Developing a European *in situ* (on farm) conservation strategy for landraces (LR)

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Pre-breeding – Fishing in the gene pool EUCARPIA Genetic Resources section meeting
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Outline

- **Context:**
  - policy
  - threat and value of LR diversity
  - ECPGR on-farm Working Group and LR conservation activities

- **PGR Secure activities**
  - Preparation of tools to aid the implementation of on-farm conservation of LR
  - National LR conservation strategies
  - European strategy for LR on-farm conservation
  - Assessment of genetic erosion and extinction risks
  - Identification of the Most Appropriate Areas for on-farm conservation
  - The European Seed Legislation on Conservation Varieties

- **Conclusions**
Context: policy

- **CBD Strategic Plan (2010) – Target 13 of 20!**
  “Target 13. “By 2020, the **genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.”

  “Target 9: **70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved**, while respecting, preserving and maintaining associated indigenous and local knowledge.”

- **FAO CGRFA-13/11/Report**
  “Secretariat of the International Treaty on PGRFA, CBD and other relevant stakeholders requested FAO to **elaborate on the means and opportunities for establishing a global network for in situ conservation and on-farm management of PGRFA, avoiding duplication of efforts”**
**Context:**

**Threat Facing LRs**

**A CENTURY AGO**

In 1903 commercial seed houses offered hundreds of varieties, as shown in this sampling of ten crops.

**80 YEARS LATER**

By 1983 few of those varieties were found in the National Seed Storage Laboratory.*

*R CHANGED ITS NAME IN 2001 TO THE NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION

SOURCE: RURAL ADVANCEMENT FOUNDATION INTERNATIONAL
LR are severely threatened elements of global biodiversity today

because:

• We have no idea how many LR exist (inventories are badly needed!!!)

• LR maintainers are almost always older and their number is dwindling each year

• Seed companies, breeders and government agencies are actively promoting modern cultivars

• In most countries no agency has direct responsibility for their conservation

Need action now or further loss and complete extinction is the only possible conclusion!

Context: why to maintain LR (especially on farm/in garden)?

LR serve the interests and are already widely used by:

- Local communities (many references)
- Breeding and Participatory Plant Breeding

LR facilitate:

- Production & development of typical local products
- Development of new (e.g. environmentally friendly) farming systems based on ‘diverse’ varieties
- Development of local food supply systems
- Maintenance of local traditions and community identity

On farm/in garden:

- **they maintain** their adaptation to the local environment and, therefore,
- **their value as sources of genes for crop improvement,** particularly to adapt crops to the increasingly adverse environmental conditions resulting from **climate change**
Context: main difference between LR and wild species *in situ* conservation

Farmers (i.e. private citizens) are the main actors in on-farm conservation! While, for example, the conservation of a wild species in a PA is under the control of a Public Authority

By definition they are ‘commercial’ subjects who will grow what yields the highest economic return

Most farmers are *not* conservationists
European cooperation context:

**ECPGR In situ and On-farm Network**
www.ecpgr.cgiar.org/networks/in_situ_and_on_farm.html

- Includes two Working Groups:
  - In situ WG, Current membership: 35 European countries
  - On-farm WG, Current membership: 37 European countries
- 4 Meetings from the establishment (2000)
- Achievements:
  - Raising professional and public awareness
  - Specific projects:
    - **AEGRO:**
      - Methodologies for the identification of genetic reserves and on-farm conservation sites
      - **AEGRO / ECPGR In Situ and On-farm Conservation Network symposium, Madeira, Sept 2010, Proceedings published by CABI December 2011**
- **PGR Secure**
Aim
To research novel characterization techniques and conservation strategies for European crop wild relative and landrace diversity, as a means of enhancing crop improvement by breeders to ensure continued food security in the face of changing consumer demand and climate change.

