

# Conserving and Facilitating Use of PGR CGN's Approach

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Centre for Genetic Resources, The Netherlands (CGN)*



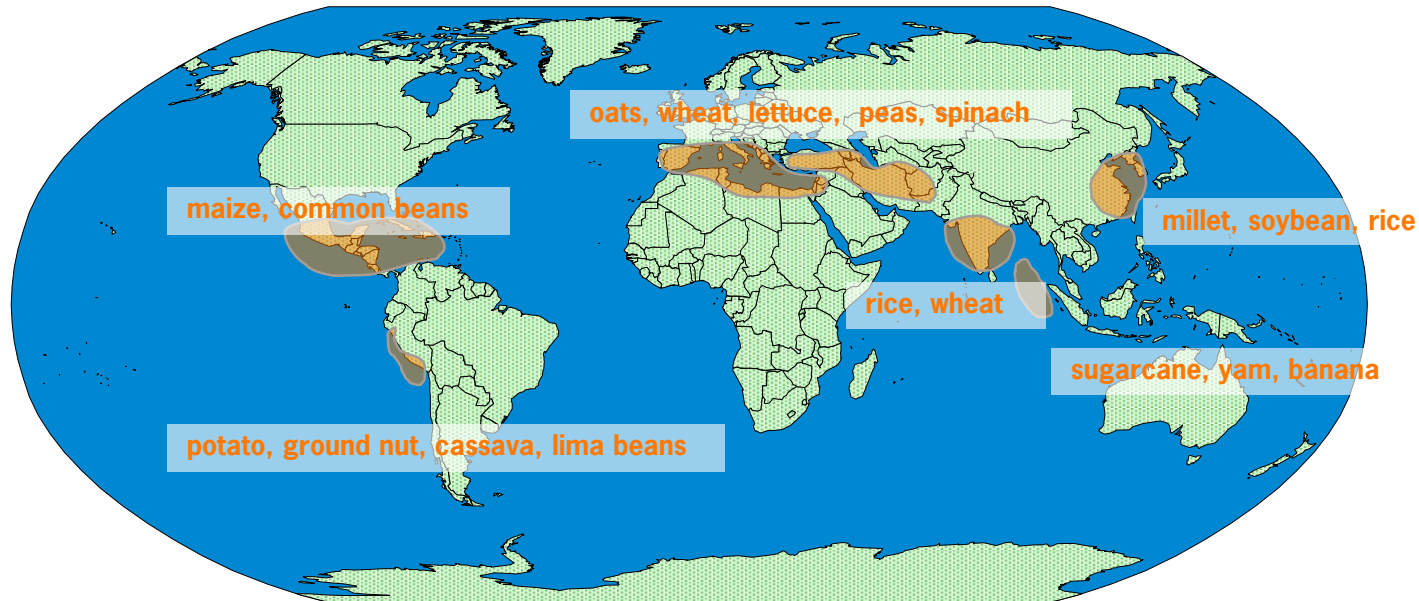
# Conserving and Facilitating Use of PGR

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- this presentation
  - plant genetic resources
    - where they come from and why they need to be managed
  - CGN
    - what it is, what it does and how it operates
  - collaboration CGN – Dutch breeding industry
    - how it is organised, why it works
    - example: a CGN collecting expedition
  - a success story

# Conserving and Facilitating Use of PGR

- PGR: Plant Genetic Resources
  - the raw material of the plant breeding process
  - origin
    - farmers domesticating crops since c. 10,000 yrs



# Conserving and Facilitating Use of PGR

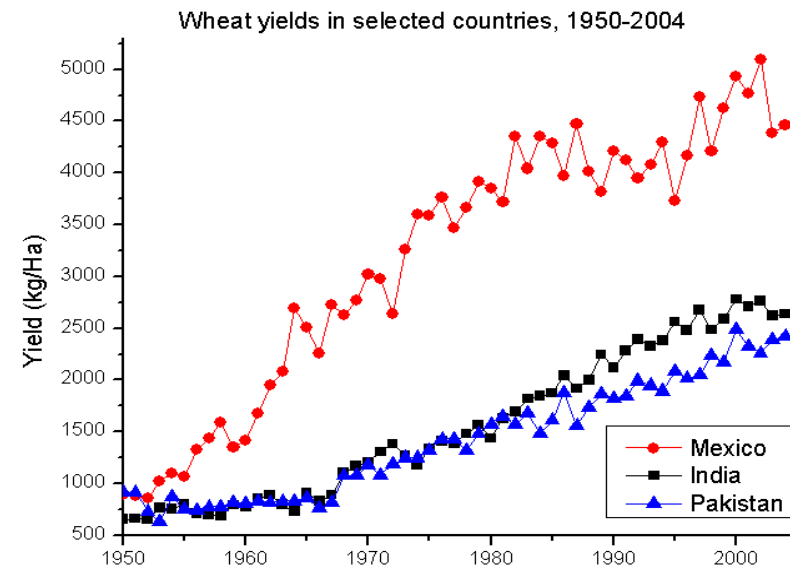
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- PGR: Plant Genetic Resources
  - the raw material of the plant breeding process
  - origin
    - farmers domesticating crops since c. 10,000 yrs
      - in Vavilov Centres of Diversity
      - sources: products of 450 million yrs of plant evolution
      - generating heterogeneous landraces
    - scientific plant breeding since c. 160 yrs
      - in 'developed world'
      - sources: landraces and (later) crop wild relatives
      - generating homogeneous varieties

