

Conservation planning for priority crop wild relatives in the SADC region

Project Overview

Crop wild relatives (CWR) are plant species that are related to cultivated crops. They include the ancestors of cultivated crops.

CWR are a critical source of genes for resistance to diseases, pests and stresses such as drought and extreme temperatures that can be used in plant breeding, with the potential to enhance sustainable food security in the face of challenges such as climate change and population growth.

CWR can be found in all types of habitats. They are often vulnerable and require urgent conservation, but are not commonly included in national conservation programmes. The ACP-EU supported SADC CWR Project, implemented in Mauritius, South Africa and Zambia, aims to enhance the *in situ* conservation of CWR by developing capacity in the SADC region to conserve and sustainably utilize CWR for climate change adaptation and to persuade governments to endorse national strategies and implement an action plan for the effective conservation of crop wild relatives.

In addition, the project has analyzed CWR diversity at regional level and identified conservation priorities to support the development of a regional CWR conservation and use strategy.



Sesamum alatum, a wild relative of sesame seed (*S. indicum*) native to the SADC region which has potential to confer resistance to a number of diseases in the crop. Credit: SANBI

CWR diversity in the SADC region

The SADC region is important for its diversity of wild relatives of a number of food and beverage crops of particular food security and/or economic value in the region – including coffee, cottonseed oil, cowpea, eggplant, millets, pigeonpea, rice, sorghum and watermelon.

Among the more than 700 wild relatives of food and beverage crops found in the region, 113 have been prioritized for immediate conservation action based on the regional food security and economic value of the crops to which they are related, and their potential for utilization in crop improvement programmes (Figure 1).

Some of these crops are also of particular global value in terms of their direct contribution to food security in other regions – notably millets, rice and sorghum. Hotspots of these priority CWR were identified in Madagascar, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe (Figure 2).



Oryza longistaminata, a close wild relative of rice, *O. sativa* and African rice, *O. glaberrima* native to the SADC region which has been used to improve yield and to confer drought tolerance and resistance to a number of diseases in the crops. Credit: ZARI

Conservation status of priority CWR

Conservation gap analyses were undertaken for 110 of the priority wild relatives for which occurrence records were available. The SADC region's important CWR diversity is poorly conserved both *ex situ* and *in situ*.

Fifty-five (50%) of the priority wild relatives analysed are not conserved *ex situ* at all and of the 55 that are found in *ex situ* collections, 22 are represented by less than five populations and nine by only one, indicating that an inadequate range of genetic diversity is conserved. Nineteen (17%) do not occur within any protected area in the region, including

wild relatives of coffee (4 taxa), millets (4), cowpea (2), brassicas (1), cottonseed oil (1), eggplant (1), rice (1), safflower seed (1), shea oil (1), sugarcane (1), sunflower seed (1), sweet potato (1), and winged bean (1). While 90 priority CWR do occur in protected areas, these populations are not monitored or actively managed and need to be incorporated into the site management plans.

Projected impact of climate change on priority CWR

The impact of climate change on CWR distribution and richness across the region was evaluated for 75 priority wild relatives (for which stable distribution models could be generated) using

projected 2050 climatic conditions for two CO₂ concentration pathways: RCP4.5 (an intermediate projection of an average increase across 19 general circulation models in annual mean temperature of 2.06 °C for the SADC region for 2050 relative to 1960–1990); and RCP8.5 (a high greenhouse gas emission scenario indicating an average increase of 2.55 °C for the same period and region).

Forty-four (59%) are predicted to be negatively affected (potential distribution area lost is higher than area gained) in both scenarios, four (5%) to be negatively impacted in at least one scenario, and 27 (36%) to be positively affected (area gained is higher than area lost) in both scenarios. For example, one wild relative

Figure 1. Number of regional priority wild relatives of crops selected on the basis of their particular food security and/or economic value in the region.