Research themes
1. Novel characterization techniques
2. CWR and LR conservation
3. Improved breeders’ use
4. Informatics
PGR Secure: main objectives for LR on farm conservation

- To systematically inventory LR diversity
- Match *in situ* inventoried LR diversity against *ex situ* conserved diversity and identify gaps in conserved LR diversity (Maxted et al., 2008)
- Ensure LR diversity is made available to breeders to benefit national agriculture and ensure food security
- To maintain LR diversity *in situ*, stimulating their direct use in:
  - organic & low input agriculture,
  - niche market promotion,
  - home gardens,
  - community gardens in urban agriculture
- Identify perverse & positive incentives to LR maintenance
- Develop an information system on LR location to monitor them across years
PGR Secure aims to

- To carry out a National (and European) LR inventory for all crops (but focus on Avena, Beta, Brassica, Medicago)
- To draw exemplar national (i.e. British, Finnish & Italian) LR conservation strategies for all crops
- To draw a European LR conservation strategy for Avena, Beta, Brassica and Medicago gene pools
- To draw a generic European LR conservation strategy

The contribution of all European countries is asked!
PGR Secure present achievements:

- **Increased capacities:**
  - *NIFP LR training workshop* (Palanga, LT)
  - Assistance made available through the *PGR Secure helpdesk* (several documents & useful links)

- **Tools to facilitate LR inventorying prepared:**
  - *LR Descriptors*
  - *MS database for in situ LR data recording*  
    *(available from [www.pgrsecure.org](http://www.pgrsecure.org) and CD-ROM)*

- **LR knowledge and awareness raised**
PGR Secure: towards a European LR on farm conservation strategy - Challenges

Countries use different LR definitions

Different countries focus on different end users (e.g. S.&N. Europe: farmers, C. Europe: breeders)

In situ maintained LR identification (differential characterization, which is costly and time consuming, needed to distinguish between a LR and other materials)

Ex situ maintained LR identification (i.e. country of origin is not necessarily the country where LR was originally developed, LR name is not always a reliable indicator)

Commercial sensitivity and possible legal repercussions over unregistered varieties

Insufficient time and resources for development of National LR Strategies

LR maintained for numerous complex reasons, lack of in situ conservation examples

Lack of scientific understanding of how LR diversity evolves under in situ managements

Focus: (a) on LR per se, (b) on the agro-ecosystems, or (c) LR maintainers?

These challenges are not insurmountable! Lessons learned from PGR Secure national LR studies will inform future conservation and use, as well as highlight future research
PGR Secure: National LR conservation strategies – present achievements

- **Finland**
  - Widely (different media) advertised LR search
  - National inventory of LR apple, pear, cereals and potato onion on-going
  - Morpho-pysiol-genetic characterization on going
  - Gap analysis completed with apples, pears and cereals

- **Italy**
  - has already drawn *Guidelines for LR on farm conservation*
    [http://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/ID](http://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/ID)
  - The *Guidelines’* implementation is in progress in several Italian Regions
  - The *First national inventory of in situ maintained LR* is completed (available in CD-ROM): 2365 LR (4806accs), belonging to 329 different spp
  - Gap analysis almost completed
  - Many LR already characterised (morpho-pysiol-genetic traits)

- **UK**
  - Science and Advice for Scottish Agriculture (SASA) established the *Scottish LR Protection Scheme* (2006)
  - But the LR number and location is still largely unknown
INVENTORYING: field/bibliographic DATA RECORDING +
(Public Authorities)

IDENTITY, ORIGIN & THREAT ASSESSMENT
(Public Authorities)

ENTERING into the PROTECTION SCHEMES
(promoted by Public Authorities)

GAP Analysis

Direct use PPB
ON FARM/IN GARDEN CONSERVATION
(FARMER CONSERVATION NETWORK)

Breeder use
EX SITU CONSERVATION
(Public Authorities)

complementarity
PGR Secure: Towards a European strategy for LR on farm conservation

Already clear that it has to pick up common elements from national strategies, while being respectful of the differential elements of each country.

Already identified key elements:

1. The need that Public Authorities promote on farm conservation
2. The objectives of on-farm conservation are different depending on the country:
   - Maintenance of extant LR
   - Reintroduction of LR
   - Introduction of LR/other variable pops
   - + holistic approach
3. The need of *ex situ* complementary safeguard of extant LR (Italy: most of extant LR are not safely duplicated *ex situ*)
4. How to assess genetic erosion & extinction risks on farm
5. The European seed legislation context as a favourable context to facilitate LR use in agriculture

Will Identify (among others):

1. areas where there is a request/interest for the maintenance/reintroduction/introduction of LR
2. needs of future research
PGR Secure: towards a European strategy
- Assessment of genetic erosion and extinction risks

Through useful indicators such as (for each LR):

A. Existence of the LR product in the market;

B. Presence of LR in catalogues of seed companies/nurseries;

C. Numbers of farmers/home gardeners cultivating LR;

D. Cultivated areas of the LR in comparison with the total regional areas for that crops;

E. Trend of new cultivation areas for the LR.

Each indicator can be associated to different risk conditions and each risk condition estimated by a score (e.g. 1 = low; 2 = medium; 3 = high).

