



**The CGN spinach collection: overview and recent collecting expeditions**

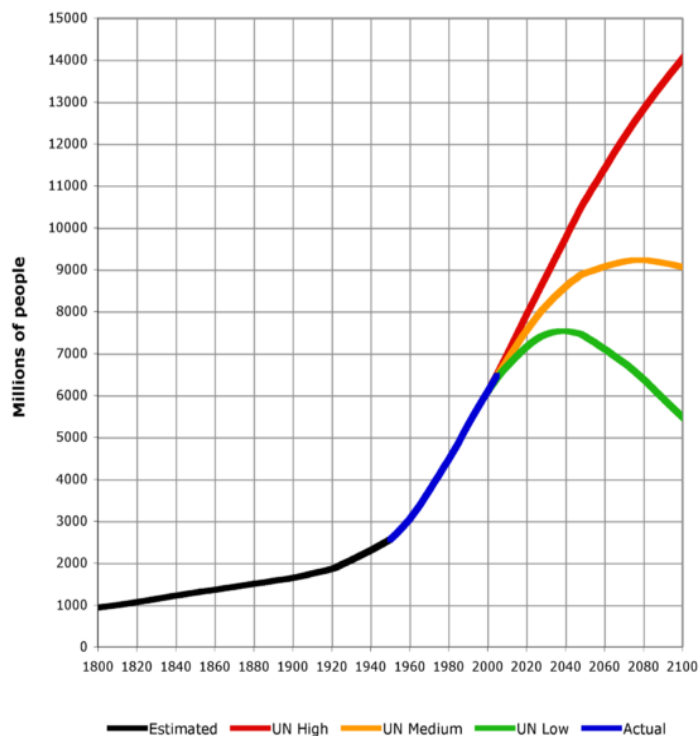
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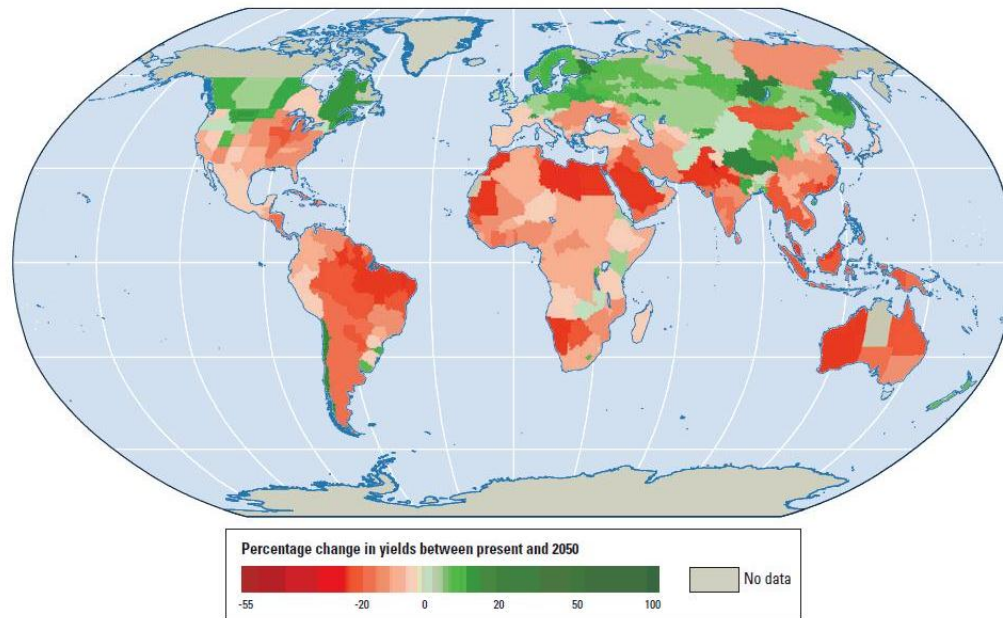
# Outline presentation

- Introduction: challenges to maintain global food security
- Genebanks: worldwide and CGN
  - CGN: vegetable genebank!
- Global spinach collections
  - the need for collecting
- Spinacia collecting expeditions
  - 2008: Central Asia
  - 2011: Trans Caucasus
- Concluding remarks

# Guarantee food security: two major challenges



Map 1 Climate change will depress agricultural yields in most countries in 2050, given current agricultural practices and crop varieties



Sources: Müller and others 2009; World Bank 2008c.

