Adapting agriculture to climate change:
collecting, protecting and preparing crop wild relatives

# Ghana

crop wild relatives

# Seed Collecting Guide

MILLENNIUM SEED BANK PARTNERSHIP
Royal Botanic Gardens Kew
CROP TRUST

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The content of this collecting guide is intended only as a general reference for future collecting missions; the contents and data within are not guaranteed to be complete, correct, timely, current or up-to-date at the time of publishing. For general information and resources on collecting crop wild relatives, visit cwrdiversity.org.

**Cover photos**
TOP LEFT: Sorghum, CREDIT: Neil Palmer/CIAT/Flickr;
TOP RIGHT: Chickpea, CREDIT: Ruth Harker/Kew;
BOTTOM LEFT: Millet, CREDIT: Neil Palmer/CIAT/Flickr;
BOTTOM RIGHT: Rice, CREDIT: Neil Palmer/CIAT/Flickr.

# Introduction



This work was undertaken as part of the initiative "Adapting Agriculture to Climate Change" which is supported by the Government of Norway. The project is managed by the Global Crop Diversity Trust with the Millennium Seed Bank of the Royal Botanic Gardens, Kew, in partnership with national and international genebanks and plant breeding institutes around the world. It is implemented in accordance with the International Treaty on Plant Genetic Resources for Food and Agriculture. For further information see the project website: www.cwrdiversity.org/

Many individual scientists, herbaria, genebanks and specialist institutes are contributing advice and information to the Project and these guides. The Project aims to collect the wild relatives of 29 key crops, conserve them in genebanks, and prepare them for use in plant improvement programs to breed new crop varieties adapted to future climates.




The boundaries and names shown on the maps included in this guide do not imply official endorsement or acceptance by the Adapting Agriculture to Climate Change Project. Data source: GADM, Version 1.0 via diva-gis.org

# Acknowledgements



The Harlan and de Wet Crop Wild Relatives Checklist was developed by Holly Vincent and Nigel Maxted at the University of Birmingham.

UNIVERSITY OF BIRMINGHAM

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

The Gap Analysis work which informed the list of species included in this guide, and all the map files, were produced by the Gap Analysis team at CIAT: Andy Jarvis, Nora Castañeda, Colin Khoury and Julian Ramirez-Villegas.

RBG Kew is involved in the research and collection phases of the project. This collecting guide was developed based on the work of the Millennium Seed Bank Enhancement Project Species Targeting Team.

Royal Botanic Gardens Kew

CROP TRUST

The Crop Wild Relatives Project is led by the Global Crop Diversity Trust. This work was undertaken as part of the initiative.

Specimen data was kindly provided to this project by many individuals and organisations who are listed on the website: http://www.cwrdiversity.org/home/data-sources

This data set will be made available for download. Please refer to the website for more information on this dataset.

This collecting guide has been compiled by:

**Ruth Harker**
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# How to use this guide

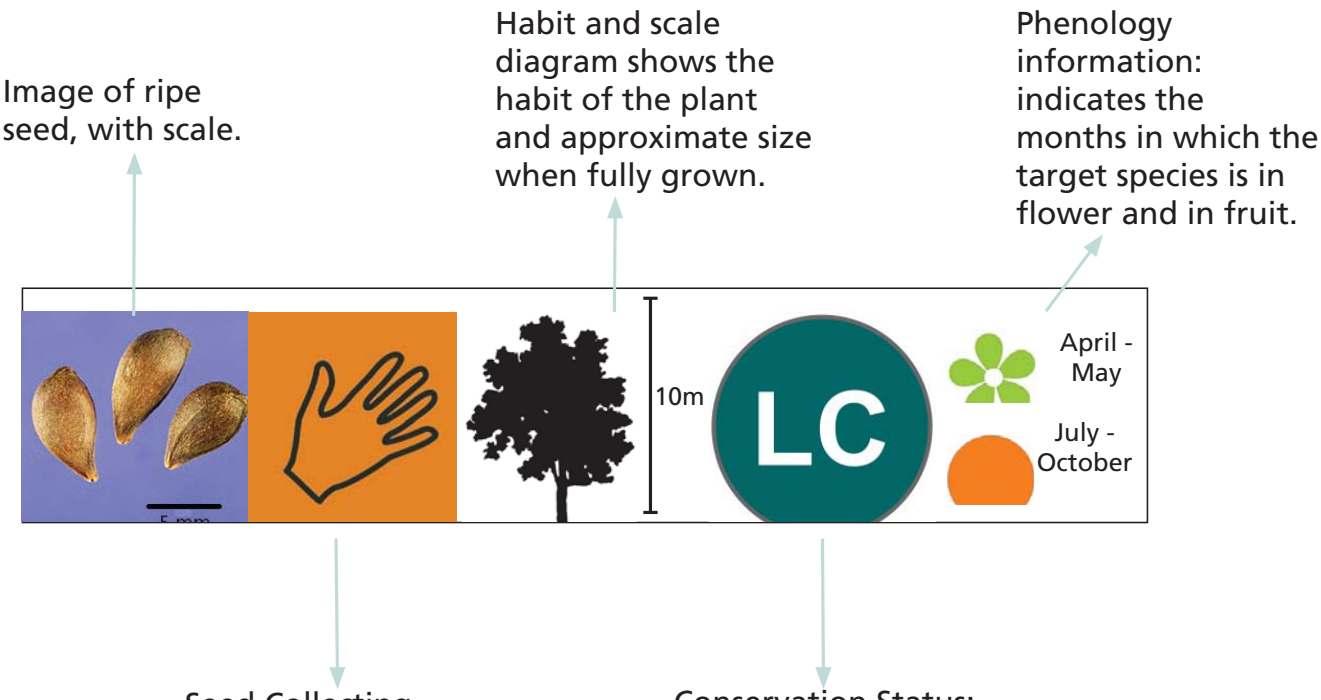


This collecting guide consists of species profiles and information sheets contained within this folder, alongside a CD which contains localities of the taxa in an Excel file.

The species included in this guide are a selection of the wild relatives of the 29 key crops which this project covers (African Rice, Alfalfa, Apple, Bambara groundnut, Banana, Barley, Bread wheat, Butter bean, Carrot, Chickpea, Common bean, Cowpea, Eggplant, Faba bean, Finger millet, Grasspea, Lentil, Oat, Pea, Pearl millet, Pigeon pea, Plantain, Potato, Rice, Rye, Sorghum, Sunflower, Sweet potato, Vetch). It is not a definitive guide to the Crop Wild Relatives in this country.

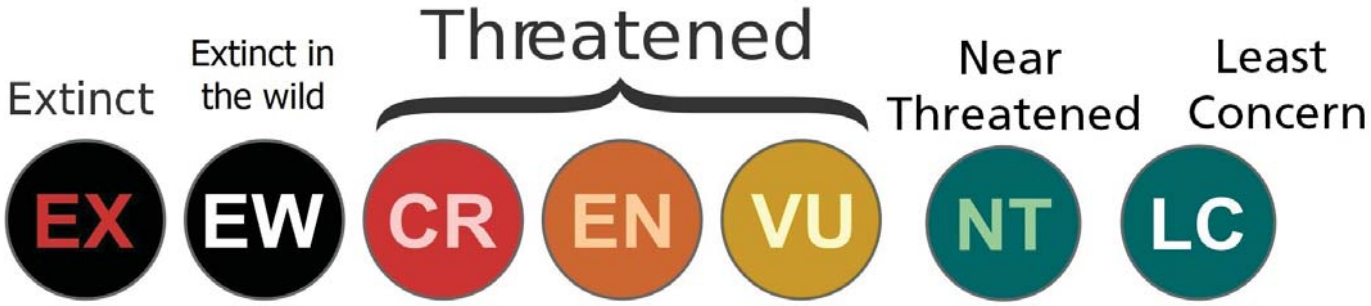
The guides are designed to be used both in the planning of a collecting trip and in the field. At the front of this guide there is a phenology table showing the flowering and fruiting times of all the taxa to indicate which species may be found at a certain time of year, or when to collect target species.

Synonyms for each species are listed in the Appendix at the end of this guide. On each species profile, there is a collection of images to help identify the target species, accompanied by a series of symbols :



# Conservation Assessments

Conservation Status:
Assessments are completed using 2001 IUCN Red List Categories and Criteria version 3.1 with the following categories:




CR
CRITICALLY ENDANGERED
Considered to be facing an extremely high risk of extinction in the wild.

EN
ENDANGERED
Considered to be facing a very high risk of extinction in the wild.

VU
VULNERABLE
Considered to be facing a high risk of extinction in the wild.

NT
NEAR THREATENED
Is close to qualifying for or is likely to qualify for a threatened category in the near future.

LC
LEAST CONCERN
Does not qualify for a threatened rating. Widespread and abundant taxa are included in this category.

DD
DATA DEFICIENT
There is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.

NE
NOT EVALUATED
A conservation assessment for this species has not yet been carried out.

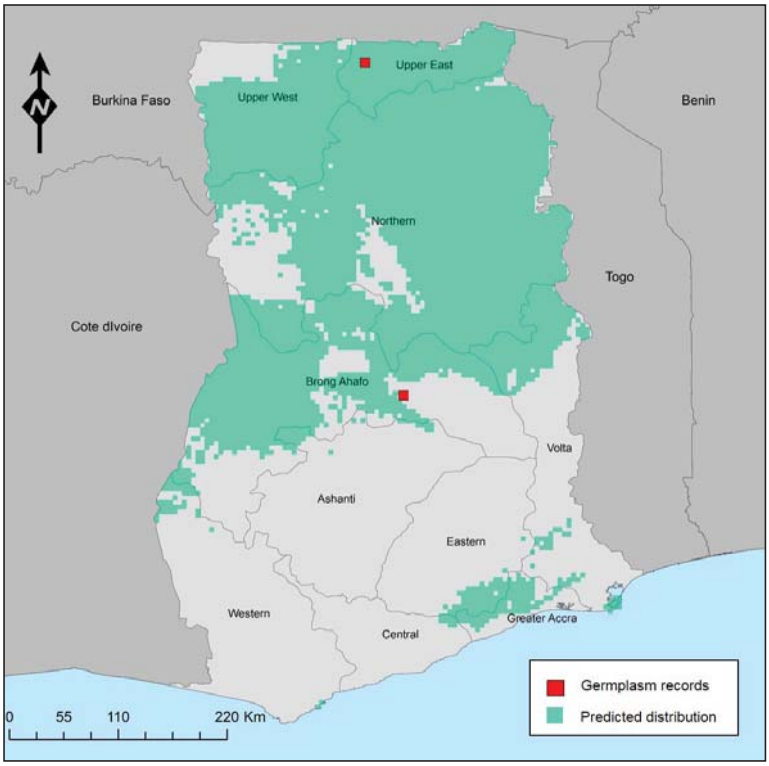
Where a full conservation assessment has not been completed, a preliminary conservation rating may be indicated. Preliminary assessments are produced using specimen locality data and GIS, which calculates two parameters accepted by IUCN as suitable measures of range: namely extent of occurence (EOO) and area of occupancy (AOO). These values derived for each species are then compared with thresholds set out by IUCN under Criterion B.
Where a preliminary conservation assessment has been caluculated this is indicated by the word PRELIM:


IUCN Graphics Credit: Peter Halasz

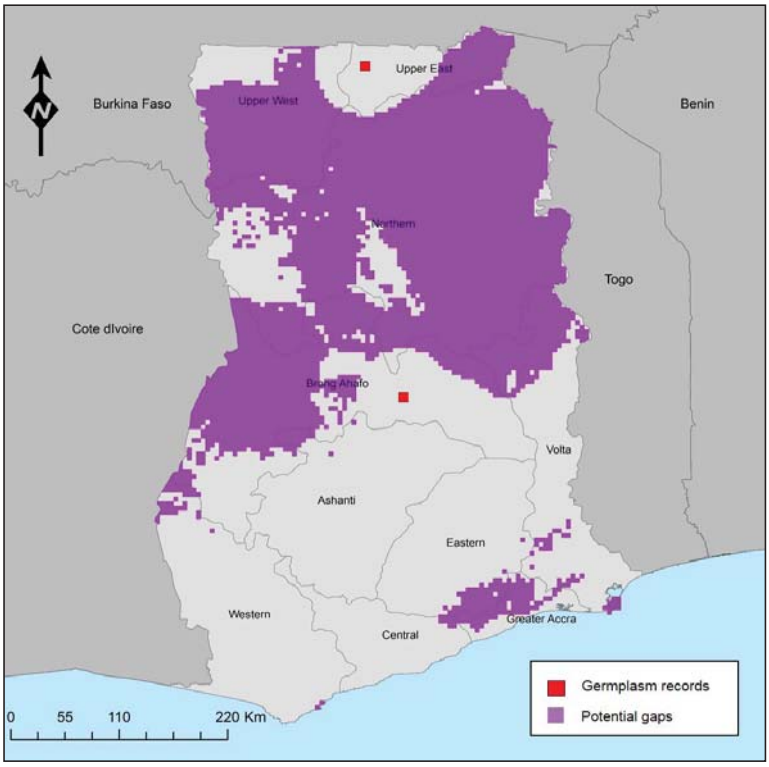
# Maps



Two maps are provided for each target species. The first map shows a point distribution of all the known localities of this species based on herbarium specimen records and existing data-sets. The area shaded on this map shows the predicted distribution based on Maxent.




The second map shows the potential gaps in gene bank collections, where seed collections should be targetted.



# Useful resources

The following resources are available online.

