



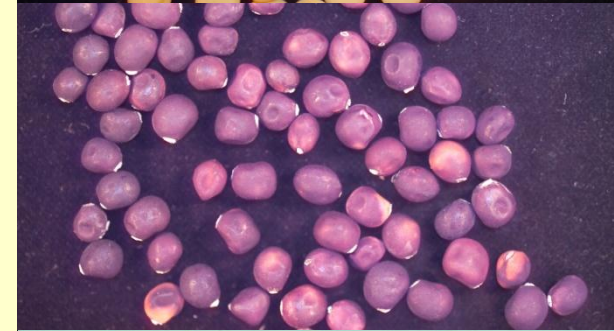
# Quality Standards in Genebanks – Improvement of Sustainability of Plant Genetic Resources



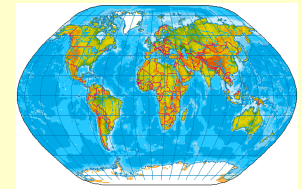
Ulrike Lohwasser

Leibniz Institute of Plant Genetics and Crop Plant Research  
(IPK), Dept. Genbank, Corrensstrasse 3, D-06466  
Gatersleben, Germany

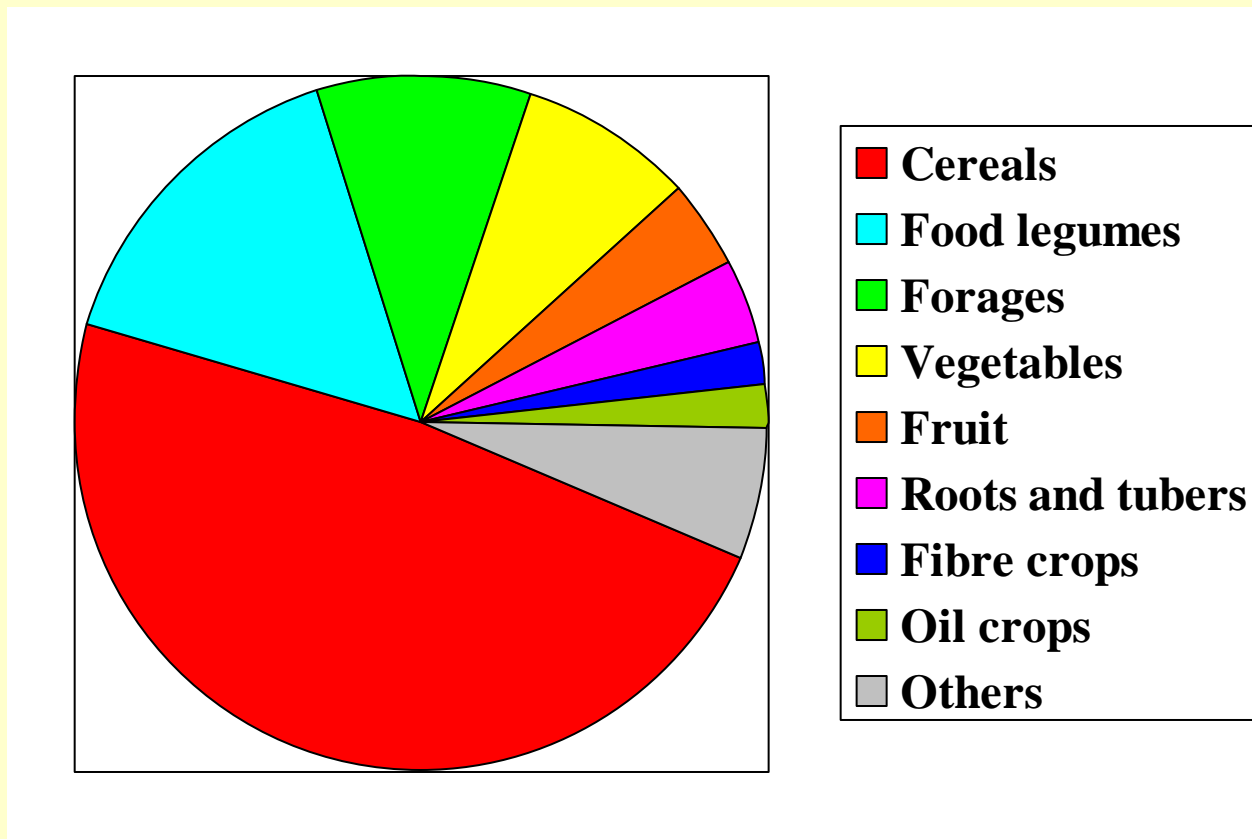
- **Crop Collections World-wide**
- **Why Quality Standards and Quality Management Systems?**
- **Improvement of Sustainability of Plant Genetic Resources**