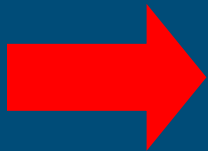
Note: The figure shows the projected percentage change in yields of 11 major crops (wheat, rice, maize, millet, field pea, sugar beet, sweet potato, soybean, groundnut, sunflower, and rapeseed) from 2046 to 2055, compared with 1996–2005. The values are the mean of three emission scenarios across five global climate models, assuming no CO<sub>2</sub> fertilization (a possible boost—of uncertain magnitude—to plant growth and water-use efficiency from higher ambient CO<sub>2</sub> concentrations). Large negative yield impacts are projected in many areas that are highly dependent on agriculture.

increasing world population

climate change

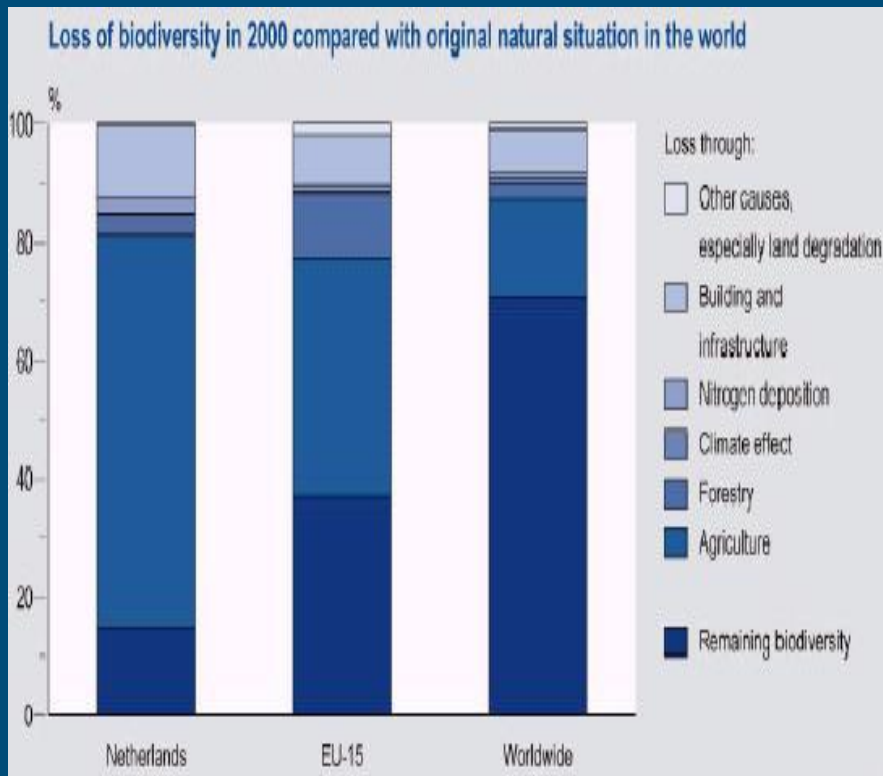


# Responding to challenges



One way to respond to these challenges is to develop improved varieties and cultivation methods which can help to increase our food production