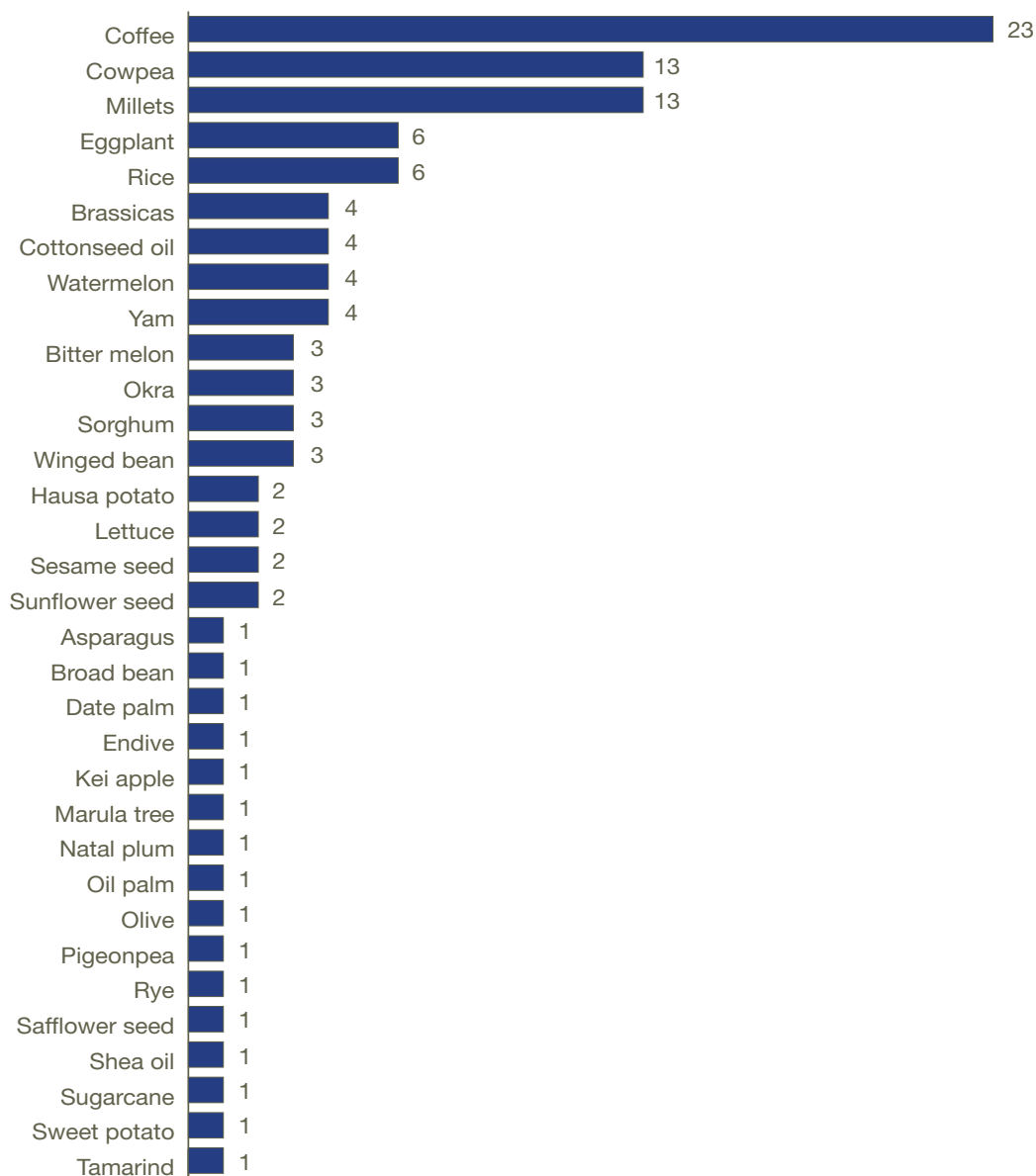
