DEVELOPING A EUROPEAN CROP WILD RELATIVE CONSERVATION STRATEGY

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OVERVIEW

- Define crop wild relatives (CWR)
- Review the number of CWR species
- Outline a strategy for CWR conservation in Europe
A crop wild relative is a wild plant taxon that has an indirect use derived from its relatively close genetic relationship to a crop; this relationship is defined in terms of the CWR belonging to gene pools 1 or 2, or taxon groups 1 to 4 of the crop.

Crops can be broadly defined as any cultivated species, including:
- Food, fodder and forage
- Medicinal plants and condiments
- Ornamental and forestry species
- Industrial crops (e.g., oils and fibres)

CWR = all taxa within the same genus as a crop

Maxted et al. 2006
HOW MANY CWR SPECIES ARE THERE?

- Global number of CWR species: > 58,000
- CWR native to Europe: > 15,000
- CWR endemic to Europe: > 8,000
- CWR native to Lithuania: > 1,000

Kell et al. 2005, 2008; Maxted and Kell 2009
HOW ARE WE GOING TO CONSERVE THEM?

- Measures need to be put in place for the systematic conservation of priority CWR *in situ* (within and outside protected areas), and *ex situ* (in genebanks).

- We can achieve this using two broad approaches:
  
  **Floristic**
  conservation of the CWR flora of a defined geographical region (usually a country)

  **Monographic**
  conservation of a defined taxon or taxonomic group (e.g., a species or a crop gene pool)

- Both approaches conclude with CWR diversity being actively conserved *in situ* in genetic reserves and *ex situ* in genebanks.

Maxted *et al.* 2011
A SYSTEMATIC APPROACH FOR EUROPE

Use floristic and monographic approaches combined

Floristic
National CWR conservation strategies

Monographic
Regional CWR conservation strategies for high priority crop gene pools

Systematic conservation of priority European CWR
FLORISTIC APPROACH
NATIONAL CWR CONSERVATION STRATEGY

1. National CWR inventory
2. Taxon prioritization
3. Diversity and gap analysis
4. Conservation planning
5. Active in situ and ex situ conservation
FLORISTIC APPROACH

NATIONAL CWR CONSERVATION STRATEGY

- The objective is to maximize the conservation of the taxonomic and genetic diversity of the country’s CWR flora
- Diversity and gap analysis leads to identification of complementary priority conservation actions
- Genetic reserves established within existing national PAs (or new reserves established if necessary)
- Germplasm collection and conservation in *ex situ* collections

National strategies have been developed in a number of European countries; including the UK, Ireland, Portugal, Switzerland and Germany
EXAMPLE OF THE FLORISTIC APPROACH
CWR CONSERVATION STRATEGY FOR THE UK

NI developed from the CWR Catalogue for Europe and the Mediterranean [1863 spp.]

NI prioritized on the basis of threat status and economic value [250 spp.]

Diversity, gap and complementarity analysis of priority species

*In situ* and *ex situ* conservation recommendations to relevant stakeholders

UK PGRFA conservation strategy under development and a CWR GR is being established

Maxted *et al.* 2007
Selection of priority crops

- Food crops (important for nutrition and food security)
- Crops of economic value
- Crops with multiple use values
MONOGRAPHIC APPROACH

SELECTION OF PRIORITY CROP GENE POOLS

185 human food crop genera containing 5995 species native to Europe

19 priority genera [279 spp.] + 19 priority genera [207 spp.]

Highly economically important crops

Additional ITPGRFA Annex I crops

23 priority crops / crop groups; 486 spp.

Kell et al. 2011a
MONOGRAPHIC APPROACH

PRIORITY GENE POOL CONSERVATION STRATEGY

1 DELINEATE GENE POOL TAXA
- List taxa in gene pool
- List taxa within target area

2 SELECT TARGET TAXA [PRIORITIZATION]
- Utilization potential
- Relative threat

3 UNDERTAKE DIVERSITY ANALYSIS
- GIS analysis
- Genetic diversity analysis
- Complementarity analysis

4 SELECT TARGET SITES
- Gap analysis
- Climate change analysis
- Site suitability

IDENTIFY COMPLEMENTARY EX SITU CONSERVATION NEEDS

DEVELOP STRATEGY DOCUMENT FOR STAKEHOLDERS AND LOBBY FOR CONSERVATION ACTION

Kell et al. 2011b
The objective is to maximize the conservation of the genetic diversity of the gene pool.

Diversity and gap analysis leads to identification of complementary priority conservation actions.

Genetic reserves established within existing PAs (or new reserves established if necessary).

Germplasm collection and conservation in \textit{ex situ} collections.

In Europe, strategies have been developed for the oat, beet and brassica gene pools; further gene pool strategies to be developed by PGR Secure.
EXAMPLE OF THE MONOGRAPHIC APPROACH
BEET GENE POOL

1 DELINEATE GENE POOL TAXA
- 2 genera, 12 spp, 2 subsp
- 9 spp native to Europe

2 SELECT TARGET TAXA [PRIORITIZATION]
- All taxa have utilization potential
- 4 threatened spp, 1 threatened subsp

3 UNDERTAKE DIVERSITY ANALYSIS
- Novel GIS analysis (ELC)
- Existing genetic diversity studies

4 SELECT TARGET SITES
- Ecogeog. representation
- Unique genetic diversity
- Natura 2000 sites

IDENTIFY COMPLEMENTARY EX SITU CONSERVATION NEEDS

DEVELOP STRATEGY DOCUMENT FOR STAKEHOLDERS AND LOBBY FOR CONSERVATION ACTION

Kell et al. 2011b; Parra-Quijano et al. 2011
Aim to conserve maximum genetic diversity within and between populations of target taxa – choose sites that are most likely to represent this diversity based on results of the diversity analysis.

Widespread taxa should not be ignored – for example, *B. vulgaris subsp. maritima* is widespread but has traits linked to specific locations.

Select sites within existing protected areas where possible – however, a balance will have to be met between ecogeographic suitability of sites and feasibility.
EUROPEAN CWR CONSERVATION STRATEGY

GENERAL CONSIDERATIONS

- Establish multi-taxon reserves where possible
- Prioritize the selected sites on the basis of conservation of maximum genetic and/or taxonomic diversity
- Other factors to consider include land use, potential development pressures, level and quality of site management, legal status, potential conflict with existing site management aims and climate change
EUROPEAN CWR CONSERVATION STRATEGY
FROM PLANNING TO PRACTICE

- Draft quality standards for genetic reserves published
- How to conserve CWR populations outside of protected areas?
- Raising awareness of the importance of CWR and lobbying for action
- Who takes the responsibility for CWR conservation?
- Resources for monitoring and managing CWR populations
- Coordinating the national and regional strategies
SUMMARY

- Working definition of a CWR
- Many CWR species—need to prioritize
- A combined floristic and monographic approach is needed to conserve priority European CWR taxa
- Data analysis techniques available to identify priority CWR populations
- Need to lobby for action to establish CWR genetic reserves
- Increased efforts to collect and conserve germplasm *ex situ*
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REFERENCES