# Why do we need genebanks?

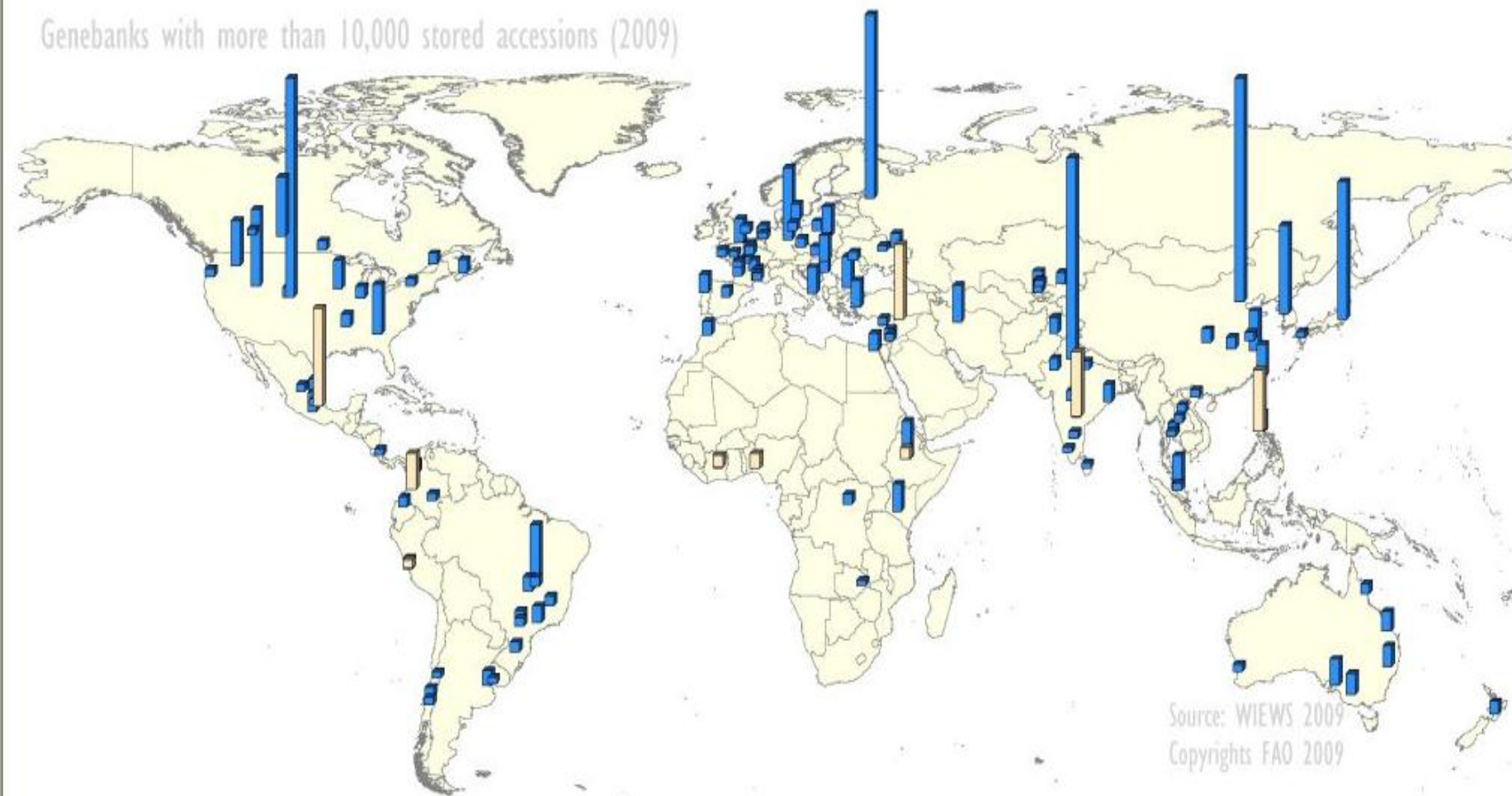


- For the development of improved varieties genetic resources are needed
- But loss of biodiversity is taking place to a large extent
- Consequently: there is a clear need to halt this loss of biodiversity
  - *In situ* management (e.g. nature reserves)
  - *Ex situ* management (e.g. genebanks)

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# Overview major genebanks worldwide

