

# Identification of Crop Wild Relatives in South Africa.

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## Introduction

Crop wild relatives (CWR) are wild plant species related to crops which have been used increasingly since the early 20<sup>th</sup> century to improve yields, resistance to biotic and abiotic stresses, and nutritional qualities of crops.

Their conservation, especially in their natural surroundings (*in situ*), is crucial for agricultural research and development for food, health and nutritional security and for climate change resilience. However, CWR species are often neglected by conservationists and are thus threatened in the wild due habitat loss or degradation. Farmers and breeders are also often unaware of the value of CWR. A SADC CWR Project is currently being implemented to identify and prioritize CWR of globally cultivated food and fodder crops and to develop a National Strategic Action Plan for the conservation and use of CWR in South Africa.

South Africa has an exceptionally rich flora, with over 20,000 species, and so there are potentially a large number of CWR which could contribute to food security not only in South Africa, but globally as well.

## Process followed for identifying CWR in South Africa

The flow diagram in figure 1 outlines the process followed for identifying CWR in South Africa

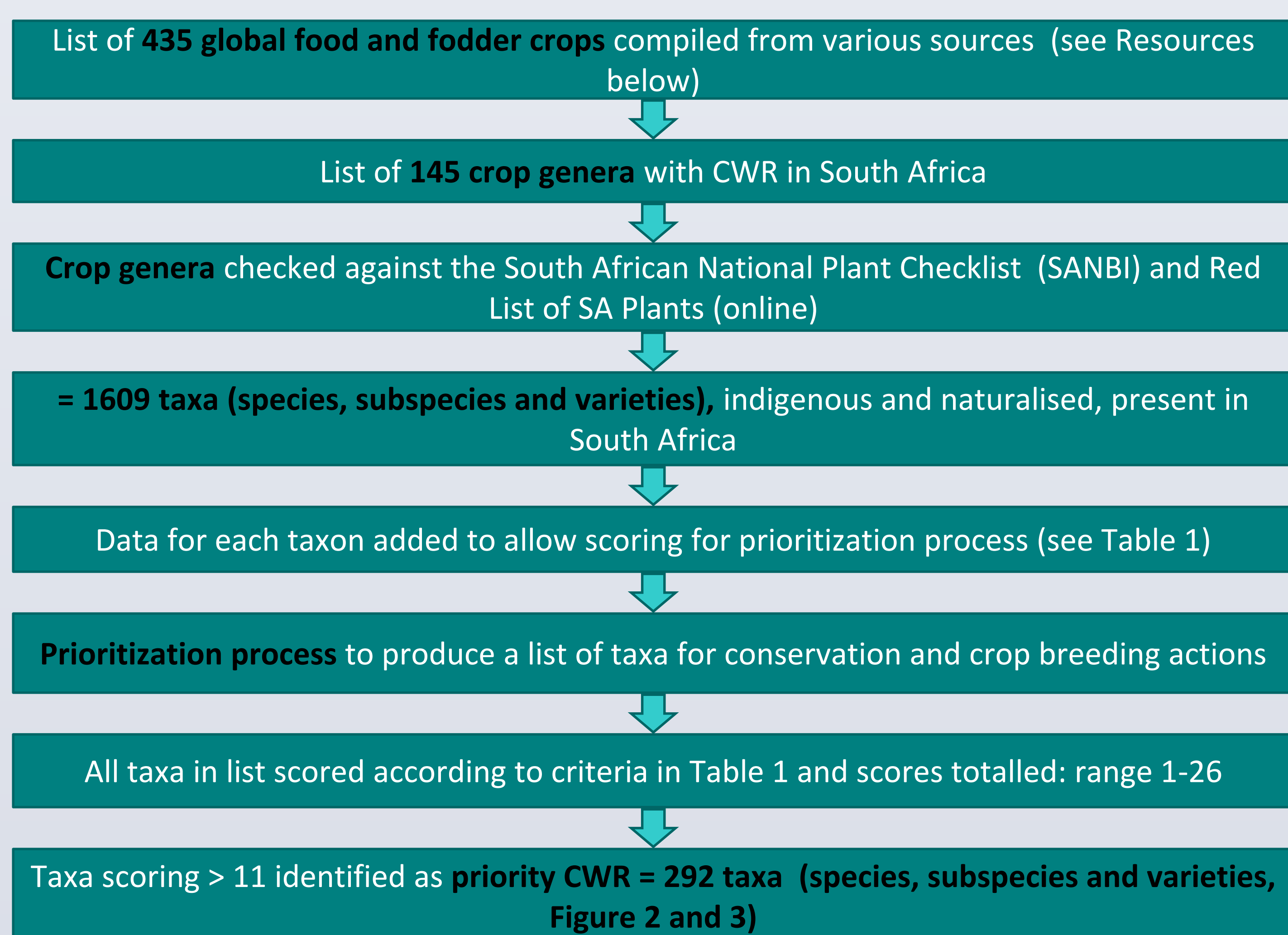


Figure 1: Flow diagram to outline the process followed for identifying CWR in South Africa