# Conserving and Facilitating Use of PGR

## ■ PGR: Plant Genetic Resources

- genetic erosion
  - loss of genes due to variety/crop replacement and environmental degradation
  - started to occur during 'green revolution'
    - high input high yielding varieties replacing landraces
    - needed to 'feed the world'



# Conserving and Facilitating Use of PGR

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- PGR: Plant Genetic Resources
  - plant breeding destroyed it's raw material
    - genetic erosion had to be counter-acted by PGR management
      - conserving PGR for the future generations
      - facilitating the use of PGR for the current generation

# Conserving and Facilitating Use of PGR

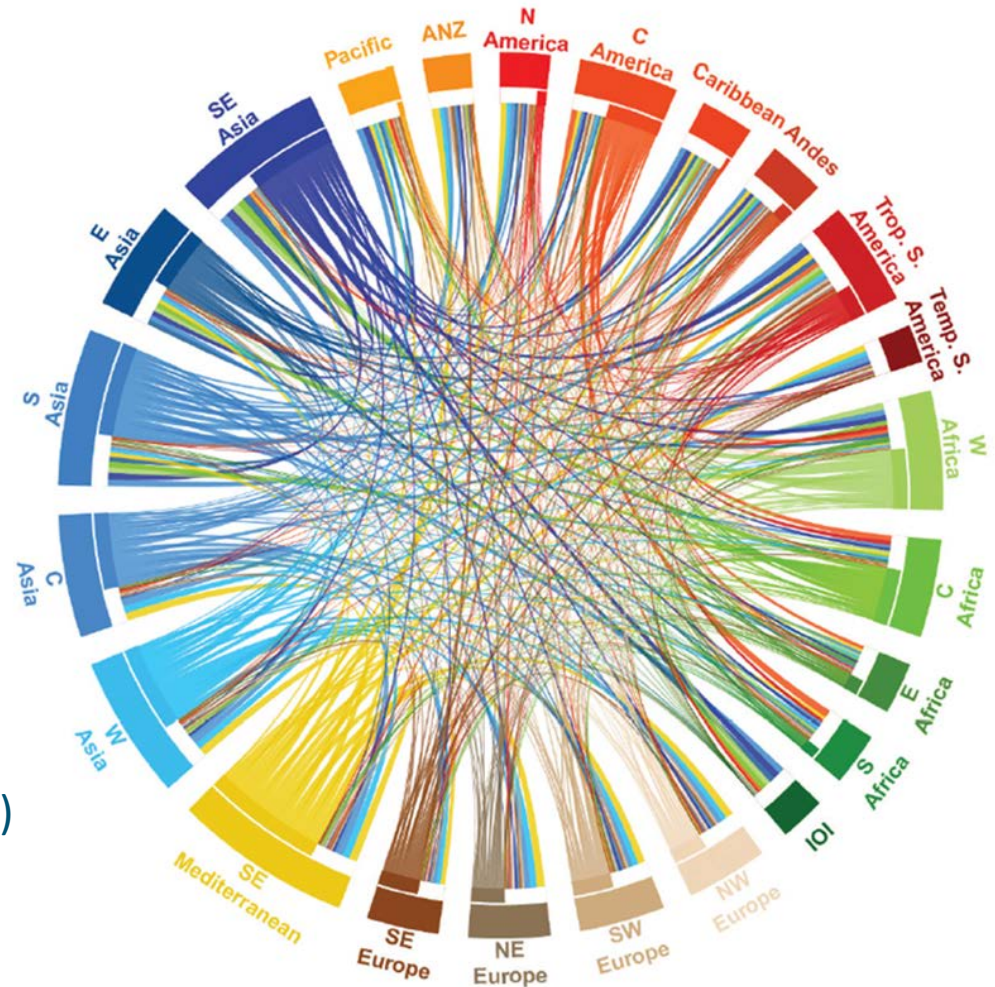
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- PGR: Plant Genetic Resources
  - PGR management
    - who should do it ?
      - very high global interdependence PGR
      - PGR paradigm shift: from heritage of mankind to national sovereignty
    - how should it be done ?
      - *ex situ* – in genebanks
      - *in situ* – in nature reserves
      - *on-farm* – in 'traditional' farming systems