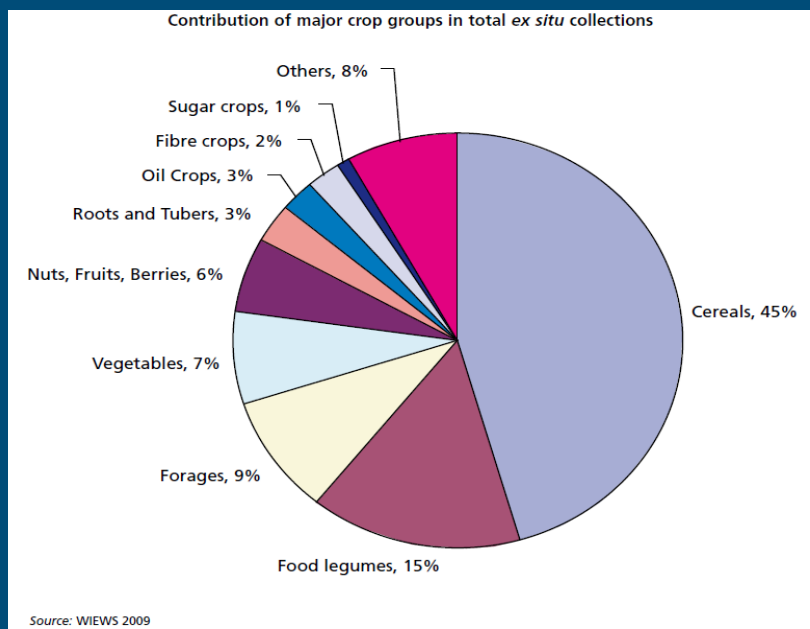
Genebanks with more than 10,000 stored accessions (2009)



Source: WIEWS 2009  
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# CGN: vegetable genebank!



- In genebanks worldwide cereals and pulses account for 60% of their content; vegetables only 7% -> large gaps present.
- The Netherlands has a strong vegetable breeding sector, therefore the national gene bank CGN focuses on these type of crops

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# General overview CGN crop collections

## Vegetables

■ leafy vegetables	2973
■ fruit vegetables	3727
■ crucifers	1780
■ Allium crops	377
■ potato	1379
■ pulses	1798

Total 12034

## Arable crops

■ cereals	8538
■ forages	966
■ flax	952

Total 10456



# *Spinacia* in genebanks worldwide

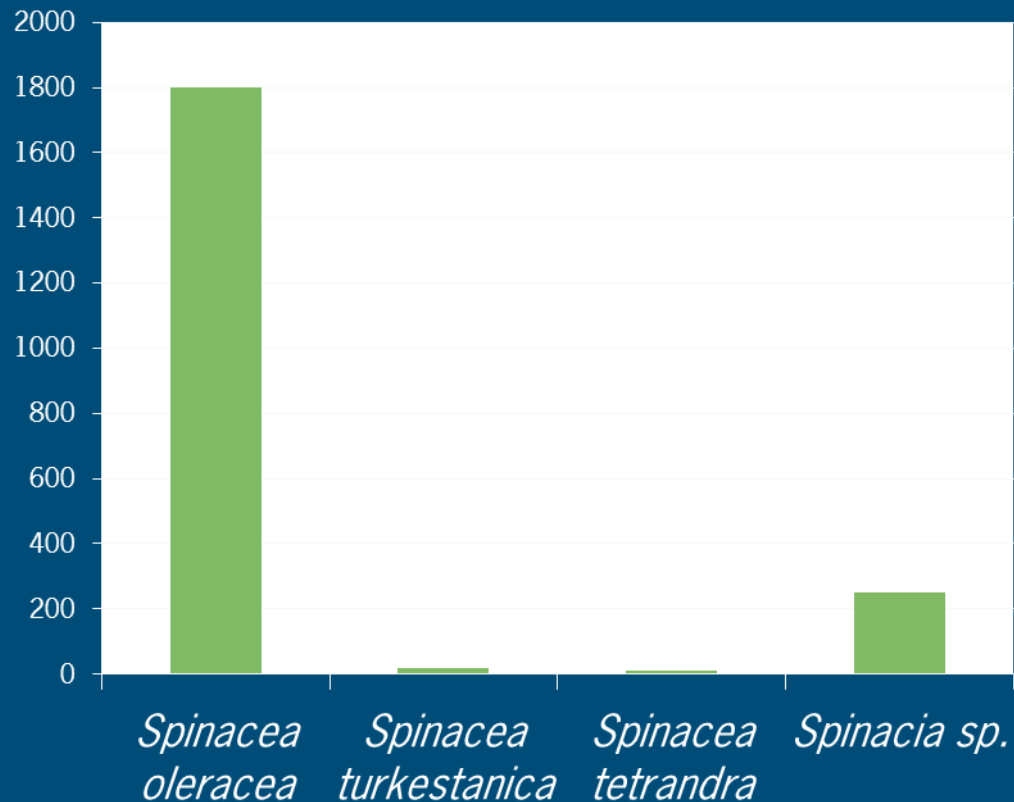
- In total 2100 acc: 1800 acc. *S. oleracea* (incl 700 landraces, 20 acc *S. turkestanica* and 10 acc *S. tetrandra* (+ 250 acc. *Spinacia* sp)
- CGN has the largest available *Spinacia* collection worldwide
  - CGN: 387 acc, (PR China: 326 acc), USDA: 301 acc, IPK: 214 acc, (VIR: 218 acc)
- Since 1988 7747 *Spinacia* requests at CGN have been registered, making it the most requested CGN collection on accession basis