Criteria	Score= 5	Score =4	Score= 3	Score= 2	Score= 1	Score =0
Economic value of related crop: SADC region (average production value for 2003-2012, with countries averaged)	>2 billion USD/ year	1-1.9 billion USD / year	0.5-0.999 billion USD / year	0.2-0.499 billion USD / year	0.001-0.199 billion USD / year	<0.001 billion USD / year
Socio-economic value of related crop: Africa (daily energy contribution averaged between 2000-2009)	>10% of daily energy supply (Kcal/capita/day)	= 7-9.9% (Kcal/capita/day)	4-6.9% (Kcal/capita/day)	2-3.9% (Kcal/capita/day)	0.1-1.99% (Kcal/capita/day)	
Socio-economic value: Global importance of related crop (Kell et al. 2015)			Provide 3% or more of plant derived dietary energy supply in one or more subregions			Provide <3% of plant derived dietary energy supply in one or more subregions
Potential for crop improvement: Gene Pool (GP) concept or Taxon Group concept (TG) (Maxted et al. 2006)	GP1b (CWR that can be crossed with the crop with ease)	GP2 (CWR that are distinct from the crop, but will still produce fertile offspring)	GP3 (Distantly related CWR that can be crossed with the crop with special intervention)	TG3 (same subgenus as crop)	TG4 (same genus as crop)	
Threat status (IUCN red list global status)	Critically Endangered	Endangered	Vulnerable	Data Deficient/ Near Threatened	Least Concern	Not Evaluated
Conservation concern			Critically Rare	Rare / Declining		Not Critically Rare / Rare or declining
Distribution status			Endemic			Not endemic
Occurrence status			Indigenous			Naturalised

