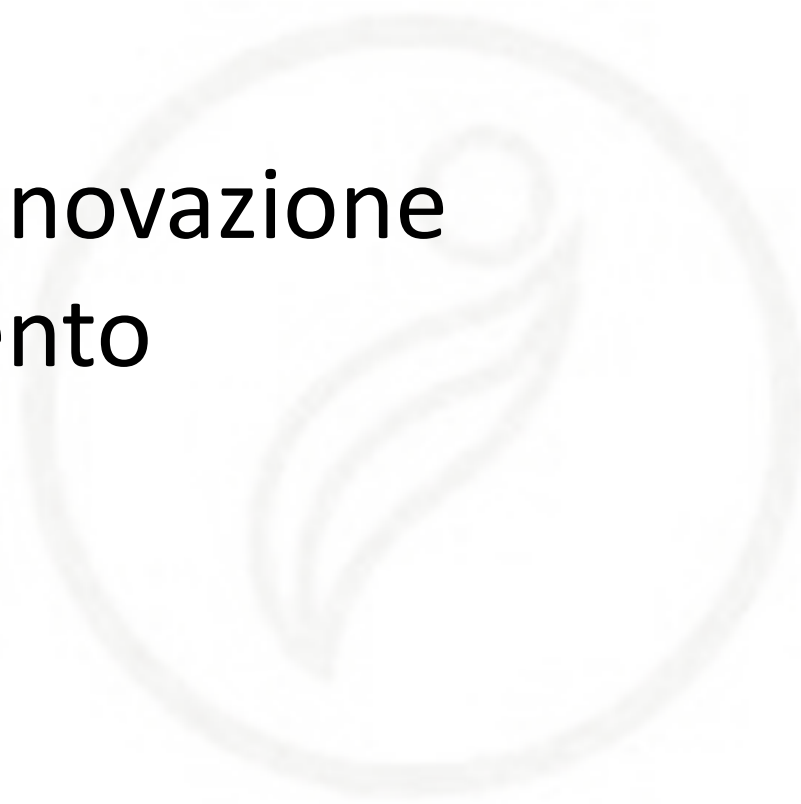


# Il contributo dell'innovazione varietale nel frumento

Michael Keller  
International Seed Federation

Bologna, 2 December 2016



# Role of ISF

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- Represent interests of the seed industry at a global level
- Facilitate free movement of seed within a fair framework
- Promote IP rights for seeds, plant varieties and technologies
- Inform members of industry developments and in the international regulatory environment

# Vision and Mission

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## Vision

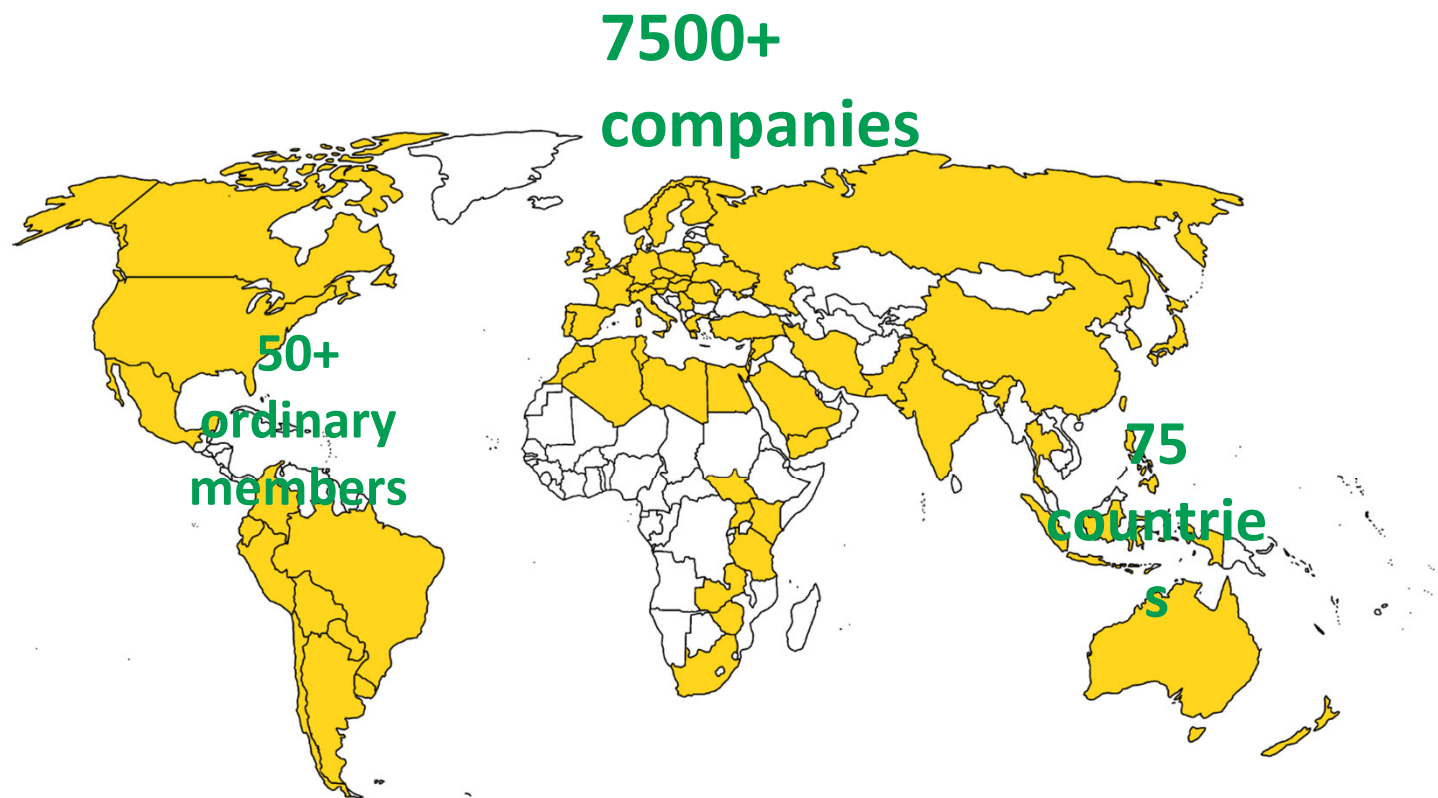
*“A world where the best quality seed is accessible to all, supporting sustainable agriculture and food security.”*