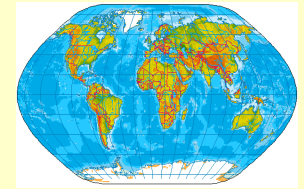
# *Ex situ* Collections world-wide



7.4 Million accessions world-wide



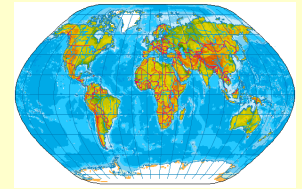
# *Ex situ* Collections world-wide



The 10 largest world-wide germplasm collections by crop

<b>Crop</b>	<b>Genus</b>	<b>Accessions</b>
<b>Wheat</b>	<b><i>Triticum</i></b>	<b>857.940</b>
<b>Rice</b>	<b><i>Oryza</i></b>	<b>773.947</b>
<b>Barley</b>	<b><i>Hordeum</i></b>	<b>470.470</b>
<b>Maize</b>	<b><i>Zea</i></b>	<b>327.931</b>
<b>Bean</b>	<b><i>Phaseolus</i></b>	<b>262.369</b>
<b>Sorghum</b>	<b><i>Sorghum</i></b>	<b>235.711</b>
<b>Soybean</b>	<b><i>Glycine</i></b>	<b>229.947</b>
<b>Oat</b>	<b><i>Avena</i></b>	<b>148.260</b>
<b>Groundnut</b>	<b><i>Arachis</i></b>	<b>128.461</b>
<b>Cotton</b>	<b><i>Gossypium</i></b>	<b>104.780</b>

# ***Ex situ* Collections world-wide**



<b>NCGRP</b>	<b>USA</b>	<b>508.994</b>
<b>ICGR</b>	<b>China</b>	<b>391.919</b>
<b>NBPGR</b>	<b>India</b>	<b>366.333</b>
<b>VIR</b>	<b>Russia</b>	<b>322.238</b>
<b>NIAS</b>	<b>Japan</b>	<b>243.463</b>
<b>CIMMYT</b>	<b>Mexico</b>	<b>173.571</b>
<b>IPK</b>	<b>Germany</b>	<b>148.128</b>
<b>ICARDA</b>	<b>Syria</b>	<b>132.793</b>

National Bureau of  
Plant Genetic Resources,  
Gene Bank,  
New Delhi, India

ULTRA NATIONAL GENE BANK  
NEW DELHI-12

DATE 01/03/11 TIME 14:37

	ACCS(Nos.)
SEED BANK	150241
CROP GROUP	055543
CEREALS	006657
MILLETS AND FORAGES	057290
PSEUDO CEREALS	055922
GRAIN LEGUMES	011543
OILSEEDS	024377
FIBRE CROPS	000530
VEGETABLES	006413
FRUITS	002972
M&AP / NARCOTICS	002442
SPICES & CONDIMENTS	010235
AGRO-FORESTRY	384165
SAFETY DUPLICATE SAMPLES	002030
TOTAL	009478
IN-VITRO BANK	0395673
CRYO BANK	005853
GRAND TOTAL	
VARIETIES / G STOCKS	