# Conserving and Facilitating Use of PGR

- PGR: very high global interdependence

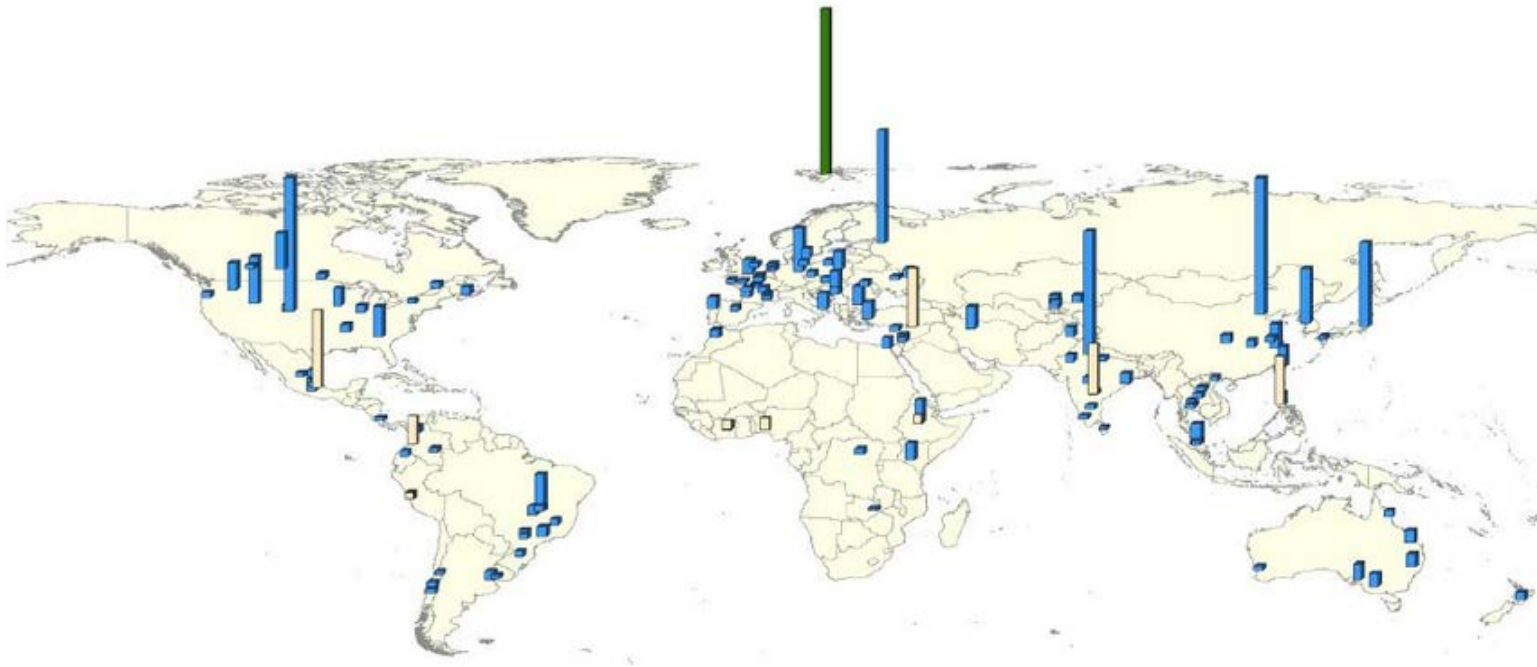


Calories in regional food supplies and their origins (Source: Khoury et al. 2015)



# Conserving and Facilitating Use of PGR

- PGR management: a global effort



Geographic distribution of genebanks with holdings of >10,000 accessions ( Source: FAO, 2010)

# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - the Dutch contribution to the global system
  - part of Wageningen University and Research



# Conserving and Facilitating Use of PGR

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- Centre for Genetic Resources, The Netherlands (CGN)
  - the Dutch contribution to the global system
    - part of Wageningen University and Research
    - activities in plant GR, animal GR and forestry GR
      - in this presentation focus on PGR
    - established in 1985
    - 80% of work on the basis of 5-year contracts with ministry of Economic Affairs
      - as Statutory Legal Task

# Conserving and Facilitating Use of PGR

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- Centre for Genetic Resources, The Netherlands (CGN)
  - the Dutch contribution to the global system
    - size
      - c. 10 staff members
      - budget k€ 1,800/yr (k¥ 240,000/yr)
    - activities
      - *ex situ*: 24 crops (22800 accessions)
      - on-farm: pro-active support to Dutch NGO networks
      - *in situ*: CWR in the Netherlands
      - policy: National Focal Point on ABS
      - research: PGR management methodology

# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - 25 crop collections with 22,844 accessions

