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Farmer's Pride

Networking, partnerships and tools to enhance *in situ* conservation of European plant genetic resources

Practice abstracts

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Practice abstract 1

Doubling the genetic diversity available to users: implementing *in situ* plant genetic resources conservation in Europe

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Plant genetic resources (PGR) are the genetic material of plants which is of value as a resource for present and future generations of people. The two core components of PGR are crop wild relatives (the wild taxa most closely related to crops), and crop landraces (the local varieties of crops maintained by seed-saving generation after generation). Both can contribute useful adaptive traits to crops, and landraces are also valued for their adaptations to local environmental conditions, as well as culinary and heritage uses. However, both types of PGR are threatened by loss of genetic diversity, and even extinction. Two strategies are applied to conserve PGR: *in situ* (on-site, either in the wild or in cultivation) and *ex situ* (off-site)—however, 99% of current PGR conservation activities are *ex situ* in genebanks, while *in situ* conservation is minimal and *ad hoc*. Meanwhile, plant breeders and farmers require far greater diversity to address the challenges posed by climate change—particularly to sources of traits adapted to abiotic and biotic stresses. Our objective is to establish a permanent network of *in situ* sites, populations and stakeholders to maximize the PGR diversity conserved and accessible for use. The network builds on existing regional, national and local networks, and relevant initiatives and policies. We encourage all stakeholders to join our network for the food, nutrition and economic security of future generations.

To find out more, visit: farmerspride/network/

Practice abstract 2

Maintenance of landrace identity and within-landrace genetic diversity

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Maintenance of landrace identity and within-landrace genetic diversity (populations retain external distinction and internal diversity across time) is of fundamental importance for *in situ* conservation. According to literature and novel evidence, ten 'key propagation management elements' help farmers maintain crop distinction and diversity in their fields:

Selection

1. Seed or propagation materials are collected from typical **mother plants** showing characteristic traits.
2. Seed is collected from **fruits** showing characteristic traits.
3. **Seed** showing characteristic traits for the landrace is used.

Field isolation (avoids undesired cross-pollination)

4. **Spatial**: based on distancing between varieties/landraces.
5. **Mechanical**: involves isolating a landrace plot or plants, often using anti-insect nets and removing other varieties/landraces nearby.
6. **Temporal**: exploits different flowering times of different landraces of the same species.

Plant

7. **Number of cultivated plants**: when adequate, this strongly reduces loss of diversity.
8. **Cultivated area**: cultivated across a wide area ensuring high numbers of plants grow which reduces diversity loss.

Farmers

9. **Material exchange** among farmers can positively impact conserved diversity.
10. **Number cultivating the resource.** Larger maintainer numbers for landraces positively impacts diversity.

For more information, see: farmerspride/wp-content/uploads/sites/19/2020/09/D2.4_In_situ_landrace_propagation_management_guidelines.pdf

Practice abstract 2

Conservazione della identità e diversità genetica delle varietà locali

Lorenzo Raggi, Leonardo Caproni and Valeria Negri

La conservazione della identità genetica e della diversità genetica (ovvero della caratterista per cui non tutte le piante di una certa varietà locale sono identiche le une alle altre) è di importanza fondamentale per la conservazione in situ. Sulla scorta dei dati disponibili in letteratura e nuove evidenze sono stati identificati 10 punti chiave utili per aiutare gli agricoltori a gestione la diversità delle varietà locali che coltivano.

Selezione

1. Il seme, o i materiali di propagazione, ottenuti da **piante madri** che mostrano i caratteri della varietà locale.
2. Il seme è ottenuto da **frutti** che mostrano i caratteri della varietà locale.
3. **Il seme (nel significato comune della parola)** mostra i caratteri della varietà locale.

Isolamento (per evitare incroci indesiderati con alter varietà della stessa specie)

4. **Spaziale**, basata su adeguato distanziamento tra le piante.
5. **Meccanico**, basato sull'uso di reti anti insetto o eliminando piante di varietà diverse nelle vicinanze.
6. **Temporale**, sfrutta le differenze nell'epoca di fioritura tra varietà diverse della stessa specie.

Pianta

7. **Numero di piante allevate**, quando elevato riduce possibili perdite di diversità genetica.
8. **Area destinata alla coltivazione**, quando elevata contribuisce a ridurre possibili perdite di diversità genetica.

Agricoltori

9. **Scambio di seme tra gli agricoltori,** può avere un effetto positivo sulla diversità conservata.
10. **Numero di agricoltori che coltivano la varietà locale,** quando sufficientemente elevato può avere un effetto positivo sulla diversità conservata.