# The German Genebank in Gatersleben



<b>Inventory</b>	<b>Total number of acc.</b>	<b>Cultivation/no of accessions</b>
<b>Cereals and Grasses</b>	<b>65,009</b>	<b>2,494</b>
wheat	27,773	769
barley	23,192	771
<b>Legumes</b>	<b>27,907</b>	<b>1,436</b>
beans ( <i>Phaseolus</i> )	8,959	283
peas	5,286	193
<b>Vegetable</b>	<b>18,471</b>	<b>2,556</b>
tomatoes	3,369	90
onions	3,225	1,421
beet/ <i>Beta</i>	2,312	180
<b>Oil/Fibreplants</b>	<b>7,981</b>	<b>928</b>
rapeseed	2,460	134
flax	2,321	104
<b>Medicine/Spice Plants</b>	<b>8,320</b>	<b>1,476</b>
<b>Mutants</b>	<b>1,780</b>	<b>266</b>
<b>Forage crops</b>	<b>12,406</b>	<b>1,410</b>
forage grasses	10,369	1,115
<b>Potatoes</b>	<b>6,060</b>	<b>2,991</b>
<b>Total</b>	<b>149,849</b>	<b>13,557</b>



**149,849 accessions**

**3,206 species**

**783 genera**



## Reference collections

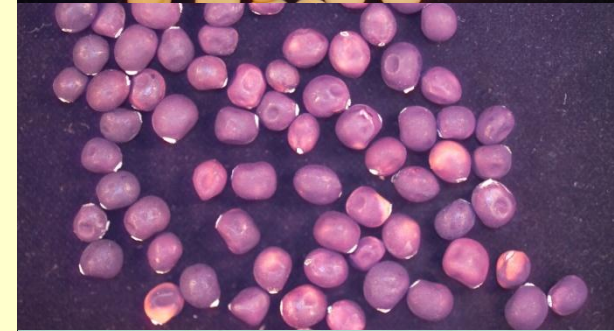
**415,888 herbarium sheets**

**100,096 seeds & fruits**

**52,249 cereal spikes**



- Crop Collections Worldwide
- **Why Quality Standards and Quality Management Systems?**
- Improvement of Sustainability of Plant Genetic Resources