## CGN collections (August 18<sup>th</sup>, 2017)

lettuce	2401	wheat	4909
potato	1471	barley	2666
tomato	1330	flax	952
onion	428	pea	1010
spinach	468		
pepper	1050	<i>other crops</i>	3442
cucumber	926		
cabbage etc.	1791	<i>TOTAL</i>	22844



# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - seed management
    - conditions
      - $T = -20^{\circ}\text{C}$
      - $\text{RH} = 15\% \rightarrow w = 6-8\%$
    - germination monitoring
      - cvs & landraces:  $> 80\%$
      - wild species:  $> 60\%$
  - availability: 99.7%





# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - documentation
    - the value of PGR is a function of the available information
    - all information is available on-line
      - on-line search and order functionality
      - [www.wur.nl/cgn](http://www.wur.nl/cgn)



The screenshot displays the CGN website interface. At the top, there is a navigation bar with links for 'About Wageningen', 'Career', 'Contact', and 'Login', along with a language selector set to 'en|English'. Below this is a green header with 'Home', 'Centre for Genetic Resources, the Netherlands', 'Plant Genetic Resources', and 'Search and request'. The main content area is titled 'Search and request seeds from CGN' and includes a sub-header 'In this section you can search and request seeds from the CGN crop collections.' A 'search and request seeds' button is visible. To the right, there is a contact section for 'dr.ir. T.J.L. (Theo) van Hintum' with a 'Contact form' button and a '+ Show more (1)' link. Below the contact section is a large image of seed packets labeled 'CGN GENETIC RESOURCES'. At the bottom, there are social media icons for Facebook, Twitter, Google+, LinkedIn, and Email. A 'Download' section on the right lists links for 'Passport and phenotypic data', 'Read about', 'Procedures used by CGN for seed requests', 'Standard Material Transfer Agreement', 'Patents on native traits', and 'Access and benefit sharing: Status of CGN collections'.

# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - complete back-up
    - duplicated in colleague genebank
    - triplicated in Svalbard 'Global Seed Vault'



# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - all regular genebank activities
    - acquisition
    - regeneration
    - characterisation/evaluation
    - documentation
    - distribution
  - ISO-9002 certification
    - first genebank (2003)



Centre for Genetic Resources, the Netherlands

# Conserving and Facilitating Use of PGR

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- Centre for Genetic Resources, The Netherlands (CGN)
  - new service: 'special collections'
    - PGR collections managed by CGN but not for open access in perpetuity
      - research populations (RILs, NILs, etc.)
      - SSD lines selected from accessions and used in sequencing projects
    - management protocols are not fixed
      - germination testing / germination / backup / availability / seed amounts
    - managed on a cost neutral basis
      - costs covered in project and/or by users

# Conserving and Facilitating Use of PGR

- Centre for Genetic Resources, The Netherlands (CGN)
  - new service: 'special collections'

The screenshot shows the 'Special collections' page of the Centre for Genetic Resources, the Netherlands (CGN). The page features a green header with navigation links: Home, Centre for Genetic Resources, the Netherlands, Plant Genetic Resources, and Special collections. The main content area is titled 'Special collections' and includes a paragraph explaining that CGN maintains regular gene bank collections and also offers seed samples from special collections developed for specific user groups. A contact box for dr. R (Rob) van Treuren is visible, along with a 'Contact form' button. A large blue DNA double helix graphic is positioned on the right. Below the main text, there are two featured collections: 'Special collection of 55 re-sequenced tomato lines' with a tomato image, and 'Special collection of 442 SSD lines of Lactuca spp.' with a lettuce image. Social media icons for Facebook, Twitter, Google+, LinkedIn, and Email are on the left side of the page.

# Conserving and Facilitating Use of PGR

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- collaboration with stakeholders
  - formal and informal sectors
  - Advisory Committee
    - annual meeting organised by CGN
    - representation of various stakeholder groups and the Ministry
    - report goes to the Ministry



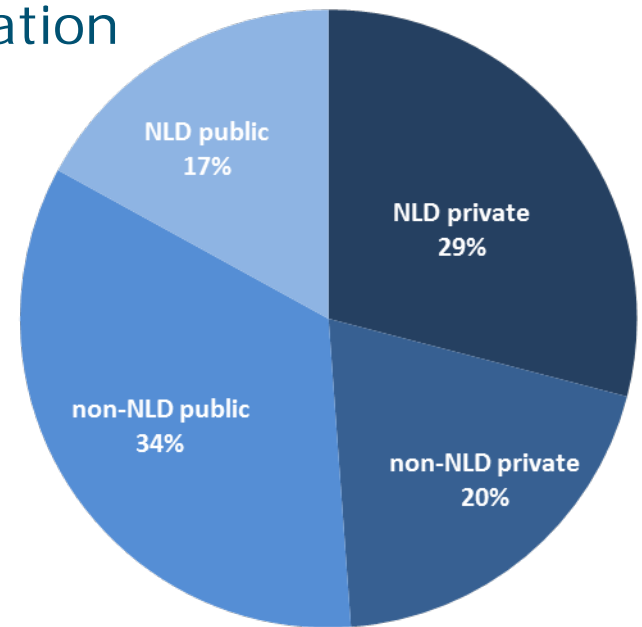
# Conserving and Facilitating Use of PGR