## Kew technical information sheets

- Assessing a potential seed collection:
  http://brahmsonline.kew.org/Content/Projects/msbp/resources/Training/02-Assessing-population.pdf

- Post-harvest handling of seed collections:
  http://brahmsonline.kew.org/Content/Projects/msbp/resources/Training/04-Post-harvest-handling.pdf

Other sheets covering the following topics are available from
http://brahmsonline.kew.org/msbp/Training/Resources

- Protocol for comparative seed longevity testing
- Measuring seed moisture status using a hygrometer
- Selecting containers for long-term seed storage
- Low-cost monitors of seed moisture status
- Small-scale seed drying methods
- Equilibrating seeds to specific moisture levels
- Identifying desiccation-sensitive seeds
- Seed bank design: seed drying rooms
- Seed bank design: cold rooms for seed storage
- Cleaning seed collections for long-term conservation

## ENSCONET seed collecting manual for wild species

http://ensconet.maich.gr/PDF/Collecting_protocol_English.pdf

## Seed conservation: turning science into practice

https://academic.oup.com/aob/article/95/5/888/201951

## Collecting plant genetic diversity: Technical guidelines (Bioversity)

http://cropgenebank.sgrp.cgiar.org/index.php?option=com_content&view=article&id=390&Itemid=557

## FAO – Commission on Genetic Resources for Food and Agriculture

http://www.fao.org/nr/cgrfa/en/

## IUCN Red List Categories and Criteria (Version 3.1)

https://iucn-csg.org/red-list-categories/

## Plants of the World Online

http://plantsoftheworldonline.org/

For more information about the Crop Wild Relatives Project and to access the Harlan and de Wet Crop Wild Relatives checklist, please visit the website:

**www.cwrdiversity.org**

# Identification Keys



Interactive identification keys can be accessed using the links below.

**Kew Grassbase interactive identification key**
http://www.kew.org/data/grasses-db/ident.htm

# Seed Collecting Techniques

**Michael Way and Kate Gold, Seed Conservation Department**

**Seed collecting from wild plants requires care, resourcefulness and determination. There are many different collecting techniques. The most appropriate technique will depend on the species, particularly the type of dispersal unit (fleshy fruit, dry fruit, individual seeds etc). This information sheet outlines the manual techniques most commonly used to make seed collections of adequate quality and quantity, for long term conservation.**

## Hand picking of whole fruits

The most basic and flexible of techniques, hand picking or plucking, has many benefits. Consider though, if you can use a more efficient technique.

Plucking is particularly suitable when:

- target fruits can easily be selected by eye (e.g. due to colour or texture change of fruit coat, or swelling of fruit);
- non-target (e.g. immature or damaged) fruit cannot be excluded from the collection by more efficient techniques;
- fruits are easily accessible and collectors can tie buckets or similar containers around the waist, releasing both hands for collecting;
- collecting many-seeded fleshy or dry indehiscent fruits; and
- making small seed collections.

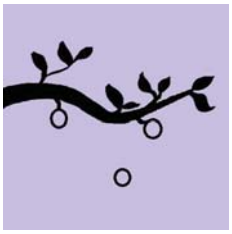
## Pruning clusters of fruit

This technique is typically used to collect tree seeds. Cut groups or clusters of fruits using secateurs or tree pruners. Assess for ripeness and damage before adding seeds to the collection.

This is a very effective technique when:

- seed is clustered at the distal (terminal) parts of branches;
- the species is abundant and a small associated loss of branch and foliage is acceptable;
- seed is beyond reach of the collectors and has to be obtained using tree pruners.

## Shaking branches



Careful shaking of branches will sometimes dislodge the best available seed, which can be collected in buckets or on a tarpaulin held or spread out beneath the plant. Start with gentle taps, and carefully check each sample of seed dislodged. Light shaking will often dislodge fully ripe fruits and seeds, leaving immature, poorly developed and damaged seeds to be retained on the parent plant. Too-heavy beating of branches may cause damage to the tree, and may also dislodge other plant material and associated insects, necessitating additional cleaning of the collection.

Shaking branches may be useful when collecting:

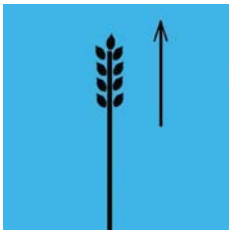
- dehiscent fruits with medium large seeds;
- seeds with irritant plumes (e.g. *Cercocarpus* of the Rosaceae);
- spiny trees such as *Prosopis* (Fabaceae);
- on level, open terrain suitable for tarpaulin use.

This technique may not be suitable for light, plumed seed from Bombacaceae and Asclepiadaceae, which may be carried away by air currents.

ABOVE: Stripping seed heads may be appropriate for grasses
Credit: Global Crop Diversity Trust/Britta Skagerfalt

Technical Information Sheet produced by Michael Way and Kate Gold for the Millennium Seed Bank Project, 2008.

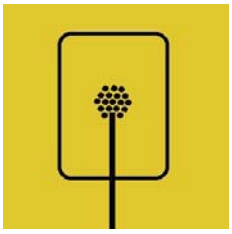
## Stripping entire seed-heads



This is a popular technique for collecting seed from grasses and may be suitable for other species with erect infructescences (seedheads). Grasp the seed-heads at the base with a gloved hand and slide the hand upwards, dislodging many or all of the seeds. This technique may introduce a proportion of immature seeds into the collection.
Such seeds might need further postharvest ripening which can be time consuming and is best avoided.

The stripping technique is most suitable for:
• dense, mono-specific stands of target species with no weed or other species present; and
• infructescences which are completely and consistently at the natural dispersal stage.

## Bagging seed-heads



If there is frequent access to the collecting site, and if seeds would otherwise be lost, fix a well-tied mesh bag loosely over pre-dispersal seed heads. Seeds are captured as soon as they are shed, and can be periodically removed. This has been successfully used on a small scale, e.g. for collecting *Fouquieria* sp.

## Collecting from the ground

You will frequently find seeds on the ground below trees or shrubs, but they will often be damaged by pests or pathogens. The seeds may have been on the ground for several months, and could even date from the previous year. Such seed will have aged and life-span in storage will be reduced. Inspect the seed carefully, noting any variation in the fruit, seed coat and internal tissues.

In general, only collect from the ground when:
• the parent tree(s) can be determined without doubt;
• you are certain that you are collecting recently dispersed seeds;
• seeds have not suffered significant damage from pests or pathogens; and
• other techniques or collecting options are unsuitable.

### Collecting fleshy fruits

• Collect fleshy fruits directly into strong plastic bags or tubs with as much air as possible.
• Pack the bags in a rigid plastic container to ensure that the fruits are not squashed and help prevent them getting too hot and fermenting during transit.
• You may need to remove the seeds from fleshy fruits either during or immedately after the field trip.

ABOVE Collecting small seeds into paper bags
Credit: Ruth Harker/ RBG Kew

## Containers

Collect into buckets, cloth or paper bags, and check each person's sample carefully before combining into a single population collection.
Using buckets has the advantage of allowing you to monitor the quality of the collection whilst associated insects disperse freely.
Place collections of dry, ripe seed into cloth or paper bags for transit. Store any awned seed or hooked fruit, that would damage or get stuck in cotton bags, in cardboard boxes or strong paper bags. Never collect or store seeds in plastic bags.
Label all seed containers inside and out with a unique collection number, and seal them securely. It is best to prepare sufficient labels before filling the containers.

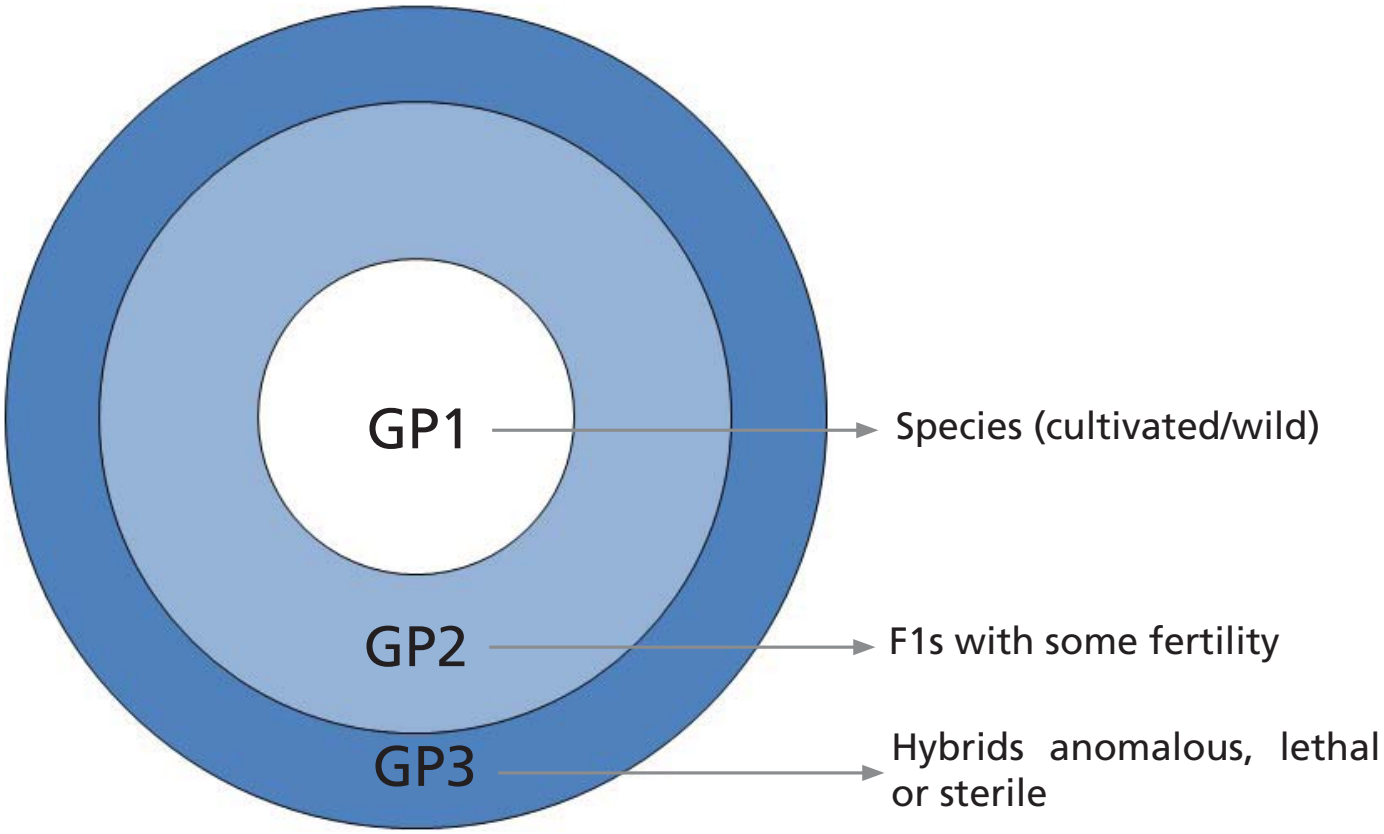
# How we define crop wild relatives



Each target species in this guide is a wild relative of a crop. On each species profile it is indicated how closely related the target species is to the crop using either the **Gene Pool concept** or the **Taxon Group concept**. Species more closely related to the crop are higher priorities for collecting.

## Gene Pool Concept

Harlan and de Wet, 1971




## Taxon Group Concept

Maxted et al. 2006

Taxon Group 1 – cultivated/wild form of the crop

Taxon Group 2 – species in same series/section as crop

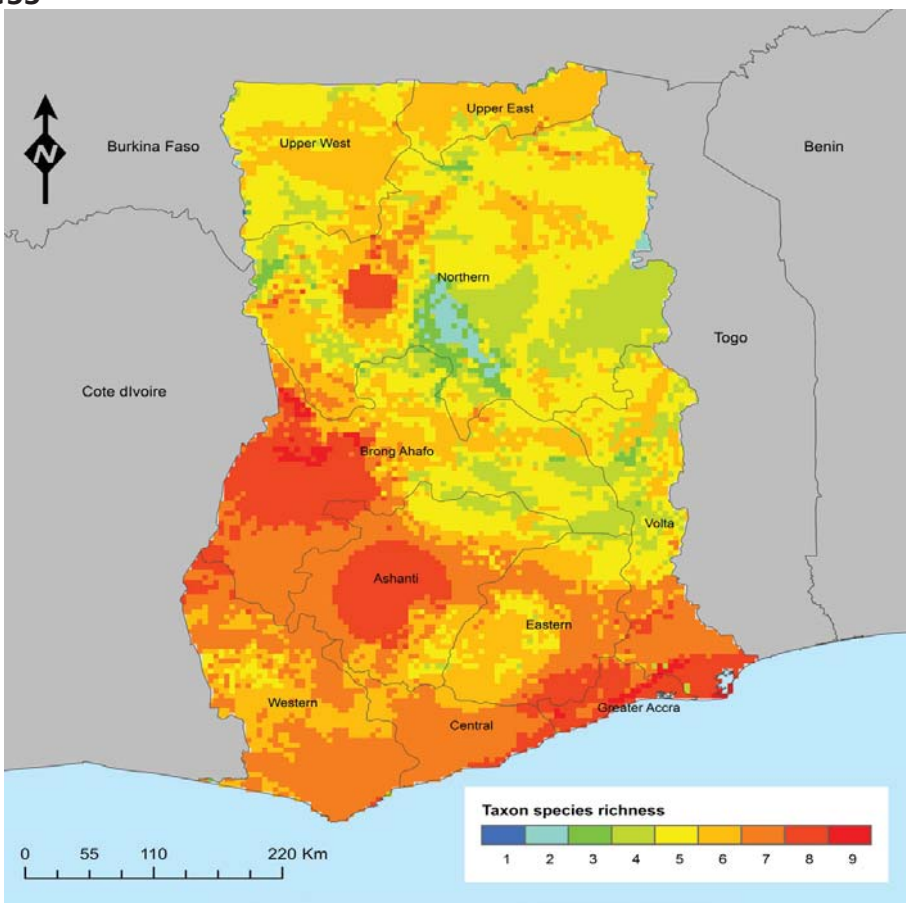
Taxon Group 3 – species in same subgenus as crop

Harlan, J. and J. de Wet (1971). Towards a rational classification of cultivated plants. Taxon 20: 509-517.