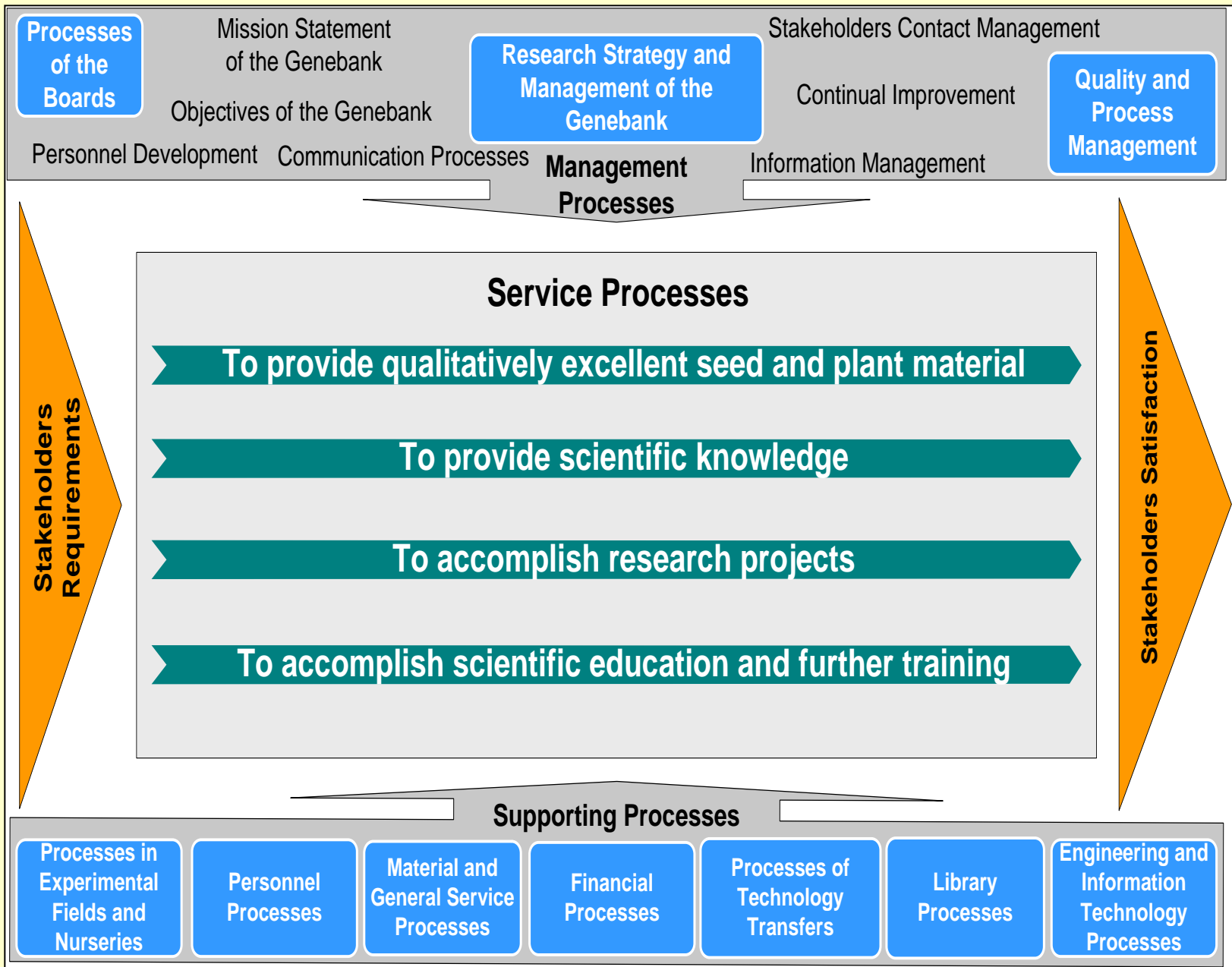
## Why Quality Standards and Quality Management Systems?

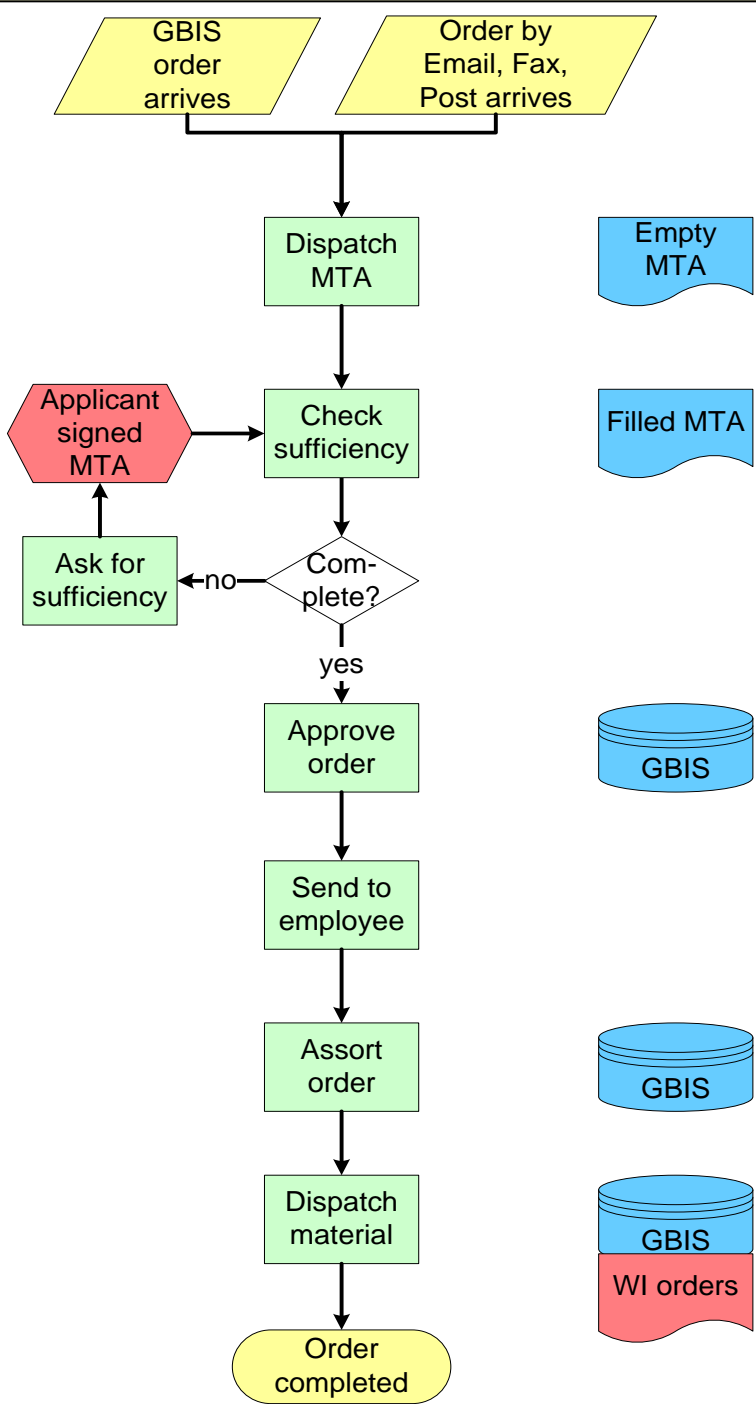
- (1) to increase the customer satisfaction
- (2) to create clear responsibilities
- (3) to motivate the employees
- (4) to reduce costs by avoiding errors
- (5) to improve competitive ability
- (6) to reduce risks
- (7) to improve the image.