# CGN spinach collection (before collecting missions)

species	# accessions
<b>S. oleracea</b>	<b>383</b>
landraces	106
cultivars	146
unknown	131
<b>S. turkestanica</b>	<b>4</b>
<b>total</b>	<b>387</b>

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# The rationale behind *Spinacia* CWR collecting



- Spinach crop wild relatives proved to be an important gene reservoir for breeding improved cv's
- Spinach CWR are almost not present in genebanks worldwide

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# Collecting spinach CWR in their centres of diversity

*S. tetrandra*

*S. turkestanica*



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# Expedition 2008: *S. turkestanica*



- Collecting area: Uzbekistan -Tajikistan
- Habitat: cultivated steppe area; loess (sandy clay) soil; along the edges of non-irrigated, non-fertilized fields (*bogara* fields)
- collected: 66 acc. *S. turkestanica* and 2 acc landraces *S. oleracea*

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# Typical habitat of *S. turkestanica*



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# Expedition 2011: *S. tetrandra*



- Collecting area: Azerbaijan, Georgia, Armenia
- Habitats: ranging from nutrient poor clay soils, along rivulets, road sides, bogara fields
- Collected: 39 acc. *S. tetrandra* and 14 acc. landraces *S. oleracea*

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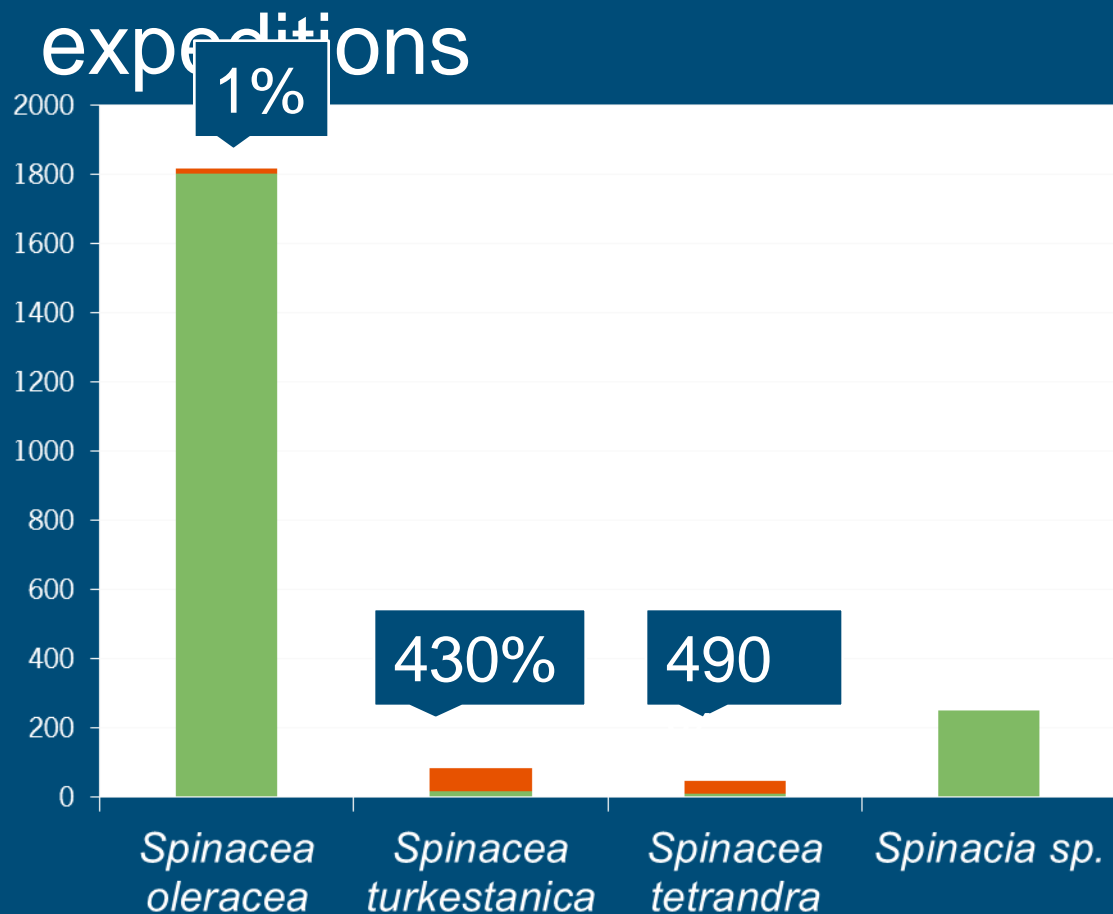
# One of the habitats of *S. tetrandra*



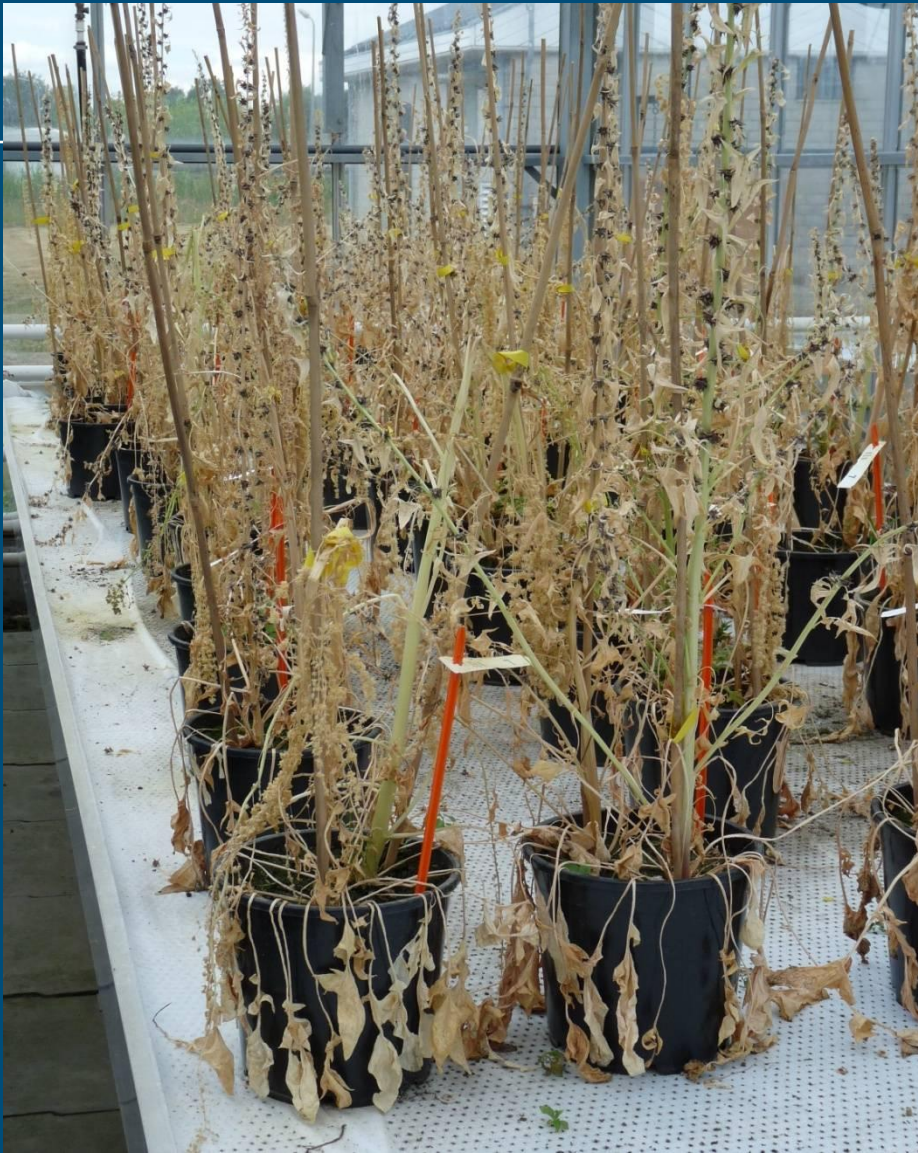
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# Results of the *Spinacia* collecting expeditions