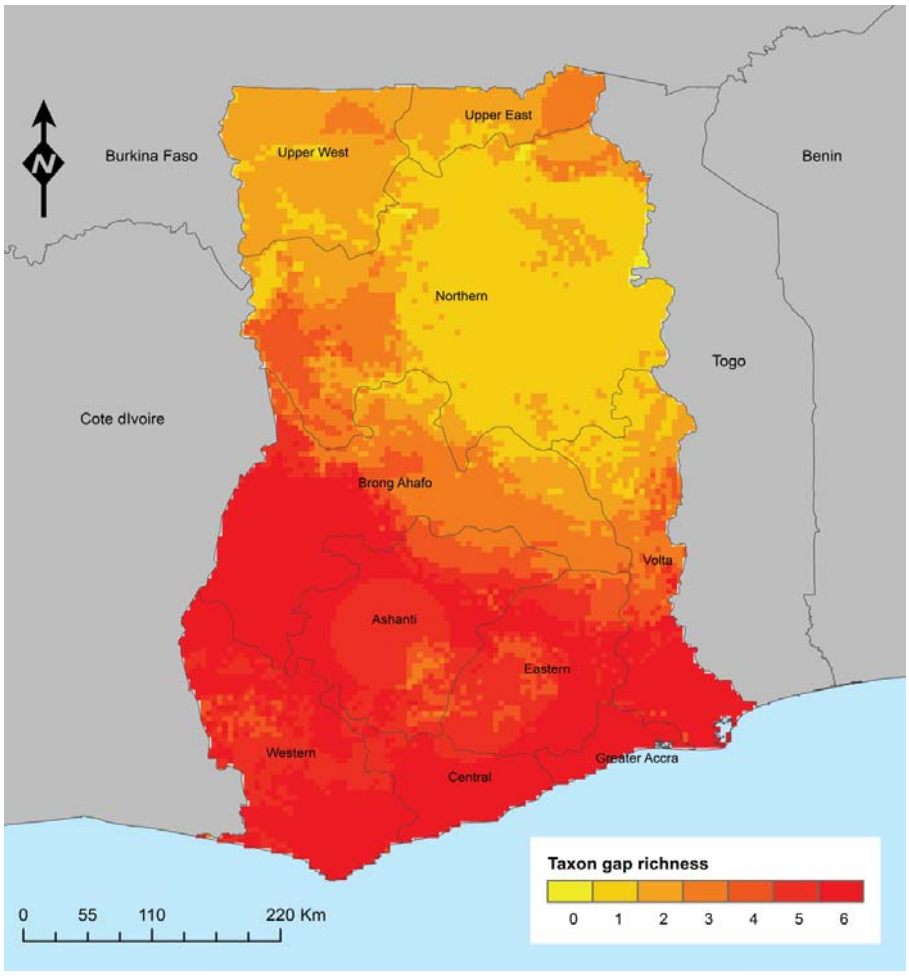
Maxted, N., B.V. Ford-Lloyd, S.L. Jury, S.P. Kell and M.A. Scholten (2006). Towards a definition of a crop wild relative. Biodiversity and Conservation 14: 1-13.

# Country Maps

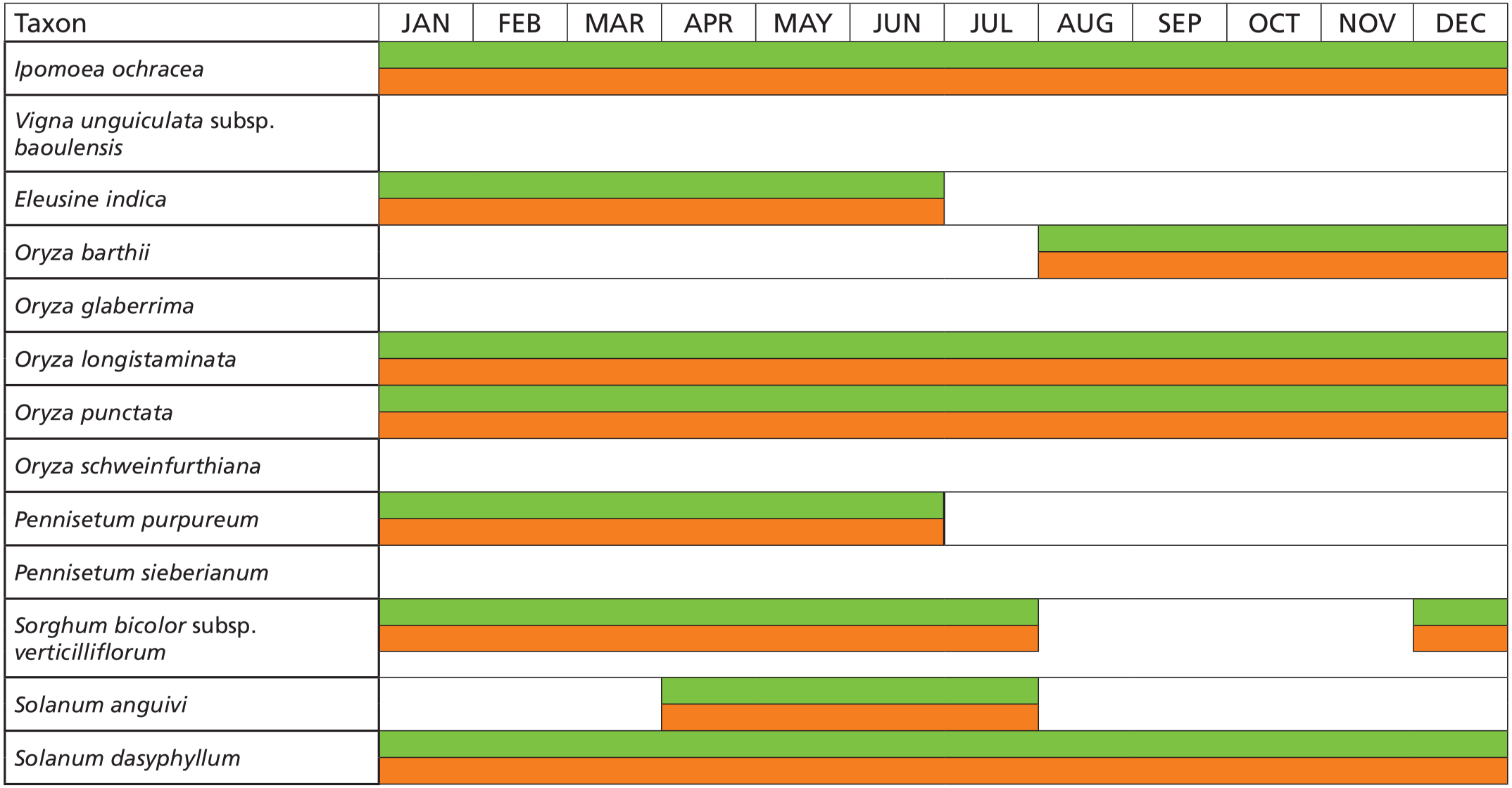
## Species richness




## Priority areas for collection



# Phenology table



# Species in this guide

| Family | Taxon | Genepool | Collection Priority | Sheet |
|---|---|---|---|---|
| Convolvulaceae | Ipomoea ochracea | Sweet Potato | Low | 1 |
| Leguminosae | Vigna unguiculata subsp. baoulensis | Cowpea | Low | 2 |
| Poaceae | Cenchrus purpureus | Pearl Millet | High | 3 |
| Poaceae | Cenchrus sieberianus | Pearl Millet | High | 4 |
| Poaceae | Eleusine indica | Finger Millet | High | 5 |
| Poaceae | Oryza barthii | Rice | Low | 6 |
| Poaceae | Oryza glaberrima | Rice | Low | 7 |
| Poaceae | Oryza longistaminata | Rice | Low | 8 |
| Poaceae | Oryza punctata | Rice | Low | 9 |
| Poaceae | Oryza schweinfurthiana | Rice | Low | 10 |
| Poaceae | Sorghum bicolor subsp. verticilliflorum | Sorghum | High | 11 |
| Solanaceae | Solanum anguivi | Eggplant | High | 12 |
| Solanaceae | Solanum dasyphyllum | Eggplant | High | 13 |

CONVOLVULACEAE

# *Ipomoea ochracea (Lindl.) G. Don*

**Wild relative of sweet potato** **Yellow morning glory**

HABIT: Vines, stems twining, herbaceous, up to ca. 3 m long, glabrous.
LEAVES: Leaf blades chartaceous, cordate, 3.5-6 cm long, 3-5 cm wide, glabrous, margins entire, apex narrowly acuminate to acute, mucronulate, petioles up to 8 cm long.
INFLORESCENCES: Flowers solitary, axillary, or few in cymes, pedicels 5-40 mm long; sepals unequal, inner ones ovate, larger than outer ones, ca. 6 mm long, ca. 3 mm wide, apex acute, base rounded, outer ones ca. 5 mm long, ca. 2.5 mm wide, apex acuminate, mucronate, base rounded, all sepals glabrous, minutely verrucose, margins scarious; corolla yellow, purple within tube, funnelform, 2.5-4 cm long.
FRUIT: Capsules brown, ovoid, 1.0-1.5 cm long, 0.5-0.7 cm in diameter, glabrous. Seeds often 4, sometimes fewer, black, globose to ovoid, ca. 4 mm in diameter, glabrous to puberulent.

## Habitat:

Grows in lower elevation, mesic (moderately wet) disturbed areas.

## Distribution:

Found throughout the tropics.

**Altitude:** Up to 600 m

| *Ipomoea ochracea* | May be confused with: *Ipomoea obscura* |
|---|---|
| Corolla bright yellow.  | Corolla white or pale yellow.  |


All populations priority for collection.

**References:** Wagner, W.L., Herbst, D.R. & Sohmer, S. H. (1999) Manual of the flowering plants of Hawaii. Revised edition. Material for seed image provided by IBPGR.



Adapting Agriculture to Climate Change Project, 2015. Ghana Crop Wild Relatives Seed Collecting Guide.
Compiled by Ruth Harker & Laura Jennings, RBG Kew

CONVOLVULACEAE

# *Ipomoea ochracea (Lindl.) G. Don*

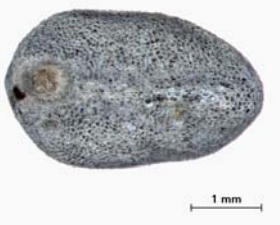
**Wild relative of sweet potato**

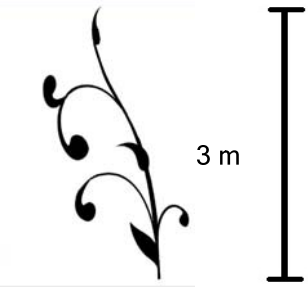
**Yellow morning glory**





Gemma Toothill (c) Board of Trustees RBG Kew




LC

PRELIM

All year

All year

LEGUMINOSAE

# *Vigna unguiculata subsp. baoulensis (A.Chev.) Pasquet*

**Primary Gene Pool relative of Vigna unguiculata (L.) Walp.**

HABIT: Annual herbs, erect, prostrate or climbing. Stipules oblong or ovate, medifixed, erect, 6–20 mm long, with a spur at the base.
LEAVES: Trifoliolate, leaflets lanceolate, ovate or rhombic, 15–165 x 8–90 mm, glabrous or sparsely hairy, apex acute or acuminate, venation reticulate.
INFLORESCENCES: Axillary, few-flowered, lax, rachis glands present. Flowers large, 26–38 mm long, with a strong aroma, calyx lobes short, 0.5–2 mm, keel twisted to the left, not beaked, style with a horizontal stigma directed outwards, number of ovules per ovary usually more than 16.
FRUIT: Pods bourne above ground, erect or pendent, linear-cylindrical or linear-oblong, 3.5–5(–12) mm long, not fleshy, not twisted at dehiscence. Seeds 11–18 per pod, testa black, brown or white, frequently mottled, aril present along rim, white.

**Habitat:**

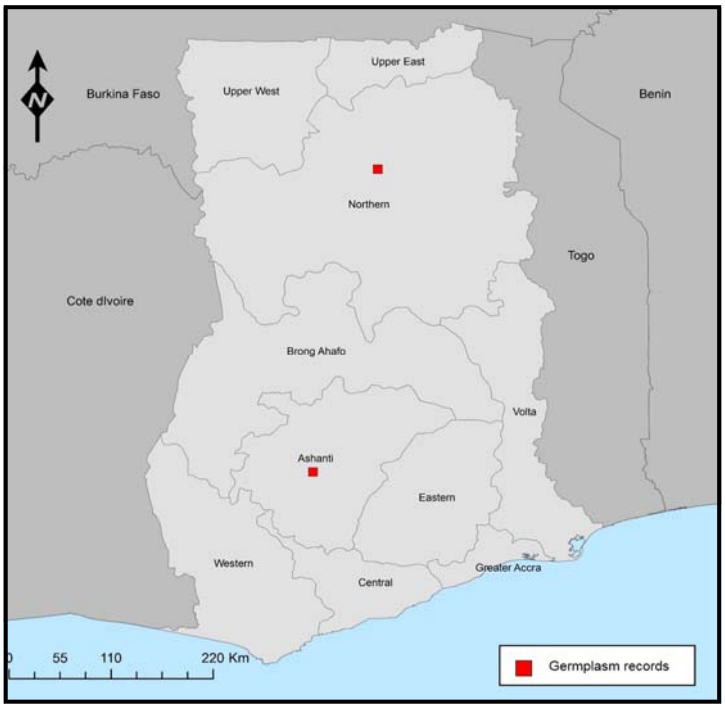
Disturbed areas.

**Distribution:**

Restricted to West Africa (with one Zambian collection).