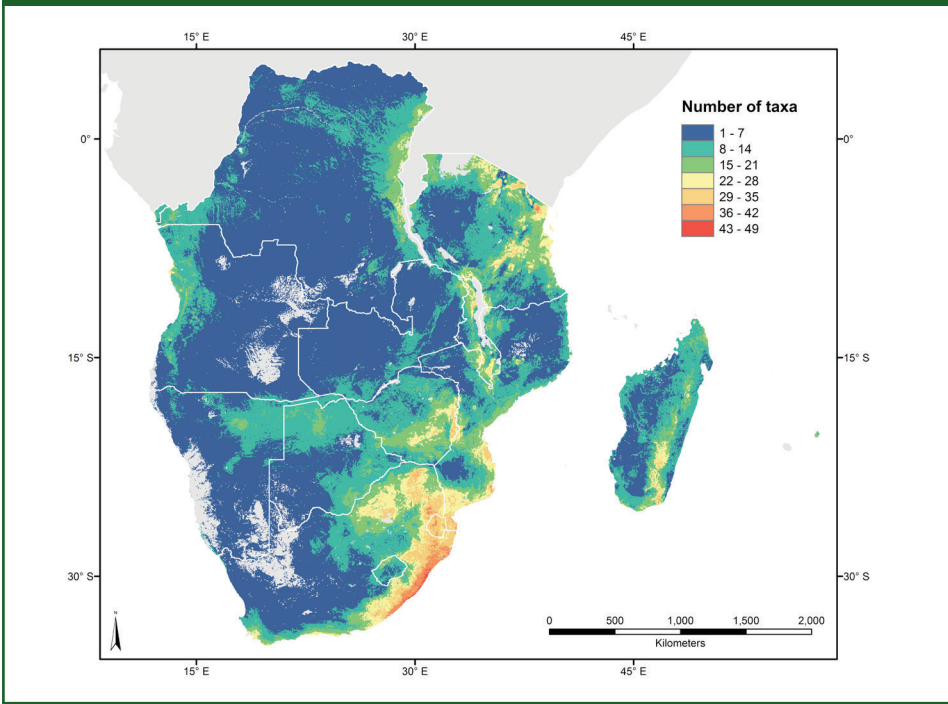