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- collaboration with private breeding sector
  - public-private partnerships with 'Dutch' plant breeding companies
    - for the development, maintenance and evaluation of the CGN collections
    - collaboration is transparent and open
      - no strict bilateral initiatives
      - approval of Ministry required

# Conserving and Facilitating Use of PGR

- CGN provides services to PGR users
  - access to PGR collections and associated information
    - high-quality material and information
    - user-friendly interface
  - advise on
    - choice of material for use
    - ABS issues



CGN samples distributed 2007-2016  
(n=64702)

# Conserving and Facilitating Use of PGR

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- Dutch private breeders support CGN
  - via Plantum
    - Dutch association of plant breeders
  - with
    - policy advice
    - technical input
    - financial support for collecting missions
    - input in kind

# Conserving and Facilitating Use of PGR

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- Dutch private breeders support CGN
  - with policy advice
    - Plantum is member CGN Advisory Committee
      - vision and policy
      - implications of international rules and legislation
      - plan and follow-up activities providing input where necessary

# Conserving and Facilitating Use of PGR

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- Dutch private breeders support CGN
  - with technical input
    - ca 6% of CGN collection (22,844 accessions) was provided by breeding companies
    - breeders are member of 'crop working groups' (n=6) which convene annually
      - providing technical advise and feed back
      - advising on priorities from the user perspective

# Conserving and Facilitating Use of PGR

- Dutch private breeders support CGN



annual leafy vegetable meeting



# Conserving and Facilitating Use of PGR

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- Dutch private breeders support CGN
  - with financial support for collecting missions
    - trips are organized with local authorities and organizations
    - material is collected
      - meeting all legal (MAT and PIC) requirements
    - material is made publicly available
      - first access to funding companies during embargo period

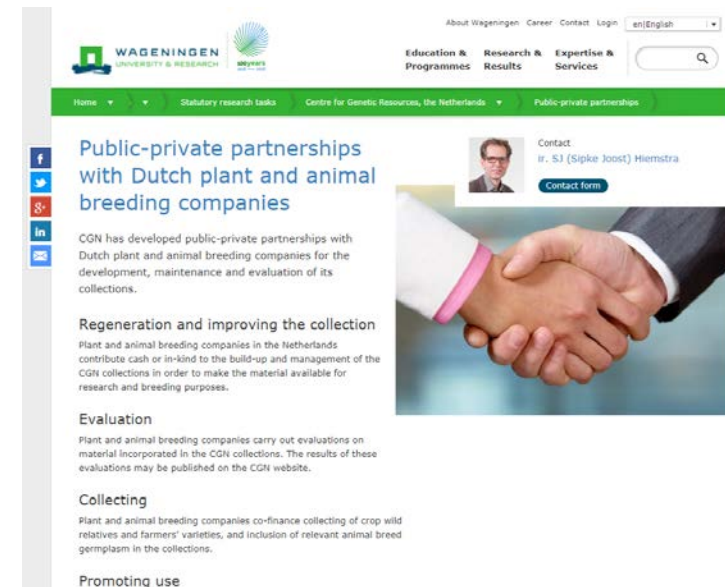
# Conserving and Facilitating Use of PGR

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- Dutch private breeders support CGN
  - with input in kind
    - regeneration of CGN accessions
      - based on CGN protocols (part of QMS)
      - amounts to 15% of CGN budget
    - collaborative pre-competitive evaluation
      - breeders/CGN decide on priority traits and do tests
      - CGN coordinates, distributes material, combines results, etc.
      - all data is made publicly available after embargo period

# Conserving and Facilitating Use of PGR

- collaboration is formalised in Letter of Intent / Memorandum of Understanding
  - currently 7 plant breeding companies
  - elements
    - regeneration and improving the collection
    - evaluation
    - collecting
    - promoting use



Centre for Genetic Resources, the Netherlands

# Conserving and Facilitating Use of PGR

- collecting new PGR in collaboration with private industry



# Conserving and Facilitating Use of PGR

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- collecting new PGR in collaboration with private industry
  - principles
    - complete transparency
      - reporting about plans to Ministry
      - full compliance to laws and ABS principles
    - collaboration with private industry is open
      - any company can join
    - material and data becomes publicly accessible
      - possibly after embargo period

