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# COBRA WP2 Overview

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# Introduction to WP2

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## Objectives

- (1) Study the potential of *Hi-D* (CCPs) and specific genotypes to adapt to climatic fluctuations;
- (2) Find determinants of early vigour and competitiveness against weeds;
- (3) Identify breeding strategies for coping with multiple stressors through studying the effects of variable degrees of functional diversity in crops.



# Tasks

## 2.1 Coping with climate change: Study the potential of *Hi-D* (CCPs) and specific genotypes to adapt to climatic fluctuations

Wheat: **Odette Weedon (25.11. 11.30 and 14:00)**

Barley: **Rikke Bagger Jørgensen (24.11. 15.45)**

Grain legumes: **Workshop (25.11. 9.00-11.00)**

## 2.3 Diversity for coping with multiple stressors

Wheat: **Poster session today, Odette Weedon (25.11. 14:00)**

Barley: **Rikke Bagger Jørgensen (24.11. 15.45)**



# Tasks

## 2.2 Find determinants of early vigour and competitiveness against weeds:

Wheat: **Nils-Ove Bertholdsson (24.11. 16:05)**

Grain legumes: **Workshop (25.11. 9.00-11.00)**



# Barley Experiments (DTU (DK) and Luke (FI))



## Goals:

- Assess diversity
- Genetic mapping
- Disease resistance
- Fertility effects
- Effects of Climate change (Temp, CO<sub>2</sub>, O<sub>3</sub>)



## Materials:

- Landraces
- Old and new cultivars

## Methods:

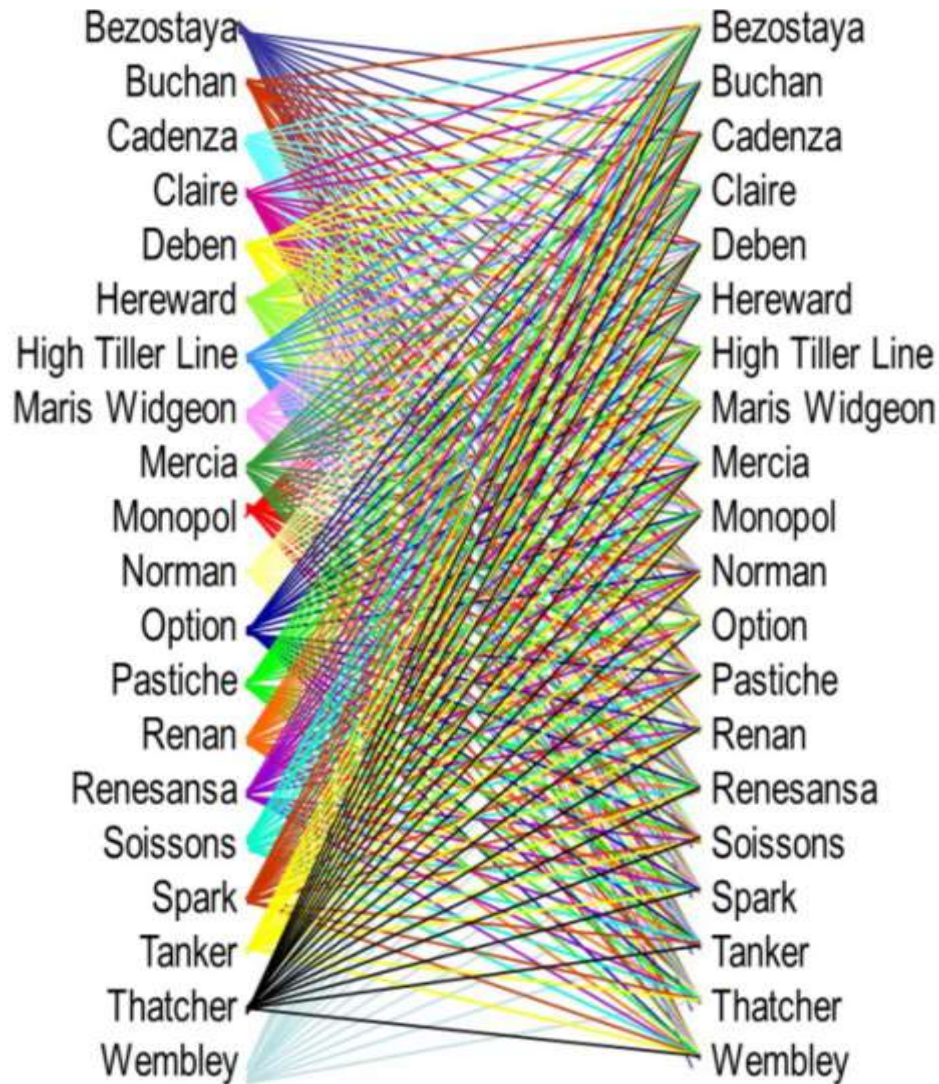
- Laboratory (Phytotron)
- Field station (open top chambers)