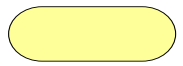
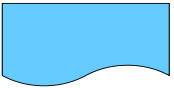
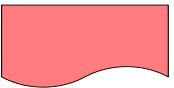
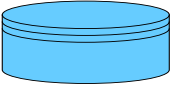

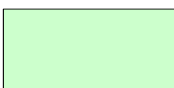
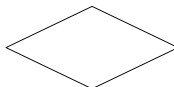
## **Procedures to get the certificate – Documentation of a QM system**

A quality management system is the documented classification system of a given institution.

# Process Landscape of the German Genebank





-  - Input
-  - Output
-  - Document
-  - Working instruction
-  - Database
-  - Interaction with users
-  - Process action, activity
-  - Decision

## Service Process Providing Seed and Plant Material

# QM documents of the German Genebank

4 main service processes

19 procedure instructions for the genebank

34 working instructions for the genebank

13 procedure instructions for the administration

11 working instructions for the administration

6 procedure instructions especially for the QM system

Operational genebank manual of IPK (on AEGIS website)

Date of compilation 15.03.2011

Draft Updated Genebank Standards:

Minimum Standards for Conservation of Orthodox Seeds

# CERTIFICATE



## DQS GmbH

Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company



### Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)

Corrensstraße 3  
06466 Gatersleben

has implemented and maintains a **Quality Management System**.

#### Scope:

Research and Service on Plant Genetic Resources

Through an audit, documented in a report, it was verified that the management system fulfills the requirements of the following standard:

## ISO 9001 : 2008

Certificate registration no. 372545 QM08

Date of certification 2010-04-21

Valid until 2013-04-20



Michael Drechsel  
Managing Director

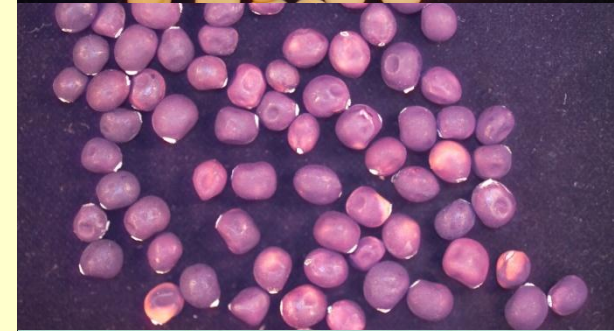
Jan Böge  
Managing Director

# Quality Management System

# Certification according to ISO 9001:2008



- Crop Collections Worldwide
- Why Quality Standards and Quality Management Systems?
- **Improvement of Sustainability of Plant Genetic Resources**