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- Regeneration of *Spinacia*
  - development of regeneration protocols
  - in close cooperation with breeding companies

# Overview of global available *Spinacia* accessions



## The International Leafy Vegetables databases

Following up on activities within the ECPGR working group on leafy vegetables, this website was developed within the framework of the EU GENRES project entitled "[Leafy vegetables germplasm, stimulating use](#)" (AGRI-2006-0262). The website provides access to the updated International *Lactuca* Database (ILDB) and to three newly developed databases containing information on accessions of spinach, chicory and minor leafy vegetables, respectively. Data were collected of accessions that in principal are available for distribution. It was aimed to cover all known European collections as much as possible and to include the main collections from outside Europe as well. EURISCO or the old ILDB was used as data source in case no current passport data were received upon request. The databases also provide access to characterization and evaluation data generated within the framework of the EU GENRES project.



### Lettuce

This link provides access to the [International \*Lactuca\* database](#), which is maintained and hosted by the Centre for Genetic Resources, the Netherlands (CGN).



### Spinach

This link provides access to the [International spinach database](#), which is maintained and hosted by the Centre for Genetic Resources, the Netherlands (CGN).



### Chicory

This link provides access to the [International chicory database](#), which is maintained and hosted by the Groupe d'Etudes et de Contrôle des Variétés et des Semences (GEVES).



### Minor Leafy Vegetables

This link provides access to the [International minor leafy vegetables database](#), which is maintained by the Leibniz-Institute of Plant Genetics and Crop Plant Research (IPK) and hosted by the Centre for Genetic Resources, the Netherlands (CGN).

<http://documents.plant.wur.nl/cgn/pgr/LVintro/>

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# Concluding remarks

- Two successful expeditions took place to collect CWR and LR of spinach
  - the size of global *S. turkestanica* (20 -> 86) and *S. tetrandra* ( 10 -> 59) collections was increased considerably
  - the number of CWR *Spinacia* accessions is still low: so there is still a need for collecting in other countries to increase CWR spinach numbers/diversity
- The expeditions were successful due to the help of
  - local experts, competent national authorities on PGR and breeding companies



# Thanks for your attention



info: [www.cgn.wur.nl](http://www.cgn.wur.nl)