Figure 2. Modelled priority CWR richness in the SADC region under the current climate.



of cowpea (*Vigna keraudrenii*) is estimated to lose 93% of its area in the intermediate scenario (RCP4.5) and 99% in the more extreme scenario (RCP8.5), while a coffee wild relative (*Coffea congensis*) is predicted to gain 94% and 119% in range in the intermediate (RCP4.5) and the extreme (RCP8.5) scenarios, respectively.

Priority CWR taxon richness is also predicted to be affected by climate change in the region and varies from country to country. Seychelles is the country that will lose more priority CWR (five in both scenarios), together with Mauritius (three in RCP4.5 and five in RCP8.5) and Zimbabwe (four in RCP4.5).

and five in RCP8.5), whereas Lesotho will gain the most (seven in RCP4.5 and ten in RCP8.5) (Figure 3). These results are of considerable concern and emphasize the urgency to implement conservation actions.

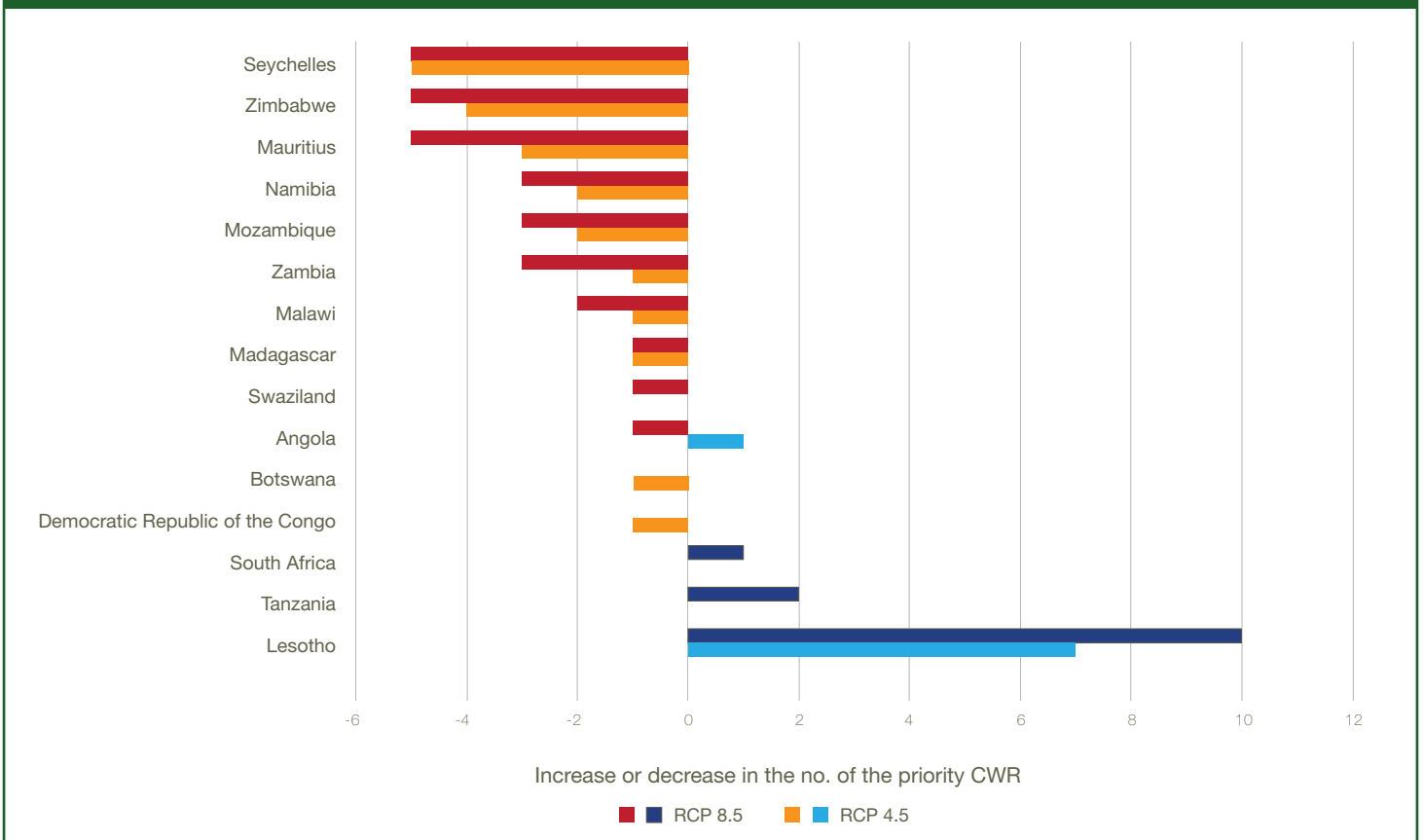
Sites for active *in situ* conservation

The majority of regional priority wild relatives (89 taxa) could be actively conserved in 133 existing protected areas (Figure 4). This is taking into account populations that are not expected to be affected by climate change as well as optimizing conservation of genetic diversity (i.e., diversity within species).

The three highest priority existing protected areas are the UNESCO-MAB Biosphere Reserve of Kruger to Canyons and the private nature reserve of De Onderstepoort, both in South Africa, and the UNESCO-MAB Biosphere Reserve of Lake Manyara in Tanzania.

Results indicate that the Democratic Republic of Congo, Tanzania and South Africa are important areas for conserving CWR diversity predicted not to be negatively impacted by climate change in the region.

Figure 3. Projected change of taxon richness for the 75 priority CWR with stable species distribution models, comparing current and projected 2050 climatic conditions under RCP 4.5 and RCP8.5 scenarios in the SADC region.



