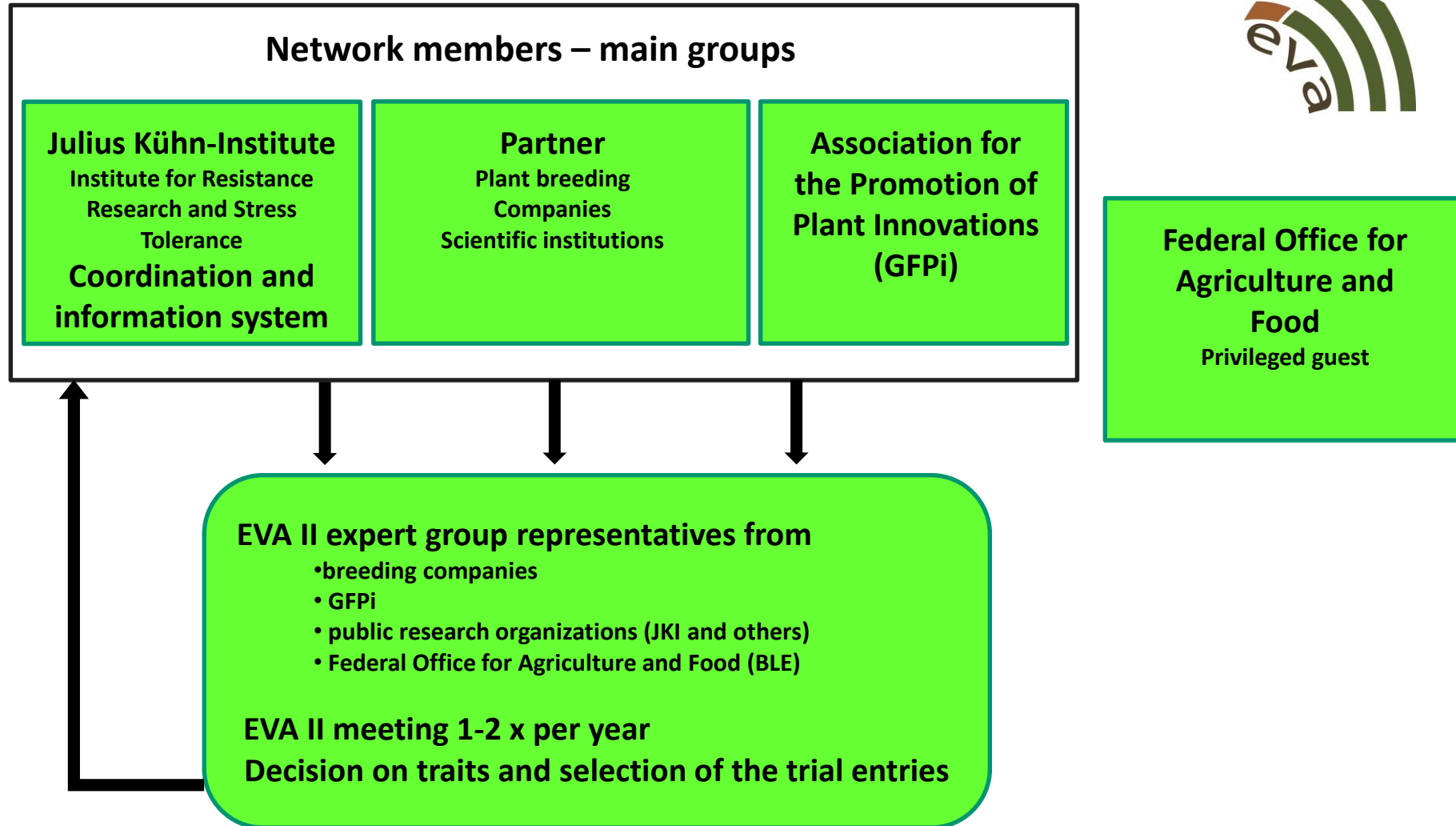


- 1** Pflanzenzucht SaKa GmbH & Co. KG
- 2** KWS LOCHOW GMBH
- 3** Saaten-Union GmbH
- 4** Limagrain GmbH
- 5** Syngenta Seeds GmbH
- 6** Strube Research GmbH & Co. KG
- 7** W. von Borries-Eckendorf GmbH & Co. KG
- 8** RAGT 2N
- 9** Nordsaat Saatzuchtgesellschaft mbH
- 10** Deutsche Saatveredelung AG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



# Workflow : evaluation & documentation

Management of the test set. Import of the genotype data in the multi crop passport descriptor format (FAO & EURISCO)



Subprojects Templates Evaluation

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

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

Accession number:  Save New proposal

MCPD Zusatzattribute Meine Begründung Alle Bewertungen Erweitert

Accession Name: CIMMYT\_2015\_38  
 Genus: Triticum  
 Species: aestivum  
 Subtaxa:   
 Institut: Centro Internacional de

