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# Information technology to assist in conserving and using crop wild relatives and landrace diversity

(the boring version without pictures)

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# Conservation Informatics

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- conservation informatics
  - Google 7 260 results
- conservation biology
  - Google ± 7 120 000 results
- biodiversity informatics
  - Google ± 159 000 results

# Conservation Informatics

## Conservation Informatics – Why is it so hard?



### Biodiversity Data Collection and Management



Tremendous efficiencies

## The Data/Tools Demand Cycle

- Powerful analytical tools lead to a demand for more and higher quality data . . .
- and more and higher quality data lead to a demand for powerful analytical tools
- A positive demand cycle



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# Conservation Informatics

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- outline presentation
  - *ex situ* PGR (as reference)
  - *in situ* crop wild relatives
  - *in situ* landraces and traditional cultivars
    - PGR documentation landscape
    - tasks and processes involved in conservation and use
    - IT tools to support these tasks and processes
  - linking systems
  - conclusions

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# Conservation Informatics

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- *ex situ* PGR documentation landscape

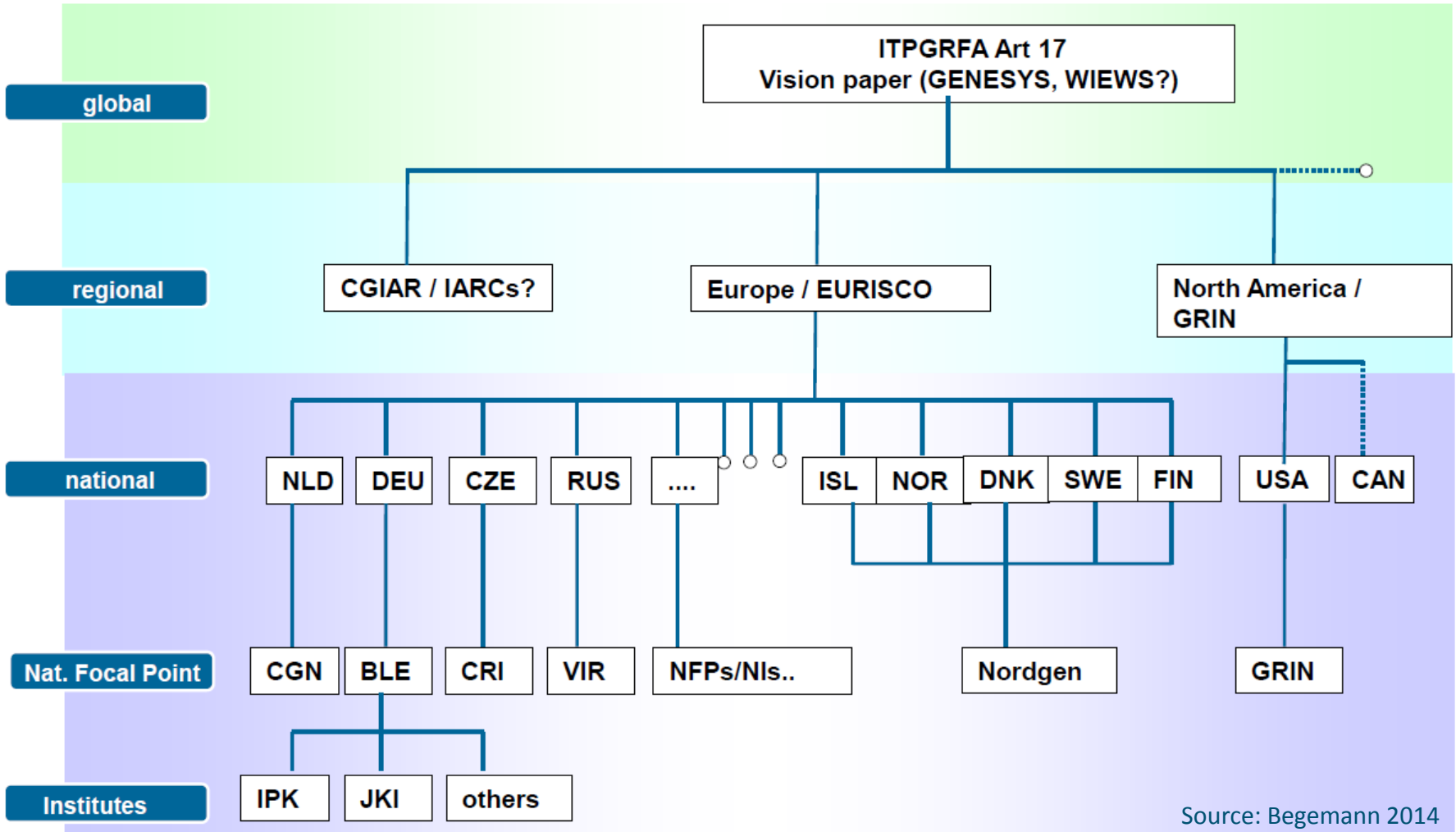


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# Conservation Informatics

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- *ex situ* PGR documentation landscape
  - data sources & PGR management
    - genebanks, botanical gardens, NGO's
  - first level aggregation
    - EURISCO National Inventories
  - higher level aggregation
    - EURISCO, Genesys
  - result
    - centrally accessible overview of conserved PGR
  - issues
    - data quality, data management / analysis, access to material, characterisation and evaluation data, ITPGRFA-Art.17, ~omics data





## About EURISCO



The EURISCO web catalogue receives data from the National inventories, and provides access to all ex situ PGR information in Europe. [\[More\]](#)

## Search the Database



### Quick Search

Make a search using key criteria

### Advanced Search

Use various criteria to search in the database



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**21 February 2013: Atelier "Biodiversité et Résilience des agroécosystèmes"**