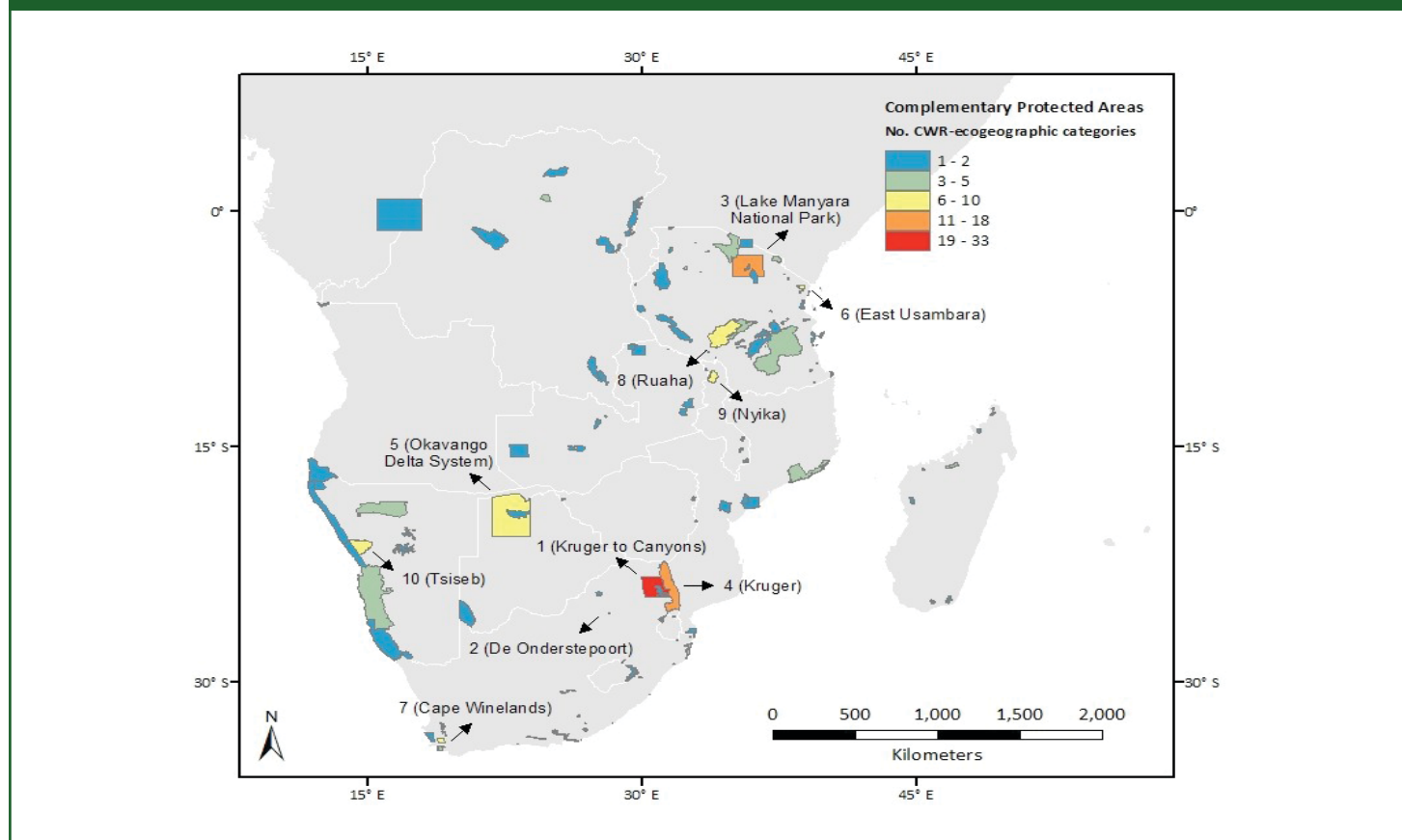
Looking forward

Collecting areas for *ex situ* conservation of SADC priority CWR will be identified and together with the *in situ* conservation planning results shown here will form the basis of a strategy for CWR conservation in the SADC region. This strategy will be important to ensure that the conservation of priority CWR diversity in the region is optimized and available for future sustainable use.

SADC CWR Project Partners

Bioversity International, Rome, Italy (Coordinating institution)
 University of Birmingham, United Kingdom
 University of Mauritius, Reduit, Mauritius
 Directorate of Genetic Resources, Department of Agriculture, Forestry and Fisheries, South Africa
 Zambia Agriculture Research Institute

Figure 4. Network of 133 existing protected areas where active *in situ* conservation of 89 regional priority CWR (out of 113) could be undertaken. The numbers on the map indicate the top 10 priority protected areas for conservation.



For further information, visit the project website: www.cropwildrelatives.org/sadc-cwr-project/



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agriculture, forestry & fisheries
Department: Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Contacts:

Bioversity International
 Via dei Tre Denari, 472/a
 00054 Maccarese (Fiumicino), Italy
 Tel. (+39) 06 61181
 Fax. (+39) 06 6118402
bioversity@cgiar.org

www.bioversityinternational.org

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