**Altitude:** 80–1250 m

| *Vigna unguiculata subsp. baoulensis* | May be confused with: *Vigna unguiculata subsp. stenophylla* |
|---|---|
| Calyx teeth 0.5–2 mm long; flower 26–38 mm long; ovules usually 17. | Calyx teeth 2–6 mm long; flower 16–21 mm long; ovules 10–14. |



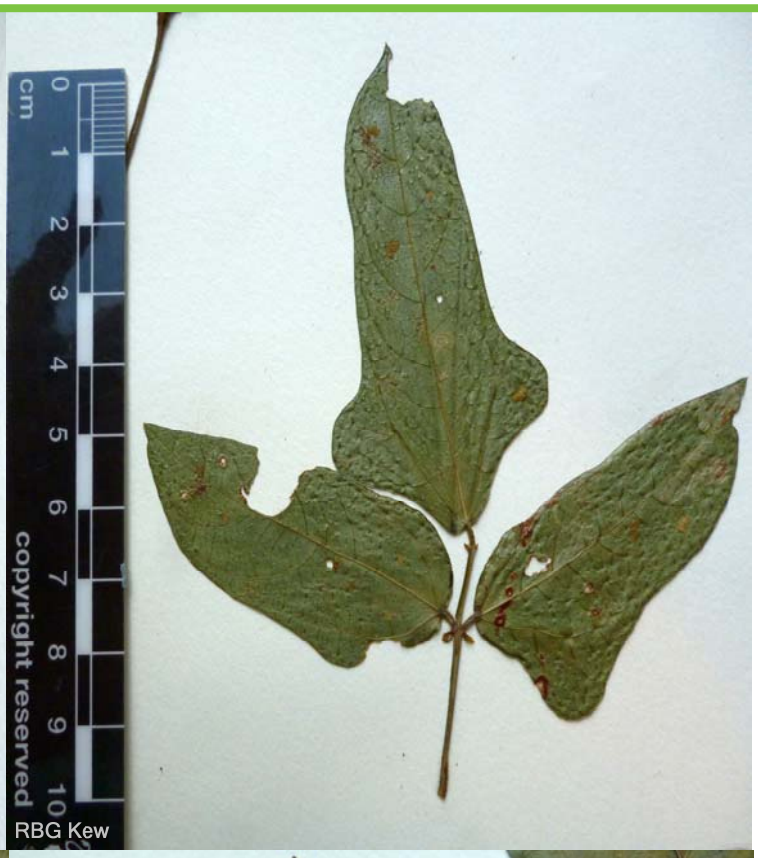

All populations priority for collection.

**References:** Maxted et al. (2004) An Ecogeographic Study of African Vigna.

LEGUMINOSAE

# *Vigna unguiculata subsp. baoulensis (A.Chev.) Pasquet*

Primary Gene Pool relative of Vigna unguiculata (L.) Walp.




No seed image available

0.5-3 m

LC PRELIM

No data

No data

POACEAE

# *Eleusine indica (L.) Gaertn.*

**Primary Gene Pool relative of Eleusine coracana (L.) Gaertn.**

HABIT Clump-forming annuals. Culms geniculately ascending, or decumbent, slender, 15–90 cm long.
LEAVES Mostly basal. Leaf-sheaths keeled, outer margin hairy. Leaf-blades conduplicate, 5–35 cm long, 2.5–6 mm wide.
INFLORESCENCES: Racemes 1–10(–17), single (rarely), or digitate, unilateral, 3.5–15.5 cm long, 3–3.5 mm wide.
Spikelets comprising 3–9 fertile florets, with diminished florets at the apex. Spikelets elliptic, laterally compressed, 3–5 mm long, breaking up at maturity. Glumes persistent, similar, shorter than spikelet. Fertile lemma lanceolate in profile, 2.1–3.6 mm long, membranous, 3 -veined (excluding subsidiaries). Lodicules 2, cuneate, fleshy.
FRUIT: Caryopsis with free soft pericarp, ellipsoid, isodiametric, trigonous, concealed by floret, 1–1.3 mm long, black, striate.

## Habitat:

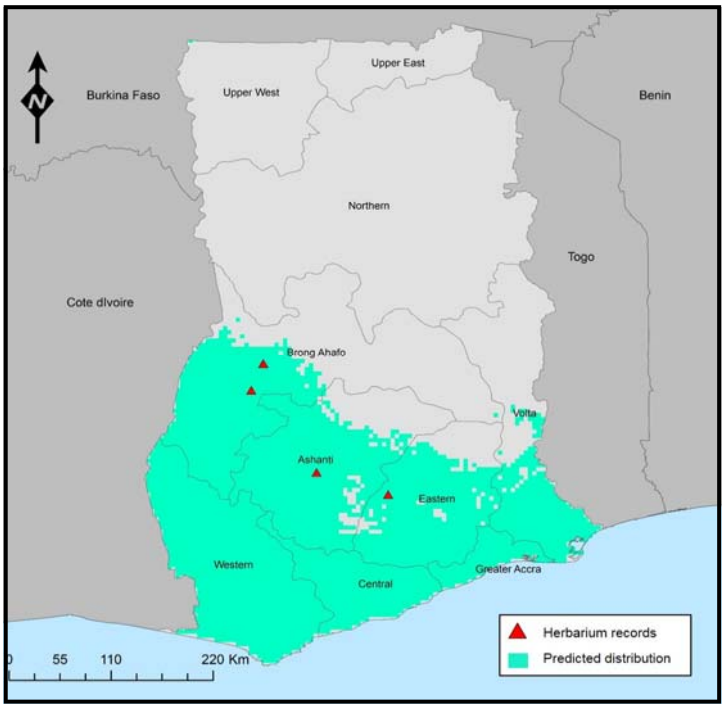
Found in moist as well as marshy areas, puddles, shallow ponds, fields, river and stream edges, ditches, canals etc.

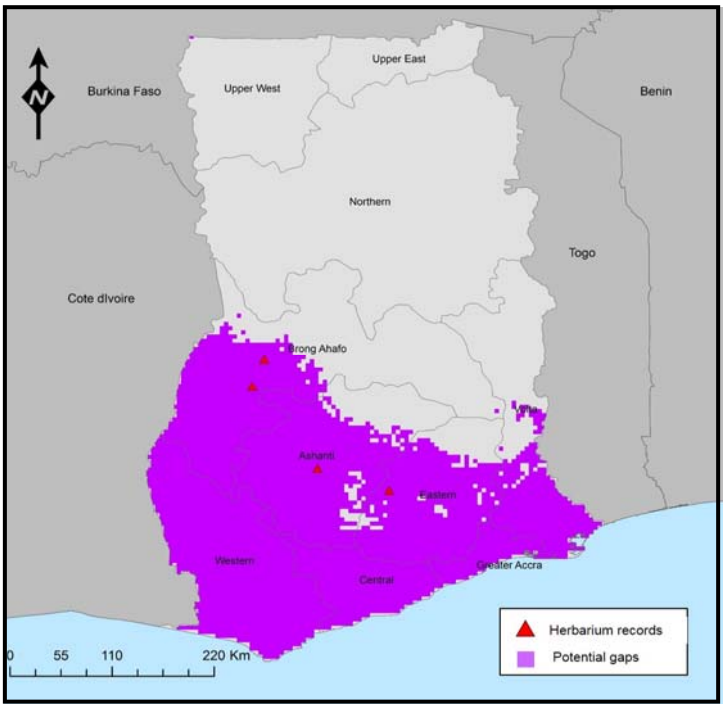
## Distribution:

Widespread throughout Africa, North and Central America, Southern Europe, Asia and Australasia.

**Altitude:** 0–2000 m

| *Eleusine indica* | May be confused with: *Eleusine africana* |
|---|---|
| Smaller spikelets (3-5mm), oblong grains. | Larger spikelets (4.6 – 7.8 mm) and rounded grains. |




**References:** Juffe Bignoli, D. (2011) IUCN Conservation assessment: http://www.iucnredlist.org/details/177359/0; Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html.

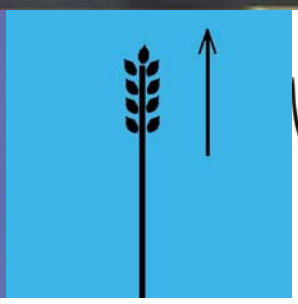
POACEAE

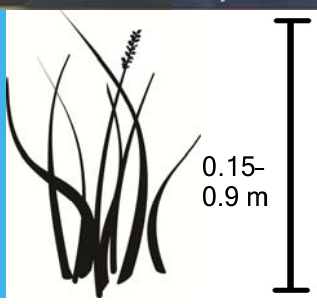
# *Eleusine indica (L.) Gaertn.*

**Primary Gene Pool relative of Eleusine coracana (L.) Gaertn.**








LC

Jan - June

Jan - June

POACEAE

# *Oryza barthii A.Chev.*

**Primary Gene Pool relative of Oryza glaberrima and Oryza sativa**

HABIT Clump-forming annuals. Culms geniculately ascending, or decumbent; 60–120 cm long, spongy; 3–8 -noded, rooting from lower nodes.
LEAVES: Leaf-sheaths smooth, glabrous on surface, auricles erect. Ligule an eciliate membrane, 2–6 mm long, truncate, or obtuse. Leaf-blades 15–45 x 0.4–1.3 cm, surface scaberulous; rough adaxially, margins scabrous, apex acute.
INFLORESCENCE Panicle open, obovate, 20–35 x 3–7.5 cm. Panicle branches angular, scaberulous, primary branches appressed or ascending. Spikelets solitary. Fertile spikelets pedicelled. Pedicels linear, angular; 1–6 mm long, smooth, or scaberulous, tip cupuliform, bibracteate. Spikelets comprising 2 basal sterile florets; and1 fertile floret, without rhachilla extension. Spikelets oblong, laterally compressed, 7–11 x 2.5–3.4 mm, falling entire, callus glabrous, base truncate, attached obliquely. Glumes absent or obscure. Basal sterile florets similar, barren, without significant palea. Lodicules 2, lanceolate, membranous. Anthers 6. Stigmas 2.
FRUIT Caryopsis with adherent pericarp. Disseminule comprising a floret.

## Habitat:

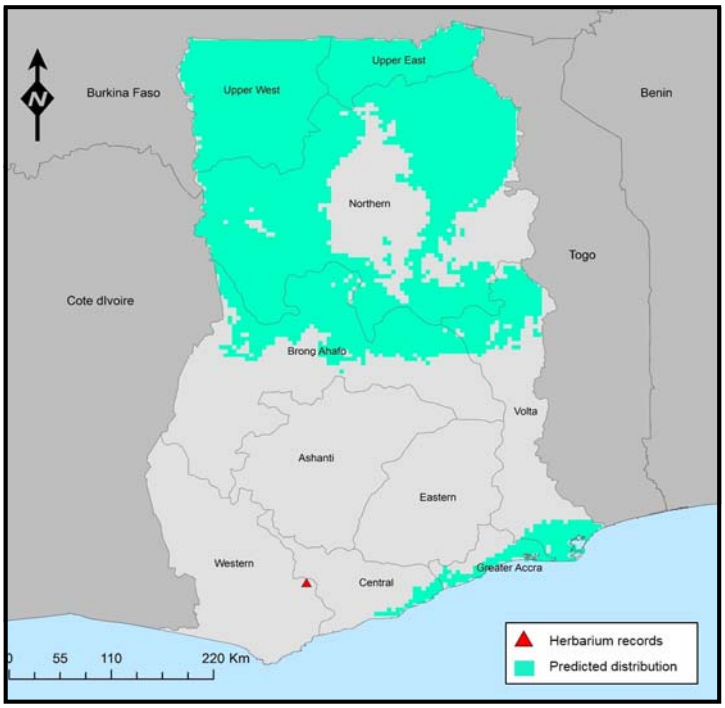
Found in Mopane or savanna woodland, savanna or fadama. Grows in deep water, seasonally flooded land, stagnant water and slowly flowing water or pools; prefers clay or black cotton soils. Found in open habitats.

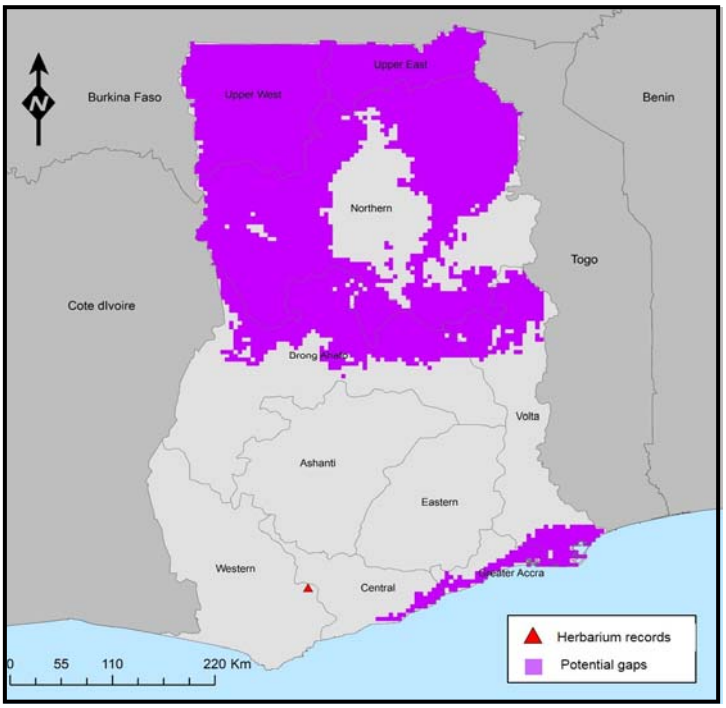
## Distribution:

Found throughout tropical Africa and as far south as Northern Botswana.