# Conserving and Facilitating Use of PGR

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- collecting new PGR in collaboration with private industry
  - procedure
    - crops/locations are selected
      - based on opportunities and contacts
      - based on CGN's needs
      - in consultation with private industry
    - CGN establishes contacts and negotiates contracts
      - with local institution regarding access and planning
      - with private industry regarding funding and regeneration



# Conserving and Facilitating Use of PGR

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- collecting new PGR in collaboration with private industry
  - local arrangements
    - plan collecting expedition with local contact
      - pre-expedition
      - planning expedition
  - contact National Focal Point (NFP) for info on ABS
    - Prior Informed Consent (PIC) from the Competent National Authority on ABS
    - Mutual Agreed Terms (MAT) from the Competent National Authority on ABS and local contact persons
    - phytosanitary certificate (im- & export)

# Conserving and Facilitating Use of PGR

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- collecting new PGR in collaboration with private industry
  - arrangements with private industry
    - funding
      - local costs during collecting trip
      - salary CGN employee
      - benefit sharing arrangement with origin country
    - use of material after collecting
      - regeneration
      - embargo on non-partner use after regeneration and distribution to partner and origin country

# Conserving and Facilitating Use of PGR

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- collecting new PGR in collaboration with private industry
  - pre-expedition
    - local expert(s) to determine where and when to collect
    - generates report for CGN and funders to decide
  - expedition
    - CGN staff member plus local experts
    - material collected, pre-dried and shipped to the Netherlands

# Conserving and Facilitating Use of PGR

- collecting new PGR in collaboration with private industry



## Greece- the Netherlands Allium collecting expedition 2009

Team/collector(s) T. van der Kolk Collecting number TK 001  
Date 3/7/09 (18:51:33) Photo number 632-636  
Crop name..... Cultivar name.....  
Latin species name A. longicaule ssp. longicaule  
Locality Ag. Iphios Karpathos  
.....  
Latitude N 35° 20' 47.7" Longitude E 027° 10' 7.15" Altitude 123 m. (± 2 m)  
Sample population.....clone.....individual.....random.....non random.....  
Frequency.....abundant.....frequent.....occasional.....rare.....  
Topography.....swamp.....flood plain.....level.....undulating.....hilly.....steep.....  
.....mountainous 1

## Biological status of accession (SAMPSTAT)

100) Wild  
110) Natural  
120) Semi-natural/wild  
  
200) Weedy  
  
300) Traditional cultivar/landrace  
  
500) Advanced/improved cultivar

23) Backyard, kitchen or home garden  
24) Fallow land  
25) Pasture  
  
30) Market or shop  
  
60) Weedy, disturbed or ruderal habitat  
61) Roadside  
62) Field margin

## Collecting/acquisition source (COLLSRC)

10) Wild habitat  
11) Forest/woodland  
12) Shrubland  
13) Grassland  
14) Desert/tundra  
15) Aquatic habitat