A similar system is already efficiently used by the Italian regions.
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<tr>
<th>Indicators</th>
<th>Description</th>
<th>Risk level</th>
<th>Score</th>
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| **A** Presence of the LR product on the market | - Markets and/or producer’s cooperatives  
- Sector: main variety in a certain DOC, DOP, IGP, IGT certified production  
- Niche market: locally limited cultivated areas  
- Only some fruits/few seeds available for consumption or research  
- No product on the market | Low | 1 |
| | | Medium | 2 |
| | | High | 3 |
| **B** LR Presence in the catalogues of the seed companies/nurseries | - Fruits: presence in variety list A, B and C  
- Vegetables and plants: listed in the national register of varieties  
- Grapevine: listed in the regional register  
- Grapevine: under registration to regional register  
- Propagation materials available by a few nurseries | Low | 1 |
| | | Medium | 2 |
| | | High | 3 |
| **C** Number of farmers cultivating the LR | >100 | Low | 1 |
| | 30÷100 | Medium | 2 |
| | <30 | High | 3 |
| **D** LR Area under cultivation (as percentage on the total regional amount for the species) | >5 % | Low | 1 |
| | 1÷5 % | Medium | 2 |
| | <1%  
- Isolated plants or home garden cultivations | High | 3 |
| **E** New LR dedicated area trend | - New areas dedicated to landrace present | Low | 1 |
| | - No new areas dedicated to landrace present | High | 3 |

**Sum of different value**  
\[ \sum \leq 9 \rightarrow \text{LOW RISK} \]  
\[ = 10-13 \rightarrow \text{MEDIUM RISK} \]  
\[ \geq 14 \rightarrow \text{HIGH RISK} \]
**PGR Secure:** towards a European strategy - the EU Seed Legislation on Conservation Varieties

  - is an opportunity to:
    - Clearly link a LR to its own territory & farmers
    - Facilitate
      - LR use by farmers and on farm conservation
      - Commercialisation of LR products as ‘typical’ products
    - Develop purposely dedicated seed commercialisation business
  - The registration should be strongly promoted by Public Authorities (Spataro & Negri, 2013)

- The new EU seed legislation will possibly loosen present restrictions (?)
General European LR onfarm conservation strategy_ key element to promote use: informative systems connected each other

EUROPEAN INFORMATIVE SYSTEM, at present, at least, it could be recommended the different National & European databases (Common Register incl.)
PGR Secure: towards a European strategy for LR on farm conservation – Most Appropriate Areas

Beside LR on farm conservation per se approach, there is a holistic approach to on farm conservation (can be complementary)

LR and diverse agro-ecosystems (holistic approach)

Areas where, beside that of the farmers, there is the community interest in the maintenance / re-introduction of LR & diverse agro-ecosystems (Most Appropriate Areas) (MAA)

LR per se

Areas where there is the interest of farmers to maintain/re/introduce LR
Areas rich in agro-biodiversity: criteria to be taken into account (method presently being tested on the Italian country area)

Subdivide the country area in subareas, and progressively and restrictively use the following criteria:

C1. Number and diversity of LRs
C2. Agro-ecosystem diversity (Corine used as a proxy)
C3. Presence of protected areas
C4. Presence of CWRs in the area

Step 1_Select:
- Areas including PA

Step 2_Select:
- Areas including CWR

Step 3_Select:
- Areas with high LR diversity

Step 4_Select:
- Areas with highest agroecosystem diversity

Within:
- Total country area

MAAs: proposed to the National or Regional authorities as areas where to set or enhance political and economic actions in favour of LR and agrobiodiversity conservation.
General European LR onfarm conservation strategy key element to promote use: build up a network of MAAs

Network of MAAs
PGR Secure: other anticipated results for LR

- Partial Europe LR inventory

- ECPGR *In Situ* Network work to develop coherent European and national strategies for LR conservation and use

- Breeders working interactively with agrobiodiversity conservationists

- Strengthen linkage between agrobiodiversity conservationists and breeder communities

- Information systems such as EURISCO containing patchy LR data
We hope that what is being developed in PGR secure could lead to an effective on-farm conservation of LR.

Thank you for your attention.