# Protocol of Reproduction

<b>species</b>	<b>month of sowing</b>	<b>preculture</b>	<b>life form</b>	<b>pollination</b>
winter wheat	September/October	not necessary	winter annual	self
spring wheat	March	not necessary	summer annual	self

<b>species</b>	<b>isolation</b>	<b>location</b>	<b>floor space</b>	<b>protection from birds</b>
winter wheat	not necessary	field	1 – 4 m <sup>2</sup>	cannon/kite
spring wheat	not necessary	field	1 – 4 m <sup>2</sup>	cannon/kite

<b>species</b>	<b>method of harvest</b>	<b>first cleaning</b>	<b>second</b>	<b>third</b>
winter wheat	hoisting	threshing	thieving	hand sorting
spring wheat	hoisting	threshing	thieving	hand sorting



# Seed Reproduction

- Options for sowing (germination rate, seed amount)
- Preparation of sowing (providing seeds, labeling)
- Planning of cultivation (location, necessary floor space)
- Sowing (time, preculture)
- Characterisation (agronomic and morphological data, descriptors)
- Botanical Control (taxonomical determination)
- Harvest (yield, labeling)
- Cleaning of seeds (threshing, sieving, hand sorting)
- Harvest control (comparing with seed pattern of first reproduction)
- Seed storage (thousand seed weight, germination test)

# Svalbard Global Seed Vault



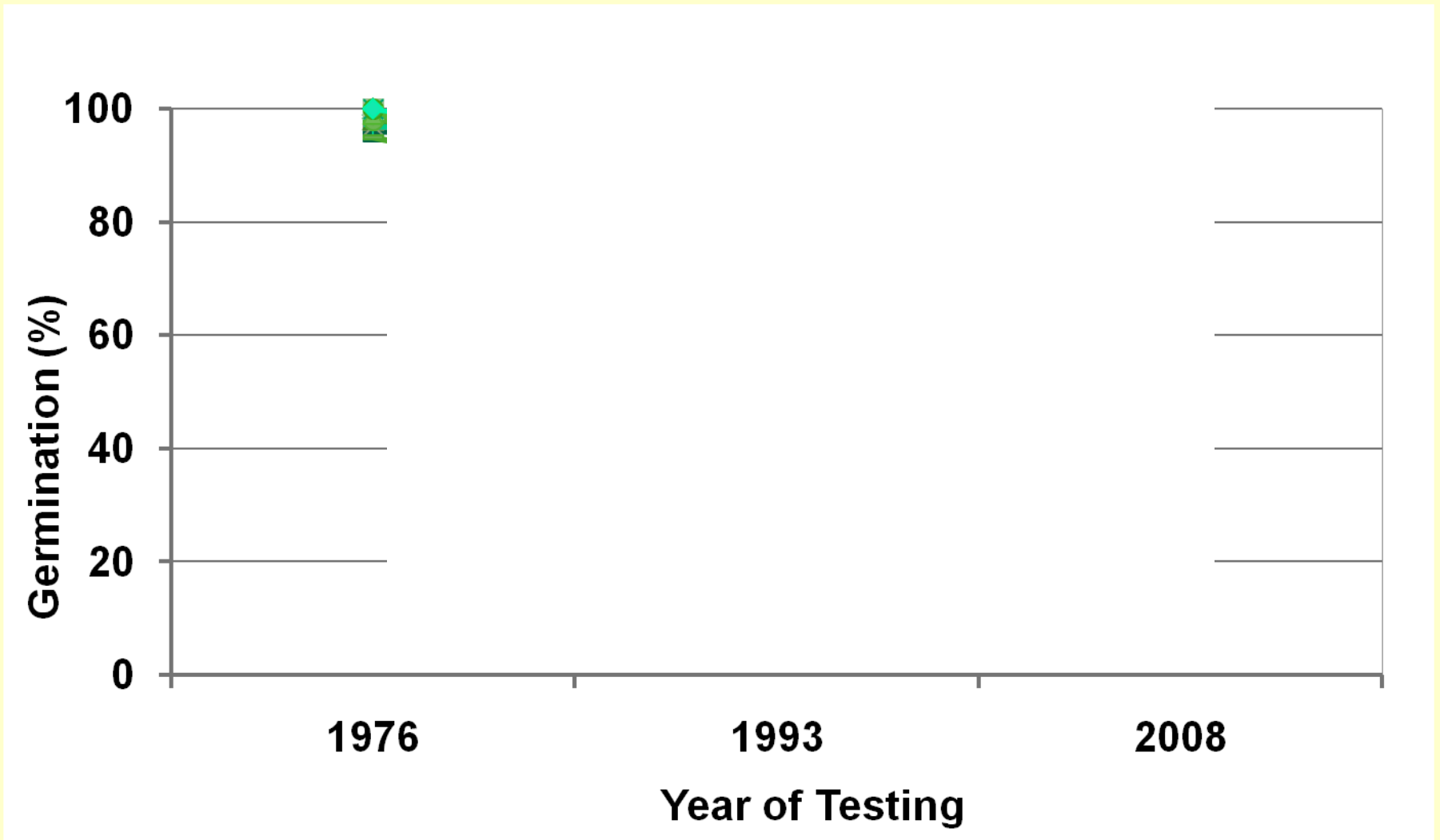
Svalbard Image Gallery (<http://www.croptrust.org/main/arctic.php?itemid=217>)