20) Farm or cultivated habitat  
21) Field  
22) Orchard

## REMARKS (diseases, pests, other)

\* limestone habitat  
cliffs  
Chasmophyte

# Conserving and Facilitating Use of PGR

- collecting new PGR in collaboration with private industry



# Conserving and Facilitating Use of PGR

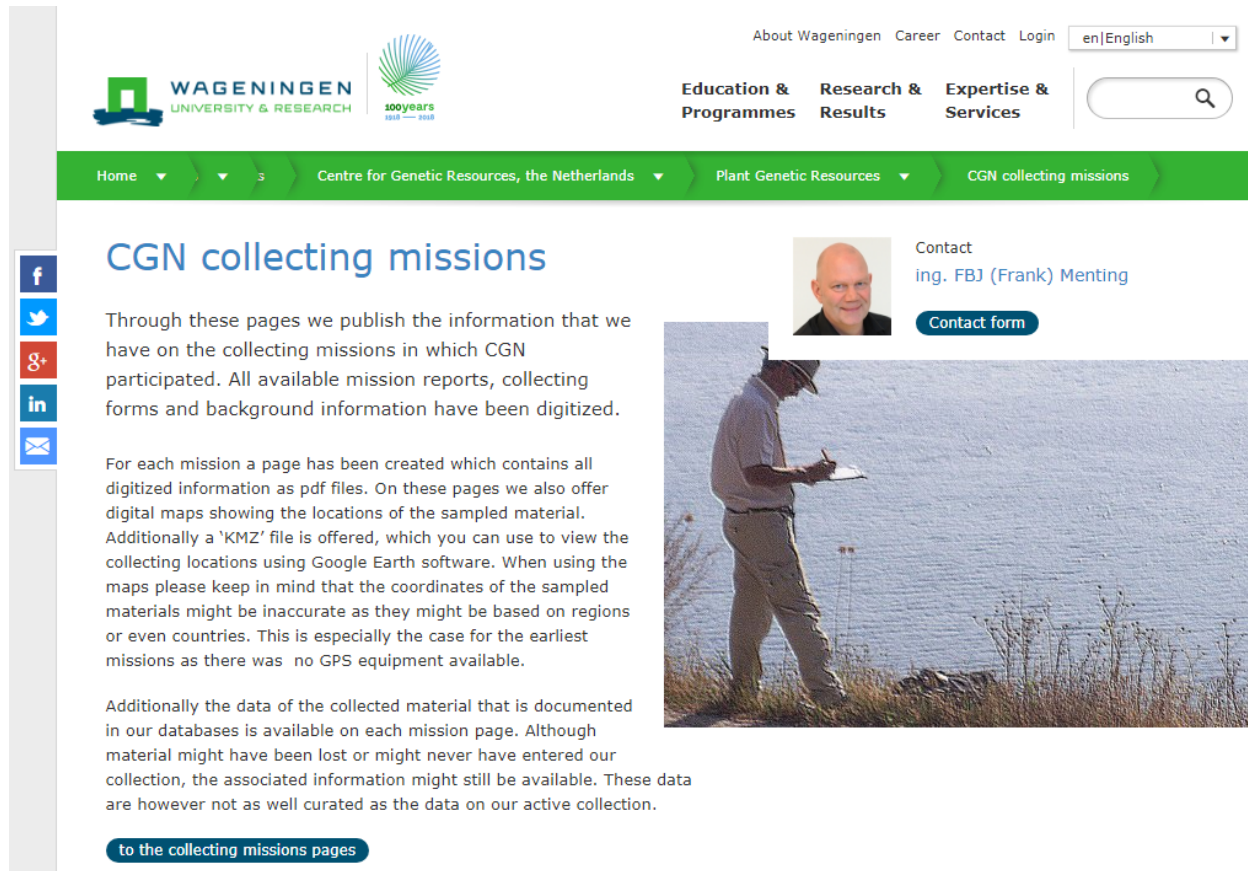
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- collecting new PGR in collaboration with private industry
  - collected material is regenerated
    - by partner companies and CGN
    - shipped to all partners (and origin country)
  - Partners can use it for few years before material becomes public
    - e.g. spinach expedition to Tajikistan & Uzbekistan



# Conserving and Facilitating Use of PGR

- all data of CGN collecting missions are on-line



The screenshot displays the Wageningen University & Research website. The header includes the university logo, a '100years' anniversary graphic, and navigation links for 'About Wageningen', 'Career', 'Contact', and 'Login'. A language dropdown menu is set to 'en|English'. Below the header, a green navigation bar contains links for 'Home', 'Centre for Genetic Resources, the Netherlands', 'Plant Genetic Resources', and 'CGN collecting missions'. The main content area is titled 'CGN collecting missions' and features a profile picture of Ing. FBJ (Frank) Menting with a 'Contact' link and a 'Contact form' button. The text describes the digitization of mission reports, collecting forms, and background information. It mentions that for each mission, a page is created with digitized information as PDF files, digital maps of sampling locations, and a 'KMZ' file for use with Google Earth. A note states that coordinates might be inaccurate due to the lack of GPS equipment in early missions. A button at the bottom left of the text area says 'to the collecting missions pages'. On the left side of the page, there is a vertical sidebar with social media icons for Facebook, Twitter, Google+, LinkedIn, and Email.

WAGENINGEN  
UNIVERSITY & RESEARCH

100years  
1882 — 2018

About Wageningen Career Contact Login en|English

Education & Programmes Research & Results Expertise & Services

Home Centre for Genetic Resources, the Netherlands Plant Genetic Resources CGN collecting missions

## CGN collecting missions

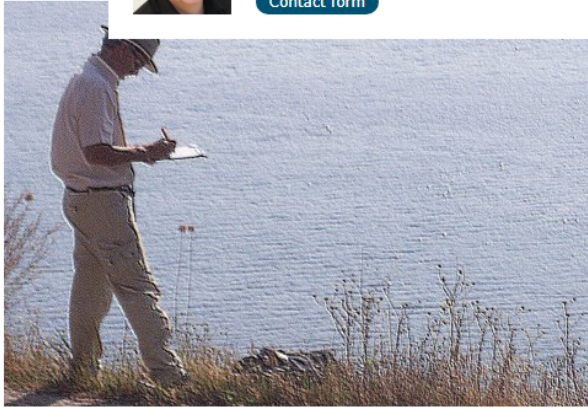
Through these pages we publish the information that we have on the collecting missions in which CGN participated. All available mission reports, collecting forms and background information have been digitized.

For each mission a page has been created which contains all digitized information as pdf files. On these pages we also offer digital maps showing the locations of the sampled material. Additionally a 'KMZ' file is offered, which you can use to view the collecting locations using Google Earth software. When using the maps please keep in mind that the coordinates of the sampled materials might be inaccurate as they might be based on regions or even countries. This is especially the case for the earliest missions as there was no GPS equipment available.