**Total: 6 field or lab experiments, most for several years**



# The CC winter wheat populations



9 High yielding parents: 9 x 9

12 High baking quality: 12 x 12

Yield x Quality: 9 x 11

Since the F<sub>4</sub> 2005/06 in Germany (Witzenhausen), UK, HU without conscious selection

2005/06 F<sub>4</sub> → 2014/15 F<sub>13</sub>



# Wheat Composite Cross work

## Goals:

Evolutionary breeding, pre-breeding, population maintenance  
Assess diversity  
Assess resilience and performance in general  
Systems effects (organic/conventional)

## Materials:

CCP from 20 parents in 2001  
Reference varieties

## Methods:

Laboratory  
Field station  
Farmers fields



# Maintaining the populations to allow for evolution

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To **avoid drift** need to have adequate population size.

Inbreeding

Variable contribution by individuals to the next generation

→ Effective population size is much smaller than the number of individuals in a population

**At 400 plants / m<sup>2</sup> mean Ne/m<sup>2</sup>:**

**F<sub>6</sub>: 153**

**F<sub>8</sub>: 120**

**Ne should be at least 5000 (Goldringer)**

**By now at least 14 partners work with CCPs in many different experiments (see various posters)**





# Evaluation of effects of changing environments; “cycling” the populations since 2008



# Evaluation of Winter wheat CCP cycling effects



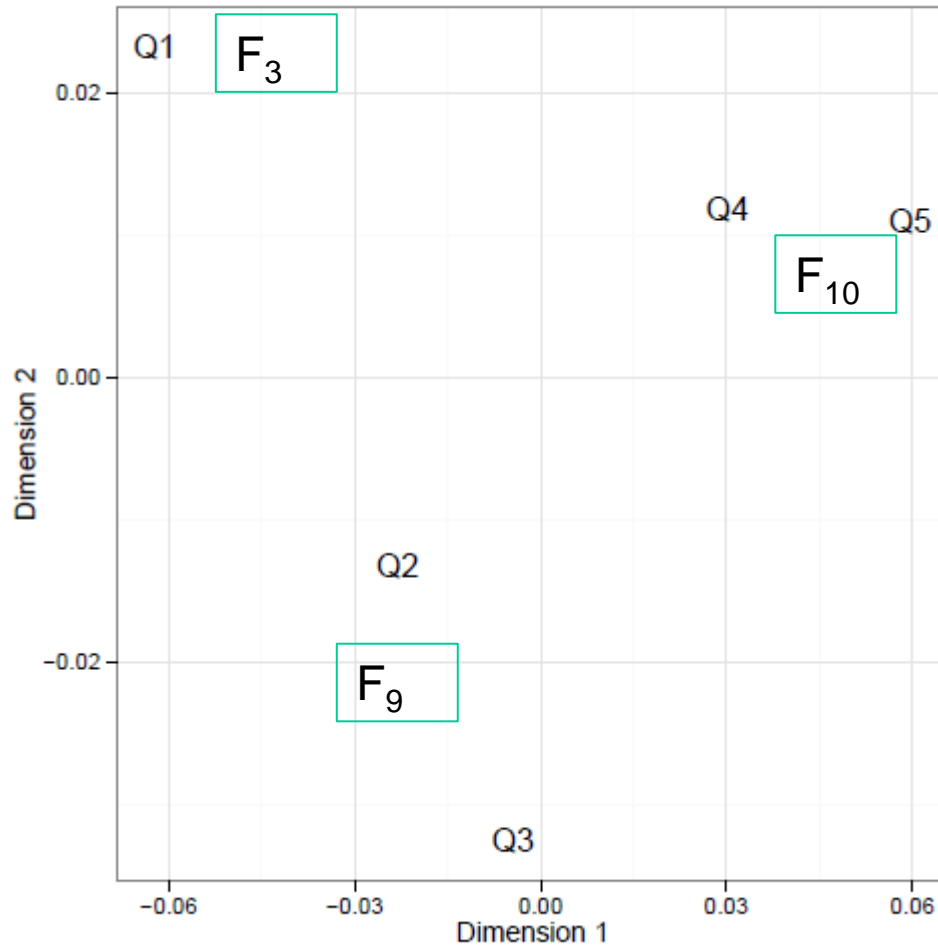
**Hypothesis:** Exposing genetically diverse material to varying environments under natural selection increases general adaptability to climate change.