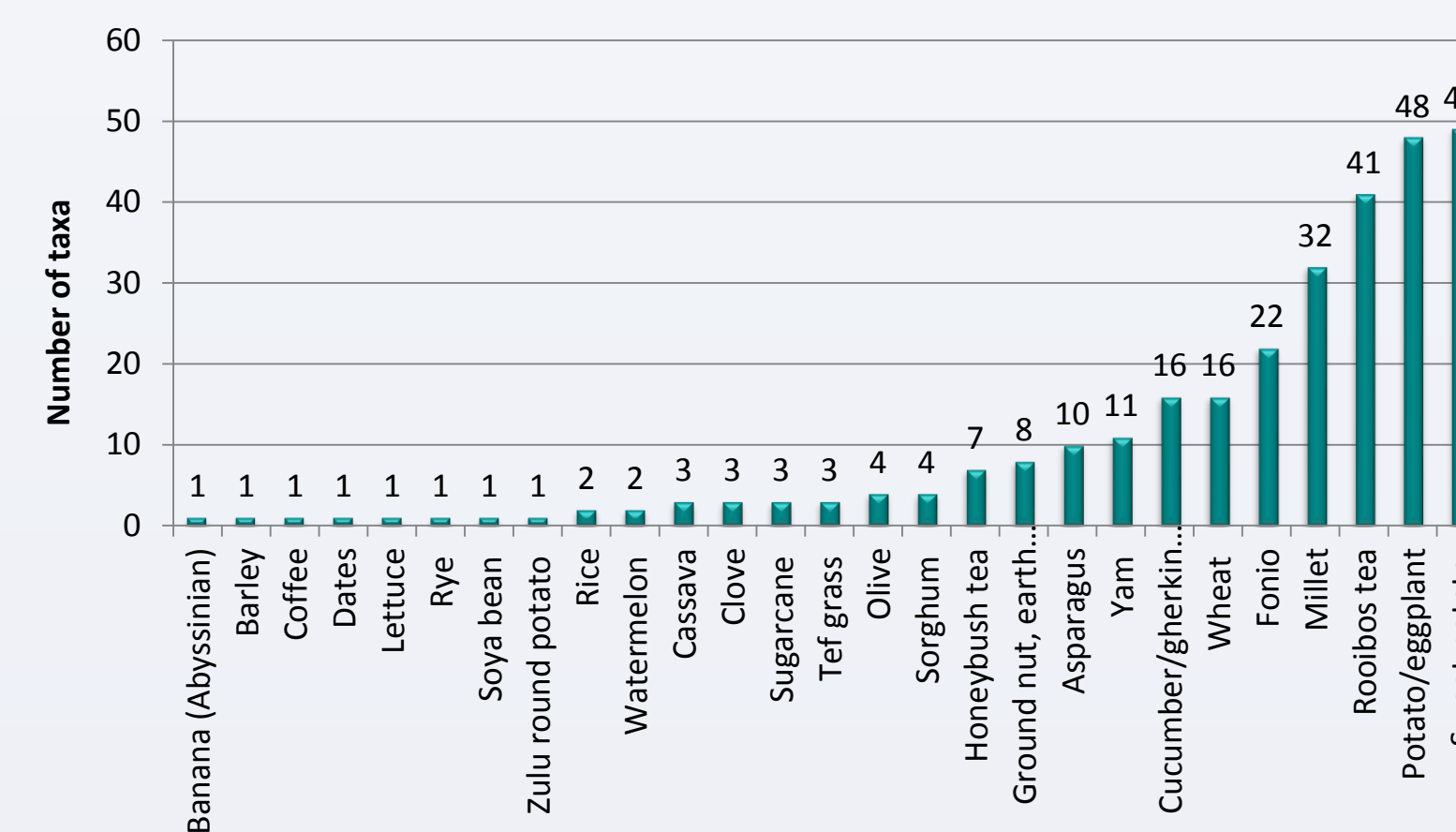


Fig. 2. Number of priority CWR (indigenous and naturalised) in South Africa for food and fodder crops.

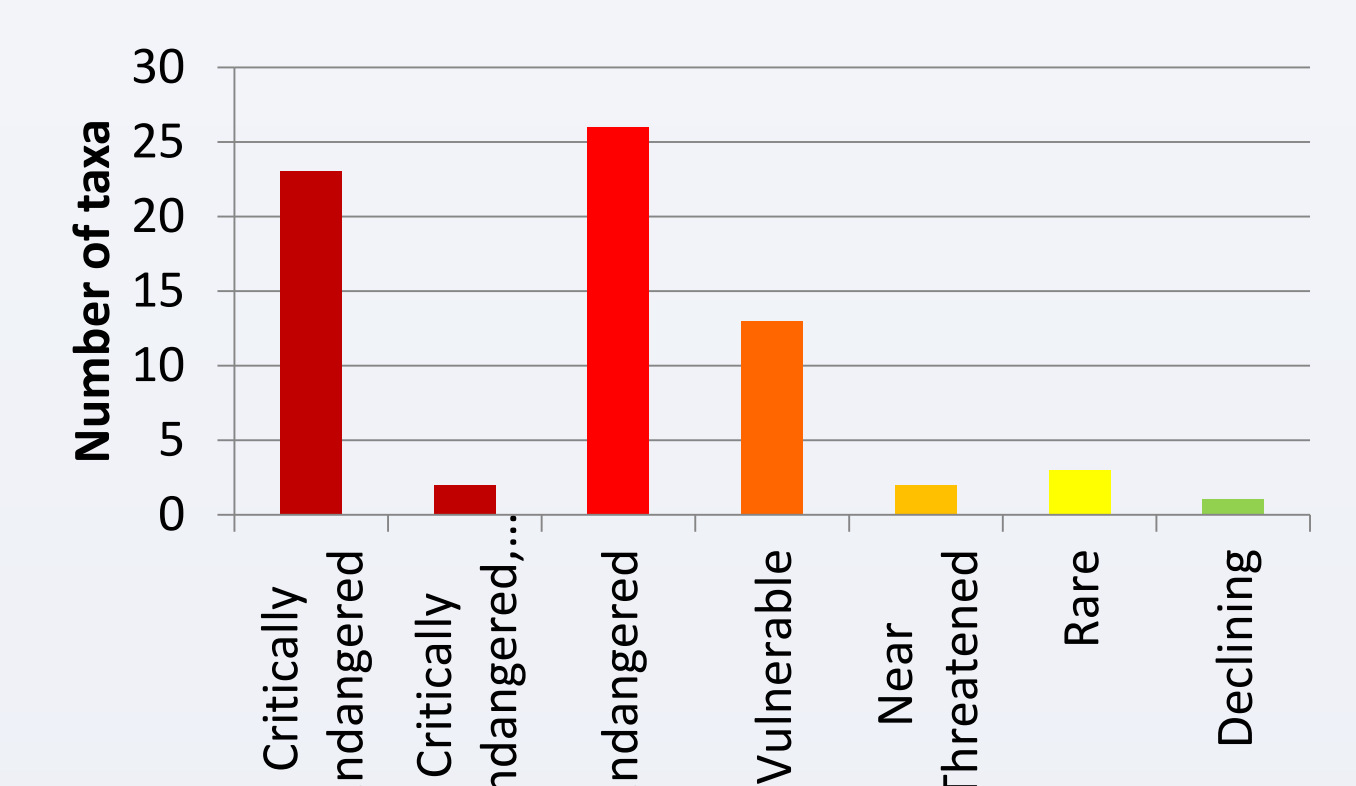


Fig. 3. Threat status of the priority CWR taxa in South Africa. (threat categories according to IUCN and represent global status, Declining and Rare as defined by SANBI's Plant Red List). 181 taxa not threatened, 39 not evaluated because they are naturalised, 1 Extinct species and 1 without sufficient data to allow assessment (Data Deficient).