## Mission

*“To create the best environment for the global movement of seed, and promote plant breeding and innovation in seed”*

# ISF in figures

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# Trends concerning the Seed Sector

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## Increasing

- global seed market
- number of regulations
- speed in breeding/commercial processes
- counter season breeding/ production
- focus on abiotic tolerance
- flow of diseases
- fluctuation of commodity prizes
- re-export
- phytosanitary measures
- use of plant variety protection (UPOV members/ applications)
- availability and adoption of international certificates : varietal identification - quality testing
- illegal seed practices
- consolidation of the sector
- ageing population in developed - impacting sectors like flowers
- consumer taste/ preferences
- farm size – farmers information on seeds
- recognition of the importance of Seed sector in agriculture by international organizations, donors, etc...
- public/private partnerships

# Seed sector trends

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## Decreasing

- price of transportation
- variety life time
- students in plant breeding/plant physiology/ agronomy/ genetics
- investment in public breeding
- smallholder farmers

# Challenges Global Wheat Improvement

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- Climate : heat, drought, erratic rains
- Yield stagnation
- Declining soil fertility, specially soil carbon
- Emerging threats: Wheat Blast, Fusarium, Rusts
- Trained scientists and assistants
- Funding

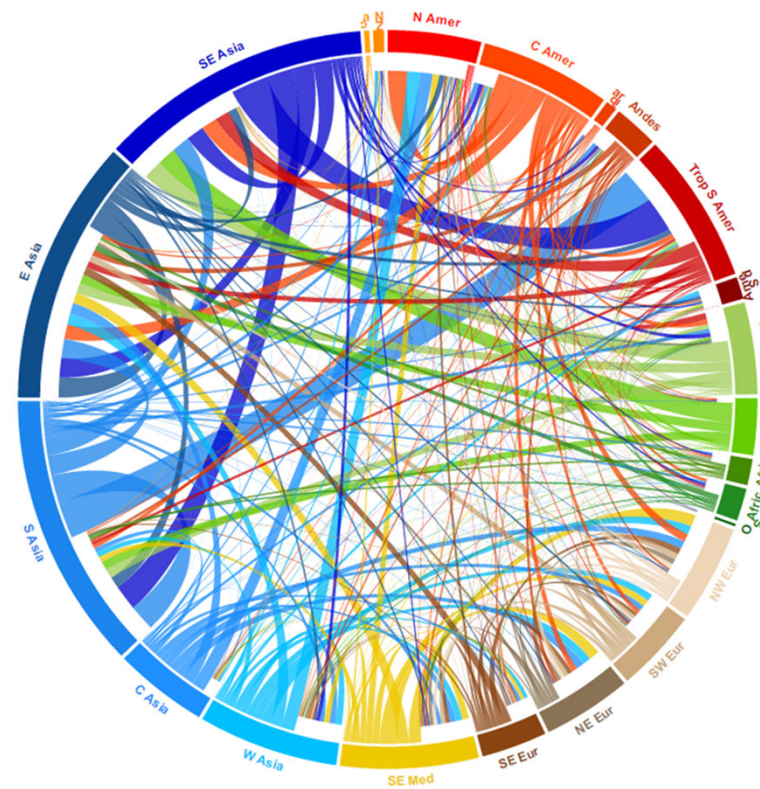
# The big challenge



# Genetic resources global interdependency

*“Origins of food crops connect countries worldwide”*

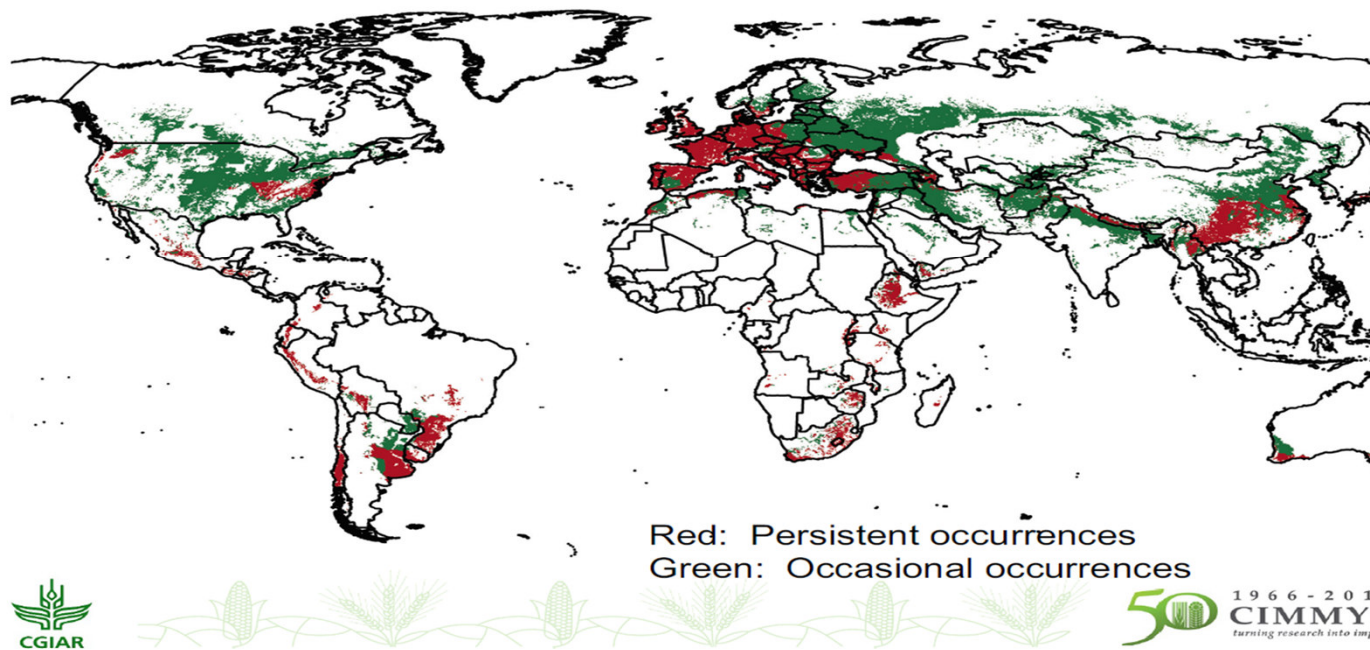
International Center  
for Tropical Agriculture (CIAT)



# Crops Pests and Diseases - a global issue

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## Global vulnerability for yellow rust (Modelled by Pardy et al. 2015)



# Innovation in Plant Breeding

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- Do you know any other industry that spends up to 20% of its turnover in innovation?
- The continued development of new varieties in all crops is vital to support sustainable agriculture and contribute to food security.
- Plant breeding is both a traditional and a hi-tech activity based on thousands of years' experience and the latest research.

