CWR conservation in the SADC region
Imke Thormann, Bioversity International

GERMINIATION seminar
Villa Delisle, S Pierre, Reunion, 18th –22th May 2015
Overview

Crop wild relatives – importance, definition, challenges

SADC Crop Wild Relatives project
• Regional training workshops
• Key outputs and collaborations

Wild Asparagus  Wild Coffea  Wild Sorghum
Global importance

CBD Strategic Plan for Biodiversity 2011 – 2020 (20 Aichi targets)

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.
Global Strategy for Plant Conservation 2011 – 2020 (16 targets)

**Target 9:** 70 % of the genetic diversity of crops including their **wild relatives** and other socio-economically valuable plant species conserved

**Target 1:** An online flora of all known plants = inventory of CWR

**Target 2:** An assessment of the conservation status of all known plant species as guide conservation action = conservation status of CWR
Global importance

Second Global Plan of Action for PGRFA 2011 (18 activities)

Activity 4: Promoting in situ conservation and management of crop wild relatives and wild food plants
Without carbon fertilization

If there are no beneficial effects from increased carbon dioxide, agricultural output declines almost everywhere and catastrophically closer to the equator.

(climate-induced percent change in agricultural productivity between 2003 and the 2080s)

Source: Cline (2007).

Note: NA refers to “not applicable” for Alaska and northern Canada, and to “not available” elsewhere.
Agricultural production will decrease by 2% each decade (IPCC 2014)

To feed the human population in 2050 we will require **food supplies to increase by 60% globally**, and 100% in developing countries (FAO, 2011)

Map 1

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Crop wild relatives (CWR)

Wild plant species closely related to crops, including wild ancestors

Broad definition
CWR = all taxa within the same genus as a crop

Narrow definition
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

http://www.cwrdiversity.org/checklist/

Beta maritima

Beta vulgaris (sugar beet)
Crop wild relatives (CWR)

Account for about 21% of the world’s flora (Maxted and Kell 2009)

Wide genetic diversity of adaptive traits

Indirect use as gene donors for crop improvement due to their relatively close genetic relationship to crops

Important socio-economic resource that offers novel genetic diversity required to maintain future food security
<table>
<thead>
<tr>
<th>Crop</th>
<th>CWR</th>
<th>Application(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley (Hordeum vulgare)</td>
<td><em>H. spontaneum</em></td>
<td>Drought and temperature tolerance</td>
</tr>
<tr>
<td>Sweet potato (Ipomoea batatas)</td>
<td><em>I. trifida</em></td>
<td>Root knot nematode and root lesion nematode resistance</td>
</tr>
<tr>
<td>Lettuce (Lactuca sativa)</td>
<td><em>L. serriola</em></td>
<td>Downy mildew resistance</td>
</tr>
<tr>
<td>Tomato (Lycopersicon esculentum)</td>
<td><em>L. virosa</em></td>
<td>Leaf aphid resistance</td>
</tr>
<tr>
<td></td>
<td><em>L. chilense</em></td>
<td>Resistance to blight, virus, leaf curl virus</td>
</tr>
<tr>
<td></td>
<td><em>L. chmielewskii</em></td>
<td>Resistance to disease</td>
</tr>
<tr>
<td></td>
<td><em>L. hirsutum</em></td>
<td>Resistance to disease</td>
</tr>
<tr>
<td></td>
<td><em>L. pimpinellifolium</em></td>
<td>Wilt causing fungus</td>
</tr>
<tr>
<td></td>
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<td>Quality control characters</td>
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<tr>
<td></td>
<td><em>L. pimpinellifolium</em></td>
<td>Fruit size and shape</td>
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<td></td>
<td></td>
<td>Disease resistance, early maturity, determinate growth habit, parthenocarpy,</td>
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<tr>
<td></td>
<td></td>
<td>soluble solids</td>
</tr>
<tr>
<td>Cassava (Manihot esculenta)</td>
<td><em>M. aesculifolia</em></td>
<td>Robustness</td>
</tr>
<tr>
<td></td>
<td><em>M. angustiloba</em></td>
<td>Drought tolerance</td>
</tr>
</tbody>
</table>

$115 \text{ billions toward increased crop yields per year}$ (Pimentel et al. 1997)

(Maxted and Kell 2009)
CWR - challenges

CWR are each expected to be affected by climate change and their agro-environment.

CWR like other wild species are threatened by the loss, degradation and fragmentation of their natural habitats and competition from alien species.

