In situ conservation and use of crop wild relatives in three ACP countries of the SADC Region

ROLE OF PREDICTIVE CHARACTERIZATION AND PRE-BREEDING ACTIVITIES IN THE DEVELOPMENT OF NATIONAL STRATEGIC ACTION PLANS

Joana Magos Brehm, Shelagh Kell, Nigel Maxted, Chikelu Mba, Mauricio Parra-Quijano, Imke Thormann, Ehsan Dulloo

Regional training workshop
Predictive characterization and pre-breeding of crop wild relatives
13-16 April 2015, Pretoria, South Africa
OVERVIEW

• National strategic action plans (NSAP) for the conservation and use of CWR
  » Aims and brief introduction
  » Specific objectives
  » How to produce a NSAP?
  » Examples

• Conservation linked to use

• Predictive characterization and pre-breeding in NSAP

• Structure of a NSAP

• Summary
To ensure appropriate conservation and sustainable use of CWR

» to prevent the loss of diversity
» to maximize their availability (e.g. for crop improvement)

CWR diversity conservation requires an integrated *in situ / ex situ* approach, best implemented via a National Strategic Action Plan (NSAP)

Governments are committed to ensure that conservation and sustainable use of PGR are a key element in the global efforts to alleviate poverty and increase food security and nutrition (CBD, ITPGRFA, Second GPA for PGRFA)
No single method of generation

Depends on:
- national context
  - availability of baseline data
  - existing policy framework
  - remit of the agencies that are responsible for formulating and implementing the NSAP
- financial and human resources for implementation

Follows a similar pattern in all countries:
- develops from an effective consultation process
- establishes a knowledge base
- analyzes conservation gaps
- identifies priorities
- plans and implements specific conservation actions

(GCRFA-15/15/Inf.24)
Specific Objectives of the NSAP

- To establish *ex situ* conservation priorities (which taxa to collect and where?)
- To recommend a network of conservation areas (*in situ*) that conserves CWR diversity
- To guide the monitoring of CWR diversity through time
- To promote the use of conserved diversity
NATIONAL STRATEGIC ACTION PLANS FOR THE CONSERVATION AND USE OF CWR

DEVELOPMENT

- National botanical diversity
- National/global crop diversity
- National CWR checklist
- Prioritization of CWR diversity for active conservation
- Taxonomic and ecogeographic diversity analysis of priority CWR
- Genetic diversity analysis of priority CWR
- Threat assessment of priority CWR
- In situ gap analysis
- Ex situ gap analysis
- Establishment of CWR conservation goals

POLICY ENVIRONMENT

- Integration with international legislation, strategies, habitat and species conservation plans

INTEGRATION WITH

- Integration with other national strategies, policies and schemes

IMPLEMENTATION

- Network of genetic reserves
- Systematic ex situ conservation
- Implementation of CWR conservation goals
- In situ actions
- Ex situ actions
- Conserved national (and global) CWR diversity

UTILISATION

- Traditional, general and professional utilisation
- Breeding activities
- Research and education

NATIONAL STRATEGIC ACTION PLAN
CWR DIVERSITY IN NORWAY

20 COMPLEMENTARY SITES to cover 201 priority CWR

Pink areas are PA (map is not a continuous representation of Norwegian mainland

Phillips et al. in prep.
Collection of CWR for ex situ conservation in Portugal

- Target taxa (16):
  

- Collect 5 ex situ accessions representing different ecogeographic conditions

CAPFITOGEN tools

Ecogeographic survey (taxonomy + phenology + occurrence data) → TesTable + GEOQUAL → SelecVar + subjective selection → ELC mapas → Representa → Selection of target populations for collecting

GCDT - Adapting agriculture to climate change: collecting, protecting and preparing CWR
# Collection of CWR for ex situ conservation in Portugal

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GLOBAL CWR CONSERVATION – ADAPTING AGRICULTURE TO CLIMATE CHANGE: COLLECTING, PROTECTING AND PREPARING CWR

Global Crop Diversity Trust + Millennium Seed Bank project with Norwegian Gov. funding (USD 50 milion)

1. 81 crop gene pools selected (1187 CWR)
2. Ecogeographic data collection (> 5.4 million records)
GLOBAL CWR CONSERVATION – ADAPTING AGRICULTURE TO CLIMATE CHANGE: COLLECTING, PROTECTING AND PREPARING CWR

4. Field collection (countries)
5. *Ex situ* storage (national genebanks, MSB, Svalbard)
6. Pre-breeding: prepare CWR for use in breeding crops for new climates
7. Evaluate them for useful traits
8. Make the resulting information widely available
WHERE TO CONSERVE PRIORITY CWR DIVERSITY?