# Goals of Plant Breeders

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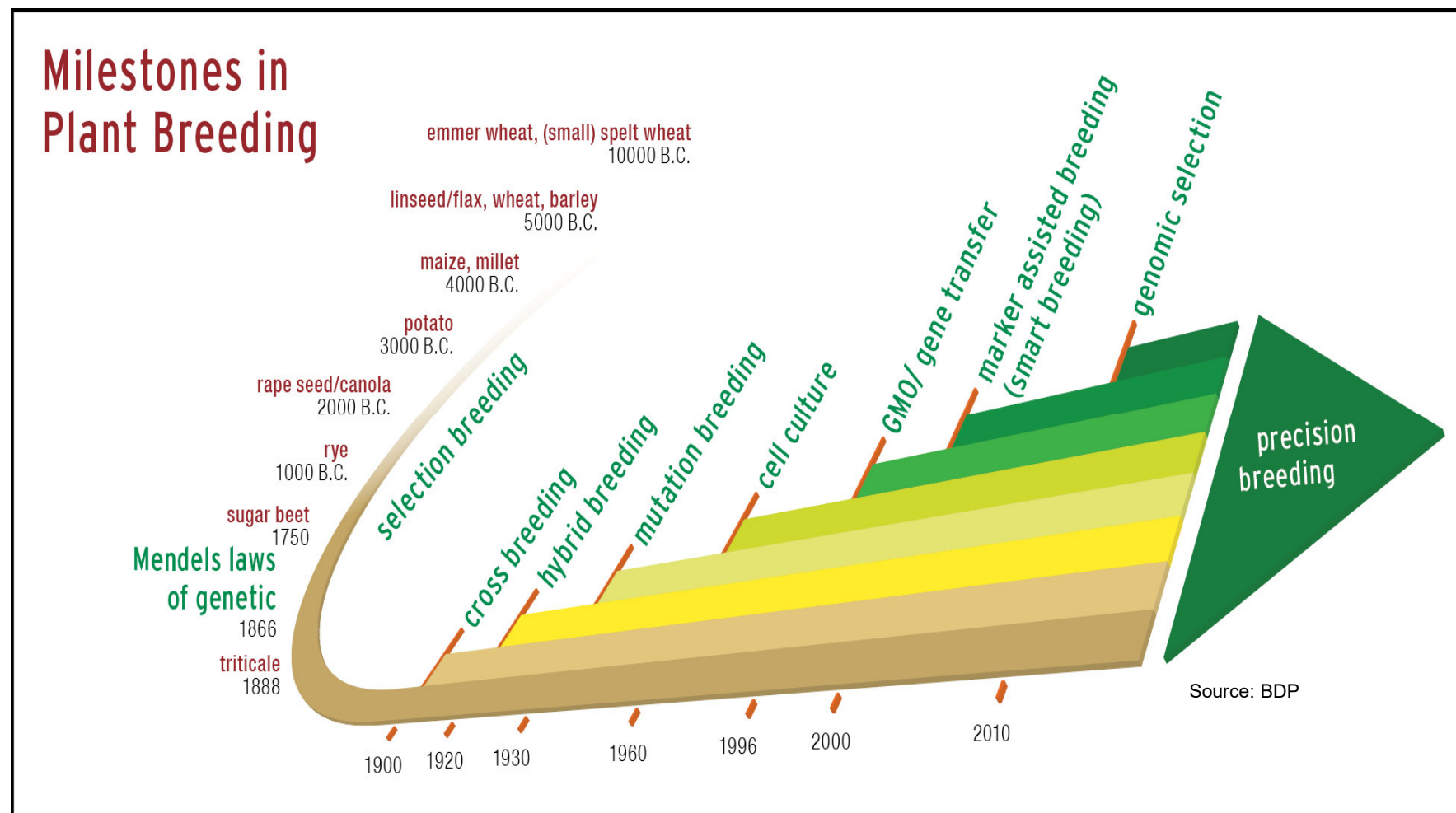
- Plant breeders have always strived to:
  - create new variations of plant characteristics
  - provide solutions for disease and pest resistance
  - increase tolerance to environmental stress
  - achieve higher yields
  - meet consumer expectations.

# Plant Breeding Innovation: Background

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- Plant breeders continue to develop more precise methods to safely increase specificity and efficiency of breeding
- Genetic variability--historically the source material for new plant characteristics
  - Inherent genetic diversity in a plant's gene pool
  - Naturally occurring and induced variations of existing genes
- Latest breeding methods, such as genome editing, also use genetic variability as source material
- **The plant varieties developed using these new tools could, in most cases, be developed through classical breeding**