Parental varieties

CCPs and mix

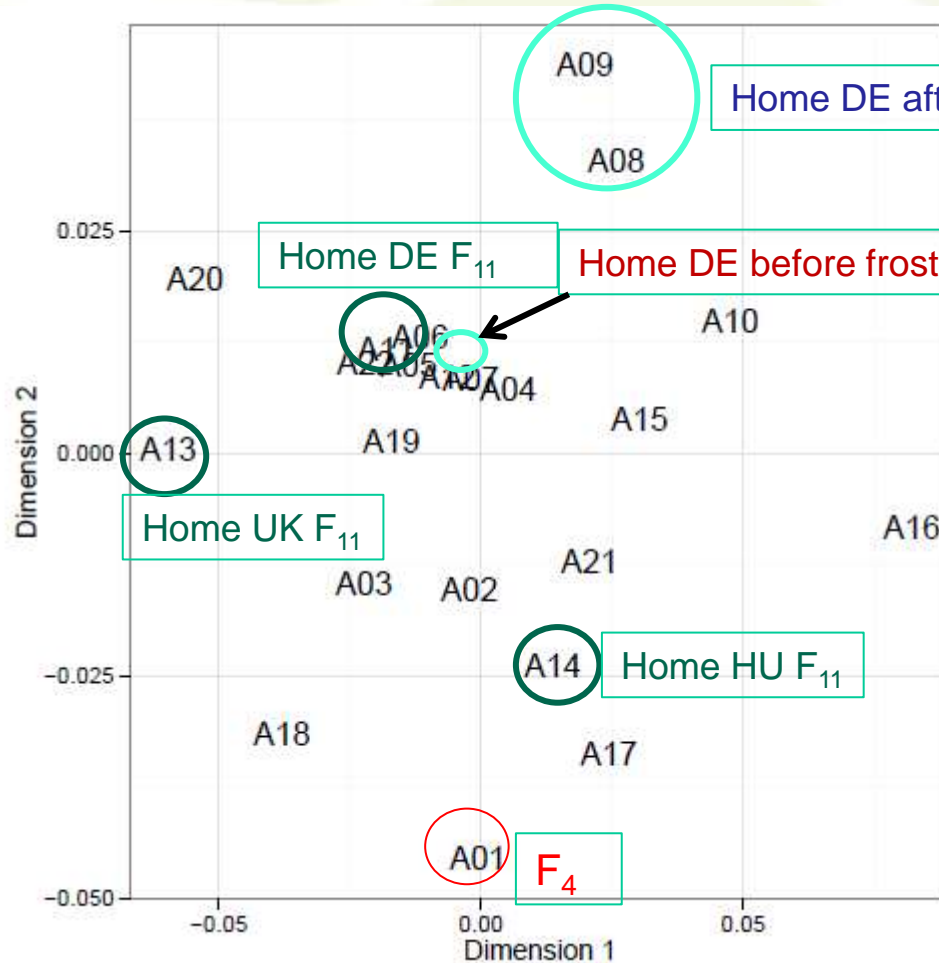
# Molecular analyses of the populations (SNP)