Per maggiori informazioni, visita: farmerspride/wp-content/uploads/sites/19/2020/09/D2.4_In_situ_landrace_propagation_management_guidelines.pdf

Practice abstract 3

Crop Wild Relative Population Management Guidelines

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In situ conservation of crop wild relatives (CWR) needs urgent implementation at a global scale to ensure that genetic diversity critical for crop adaptation to climate change is available for use. However, so far, there is little experience of CWR population management that efficiently conserves genetic diversity long term. The 'CWR Population Management Guidelines' were produced to close this gap. The guidelines, which are targeted at protected area (PA) and other site managers, provide information on the preparation of a CWR site/population management plan, including: i) site description and definition of the management units; ii) location and characterization of target CWR populations; iii) habitat characterization and existing threats; iv) management objectives; v) prescriptions; vi) work plan; and vii) monitoring and evaluation plans. The guidelines also provide useful information on the specific management aspects to consider depending on whether the populations are being conserved inside or outside PAs. Furthermore, they present a management approach to address climate change and the different techniques that can be applied. Finally, the various ways in which *in situ* and *ex situ* conservation of CWR can be linked to their use are presented. This is an important management practice since the purpose of CWR conservation is for their use in crop improvement.

For more information, visit: cwrpopulation-toolkit.cropwildrelatives.org

Practice abstract 3

Guía para la gestion de poblaciones de parientes silvestres de los cultivos

José Iriondo, Joana Magos Brehm, Ehsan Dulloo and Nigel Maxted

La conservación *in situ* de parientes silvestres de los cultivos (PSC) debe aplicarse con urgencia para asegurar el mantenimiento de la diversidad genética necesaria para la adaptación de los cultivos al cambio climático. Sin embargo, existe una escasa experiencia acumulada sobre cómo se deben gestionar las poblaciones de los PSC para conservar eficazmente su diversidad genética a largo plazo. Esta guía, dirigida a gestores de espacios protegidos (EP) y de otros lugares proporciona información sobre la preparación de un plan de gestión de una población de PSC incluyendo: i) descripción del lugar y definición de las unidades de gestión; ii) localización y caracterización de las poblaciones PSC objetivo; iii) caracterización del hábitat y amenazas existentes; iv) objetivos de gestión; v) prescripciones; vi) plan de trabajo y vi) planes de seguimiento y evaluación. La guía también proporciona información útil sobre los aspectos de gestión a considerar dependiendo de si las poblaciones se conservan dentro o fuera de un EP. Además, proporciona recomendaciones de gestión destinadas a afrontar los problemas asociados al cambio climático y diferentes técnicas que se pueden aplicar. Finalmente, también se presentan las diversas maneras en las que la conservación *in situ* y *ex situ* de PSC pueden conectarse con su uso. Esto constituye un elemento importante de la práctica de gestión dado que el propósito de la conservación de PSC es su utilización en la mejora de los cultivos.

Para más información, visita: cwrpopulation-toolkit.cropwildrelatives.org/

Practice abstract 4

Getting incentives right? Support mechanisms for effective conservation and use of landraces in Europe and public willingness to pay

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Given that agrobiodiversity is associated with a range of important but poorly quantified public good ecosystem services, its conservation requires public support. Farmer's Pride surveys designed to determine the general public's willingness-to-pay (WTP) for wheat landrace conservation in Europe (demand-side), as well as to assess the willingness of farmers to participate in on-farm conservation (supply-side), reveal that estimated conservation costs (€1.8m–€33m p.a.) are well within the general public's willingness to pay (€80.2m p.a.), resulting in a high benefit-cost ratio (2.4–44.6). Yet while formal support schemes under the CAP exist for animal genetic resources, at best only *ad hoc* ones exist for landraces and these can fail to cover farmer stated opportunity costs. National policymakers urgently need to explore mechanisms through the CAP and/or their national policies to systematically support the on-farm conservation of Europe's agricultural heritage of landraces of wheat and other crops; thereby improving the alignment of agrobiodiversity conservation funding with EU citizens' preferences. Furthermore, given the high heterogeneity in farmers' WTA compensation for participating in public good conservation activities—including across different landraces, the use of conservation tender mechanisms has high potential for improving cost-effectiveness and social equity, given that savings relative to current uniform payments approaches could be significant (21–60%).

For more information, visit: farmerspride/key-documents/policy-documents/

Practice abstract 5

Concept for a possible extension of EURISCO for *in situ* plant genetic resources data

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The European Search Catalogue for Plant Genetic Resources (EURISCO – eurisco.ipk-gatersleben.de/) is a catalogue for plant genetic resources (PGR) held in genebanks in Europe. It is composed of National Inventories from 43 member countries, and includes more than two million *ex situ* accessions (population samples) stored by over 400 institutes, comprising > 6,700 genera and > 45,000 species. The included descriptive data are based on the Multi-Crop Passport Descriptors format (bioversityinternational.org/e-library/publications/detail/faobioversity-multi-crop-passport-descriptors-v21-mcpd-v21/). It is now widely recognized that plant breeders and other PGR users cannot access sufficient genetic diversity from *ex situ* collections alone and there are growing calls for access to plant material conserved *in situ* (on-site, either in the wild or in cultivation). Due to the fundamental differences in the context of *in situ* conservation, we envisage that the development of two separate exchange formats for the management of data associated with *in situ* populations of crop wild relatives (CWR) and crop landraces will be required. Two descriptor lists (data standards) have been published, largely based on the existing MCPD descriptors but including five additional descriptors for the management of data associated with *in situ* populations of CWR and four for *in situ* populations of landraces.