71% of all taxa are in urgent need of collection and conservation in genebanks.

a. Species richness map
(Vincent et al., 2014)

b. Hotspots for *ex situ* seed collecting
(Castaneda Alvarez et al., 2014)

Collected hotspots for high priority species from all crop genebanks combined

Project: Adapting Agriculture to Climate Change: Collecting, protecting and preserving crop wild relatives
International Center for Tropical Agriculture (CIAT), Global Crop Trust Diversity (GCBT),
Millennium Seed Bank Partnership (Kew, University of Birmingham)

c. Hotspots for genetic reserve *in situ* conservation
(Vincent et al., 2014)
• CWR defined by their intrinsic potential to contribute novel traits for crop improvement

• **Conservation not the end goal!**

• SoW1 (FAO 1998): 35% of countries reported lack of C&E data which is a major constraint for germplasm use

• SoW2 (FAO 2010): ‘country reports were virtually unanimous in suggesting most significant obstacle for greater use of PGRFA is the lack of C&E data’

• Conventional C&E has failed to meet the demand
PROMOTING THE USE OF CONSERVED DIVERSITY

IN SITU STRATEGIC ACTIONS
EX SITU STRATEGIC ACTIONS

IMPLEMENTATION OF STRATEGIC ACTIONS

USER DEMANDS

CWR checklist
Prioritization
CWR inventory
Diversity analysis
Gap analysis

Predictive characterization

Breeding
Pre-breeding
Education
Traditional uses
Public awareness

Research

CONSERVATIONISTS (in situ managers, genebank curators...)

GERMLASM USERS (pre)breeders, etc)
PART 1: INTRODUCTION

- Leadership, stakeholders and endorsement
- Aims and specific objectives of the NSAP
- General methodology used

PART 2: UNDERSTANDING THE COUNTRY CONTEXT

- Constitutional, legal and institutional framework
- State of CWR conservation and use (threats, Red List, current status of in situ and ex situ conservation, current status of use...)

STRUCTURE OF THE NSAP
PART 3: CWR DIVERSITY ASSESSMENT AND PRIORITIZING FOR CONSERVATION

- CWR checklist
- Prioritizing for conservation
- CWR inventory
- Conservation assessment of prioritized CWR (diversity, gap and climate change analyses)

PART 4: POTENTIAL UTILIZATION OF CWR

- Current user demands
- Predictive characterization

PART 5: ACTION FOR THE FUTURE

- In situ and ex situ strategic actions
- Promoting the use of conserved diversity (pre-breeding, public awareness...)
- Implementation of the strategic actions (timeline, management responsibilities, financial and human resources)
PART 5: MONITORING AND INFORMATION MANAGEMENT

- Monitoring CWR diversity
- Information system

PART 6: DISCUSSION

- Methodology applied and strategy limitations
- Future research recommendations
- Towards regional integration and international collaboration
- Next NSAP iteration
SUMMARY

• NSAP are fundamental tools to effective conservation and sustainable use of CWR diversity

• No single method of producing NSAP but have common elements

• Predictive characterization helps prioritizing populations for (ex situ) conservation

• Pre-breeding uses conserved diversity by looking for desirables characteristics and preparing pre-breeding populations

• User demands help to determine priority species for conservation, predictive characterization and pre-breeding activities
SUMMARY

NATIONAL STRATEGIC ACTION PLANS FOR THE CONSERVATION AND USE OF CWR

- CONSERVATION
- PREDICTIVE CHARACTERIZATION
- PRE-BREEDING
- UTILIZATION
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