**Storage of safety  
duplicates  
of the German  
genebank  
22,350 accessions**



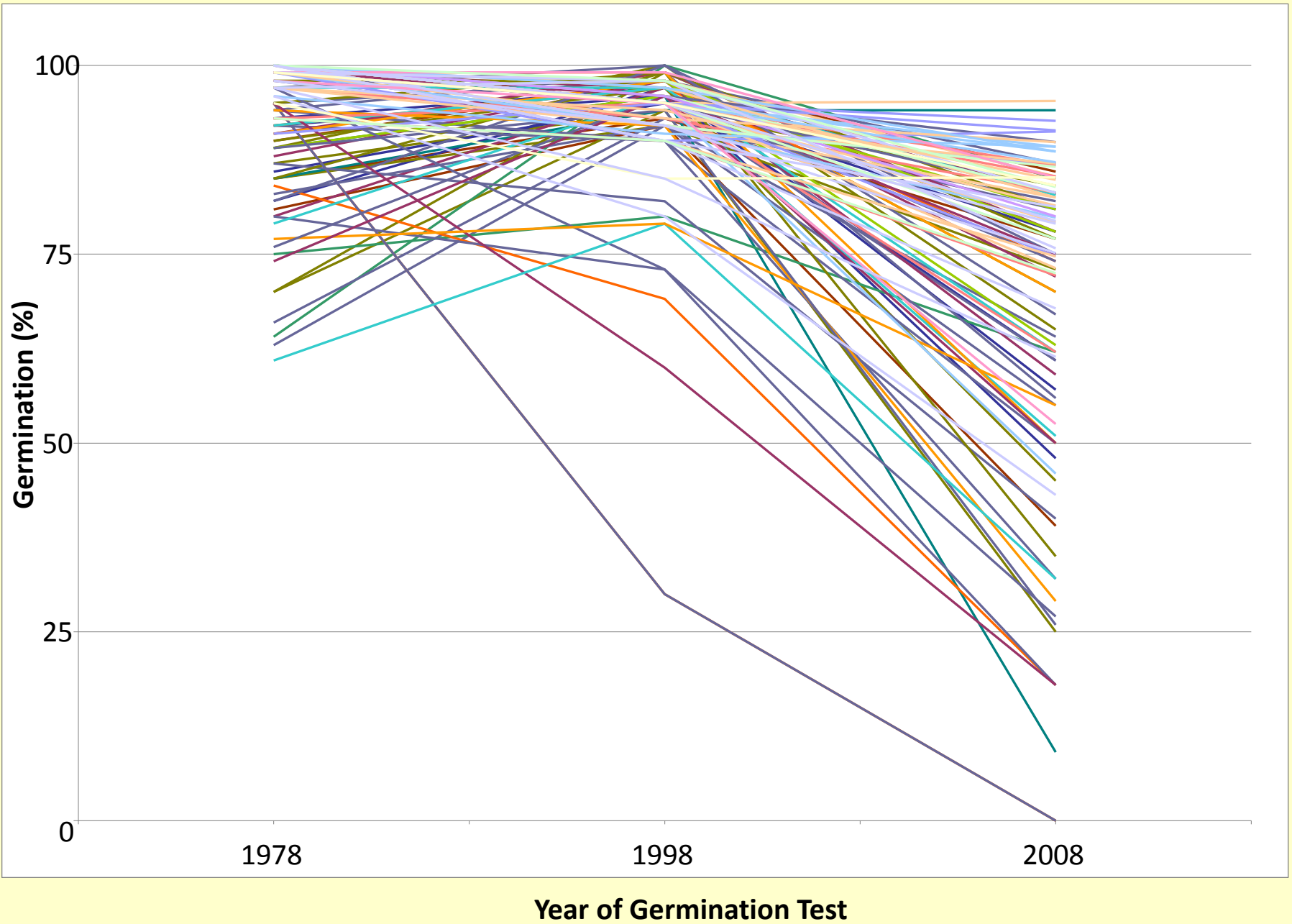
# Studies of germinability for different crops (intraspecific variability)