Accession number: STEMRRSN\_6021\_2014  
 Collecting number:   
 Collecting Institute:   
 Common crop name: winter wheat  
 Country of origin: ME

Location of collection:   
 Breeding institute:   
 Biological status:   
 Collecting/acquisition:   
 Remarks:

Boniturtabelle nach Merkmal für EVA II

Bonitur: Percent  
 Merkmal: Mehltau  
 Sortiment: winterbarley\_03  
 Jahr: 2003  
 Partner: eva2\_coordinator  
 wiss. Merkmal:   
 Behandlung:   
 Rasse:   
 Test:   
 Versuchsort:

No.	Accessions-name	Accessions-number	Instituts-code	Sortiments-ID	Wiederholungs	1			2			3		
						BCH min	BCH max	BCH avg	BCH min	BCH max	BCH avg	BCH min	BCH max	BCH avg
12	1375	1375	DEUS29	WG2003_001	A									
13	1241	1241	BLR011	WG2003_002	A									
14	3111	3111	DEUS29	WG2003_004	A									
15	RE SOLUT	RE SOLUT	DEUS38	WG2003_003	A									
16	Abel 2.55	3408	GBR011	WG2003_005	A									
17	BYDV16	BYDV16	DEUS29	WG2003_006	A									
18	1329	1329	DEUS29	WG2003_007	A									
19	MSSCALD	MSSCALD	DEU146	WG2003_008	A									
20	Messeur Damsée	PI 174433	USA029	WG2003_009	A									
21	W11	W11	DEU082	WG2003_010	A									
22	INTRO	INTRO	DEU072	WG2003_011	A									
23	BYDV10	BYDV10	DEUS29	WG2003_013	A									
24	KOMOTO	KOMOTO	DEU036	WG2003_012	A									
25	252	PI 58053	USA029	WG2003_016	A									
26	2034	2034	ITA024	WG2003_015	A									
27	BYDV09	BYDV09	DEUS29	WG2003_014	A									
28	1037	1037	DEUS29	WG2003_017	A									
29	JAMAIQUE	JAMAIQUE	FRA081	WG2003_018	A									
30	Missouri B640	Clho 7572	USA029	WG2003_019	A									
31	3802	3802	DEUS29	WG2003_022	A									
32	BYDV06	BYDV06	DEUS29	WG2003_021	A									
33	Samano	Samano	DEU060	WG2003_020	A									

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 

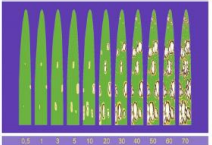
**Testdesign:** micro plots

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 % rfi).

**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 alternatively: Symptom expression as score  
1. Symptom expression as percentage of infested leaf area



**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.

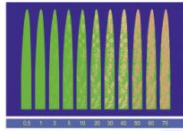
**Inoculation stage:** BBCH 25-29

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

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

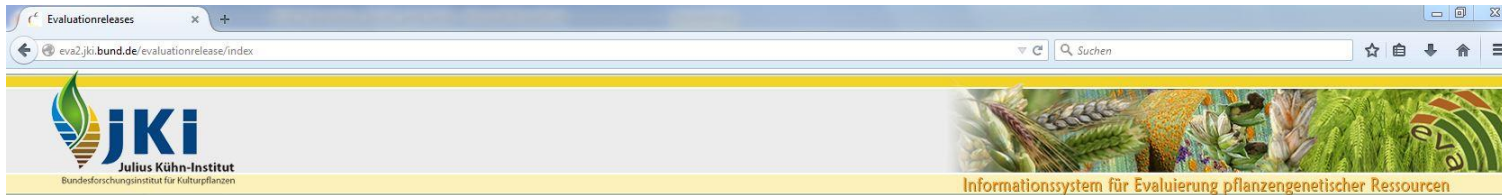
**alternatively:** Symptom expression as score

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



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

# Workflow : evaluation & documentation



## Evaluationreleas

1a Sortiment auswählen  
keine Auswahl

1b Akzession(en) auswählen  
Akzessionsname

## Evaluationreleases

2 Merkmal auswählen  
Erst Sortiment/Akzession wählen

3 Ort(e) auswählen  
Erst Sortiment/Akzession wählen

4 Jahr(e) auswählen  
Erst Sortiment/Akzession wählen

5 Filter übernehmen

6 Ergebnisse anzeigen

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

SORTIMENT / AKZESSION(EN)	MERKMAL	ORT(E)	JAHR(E)
Sommergerste	Mehitau_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)	Mehitau Avg Note	Mehitau Min Note	Mehitau Max Note	Mehitau 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

# Why EVAII as a blue print ?

Eva II fullfills 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