**18 February 2013: International Plant Breeding Congress - 1st announcement**

**7 February 2013: Bioversity International in 2013**

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# Conservation Informatics

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## ■ PGR documentation landscape

- *in situ* crop wild relatives
  - many actors/initiatives
    - levels of government, private landowners, nature organisation
    - PGR-Forum, AEGRO, PGR Secure, Bioversity's CWR portal & descriptor list, CWR Markup Language, Global Crop Diversity Trust's Harlan and de Wet CWR inventory, GRIN Taxonomy CWR, national CWR sites/inventories/portals
    - Crop Wild Relative Information System (CWRIS)
      - list of CWR species x country + some taxonomic info
  - accessible data is still very scarce and scattered



Home Page

Data set [PGR Forum CWR Catalogue for Europe and the Mediterranean](#)  
[CWR Case Studies](#)

[Home](#)  
[Taxonomy](#)  
[People](#)  
[Links](#)  
[Search](#)  
[About](#)  
[PGR Forum](#)

## Welcome to CWRIS: the PGR Forum Crop Wild Relative Information System

CWRIS is an online information management system specifically designed to facilitate CWR conservation and use. Please read the [introduction to CWRIS](#) before using the system.

From this page, you can browse or search the PGR Forum CWR Catalogue for Europe and the Mediterranean or view the PGR Forum CWR case studies by following the links on the left.

To return to the PGR Forum web site, click on the PGR Forum logo from any page.



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# Conservation Informatics

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## ■ *in situ* crop wild relatives

### ● National CWR Conservation planning

Maxted N, Magos Brehm J and Kell S (2013) Resource book for preparation of national conservation plans for crop wild relatives and landraces

- preparation of a national CWR checklist
- prioritization of national CWR
- eco-geographic diversity analysis of priority CWR
- threat assessment of priority CWR
- gap analysis
- formulation of the National management plan
- monitoring of conservation status
- promotion of the use of CWR

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# Conservation Informatics

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- *in situ* crop wild relatives

- National CWR Conservation planning

Maxted N, Magos Brehm J and Kell S (2013) Resource book for preparation of national conservation plans for crop wild relatives and landraces