***Hordeum vulgare* L.**

Nagel et al., Euphytica 170, 2009

# *Triticum aestivum* L.



# Avoiding Contamination of Genebank Material with GMOs



Humming Bird - made of  
chilly and celery leaf

- Strong rules for cultivation of GMOs
- Documented distances between genebank material and GMOs



### Questionnaire

(very good) (bad)

Did the material arrive in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the interval between order and receipt meet your expectation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do you consider the information supplied with the material as adequate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do you agree with the received quantity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How do you assess the quality of the online information offered by the genebank?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remarks / Suggestions:

**Address:**  
Leibniz-Institute of Plant Genetics and  
Crop Plant Research (IPK)  
Secretary Genebank – Mrs Ballhausen  
Corrensstrasse 3  
D-06466 Gatersleben  
Phone: +49 - (0)39482 - 5109  
Fax: +49 - (0)39482 - 5155  
Email: ballhaus@ipk-gatersleben.de



## Customer Satisfaction

- Did the material arrive in good condition?
- Does the interval between order and receipt meet your expectation?
- Do you consider the information supplied with the material as adequate?
- Do you agree with the received quantity?
- How do assess the quality of the online information offered by the genebank?

# Customer Satisfaction

39% completed questionnaires

	1 (very good)	2	3	4	5	6 (bad)	no answer
Condition	92%	5%	3%	0%	0%	0%	0%
Interval	72%	17%	7%	2%	2%	0%	0%
Information	35%	35%	14%	7%	3%	1%	5%
Quantity	66%	23%	8%	2%	1%	0%	0%
Online	42%	28%	12%	4%	2%	0%	12%

# **Special Advantages for the Genebank**

1. to perpetuate the long standing experience and knowledge of the employees
2. to avoid contamination of genebank material with genetic modified organisms
3. to increase the satisfaction of the customers (stakeholders)
4. to improve the internal genebank management
5. to accomplish excellent scientific research
6. to maintain the plant genetic resources and to optimise the conservation and utilisation



# History of QM

Code of Hammurabi  
1760 BC



“If a builder build a house for some one, and does not construct it properly, and the house which he built fall in and kill its owner, then that builder shall be put to death”.



Thank you for your attention!

Source: <http://en.wikipedia.org/>