CWR are often located in disturbed habitats (e.g. field margins, forest edges and roadsides), that are not being conserved by ecosystem conservation agencies.
CWR - challenges

Found in existing PA but not monitored and actively managed

Very few examples of active *in situ* CWR conservation:

2 out of 10 CWR in Europe are threatened by extinction in the wild
(Kell *et al.* 2012)
CWR are largely uncharacterized, unevaluated and undervalued

Underrepresented in ex situ collections (< 10%; Maxted and Kell 2009)

Not taken into account in environmental policy planning

Lack of partnership between environment and agriculture which is key to address challenges

Sesamum alatum
‘In situ conservation and use of crop wild relatives in three ACP countries of the SADC region’ (short name - SADC Crop Wild Relatives) is a three-year project (2014-2016) co-funded by the European Union and implemented through the ACP-EU Co-operation Programme in Science and Technology (S&T II) by the ACP Group of States. Grant agreement no. FED/2013/330-210.
Project objectives

Overall objective

Enhance link between conservation and use of CWR in three ACP countries within the SADC region, as a means of underpinning regional food security and mitigating the predicted adverse impact of climate change.

Specific objectives

Enhance the scientific capacities within the partner countries to conserve CWR and identify useful potential traits for use to adapt to climate change.

Develop exemplar National Strategic Action Plans for the conservation and use of CWR in the face of the challenges of climate change across the SADC region.
Work packages

1: Improving national capacities in the three ACP countries of SADC region on conservation and use of CWR

2: Science, technology and innovation tools for in situ conservation and use of CWR are deployed and tested in three ACP countries of SADC

3: National Strategic Action Plans, supported by information systems, for on in situ conservation and use of priority CWR

4: Awareness raising among national policymakers

5: Project management and governance
Regional training workshop on *in situ* conservation of CWR and diversity assessment techniques

*Mauritius, November 2014*

**Topics**

Creation of CWR checklists and inventories

Prioritization of CWR for conservation

Conservation status and diversity assessment of priority CWR

Plans for implementation of conservation priorities

Relevant policy for the conservation of CWR
Regional training workshop on predictive characterization and pre-breeding

Pretoria, South Africa, April 2015

Topics

Application of eco-geography in PGR
Predictive characterization of a selected CWR for a specific trait
Use of CAPFITGEN tools
Definition and application of pre-breeding
Genebank operations critical to pre-breeding programmes
Principles for parental selection and the generation and management of variation

⇒ outline actions that promote the use of CWR diversity for inclusion into National Strategic Plan for the conservation and use of CWR
Capacity Building

Improving national capacities in the three ACP countries of SADC region on conservation and use of CWR

Lead partner: Biodiversity International

Expected results: National capacities in the three ACP countries on conservation and use of CWR of SADC region are improved.

Content: This work package will first involve a study to assess the existing capacities of different stakeholders including ministries of agriculture, environment, land use planning and forestry, national and regional universities, protected area agencies, nature conservation organizations, breeders, farmer communities and other stakeholders to conserve and use CWRs at local, national and regional levels. This action will enable the identification of specific capacity-building needs of the stakeholders and will help develop the training curriculum necessary to strengthen the capacities of the target groups.

Based on the findings of the needs assessment exercise, two tailor-made thematic regional training workshops will be carried out. The first regional training workshop will focus on in situ conservation of crop wild relatives and will take place in Mauritius in November 2014. The second regional training workshop will take place in South Africa in April 2015 and focus on predictive characterization and pre-breeding.

After the regional training has taken place, the project will support the three partner countries to put into practice the knowledge gained from the training courses through on-the-job training in the teams’ home countries, for greater cost efficiency and impact on national crop improvement programmes.

Activities

1.1: Conduct a needs assessment of the capacity of stakeholders in the conservation and use of CWR

1.2: Conduct two thematic regional training workshops on in situ conservation and use of CWR, based on identified capacity building needs

1.3: Support on-the-job training in the three ACP countries

http://www.cropwildrelatives.org/sadc-cwr-project/
Key outputs

Capacity of at least 30 people from SADC Member States in *in situ* conservation and use of CWR has improved by the end of project.

An interactive toolkit for conservation of CWR published and shared.

Detailed checklist and inventory of CWR in each of the three partner countries.

Regional assessment of CWR within SADC region.

Three National Strategic Actions plans (NSAP) for CWR conservation and use.
Collaborations and synergies

GERMINATION project:

- Supported the participation of two members at workshop in Mauritius

FAO: Interactive toolkit and NSAP development based on resources developed by FAO

- Resource Book for the Preparation of National Plans for Conservation of Crop Wild Relatives and Landraces
- Guidelines for the developing a national strategy for PGRFA

SADC Plant Genetic Resources Centre

NSAP: will feed into NBSAPs, GSPC, FAO country reports, GPA reporting
Thank you

www.bioversityinternational.org