# Evolution in Plant Breeding



# Plant Breeding Innovation: Focus of the Global Seed Sector

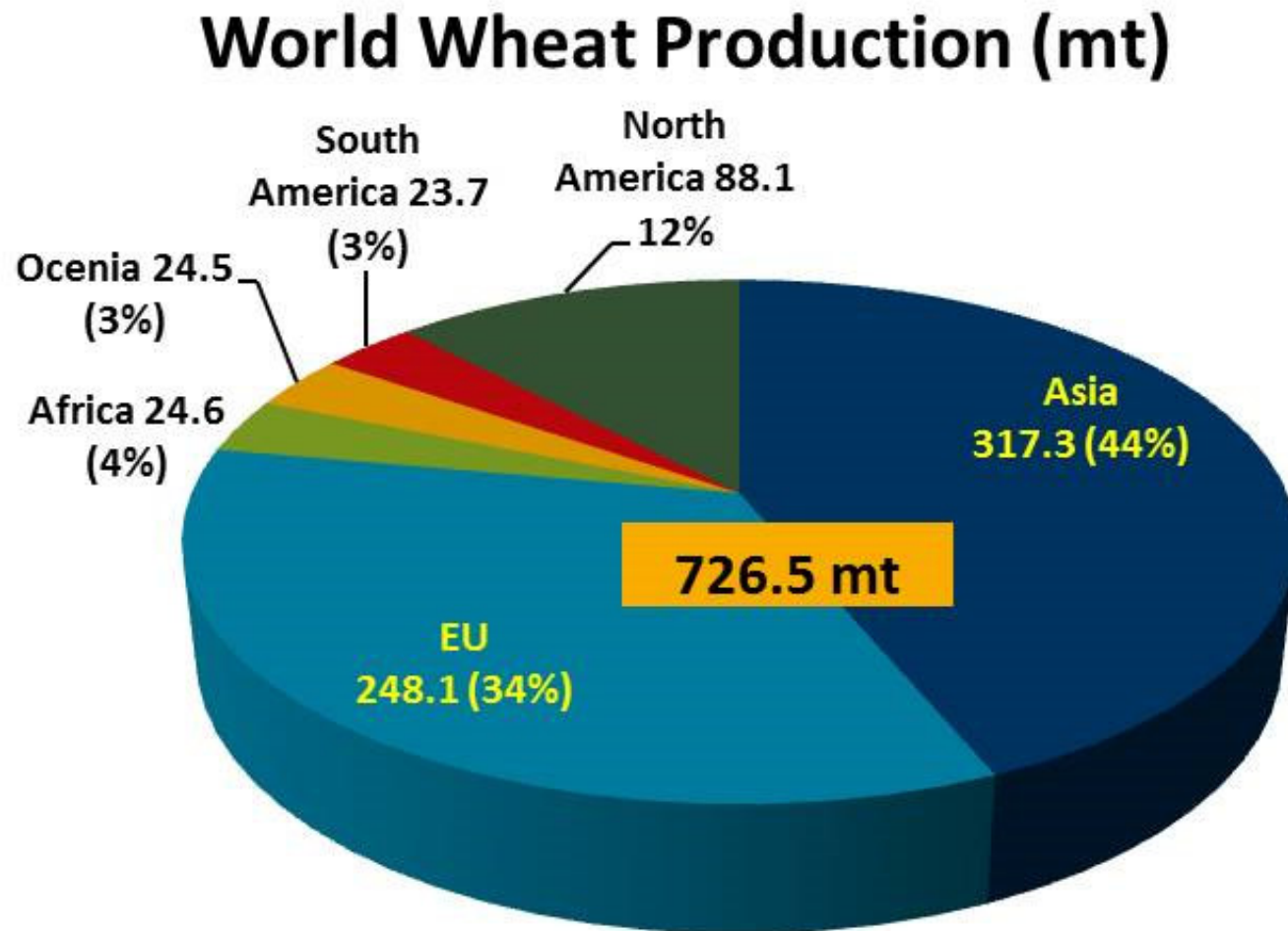
- The seed sector and agriculture are global—What is needed?
  - Clear, scientifically based, government policy
  - Facilitation of innovation and collaboration
  - Consistent policies across countries