- determination which CWR to conserve
- determination conservation status / threat
- organise conservation (incl. monitoring)
- facilitate use

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# Conservation Informatics

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- National CWR Conservation planning
  - determination which CWR to conserve
    - preparation of a national CWR checklist
  - selection of crops
    - importance
      - national (economic)/ global (nutritional)
      - breeding activity
  - crop checklist: Mansfeld's World Database of Agriculture and Horticultural Crops
    - 6,100 crop species – no forestry and ornamental crops – no indication of importance
    - on-line searchable – not down-loadable

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# Conservation Informatics

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- National CWR Conservation planning
  - determination which CWR to conserve
    - preparation of a national CWR checklist
  - identification of related relatives
    - often genepools are unknown – taxonomic group is alternative
    - often data is lacking in inventory
  - CWR checklist: Harlan and de Wet CWR Inventory
    - 1400 taxa in 92 genera – most important – far from complete
    - on-line searchable – not down-loadable (but requestable)



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# Conservation Informatics

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- National CWR Conservation planning
  - determination conservation status / threat
    - focus attention on CWR that need attention
  
  - geographical occurrence and trends
    - distribution atlas
    - protected areas
    - look into the future
      - species niche modelling & climate change models
  
  - *ex situ* conservation status
    - EURISCO / Genesys
      - quality of conservation is issue

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# Conservation Informatics

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- National CWR Conservation planning
  - organise conservation (incl. monitoring)
    - what is happening to the protected material?
  
  - *ex situ* backup (when possible)
    - monitoring regular part of genebank management
      - is the *ex situ* system up to the job?
  
  - *in situ* conservation (when possible)
    - monitoring via regular inventories – hope it is still there!

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# Conservation Informatics

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- National CWR Conservation planning
  - facilitate use
    - where can the user find material and traits for use?
  - protected CWR populations can soon be entered in EURISCO
  - genomics might offer options to better 'mine the gold'
    - classical breeding only used qualitative genes from GP1b & GP2
    - comparative genomics and reverse genetics could offer help
  - biotechnologies might offer options to better 'use the gold'
    - society is not convinced

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# Conservation Informatics

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- National CWR Conservation planning
  - IT resources needed
    - data sets
      - crop checklist with socio/economic indicators
      - CWR checklist with information about relatedness
      - taxonomic synonymy checklist (GRIN Taxonomy)
      - plant species distribution atlases
      - protected area atlases
    - all of these digital & downloadable/machine-readable & useable (IP)

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# Conservation Informatics

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- National CWR Conservation planning
  - IT resources needed
    - tools
      - species niche modelling tools with climate change scenario's
        - clean occurrence data (GBIF)
        - on-line accessible easy to run software
      - geo-referencing tools
      - CWR management tools – integration of data sources
    - platform
      - authoritative portal with high value information, tools & datasets
        - much is available already, but needs to be reviewed and reorganised

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# Conservation Informatics

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- *in situ* crop wild relatives
  - alternative / complementary approach for priority CWR
    - identification 'genetic reserves' for specific populations
      - with proper description, incl. 'maintaining institute'
    - report the CWR population to EURISCO National Inventory Focal Point
      - *in situ* maintained CWR accessions included in EURISCO
      - *in situ* maintenance is added as PGR management method
  - these populations are part of the 'National PGR Collection'



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# Conservation Informatics

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- PGR documentation landscape
  - *in situ* on-farm diversity
    - local approaches / very many actors
    - ECPGR descriptor list developed
      - Descriptors for web-enabled national *in situ* landrace inventories (2012) Negri V, Maxted N, Torricelli R, Heinonen M, Vetelainen M and Dias S
      - monitoring tool: which farmer grows what landrace and why
    - no data compilation or sharing

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# Conservation Informatics

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- *in situ* landraces and traditional cultivars
  - the ECPGR concept for *in situ* (on-farm) conservation in Europe