Additionally the data of the collected material that is documented in our databases is available on each mission page. Although material might have been lost or might never have entered our collection, the associated information might still be available. These data are however not as well curated as the data on our active collection.

[to the collecting missions pages](#)

Contact  
Ing. FBJ (Frank) Menting  
[Contact form](#)





# Conserving and Facilitating Use of PGR

- all data of CGN collecting missions are on-line



## CGN Collecting Missions [🔗](#)

- 1955, Peru, primitive potatoes
- 1959, Andes, potatoes
- 1974, Peru, Bolivia, Argentina, wild and primitive potatoes
- 1976, Pakistan, different crops
- 1976, Israel, lettuce
- 1980, Bolivia, wild and primitive potatoes
- 1981, Greece, wild and primitive beets
- 1981, Pakistan, different crops
- 1981-1982, European countries, cruciferous crops
- 1982-1983, the Netherlands, onion and leek
- 1985-1986, the Netherlands, red clover
- 1985-1986, Egypt, vegetables
- 1987, Indonesia, vegetables
- 1987, Ireland, beet
- 1989, Spain, Portugal, beet and lettuce
- 1989, Spain, beet and *Euphorbia*
- 1989, Bulgaria, vegetables
- 1990, the Netherlands, Perennial ryegrass
- 1990, Turkey, different crops
- 1990, Armenia, Dagestan, different crops
- 1991, Georgia, Dagestan, different crops
- 1993, Bolivia, wild potatoes
- 1994, Germany, wild caraway
- 1994, Italy, different crops
- 1994, Bolivia, wild potatoes
- 1995, Guatemala, wild potatoes
- 1996, Costa Rica, wild potatoes
- 1997-1998, the Netherlands, white clover
- 1997, Uzbekistan, different crops
- 1999, Peru, wild and primitive potatoes

# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding
  - basis (on CGN side)
    - high quality of services
    - two-way collaboration with users
  - large impact on breeding research and development
    - strong Dutch breeding industry
    - large demand of material
    - positive user feedback and willingness to collaborate

# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding
  - spinach suffers from *Peronospora farinosa*

# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding
  - spinach suffers from *Peronospora farinosa*

# Conserving and Facilitating Use of PGR

- case story of succesful use exotic PGR in breeding
  - resistances can be found in wild spinach



*Spinacia turkestanica*

source: de Visser, Pop Vriend Seeds

Centre for Genetic Resources, the Netherlands

# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding
  - 2008: CGN organises collection trip to Uzbekistan

collecting locations Uzbekistan

*source: Kik, CGN*

# Conserving and Facilitating Use of PGR

- case story of succesful use exotic PGR in breeding
  - 2008: CGN organises collection trip to Uzbekistan



*Spinacia turkestanica* in Uzbekistan

source: Kik, CGN



# Conserving and Facilitating Use of PGR

- case story of succesful use exotic PGR in breeding
  - 2008: CGN organises collection trip to Uzbekistan



CGN collecting in Uzbekistan

*source: Kik, CGN*

# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding
  - 2008: CGN organises collection trip to Uzbekistan
    - result: 66 wild spinach accessions
  - 2009-2010: regeneration by participating companies
  - 2010-2011: distribution to participating companies

Pop Vriend:

- 2011: crosses with cv Viroflay and tests on peronospora resistance
- 2012-2013: backcrosses and testing
- 2014-2015: base and commercial seed production

# Conserving and Facilitating Use of PGR

- case story of succesful use exotic PGR in breeding



# Conserving and Facilitating Use of PGR

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- case story of succesful use exotic PGR in breeding

# Conserving and Facilitating Use of PGR

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- concluding remarks (1/2)
  - CGN is
    - medium size national PGR center
    - embedded in a high-tech scientific environment
    - collaborating actively in international networks
    - trying to optimally serve current and future users of PGR with
      - conservation activities (ex situ and in situ)
      - user-oriented services
      - methodological and strategic research
      - policy support

# Conserving and Facilitating Use of PGR

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- concluding remarks (2/2)
  - Dutch plant breeding industry contributes significantly to CGN's succes
    - PGR needs to be managed
      - for future generations
      - for current use (economic interests & world food supply)
    - plant breeding industry has a responsibility
    - based on positive collaborative relationship
      - transparency about motives and collaboration

# Thank you for your attention !

Genetic resources are useful,  
pretty and tasteful

Genetic resources are the  
food on your plate



To explore  
the potential  
of nature to  
improve the  
quality of life



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# Thank you for your attention

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**WAGENINGENUR**  
*For quality of life*

Centre for Genetic Resources, The Netherlands (CGN)

# ご清聴ありがとうございました



**WAGENINGENUR**  
For quality of life

Centre for Genetic Resources, The Netherlands (CGN)