# Plant Breeding Innovation: Impact of Inconsistent Policies

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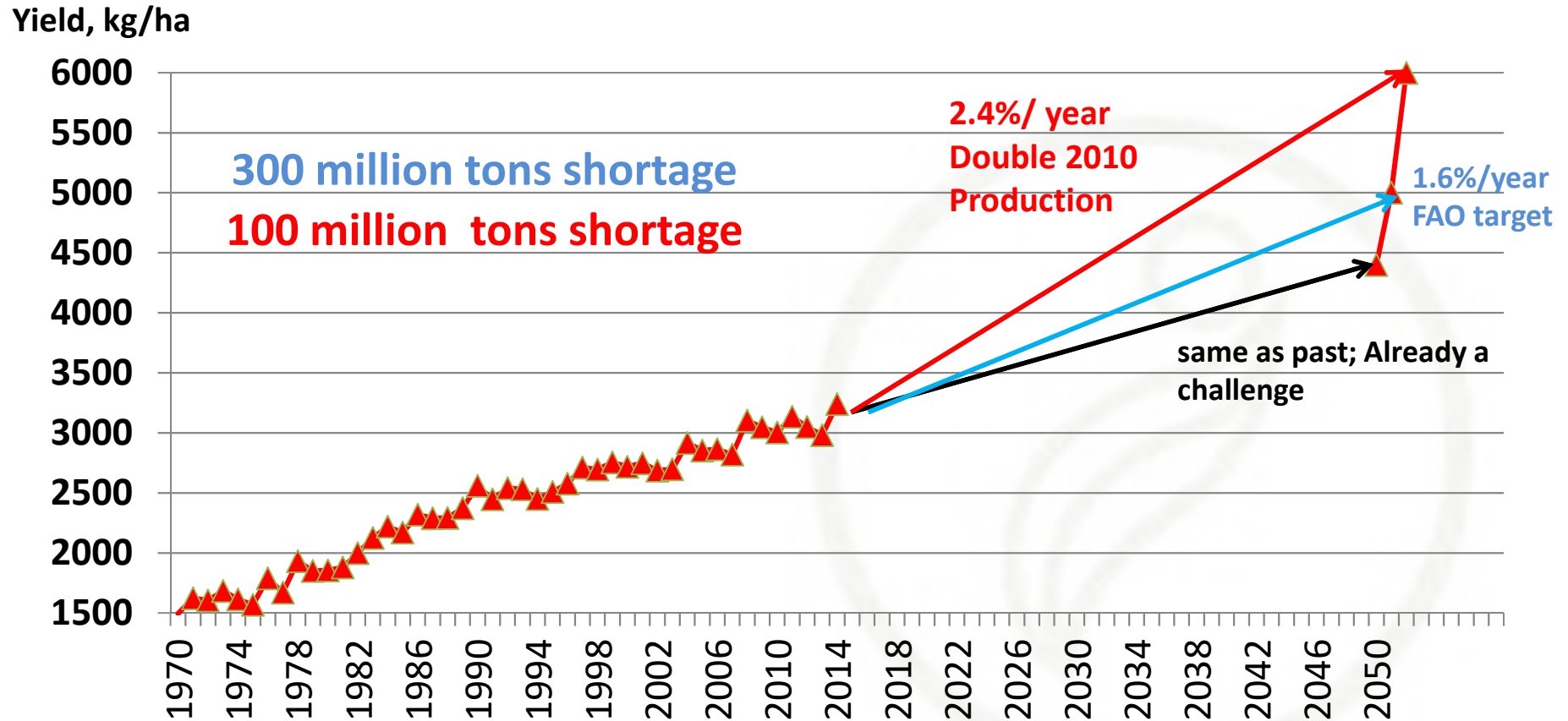
- Make research collaborations difficult
- Negative impact on commercial seed trade
- Negative impact on trade in agricultural products
- Determine range of new varieties for farmers and new products for consumers
- Impact on overall innovation and agricultural development

# World Wheat Production



Source: <http://apps.fas.usda.gov/psdonline/circulars/grain-wheat.pdf>

# Global Yield Projection Scenarios for Wheat until 2050



Source: H-J Braun

## Summary of the global yield increase in major crops

|              | Yield (t/ha) |             |             | Increase % |            |
|--------------|--------------|-------------|-------------|------------|------------|
|              | 1961         | 2007        | 2050        | 1961-2007  | 2007-2050* |
| <b>Wheat</b> | <b>1.14</b>  | <b>2.77</b> | <b>3.82</b> | <b>143</b> | <b>38</b>  |
| Rice         | 1.94         | 4.07        | 5.32        | 110        | 31         |
| Maize        | 1.99         | 4.74        | 6.06        | 138        | 28         |
| Soybean      | 1.13         | 2.31        | 3.15        | 104        | 36         |