Negri V, Freudenthaler P, Gasi F, Goldringer I, Mendes Moreira P, Străjeru S, Tan A, Veteläinen M, Vögel R, Weibull J and Maxted N (draft circulated to NC's)
  - bottom-up additive strategy
    - creation official National Inventories based on occurrence data
  - top-down strategy
    - create National Inventories on the basis of bibliographic and database information

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# Conservation Informatics

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- ECPGR concept for *in situ* (on-farm) conservation
  - relies on on-farm conservation with *ex situ* back up
    - dynamic nature makes conservation difficult to manage
      - ‘... both the bottom up and the top down strategies would require a periodic reworking because *in situ* (on-farm) inventories deal with very dynamic situations (growers come and go, new variable population arise meanwhile, so that situations can change rapidly) ...’

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# Conservation Informatics

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- ECPGR concept for *in situ* (on-farm) conservation
  - relies on on-farm conservation with *ex situ* back up
    - 'snapshot' from a farm can be made using descriptor list
      - easy to combine in database
      - databases can be combined in National Inventory
    - 'monitor' is needed for conservation purposes
      - big challenge due to dynamic nature
  - exception: perennial species
    - fruit trees, grasses, etc.

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# Conservation Informatics

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- ECPGR concept for *in situ* (on-farm) conservation
  - alternative top-down approach (proposed in the Netherlands)
    - create 'orange' lists with landraces and old varieties
      - so far 4661 records
        - sources: variety catalogues, grey and scientific literature
        - data: name, synonyms, origin year, ancestors, source record, availability
    - conservation in *ex situ* collections where needed (and still available)
    - make *ex situ* conserved material available to general public
      - with appealing information

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# Conservation Informatics

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- ECPGR concept for *in situ* (on-farm) conservation
  - IT resources needed
    - occurrence based monitoring
      - no extra tools needed
      - low feasibility
    - 'variety based' inventory & *ex situ* back-up/reintroduction
      - data on landraces and old varieties
        - past existence
        - conservation: basic passport data
        - awareness raising: anecdotal information



# Conservation Informatics

- ECPGR concept for *in situ* (on-farm) conservation
  - front page from the brochure about the 'oranje lijst'



# Conservation Informatics

- ECPGR concept for *in situ* (on-farm) conservation
  - 2 pages from the brochure about the 'oranje lijst'

## Aardappel

6 (Solanum tuberosum)



De naam van Bintje Jansma zal altijd verbonden blijven met een aardappel. Jansma was een van de meest succesvolle oud-leerlingen van hoofdonderwijzer Kornelis Lieuwes de Vries uit Suameer. Naast zijn werk als schoolmeester gaf De Vries ook landbouw wintercursussen. In 1898 vroeg de Friese Maatschappij van Landbouw hem een proefveld voor de aardappelteelt in te richten. In de 25 jaar waarin hij dat veld beheerde, kweekte hij ongeveer 150 rassen, die hij vernoemde naar (oud)leerlingen uit zijn klas. Bintje werd het grootste succes. Bintje was vanaf 1910 de meest verbouwde consumptieaardappel in West-Europa. Het was ook het belangrijkste exportras in Nederland. Het is een midden vroege consumptieaardappel met lichtgele, viezige, 'vlakogige' knollen. De opbrengst is zeer goed. De aardappel is bij uitstek geschikt voor de bereiding van friet. Het Bintje verdween uiteindelijk uit de schappen van de supermarkten onder druk van de milieubeweging. Het ras bleek zeer gevoelig voor 'het kwaad': de schimmel phytophthora. Bintje zou dus veel bestrijdingsmiddelen nodig hebben. Liefhebbers van het ras zeggen dat die milieulast dankzij de relatief snelle groei juist meevalt. Wat Bintje Jansma van de eer vond om een aardappelras op haar naam te hebben valt haar niet meer te vragen. Ze stierf in 1976 op 88-jarige leeftijd in een rusthuis in Franeker.