**Altitude:** 65-1600 m

| *Oryza barthii* | May be confused with: *Oryza longistaminata* |
|---|---|
| Leaves have short ligule (<13mm) | Ligule of lower leaves >15mm |




**References:** Vaughan, D.A. (1994) The Wild Relatives of Rice: A Genetic Resources Handbook.

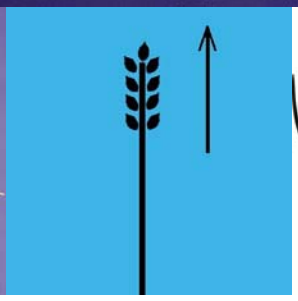
POACEAE

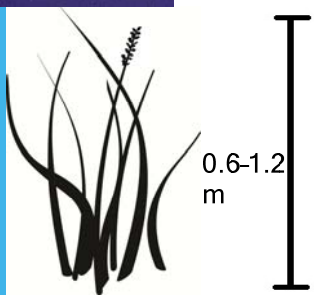
# *Oryza barthii A.Chev.*

**Primary Gene Pool relative of Oryza glaberrima and Oryza sativa**










LC PRELIM

Aug - Dec

Aug - Dec

POACEAE

# *Oryza glaberrima Steud.*

**Primary Gene Pool relative of Oryza glaberrima** — **African rice**

HABIT: Annuals, culms erect, or ascending, 90–150 cm long.
LEAVES: Leaf-sheaths smooth, surface glabrous. Ligule membranous, 1.5–2 mm long, truncate. Leaf-blades 200–300 x 10–15 mm, apex acute.
INFLORESCENCES: Panicle open, linear, equilateral, or nodding, 15–25 cm long. Primary panicle branches appressed, or ascending, angular, scaberulous. Spikelets solitary. Fertile spikelets pedicelled. Pedicels linear; angular, scaberulous, tip cupuliform, bibracteate. Spikelets comprising 2 basal sterile florets and 1 fertile floret, elliptic, or oblong, laterally compressed, 7–8 mm long, persistent. Glumes absent or obscure. Basal sterile florets similar, without significant palea. Lemma surface reticulate, glabrous, margins involute, apex rostrate. Lemma of sterile florets lanceolate; 2–4 mm long, 0.3–0.5 length of spikelet, membranous, 1 -veined, apex acute. Fertile lemma elliptic, laterally compressed, 7–8 mm long, coriaceous, keeled, 5 -veined. Palea elliptic, equalling length of lemma, coriaceous, 3 -veined, keeled. Palea keels smooth, apex acute. Flower with 2 lanceolate, membranous lodicules, anthers 6, stigmas 2.
FRUIT: Caryopsis with adherent pericarp.

## Habitat:

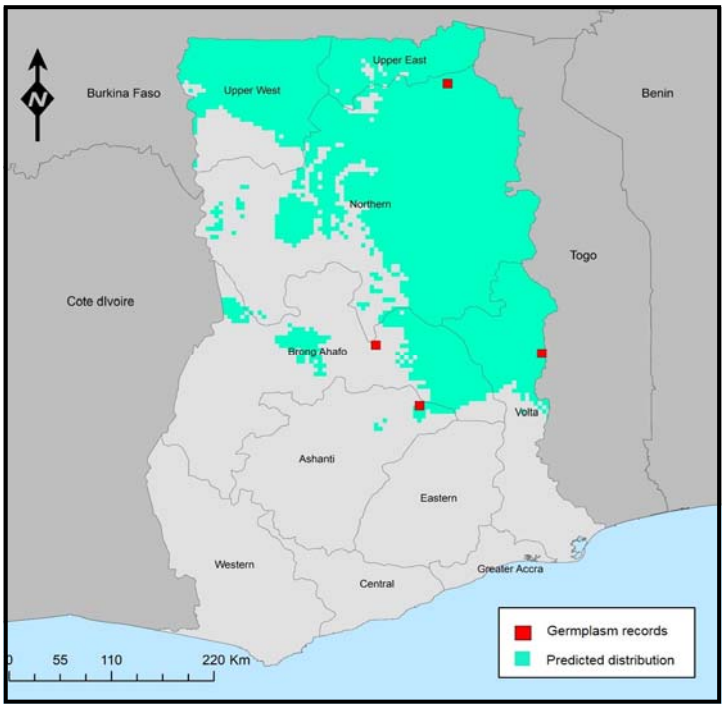
Grown in a wide range of conditions from uplands to mangroves. There are two main ecotypes: one is floating and photosenstitive, the other is grown in uplands or moderately dry lowlands.

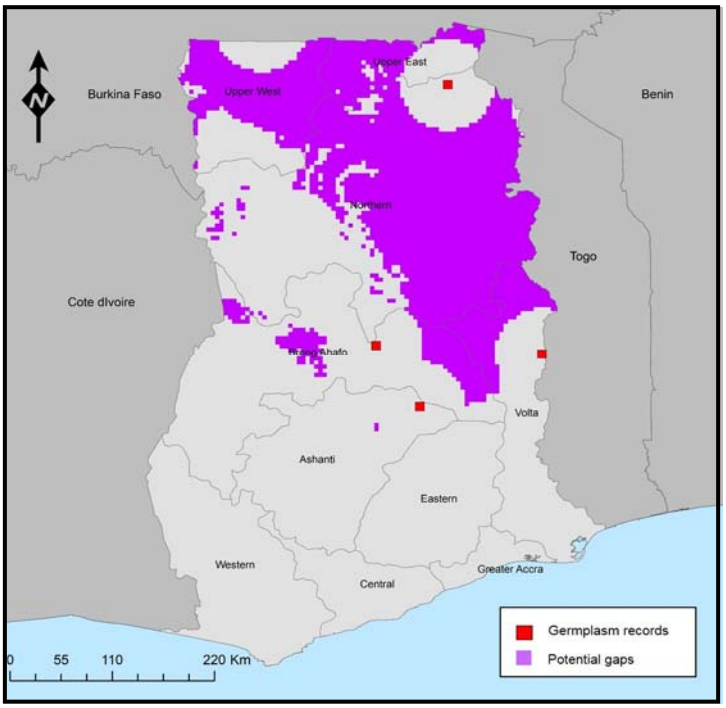
## Distribution:

Tropical west and central Africa

**Altitude:** 0-1700

| *Oryza glaberrima* | May be confused with: *Oryza sativa* |
|---|---|
| Inflorescence with few or no branches; ligule short (usually <5mm) and rounded; spikelets without awns, 8–8.5 mm long by 3.3–3.6 mm wide; pubescence on leaves and spikelets usually sparse. | Inflorescence many-branched; ligule 11.5–32 mm long and usually acute; spikelets with awns, 7.3–8.5 mm long by 2.8–3.6 mm wide; pubescence on leaves and spikelets long and moderately dense to dense. |




**References:** Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html;

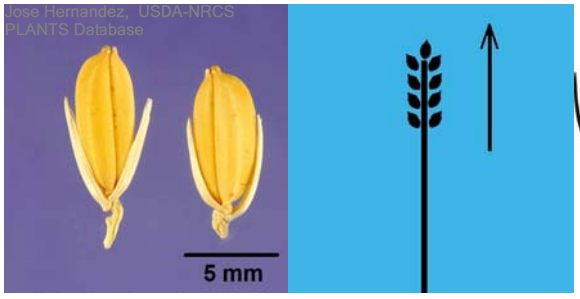
POACEAE

# *Oryza glaberrima Steud.*

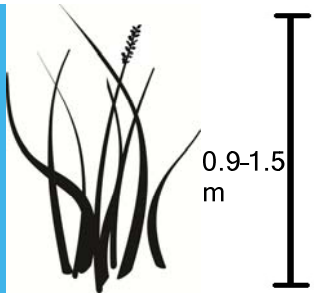
Primary Gene Pool relative of Oryza glaberrima

African rice


RBG Kew




Jose Hernandez, USDA-NRCS PLANTS Database




NE

Oct - Dec

POACEAE

# *Oryza longistaminata A.Chev. & Roehrich*

**Primary Gene Pool relative of Oryza glaberrima and Oryza sativa**

HABIT: Rhizomes elongated. Culms geniculately ascending, or decumbent, 70–120 x 0.5–1 cm.
LEAVES: Leaf-sheaths smooth, glabrous on surface. Ligule an eciliate membrane, Leaf-blades 10–75 x 0.5–2.5 cm.
INFLORESCENCES: Panicle open, elliptic, or oblong, 16–40 cm long, 1.5–8 cm wide. Primary panicle branches appressed, or ascending. Panicle branches angular; scaberulous, glabrous or pubescent in axils. Spikelets solitary. Fertile spikelets pedicelled, comprising 2 basal sterile florets and 1 fertile floret without rhachilla extension. Spikelets oblong, laterally compressed, 7–12 x 2–3 mm, falling entire. Spikelet callus glabrous, base truncate, attached obliquely. Glumes absent or obscure. Basal sterile florets similar, barren, without significant palea. Lodicules 2, lanceolate, membranous. Anthers 6, 4.5–5.5 mm long. Stigmas 2.
FRUIT: Caryopsis lanceolate or oblong, 5–7 mm long, laterally compressed, reddish, hilum linear, as long as caryopsis.

**Habitat:**

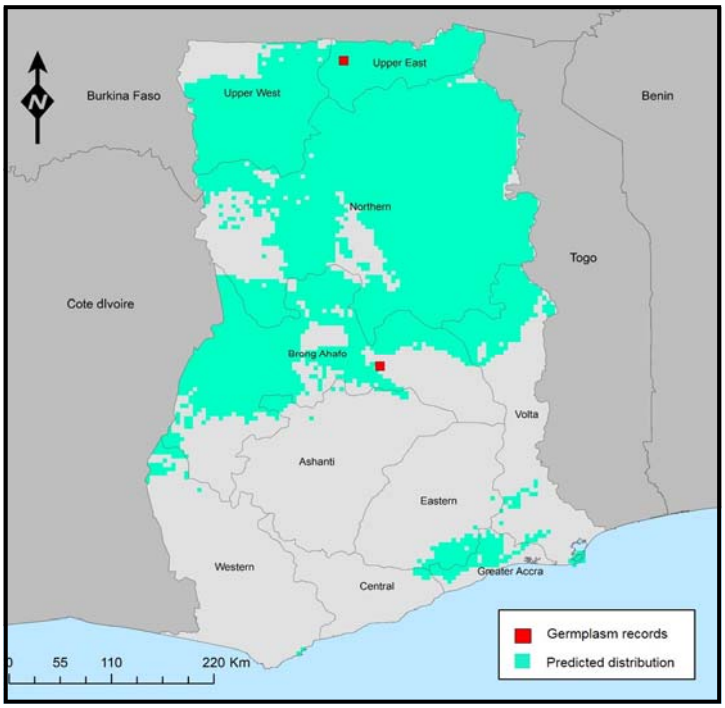
Deep water, standing or running water, salt marshes, dry, sandy fields.

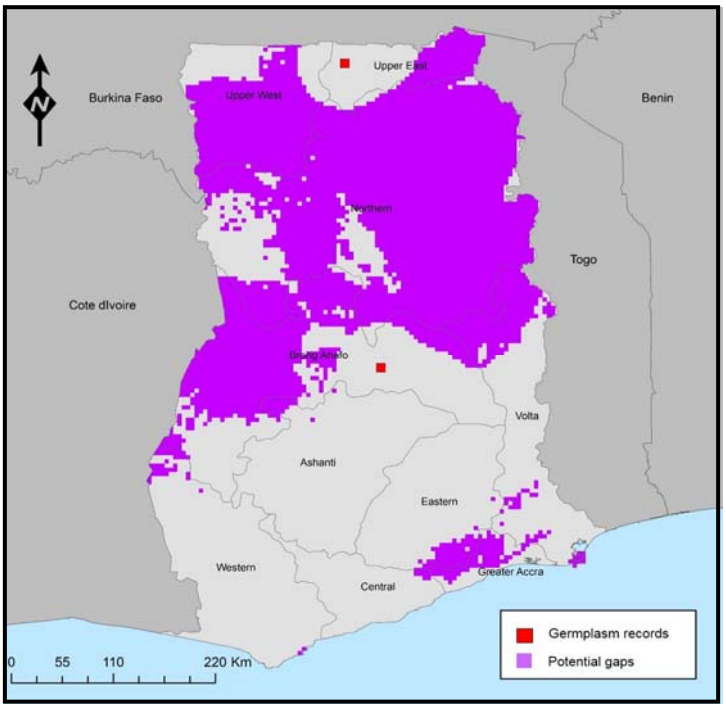
**Distribution:**

Throughout Africa.