\*estimation

Source FAO

Global grain demand to increase production 70 percent by 2050

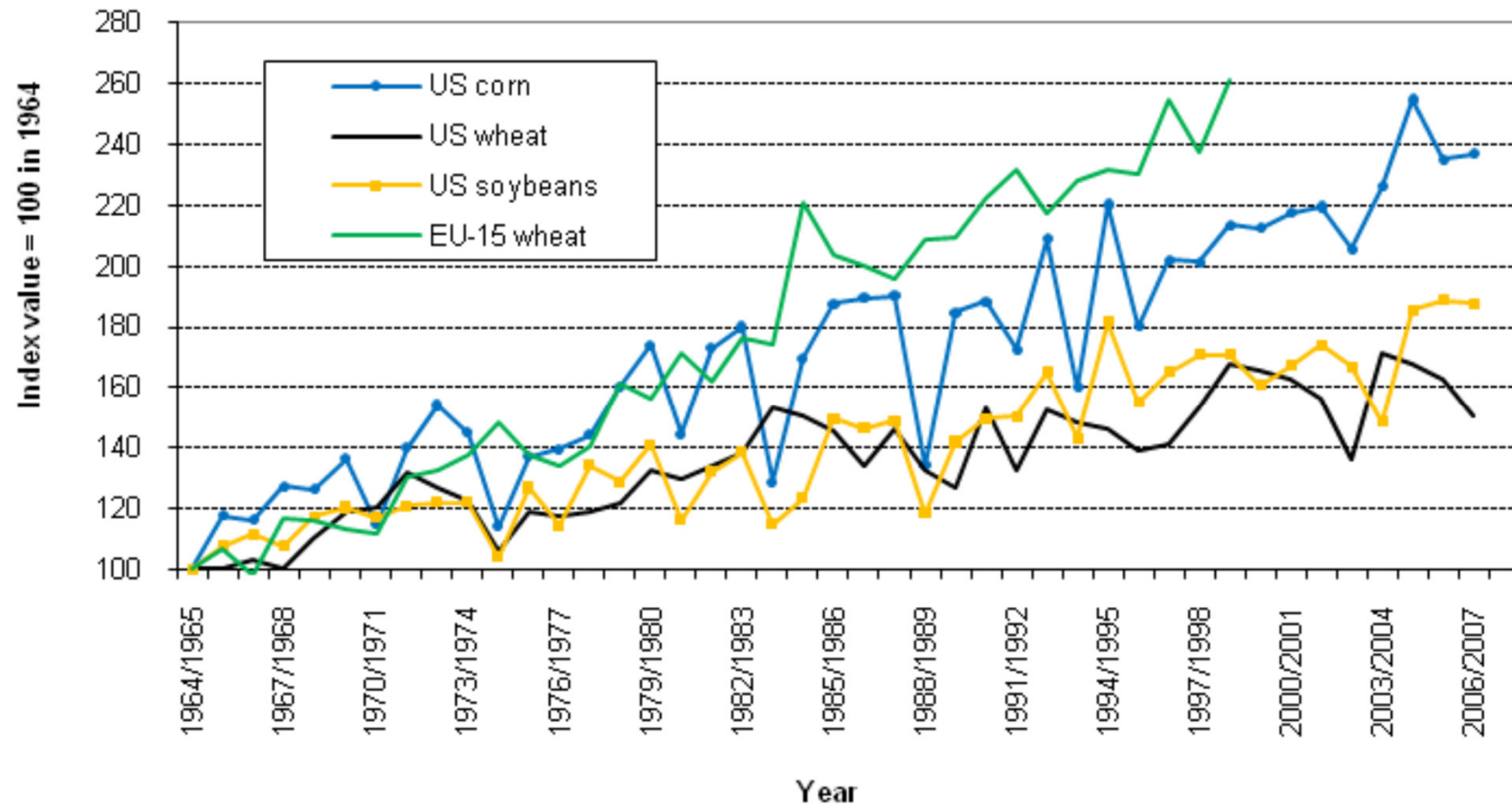
## Estimated percentage of areas planted with private sector wheat varieties

| Country/Region | %  |
|----------------|----|
| United States  | 24 |
| Australia      | 1  |
| Canada         | 5  |
| EU             | 71 |

Source: CIMMYT, Canadian Wheat Board (2000)

# Yield gain of major crops

## Yield index for US corn, US soybeans, US wheat, and wheat in the EU-15



Source: Agbioforum (2009)

# Contribution of genetic and environmental factors to yield increase in UK

- Yield increase last 60 years 2.5-8.0 t/ha
- Last 25 years increase almost exclusively due to genetic improvement

| Yield increase due to new varieties (1982-2007) | %  |
|-------------------------------------------------|----|
| Winter Wheat                                    | 92 |
| Spring barley                                   | 87 |
| Winter barley                                   | 92 |