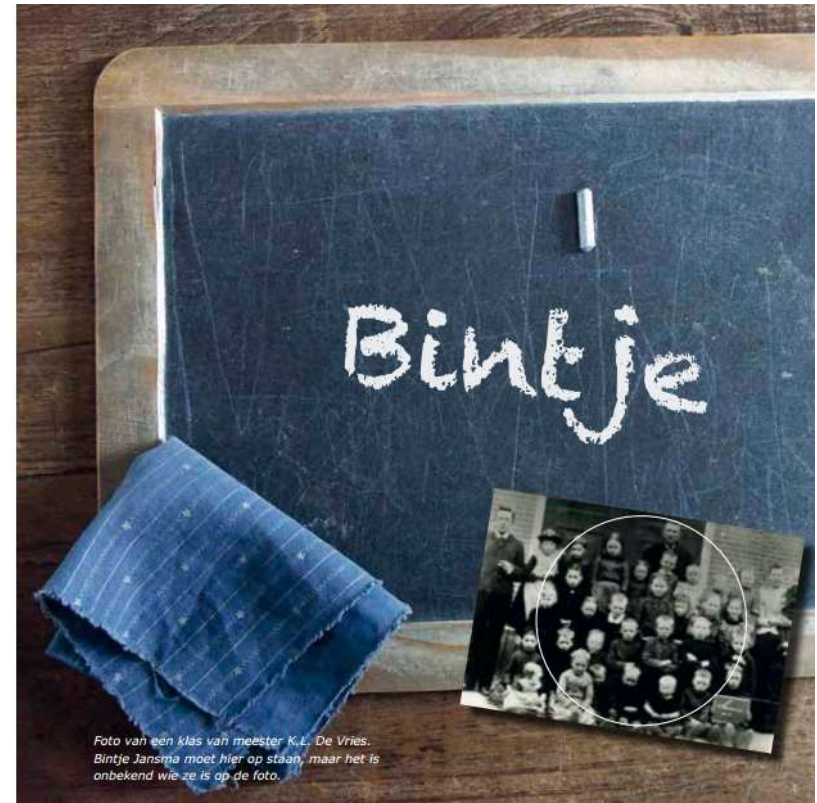


Foto van een klas van meester K.L. De Vries. Bintje Jansma moet hier op staan, maar het is onbekend wie ze is op de foto.

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# Conservation Informatics

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## ■ linking the systems

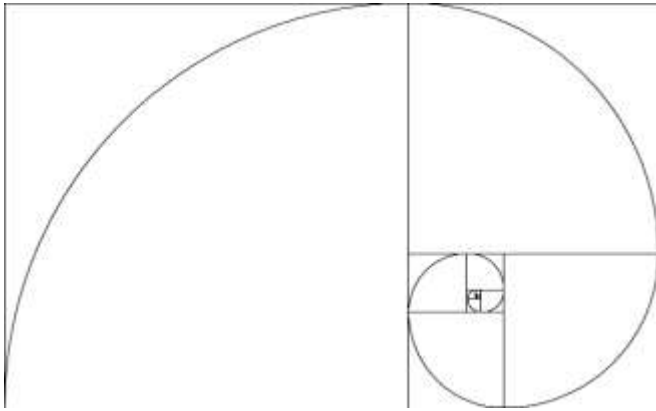
- tools for keeping systems to-be-developed inter-operable
  - standard vocabulary & ontologies
    - descriptor lists
    - Darwin Core & Access to Biological Collections Data (ABCD)
    - Crop Ontology
  - developing web-services tools
    - GBIF Internet Publishing Toolkit

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# Conservation Informatics

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- conclusions



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# Conservation Informatics

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## ■ conclusions

- IT situation is very different for *ex situ*, *in situ* CWR and *in situ* on farm community
- for *in situ* CWR, occurrence based approaches can be followed
  - several IT tools and data sources could be (further) developed
- for *in situ* on farm occurrence based inventories generally are not feasible due to dynamic nature
  - alternative approaches based on inventories of varieties / landraces can be considered
- connectivity is not an issue provided standards are used