**Altitude:** 0–2000 m

| *Oryza longistaminata* | May be confused with: *Oryza sativa* |
|---|---|
| Red caryopsis. | Caryopsis brown to white. |



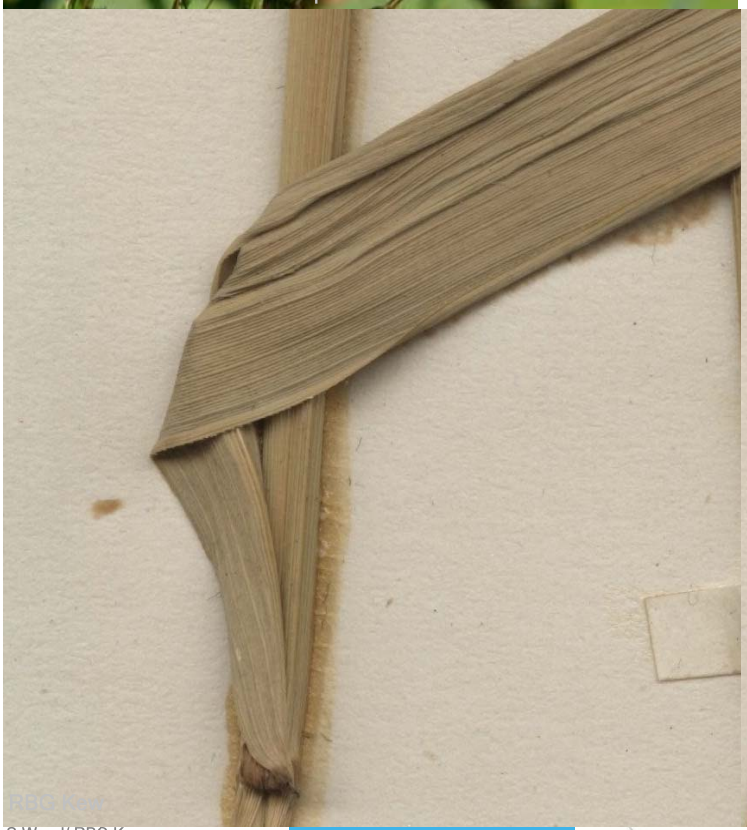

**References:** Flora of Mozambique website: http://www.mozambiqueflora.com; IRRI Rice Knowledge Bank http://www.knowledgebank.irri.org

POACEAE

# *Oryza longistaminata A.Chev. & Roehrich*

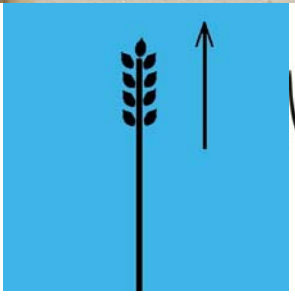
**Primary Gene Pool relative of Oryza glaberrima and Oryza sativa**

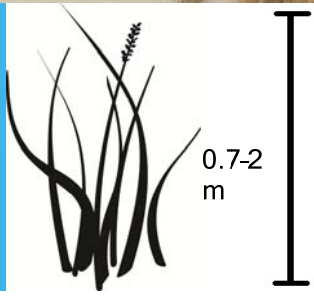






S.Wood/ RBG Kew



0.7-2 m

LC PRELIM

All year-
May peak

All year

POACEAE

# *Oryza punctata Kotschy ex Steud.*

**Secondary Gene Pool relative of Oryza glaberrima and Oryza sativa** **Red rice**

HABIT: Clump-forming annuals. Culms 50–120(–150) cm long, 3–6 mm diameter, spongy, 3–5 -noded.
LEAVES: Leaf-sheaths smooth, glabrous on surface. Leaf-blade surface scaberulous, rough on both sides, margins scabrous, apex acuminate.
INFLORESCENCES: Panicle open, elliptic; 15–35 x 3–17 cm. Primary panicle branches ascending, or spreading. Panicle branches angular; scaberulous. Spikelets solitary. Fertile spikelets pedicelled. Pedicels linear, angular; 2–5 mm long, scaberulous, tip cupuliform. Fertile spikelets comprising 2 basal sterile florets and 1 fertile floret, without rhachilla extension. Spikelets elliptic, laterally compressed, 4.9–6.2 mm long, 1.9–2.6 mm wide (2.5 times longer than wide), falling entire. Spikelet callus glabrous, base truncate, attached transversely. Glumes absent or obscure. Basal sterile florets similar, barren, without significant palea.
FRUIT: Caryopsis with adherent pericarp. Disseminule comprising a floret.

## Habitat:

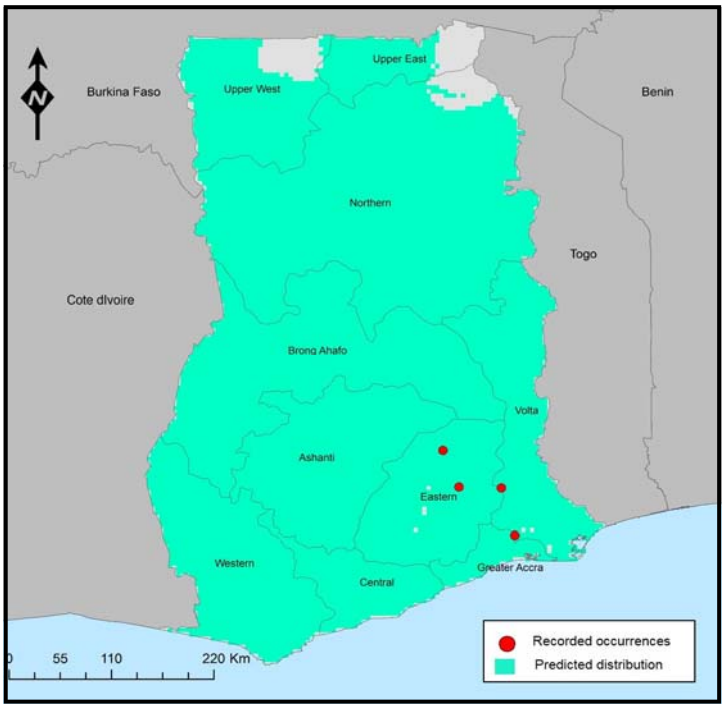
Open/semi-open habitats, forest margins, grassland and thickets, degraded mopane scrub, open bush or shifting cultivation fields; swampy areas, around water holes and pools, on riverbanks that flood to 1 m. Prefers black clay or sandy soil.

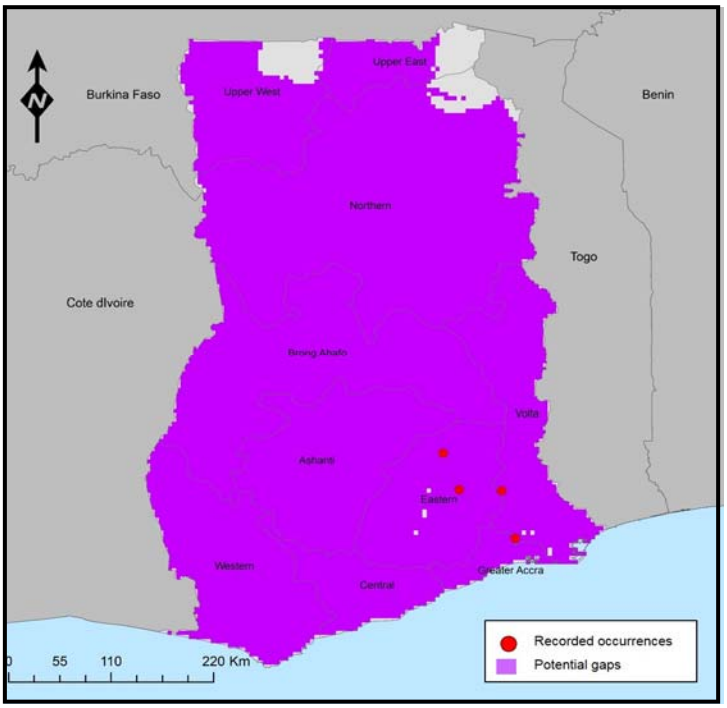
**Altitude:** 33-930 m

## Distribution:

Distributed across southern, eastern, central and western Africa.

| *Oryza punctata* | May be confused with: *Oryza eichingeri* |
|---|---|
| Culms 3-6 mm diameter. | Culms 2-3 mm diameter. |




**References:** Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html; IRRI rice knowledgebank http://www.knowledgebank.irri.org/extension/oryza-punctata-kotschy-ex-steud.html

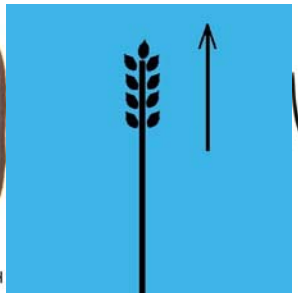
POACEAE

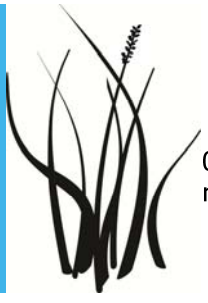
# *Oryza punctata Kotschy ex Steud.*

**Secondary Gene Pool relative of Oryza glaberrima and Oryza sativa** Red rice









0.5-1.2 m

LC PRELIM

All year

All year

POACEAE

# *Oryza schweinfurthiana Prodoehl*

**Secondary Gene Pool relative of Oryza glaberrima and Oryza sativa**

HABIT: Culms 50–120(–150) cm tall, 3-5-noded. Leaf-sheaths scarious, often spongy and aerenchymatous, distinctly striate. Ligule 3-10 mm.
LEAVES: Leaf-laminae 15–45 x 0.5–2.5 cm, linear to very narrowly elliptic, acuminate, usually broadest around the middle, pale-green or rarely glaucous, rather flaccid, expanded or folded around the midrib; midrib distinct beneath.
INFLORESCENCES: Panicle 15–35 x 3–17 cm, narrowly to broadly elliptic, sometimes fan-shaped in outline, loose, erect, or drooping, rhachis obtusely angular; solitary or sometimes adnate, angular, scabrous. Pedicels 2-5 mm long. Spikelets 5.5–6.25 x 2.25–2.8 mm. (usually 2.5 times longer than wide), deciduous, asymmetrically elliptic-oblong or broadly oblong in lateral view, greyish-green or glaucous. Glumes reduced to a membranous whitish narrow rim. Sterile lemmas about equal in shape and size, 1–1.5 mm long, lanceolate to lanceolate-deltate, acuminate, glabrous. Fertile lemmas slightly shorter than the spikelet, cymbiform, semi-elliptic-oblong in lateral view, coriaceous, flanks finely tesselate, shortly but stiffly hispid, rarely glabrous, keel and margins stiffly ciliate, lateral apical protrusions usually distinct, awn (1)2–7.5 cm long, very slender, flexuous, scaberulous, pale yellow. Palea slightly shorter than the lemma and much narrower. Anthers oblong, pale-violet. Stigmas blackish.
FRUIT: Caryopsis 4–4.75 x 1.5–1.75 mm, oblong, glabrous, light brown.

**Habitat:**

Semi-open or shaded habitats of forest margins and forests. Swampy areas, around water holes and pools, and flooding riverbanks. Clay or sandy soil.

**Distribution:**

East, Central, West and Southern Africa.

**Altitude:** unknown

| *Oryza schweinfurthiana* | May be confused with: *Oryza punctata* |
|---|---|
| O. schweinfurthiana may be considered a tetraploid form of O. punctata | |

Reported from Ghana, but no localities known.

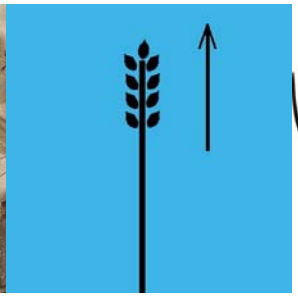
All populations priority for collection.

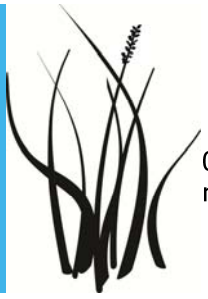
**References:** IRRI Rice Knowledge Bank http://www.knowledgebank.irri.org

# *Oryza schweinfurthiana Prodoehl*

Secondary Gene Pool relative of Oryza glaberrima and Oryza sativa


RBG Kew





0.5-1.2 m

LC PRELIM

No data

No data

POACEAE

# *Pennisetum purpureum Schumach.*

**Secondary Gene Pool relative of Pennisetum glaucum (L.) R. Br.**

**Elephant grass, Napier grass**

HABIT: Robust perennial forming large, bamboo-like clumps, with culms usually 2–3.5 m high (up to 7.5 m) and branched towards the top. Stem to 3 cm diameter near the base. Spreads by short rhizomes, rooting from lower nodes or falling stems rooting at nodes creating a stolon.
LEAVES: Leaf blades glabrous or hairy, 30–120 cm long and 1–5 cm wide; leaf-sheaths glabrous or with stiff hairs.
INFLORESCENCES: Bristly false spikes 10–30 cm long, 1.5–3 cm wide (excluding bristles) dense, usually yellow-brown in colour, more rarely greenish or purplish.
FRUIT: Caryopsis with adherent pericarp, ellipsoid, or ovoid, dorsally compressed, concealed by floret, 1.8–2.2 mm long.

## Habitat:

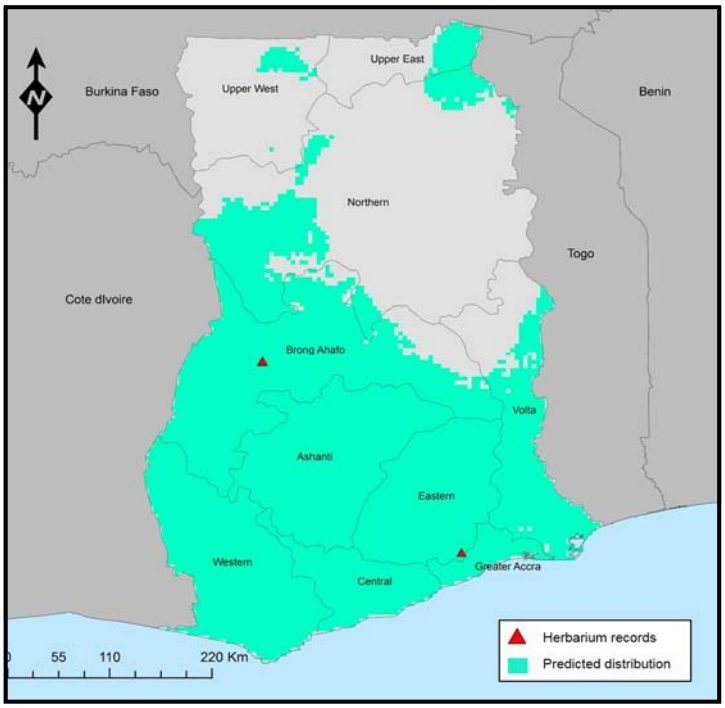
Riverine sites, valley bottoms and forest margins, with a preference for rich soils.

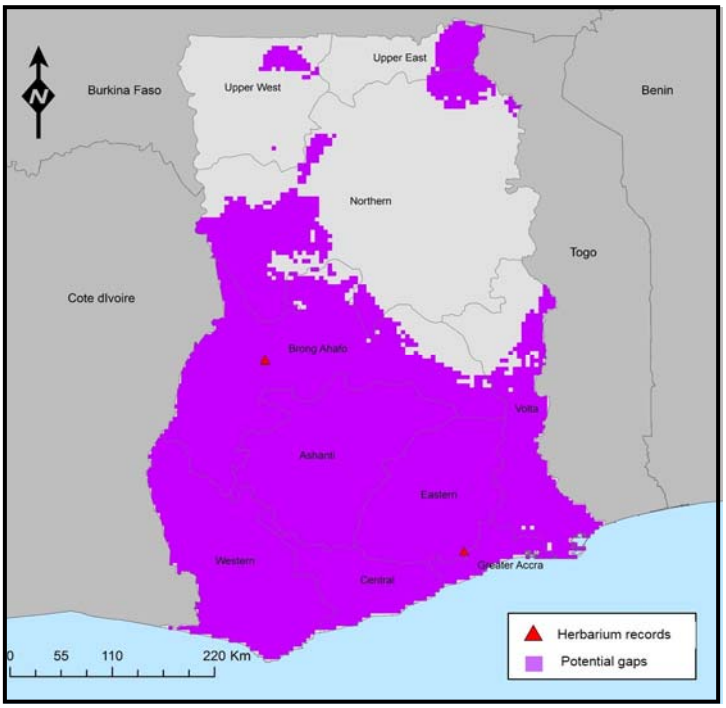
## Distribution:

Tropical Africa; introduced to most other tropical countries.