Frost changed the populations



# Molecular analyses of the populations (SNP)



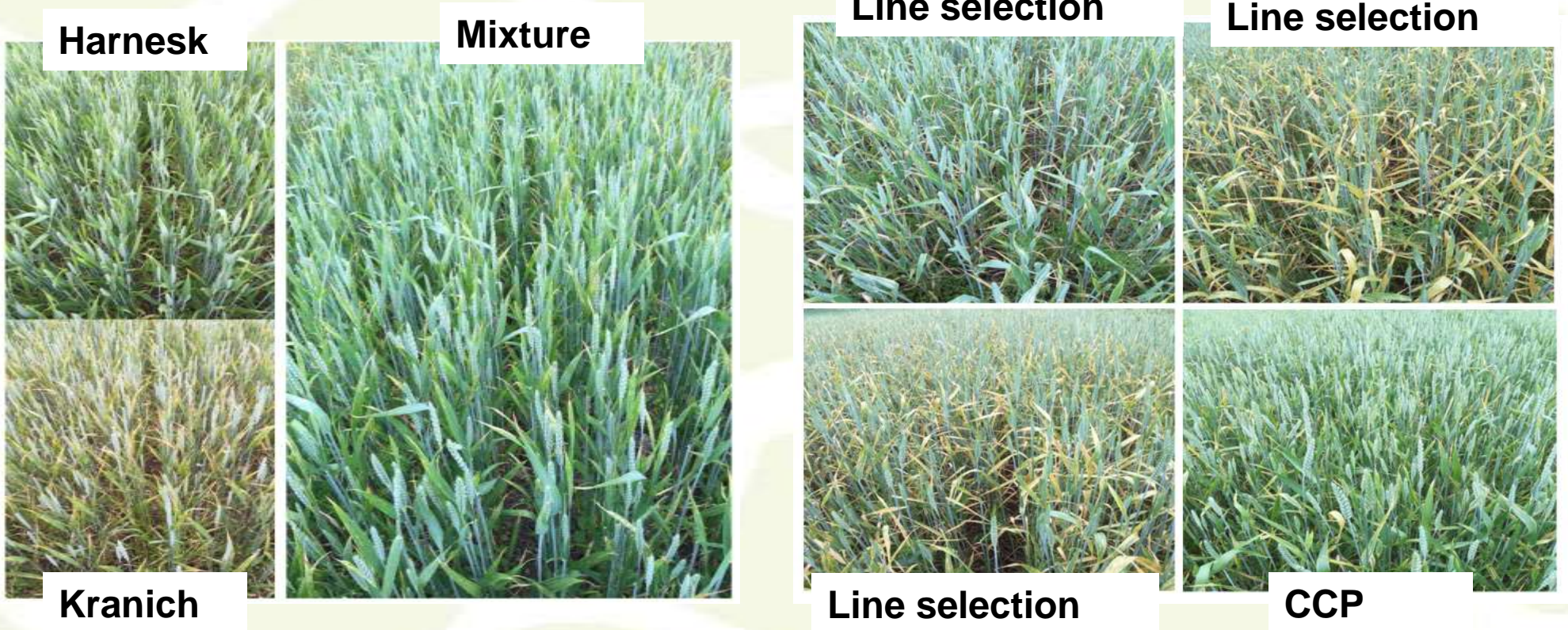
Frost changed the populations

Apparently they returned to what they were before



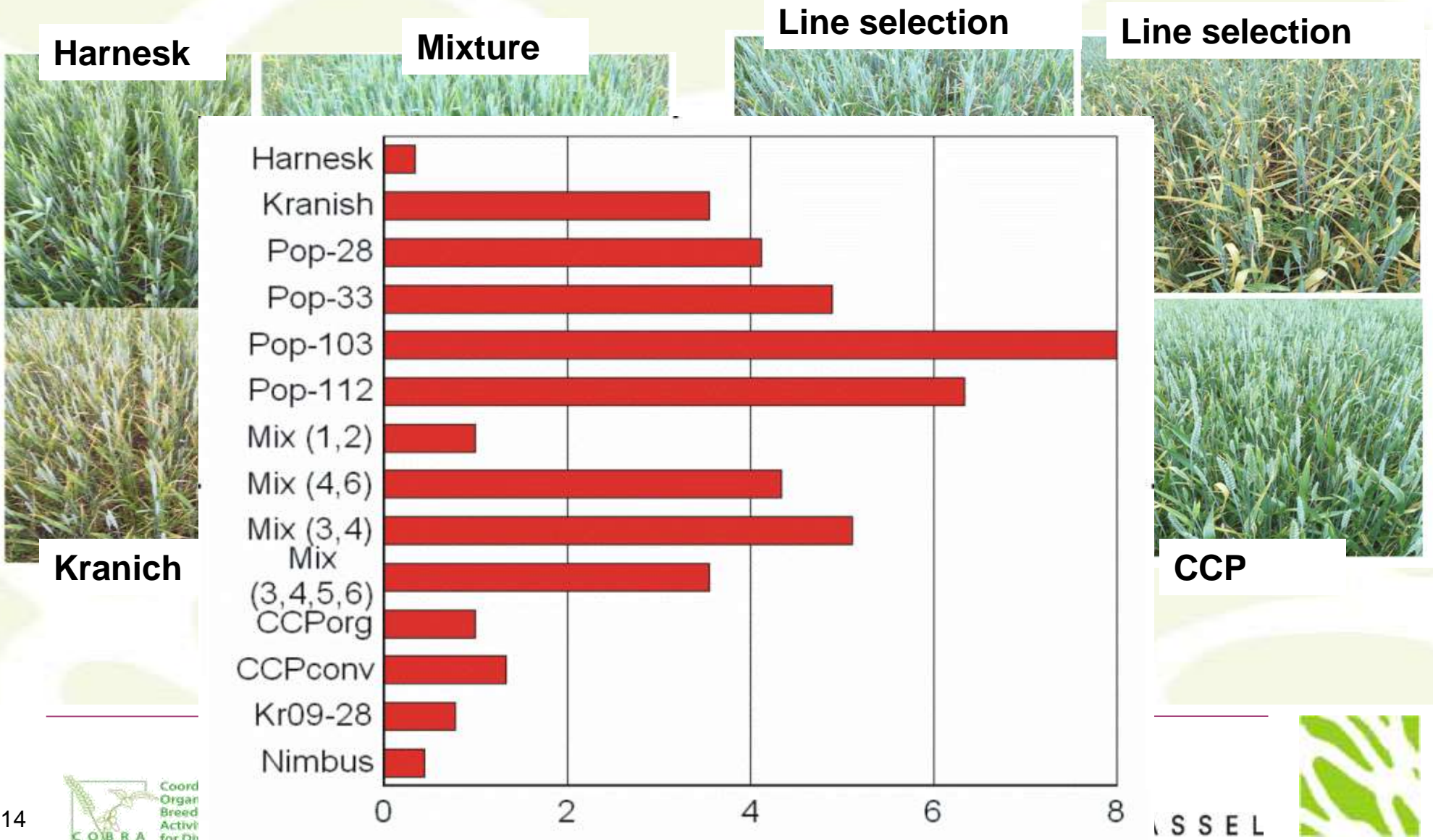
# Wheat trials: Sweden

Diversity greatly reduces yellow rust:



# Wheat trials: Sweden

Diversity greatly reduces yellow rust:



# Spring wheat in Estonia

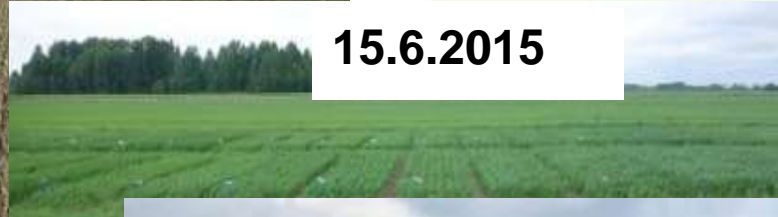
5.5.2015



20.5..2015



15.6.2015



31. 8.2015



14.7..2015



# Grain legumes activities

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- Field screening of grain legumes in central and eastern Europe (**posters 25. Nov. 10.00**)
- Soybeans for organic management in Turkey (**Alev Kir: 25. Nov. 9.45**)
- Value of legumes in the rotation (**Steffi Zimmer: 25. Nov. 9.30**)
- Breeding for diversity in peas (**Paolo Annichiaricco: 25. Nov. 9.15**)





# Organic soybean trials Turkey



# COBRA profited from other projects and a long history of collaboration

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## CCP work:

- SUSVAR (COST 860)
- DEFRA (UK) (Several projects)
- PopZucht Diva (German Ministry)

## Barley work

- SUSTAIN Nordforsk

## Legume work

- EraNet
- German ministry
- EU OSCAR



# COBRA profited from other projects and a long history of collaboration



CCP work:

The image shows a woman with glasses and a white shirt standing at a wooden podium, addressing an audience. Behind her is a large projection screen displaying the following information:

**Coordinating Organic Plant Breeding Activities for diversity (COBRA)**  
Organik Bitki Islahında Çeşitlilik için Çalışmaların Koordinasyonu

Basvuru Programı	AB Komisyonu 7. Çerçeve Programı AB ERA-NET PROJESİ
Projenin Butcesi	3022000 €
Projenin Türkiye Partneri	Ege Tarımsal Araştırma Enstitüsü Dr. Alev KIR Dr. Eylem TUGAY KARAGUL Dr. Ceylan BUYUKKILIC Uzm. Ahmet KALIN

# COBRA profited from other projects and a long history of collaboration



# Thank you

**Bruce Pearce** and all from ORC that worked for this project and kept it together

All partners that reliably performed their work

Gunter Backes for preliminary analysis of molecular data