Source BSPB, NIAB

# Innovation in Wheat Breeding

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- Biofortified wheat: Rich in Zn, Iron
- Resistance Stem rust race Ug99
- Increased protein content

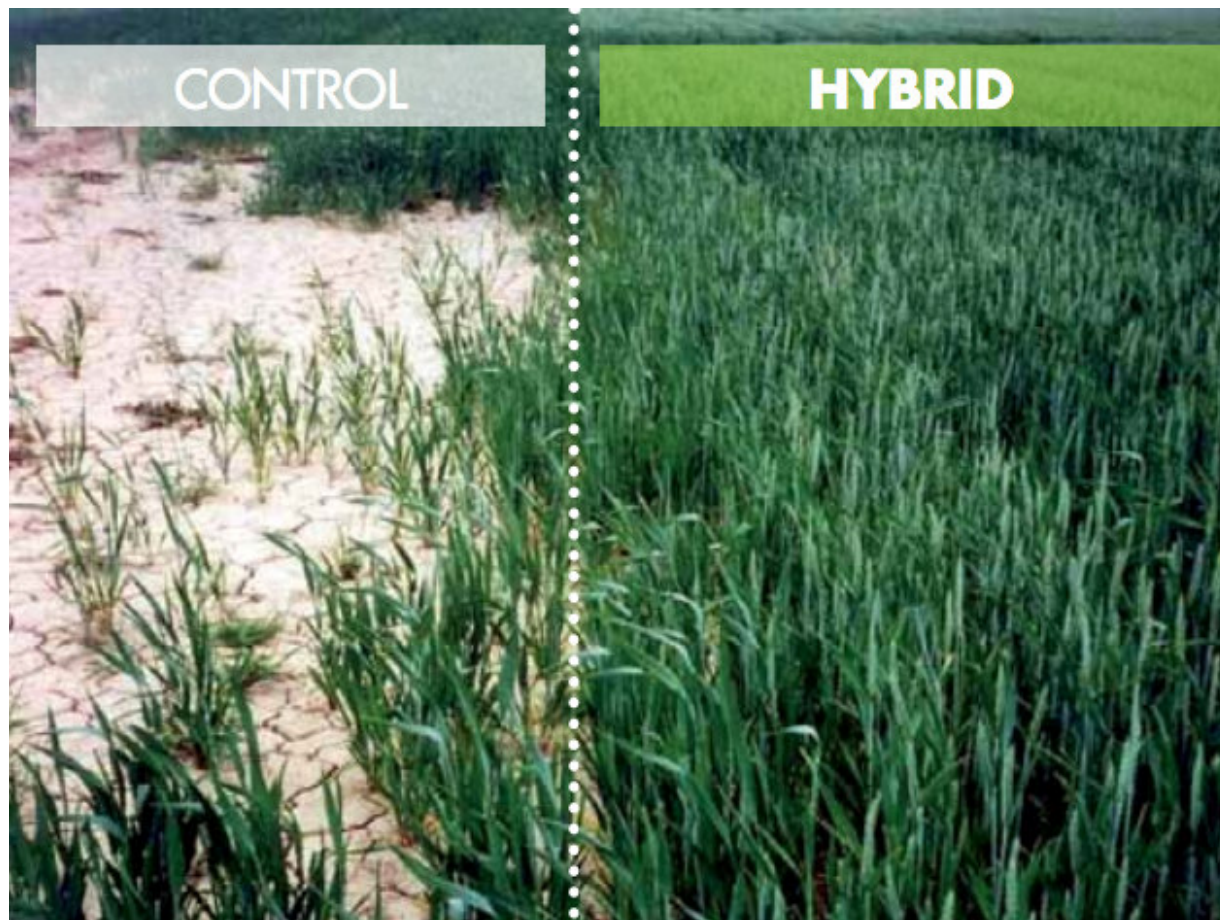
# Hybrid wheat One of the potential ways of genetic yield gain?

- Origin in 1930s: In USA (after maize was a success)
- No progress for 30 years
- Some hope after CMS system discovered in 1962 (Wilson and Ross, 1962)
- Still struggling?



# Hybrid wheat for a waterlogged area

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# Promising indications

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- Hybrids have shown potential of a wider adaptation in Europe
- Also being tried in wheat heavy countries like India and China
- Combined alliance of companies in different parts of the world
- Indication of a molecular breakthrough
- Could be a necessity due to increased food demand
- And higher protein content



# Seed is Life



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[www.worldseed.org](http://www.worldseed.org)

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