**Altitude:** 300-1800 m

| *Pennisetum purpureum* | May be confused with: *Setaria spp.* |
|---|---|
| Bristles are shed with the seeds.   | Seeds are shed without bristles.   |




**References:** W. D. Clayton (1989) Flora Zambesiaca, Volume10, part 3, Gramineae; Cook, B.G.,et al. (2005) Tropical Forages: an interactive selection tool http://www.tropicalforages.info/; Ibrahim K.M. & Kabuye C.H.S. (1987) An Illustrated Manual of Kenya Grasses

POACEAE

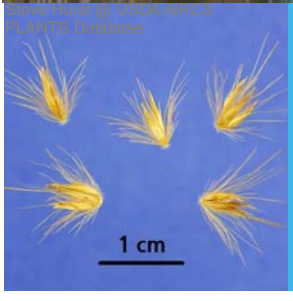
# *Pennisetum purpureum Schumach.*

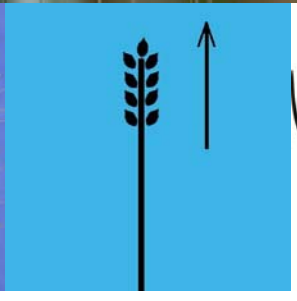
Secondary Gene Pool relative of Pennisetum glaucum (L.) R. Br.

Elephant grass, Napier grass







1-6 m

LC

PRELIM

Jan - June

Jan - June

POACEAE

# *Pennisetum sieberianum (Schltdl.) Stapf & C.E.Hubb.*

**Wild relative of Pennisetum glaucum (L.) R. Br**

HABIT Annual, culms robust; 100–300 cm long. Ligule a fringe of hairs.
LEAVES: Leaf-blades 50–100 x 0.2–0.4 cm wide.
INFLORESCENCES: Panicle spiciform, linear, 5–150 cm long, primary branches accrescent to a central axis, with lateral stumps, pubescent, spikelet clusters on a 0.3–1.5 mm stipe. Spikelets subtended by a bristly involucre 6–9 mm long, desciduous with spikelets. Spikelets comprising 1 basal sterile floret and 1 fertile floret, lanceolate, or elliptic, or obovate, dorsally compressed, 4–6 mm long, falling entire, deciduous with accessory branch structures. Lower glume usually absent or obscure, shorter than spikelet. Upper glume oblong, 1–3 mm long, 0.25–0.5 length of spikelet, membranous, without keels, 0–3 -veined, apex obtuse, or acute. Basal sterile florets male, or barren, palea present or absent. Lemma of lower sterile floret lanceolate, or oblong, 1.5–6 mm long, 0.33–1 length of spikelet, chartaceous, 3–5 -veined, margins ciliolate, apex emarginate, or obtuse. Fertile lemma lanceolate, or ovate, 3.5–5.5 mm long, coriaceous. Lemma margins flat, pubescent, apex truncate to acuminate. Palea coriaceous. Lodicules absent. Anthers 3, anther tip penicillate. Styles connate below.
FRUIT Caryopsis with adherent pericarp, ellipsoid, or ovoid, isodiametric, or dorsally compressed, concealed by floret, or exposed between gaping lemma and palea at maturity, 2–4.5 x 1–2 mm truncate, or obtuse.

**Habitat:**

**Distribution:**

Sahel zone of Africa, south to Angola and Namibia

**Altitude:** 0–1800 m

| *Pennisetum sieberianum* | May be confused with: *Pennisetum violaceum* |
|---|---|
| Involucres (cluster of spikelets and bristles) with stipe 0.3–1.5 mm long; mature caryopsis rounder, 1–2 mm thick. | Involucres (cluster of spikelets and bristles) sessile; mature caryopsis slender, 0.6–1 mm thick. |

Reported from Ghana, but no localities known.

All populations priority for collection.

**References:** Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html;

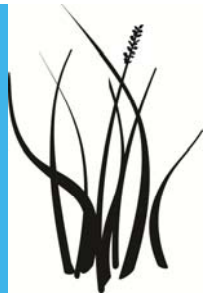
POACEAE

# *Pennisetum sieberianum (Schltdl.) Stapf & C.E.Hubb.*

Wild relative of Pennisetum glaucum (L.) R. Br


RBG Kew

No seed image available



1-3 m

NE

No data

No data

POACEAE

# *Sorghum bicolor subsp. verticilliflorum (Steud.) de Wet*

**Primary Gene Pool relative of Sorghum bicolor** — **Common wild Sorghum**

HABIT: Annual, rarely short-lived perennial, culms 30–400 cm high, robust, branched.
LEAVES: Leaf sheaths glabrous, ligule a membrane, edged with a fringe of fine hairs and hairy on the back, leaf laminas often large, 5–75 × 0.5–0.7 cm, broadly lanceolate, flat, glabrous on both surfaces, with a prominent whitish midrib.
INFLORESCENCES: Panicle 10–60 cm long, broadly spreading, main axis angular, glabrous, primary branches divided, pubescent at the nodes, 2–7-jointed, rhachis internodes and pedicels pilose. Sessile spikelet (4–)7(–9) mm long, lanceolate to narrowly ovate. Glumes coriaceous, inferior glume dorsally compressed, narrowly ovate, 2-keeled on the margins, superior glume glabrescent or with sparse hairs on the back, inferior floret empty, its lemma c. 5.5 mm long, lanceolate, ciliate on the margins, superior floret bisexual, its lemma c. 3 mm long, deeply lobed, ciliate on the lobes and margins, 1-awned,, glabrous. Palea c. 2 mm long. Pedicelled spikelets neuter, c. 6.5 mm long, linear to lanceolate, glumes chartaceous, inferior glume glabrous, superior glume slightly shorter than the inferior, glabrous, inferior lemma glabrous, with a truncate apex.

## Habitat:

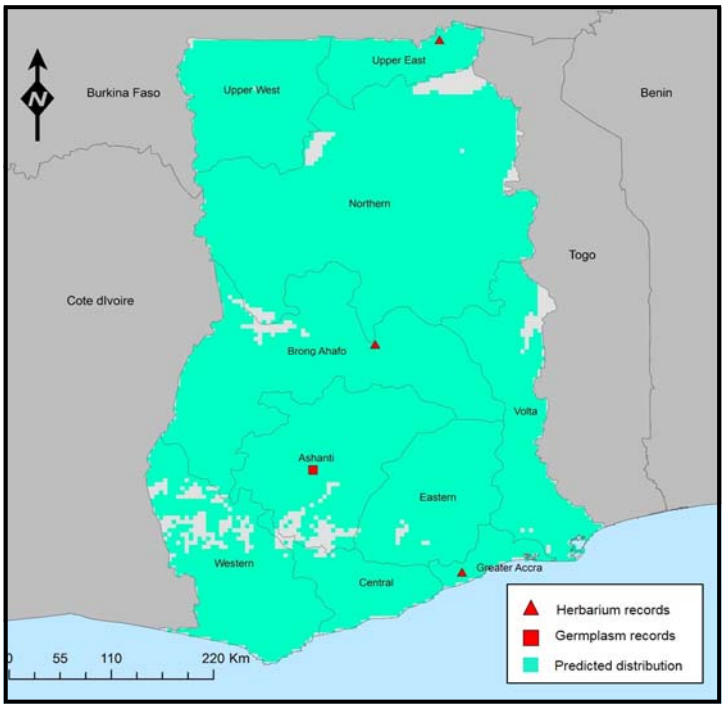
Swampy soils, streamsides, disturbed places and old farmland.

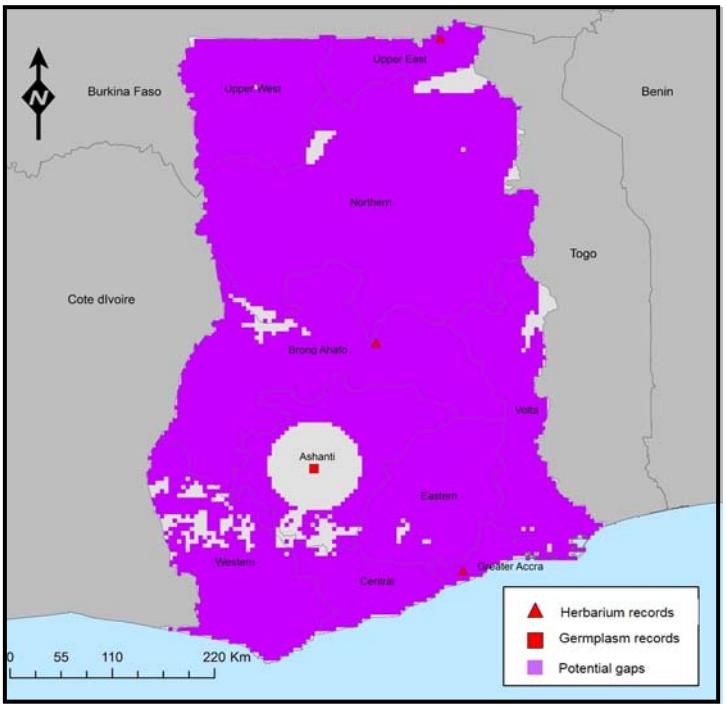
## Distribution:

Native to Africa, Madagascar, and perhaps to the Mascarenes. Introduced to India, Australia, and the Americas.

**Altitude:** 50-1400 m

| *Sorghum bicolor subsp. verticilliflorum* | May be confused with: *Sorghum bicolor subsp. drumondii* |
|---|---|
| Leaf blades linear lanceolate, up to 75 x 7cm, panicle up to 60 cm long x 25 cm wide. | Leaf blades lanceolate 50 x 6 cm, panicles 30 cm long x 15 cm wide. |




**References:** Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html.

POACEAE

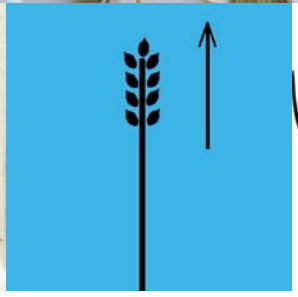
# *Sorghum bicolor subsp. verticilliflorum (Steud.) de Wet*

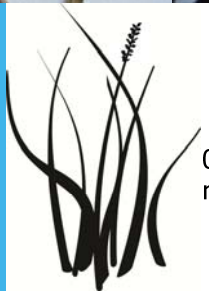
Primary Gene Pool relative of Sorghum bicolor

Common wild Sorghum









0.3-4 m

LC

PRELIM

Dec - July

Dec - July

SOLANACEAE

# *Solanum anguivi Lam.*

**Secondary Gene Pool relative of Solanum melongena L.**

**Forest bitterberry, Njujui**

HABIT: Erect woody herb or shrub, up to c. 4 m tall. Stems and leaves armed with straight or somewhat curved spines, yellowish to brownish, sometimes purple near the base, up to 13 mm long, branches often purple tinged. All parts covered in stellate hairs.
LEAVES: Rhombic-ovate, elliptic or lanceolate, thinly stellate hairy above, densely so below. The central ray of the stellate hairs often much longer than the lateral rays. Leaf margin subentire to triangularly lobed. Prickles usually present on the midrib and main veins.
INFLORESCENCES Racemose heads, up to 20-flowered. Corolla pale mauve or purple to almost whitish, star-shaped.
FRUITS: 6-12 mm in diameter, spherical, green, turning yellow and glossy orange-red when ripe. Edible when mature.

## Habitat:

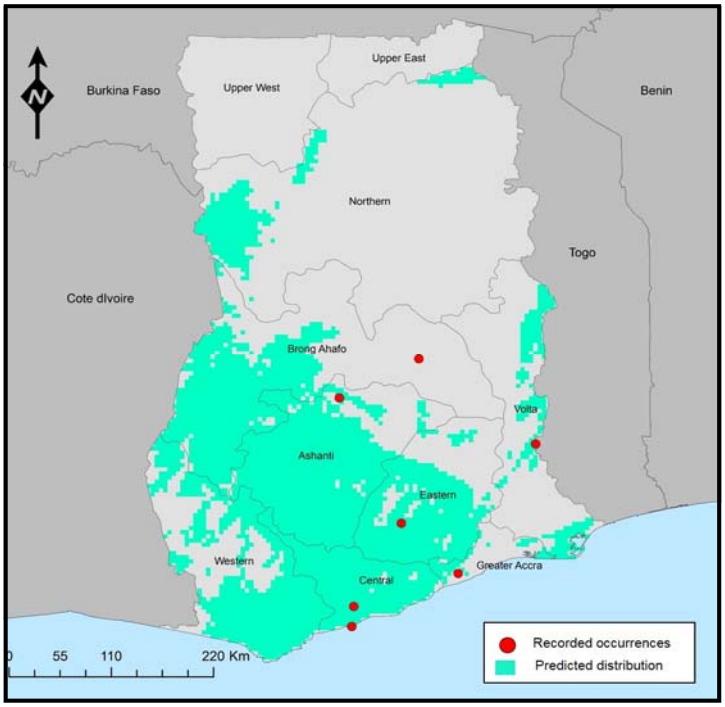
Markedly tolerant of open and shady sites in and at edges of both dry and wet forests, montane grassland and bushland, riverine associations, savanna woodland, thickets and coastal bushland.