For more information, see: farmerspride/wp-content/uploads/sites/19/2020/10/D2.5_EURISCO_in_situ_extension_concept.pdf

Practice abstract 5

Konzept für eine mögliche Verlängerung von EURISCO für in situ pflanzengenetische Ressourcendaten

Stephan Weise, Stefanie Kreide and Nigel Maxted

Der Europäische Suchkatalog für pflanzengenetische Ressourcen (EURISCO - eurisco.ipk-gatersleben.de/) ist ein Katalog für pflanzengenetische Ressourcen (PGR) in Genbanken in Europa. Es besteht aus nationalen Inventaren aus 43 Mitgliedsländern und umfasst mehr als zwei Millionen ex situ-Akzessionen (Populationsproben), die von über 400 Instituten gespeichert werden, die > 6.700 Gattungen und > 45.000 Arten umfassen. Die enthaltenen deskriptiven Daten basieren auf dem Format Multi-Crop Passport Descriptors (bioversityinternational.org/e-library/publications/detail/faobioversity-multi-crop-passport-descriptors-v21-mcpd-v21/). Es ist mittlerweile allgemein anerkannt, dass Pflanzenzüchter und andere PGR-Anwender allein aus Ex-situ-Sammlungen nicht auf ausreichende genetische Vielfalt zugreifen können, und es werden zunehmend Forderungen nach Zugang zu in situ konserviertem Pflanzenmaterial (vor Ort, entweder in freier Wildbahn oder in Kultur) gestellt. Aufgrund der grundlegenden Unterschiede im Kontext der in situ-Erhaltung sehen wir die Entwicklung zweier separater Austauschformate für das Management von Daten zu in situ-Populationen von Kulturpflanzenwildverwandten (CWR) und Ackerlandrassen erforderlich. Es wurden zwei Deskriptorenlisten (Datenstandards) veröffentlicht, die größtenteils auf den bestehenden MCPD-Deskriptoren basieren, jedoch fünf zusätzliche Deskriptoren für das Management von Daten im Zusammenhang mit in situ-Populationen von CWR und vier für in situ-Populationen von Landrassen enthalten.

Weitere Informationen finden, Sie unter: farmerspride/wp-content/uploads/sites/19/2020/10/D2.5_EURISCO_in_situ_extension_concept.pdf

Practice Abstract 6

Developing network models: Analyzing the development of four community seedbank showcases and comparison with formal sector gene banks

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Community seedbanks (CSBs) have been developed throughout Europe since the 1980s, to put PGR conservation and use directly in stakeholders hands' and conserve the resource for future generations. In Farmer's Pride CSB structure and development in four different countries been analyzed to inform CSB coordinators, decision-makers and genebank managers. The analysis shows development is associated with different internal and external factors, such as organizational, membership and funding structure, commercial orientation, political commitment, and the national legal environment. The advantages of CSBs in a national conservation context were also analyzed and shown to complement national and state-funded genebanks. CSBs strength is in regional outreach to the wider population, direct stakeholder engagement, reintroduction of PGR into diverse agroecosystems and awareness raising, while more formal genebanks have the advanced facilities for backup, supportive quality assurance and know-how transfer. Concrete examples how CSBs describe the PGR they manage and better document the exchange, transfer and traceability of the varieties maintained. Working in collaboration and monitoring PGR as described should allow for the greatest possible dynamics of PGR management and effectively record the various activities of the CSB network members.

For more information, see: farmerspride/wp-content/uploads/sites/19/2021/07/D2.3_Community_seedbank_management_guidelines.pdf

Practice abstract 7

Another look at plant genetic resources conservation and use linkage

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A key aim of plant genetic resources (PGR) conservation is to maximize the available genetic diversity for the user community (e.g. plant breeders, farmers and researchers) to underpin crop improvement. This can most effectively be achieved by a combination of complementary *in situ* (on-site, either in the wild or in cultivation) and *ex situ* (off-site) conservation activities, but this assumes equal access to the conserved resource. Experience has shown direct access by users to PGR populations conserved *in situ* is not practical—therefore, the logical alternative is via genebanks and their tried tested protocols for facilitate access to material using material transfer agreements (MTAs). However, the question arises how to facilitate access to *in situ* conserved material via genebanks that respect the rights of the *in situ* PGR maintainer and avoid significant additional workload for genebanks? Four options are proposed:

1. All *in situ* conserved populations are treated like normal *ex situ* samples;
2. All *in situ* conserved populations are backed-up in genebanks using the black box protocol (i.e., not made available to users);
3. *In situ* conserved populations are not made available routinely—only on request from a user; and
4. All *in situ* conserved populations are treated like normal *ex situ* samples but not regenerated – when germination levels fall, fresh samples are collected.

The preferred option to maximize the conservation and availability of genetic diversity is Option 4.