Taxon	Potential for Crop Improvement (Genepool group: GP1 or GP2 or Taxon Group: TG1 or TG2)	Distribution and Threat status
<i>Oryza longistaminata</i> A.Chev. & Roehr.	Primary gene pool (GP1) for <i>Oryza sativa</i> and <i>O. gaberrima</i> - rice and African rice	Indigenous to SA, Vulnerable
<i>Oryza punctata</i> Kotschy ex Steud.	Secondary gene pool (GP1) for <i>Oryza sativa</i> and <i>O. gaberrima</i> - rice and African rice	Indigenous to SA, Not threatened
<i>Secale strictum</i> (J.Presl) J.Presl subsp. <i>africanum</i> (Stapf) K.Hammer	Secondary gene pool for <i>Secale cereale</i> (rye) and tertiary gene pool for <i>Triticum aestivum</i> (wheat group)	Endemic to SA, Critically Endangered
<i>Sorghum bicolor</i> (L.) Moench subsp. <i>drummondii</i> (Steud.) de Wet	TG1b for <i>Sorghum bicolor</i> - sorghum	Indigenous to SA, Not threatened
<i>Sorghum bicolor</i> (L.) Moench subsp. <i>arundinaceum</i> (Desv.) de Wet & Harlan	TG1b for <i>Sorghum bicolor</i> - sorghum	Indigenous SA, Not threatened
<i>Manihot esculenta</i> Ule	TG1b for cassava	Naturalised, Not Evaluated

## Conclusion

South Africa has a rich flora, with a large number of CWR that can contribute to food security through the improvement of global, regional and national important crops such as rice, sweet potato, wheat sorghum and cassava (Table 2).

## Next Steps

- Map the distribution of each priority CWR to determine extent of occurrence and representation in protected areas.
- Identify extent to which each priority CWR is represented in ex situ collections (gene banks and botanical gardens) and address gaps through a collecting programme.
- Include priority CWR in spatial planning to ensure adequate protection.
- Develop a National Strategic Action Plan (NSAP) for the conservation and utilization of CWR in South Africa.

## Acknowledgements

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## Resources

Resources for the development of the list of food and fodder crops: Mansfeld's World Database of Agricultural and Horticultural Crops (Hanelt & IPK Gatersleben, 2003), Annex 1 of the International Treaty on Plant Genetic Resources for Food and Agriculture (FAO, 2001); Assessment of activities on underutilised crops (Williams & Haq, 2002), World Programme for the Census of Agriculture 2010. Appendix 4: Alphabetical list of crops with botanical name and crop code (FAO, 2005), and a draft list of indigenous and alternative food crops in South Africa prepared by ARC.

Resources used for CWR prioritization process: Kell, S., Qin, H., Chen, B., Ford-Lloyd, B., Wei, W., Kang, D. & Maxted, N. 2015. China's crop wild relatives: diversity for agriculture and food security. *Agriculture, Ecosystems and Environment* 209: 138-154. <http://dx.doi.org/10.1016/j.agee.2015.02.012>. (global importance in terms of food security, ie. whether they provide 3% or more of plant derived dietary energy supply in one or more subregions; energy contribution of human food crops or crop groups as the average annual contribution to dietary energy (%) for Africa)  
 Maxted, N., Ford-Lloyd, B.V., Jury, S.L., Kell, S.P. and Scholten, M.A. (2006) Towards a definition of a crop wild relative. *Biodiversity and Conservation* 15(8): 2673-2685.  
 FAOSTAT (<http://faostat3.fao.org/download/Q/QC/E>) (The economic value (10 yr average production value in million USD (2003-2012) for the SADC region)  
 SANBI Red List of South African Plants. Available at [redlist.sanbi.org/](http://redlist.sanbi.org/) (distribution and threat status data)  
 South African National Plant Checklist (SANBI) (taxonomic details, distribution data)  
 United States Department of Agriculture, Germplasm Resources Information Network (GRIN) database. Available at <http://www.ars-grin.gov/~sbmljw/cgi-bin/taxcrop.pl>. (Gene pool status)