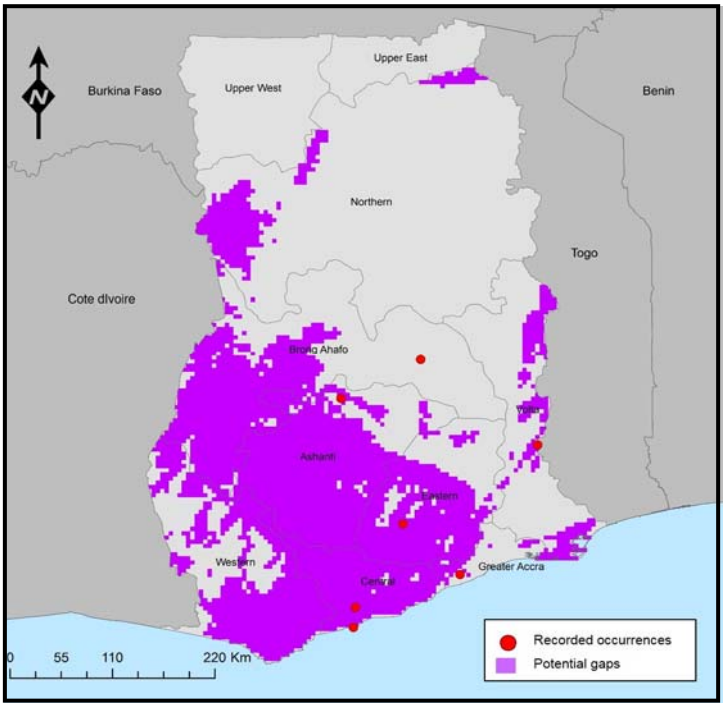
## Distribution:

Widespread in tropical Africa: distributed from Ethiopia southwards to South Africa (KwaZulu-Natal), also in Indian Ocean islands and the Arabian Peninsula.

**Altitude:** 0-2380 m

| *Solanum anguivi* | May be confused with: *Solanum torvum* |
|---|---|
| Ripe fruit is red. No glands on trichomes.  | Fruit yellow when fully ripe. Gland tipped trichomes on infloresence axis.  |




**References:** FZ volume:8 part:4 (2005) Solanaceae by A.E. Gonçalves; Hyde, M.A., Wursten, B.T. & Ballings, P. (2012). Flora of Zimbabwe: Species information: Solanum anguivi; Plant Resources of Tropical Africa (PROTA) website: http://www.prota.co.ke/en/home. ; Edible Wild Plants of Tanzania, Ruffo, C.K., 2002. Material for seed image provided by South African National Biodiversity Institute.

SOLANACEAE

# *Solanum anguivi Lam.*

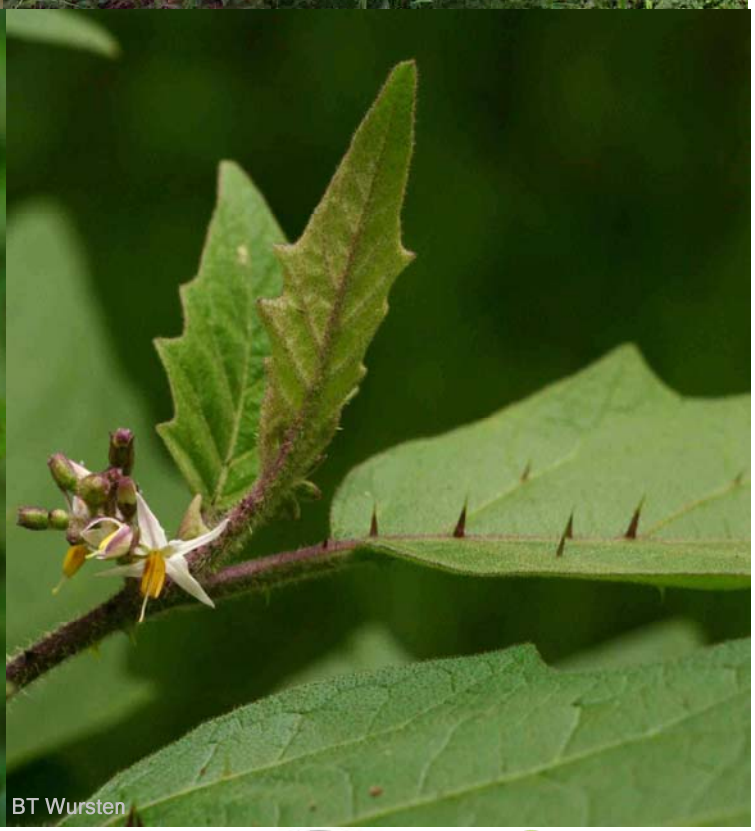
Secondary Gene Pool relative of Solanum melongena L.

Forest bitterberry, Njujui

G.A. Cooper, courtesy of Smithsonian Institution.

BT Wursten

BT Wursten



BT Wursten

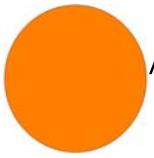
Gemma Toothill (c) Board of Trustees RBG Kew


2 -4 m

LC

PRELIM

Apr - Jul



Apr - Jul

# *Solanum dasyphyllum Schumach.*

**Tertiary Gene Pool relative of Solanum melongena L.**

HABIT: Erect woody perennial herb, 0.5–1 m, heavily armed, branched at the base.
LEAVES: Simple, blades 10–35 × 6–20 cm, 1.2–2 times longer than wide, elliptic, chartaceous, sparsely to densely stellate-pubescent on both sides.
INFLORESCENCES: Lateral, extra-axillary, 4–7 cm long, unbranched, with 5–10 flowers. Plants strongly andromonoecious, with one long-styled flower at the base of the inflorescence and all other flowers short-styled, the flowers 5-merous. Calyx 1–3 cm long in long-styled flowers, 0.8–2 cm long in short-styled flowers. Corolla 3.5–6 cm in diameter in long-styled flowers, 1.5–3.5 cm in diameter in short-styled flowers, (white) pale mauve to purple, almost rotate, the abundant interpetalar tissue often tearing.
FRUIT: A globose berry, 1(–2) per infructescence, 2.5–4 cm in diameter, spherical throughout development, rarely somewhat elongate, the pericarp thin, smooth, shiny, glabrous, plain green or with dark green stripes when young, yellow at maturity, drying orange-brown.
SEEDS ca. 50–100 per berry, 2.8–4.5 × 2–3.5 mm, flattened-reniform, almost round, orange to brown or almost black.

## Habitat:

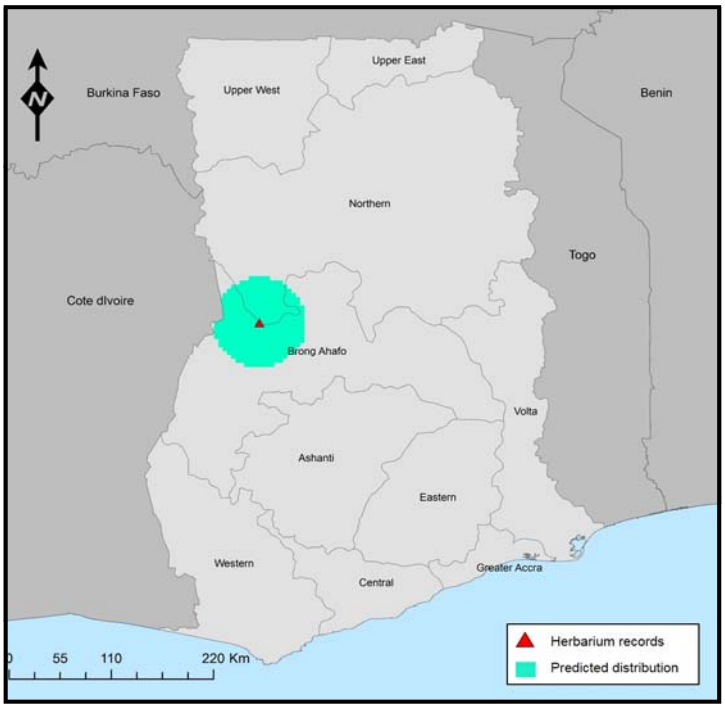
Usually a forest species but also found on hillsides, savannah, grassland, or wasteland, frequently near water.

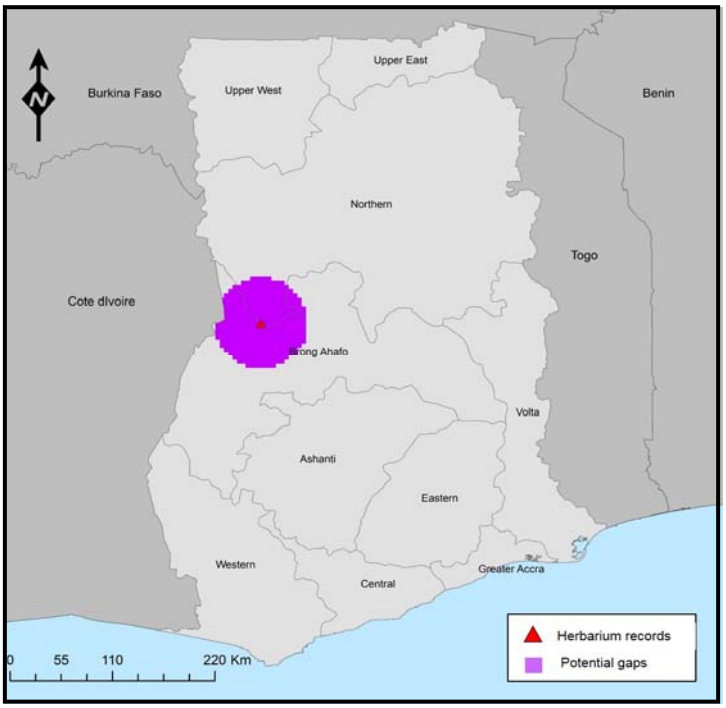
## Distribution:

Common throughout the highlands of West, Central and East Africa, between ca. 15°N and ca. 5°S.

**Altitude:** 600-1600 m

| *Solanum dasyphyllum* | May be confused with: *Other prickly Solanums* |
|---|---|
| Distinguished by lack of distinct petiole or long-attenuate leaf bases, almost rotate corolla on short-styled flowers, and only 4(5) rays on the stellae on vegetative parts of the plant.  | Other prickly Solanums in this area do not have this combination of characteristics. |




**References:** Vorontsova, M, (2009) Solanum dasyphyllum. In: Solanaceae Source. http://solanaceaesource.org/content/solanum-dasyphyllum.
Material for seed photo provided by IBPGR.

SOLANACEAE

# *Solanum dasyphyllum Schumach.*

**Tertiary Gene Pool relative of Solanum melongena L.**





Gemma Toothill (c) Board of Trustees RBG Kew


0.5-1 m

LC PRELIM

All year

All year

# Appendix - Synonyms



| Taxon | Sheet | Synonyms |
|---|---|---|
| *Ipomoea ochracea* | 1 | *Ipomoea curtisii* House; *Ipomoea ochracea* var. *curtissii* (House) Stearn |
| *Vigna unguiculata* subsp. *baoulensis* | 2 | *Vigna baoulensis* A. Chev. |
| *Eleusine indica* | 3 | *Agropyron geminatum* Schult. & Schult.f.; *Chloris repens* Steud.; *Cynodon indicus* (L.) Raspail; *Cynosurus ara* Buch.-Ham. ex Wall.; *Cynosurus indicus* L.; *Cynosurus pectinatus* Lam.; *Eleusine distachya* Trin. ex Steud.; *Eleusine distans* Link; *Eleusine distans* Moench; *Eleusine domingensis* Sieber ex Schult.; *Eleusine glabra* Schumach.; *Eleusine gonantha* Schrank; *Eleusine gouinii* E.Fourn.; *Eleusine inaequalis* E.Fourn.; *Eleusine indica* var. *major* E.Fourn.; *Eleusine indica* var. *monostachya* F.M.Bailey; *Eleusine indica* var. *oligostachya* Honda; *Eleusine indica* var. *sandaensis* Vanderyst; *Eleusine japonica* Steud.; *Eleusine macrosperma* Stokes; *Eleusine marginata* Lindl.; *Eleusine polydactyla* Steud.; *Eleusine rigidifolia* E.Fourn.; *Eleusine scabra* E.Fourn.; *Eleusine textilis* Welw.; *Juncus loureiroana* Schult. & Schult.f.; *Leptochloa pectinata* (Lam.) Kunth; *Paspalum dissectum* Kniph.; *Poa spicata* Willd. ex Steud.; *Triticum geminatum* Spreng. |
| *Oryza barthii* | 4 | *Oryza breviligulata* A.Chev. & Roehr.; *Oryza glaberrima* subsp. *barthii* (A.Chev.) De Wet; *Oryza mezii* Prodoehl; *Oryza perennis* subsp. *barthii* (A.Chev.) A.Chev.; *Oryza stapfii* Roshev. |
| *Oryza glaberrima* | 5 | *Oryza glaberrima* var. *subaristata* Roshev. |
| *Oryza longistaminata* | 6 | *Oryza dewildemanii* Vanderyst [Invalid]; *Oryza madagascariensis* (A.Chev.) Roshev.; *Oryza perennis* subsp. *madagascariensis* A.Chev.; *Oryza silvestris* Stapf ex A.Chev. [Invalid] |
| *Oryza punctata* | 7 | *Oryza eichingeri* var. *longiaristata* Peter; *Oryza sativa* var. *punctata* (Kotschy ex Steud.) Kotschy; *Oryza schweinfurthiana* Prodoehl |
| *Oryza schweinfurthiana* | 8 | None known |
| *Pennisetum purpureum* | 9 | *Pennisetum benthamii* Steud.; *Pennisetum purpureum* subsp. *benthamii* (Steud.) Maire & Weiller; *Pennisetum purpureum* subsp. *flexispica* (K.Schum.) Maire & Weiller |
| *Pennisetum sieberianum* | 10 | *Penicillaria compacta* A.Braun & C.D.Bouché; *Penicillaria cordofana* A.Braun & C.D.Bouché; *Penicillaria doche* A.Braun [Invalid]; *Penicillaria gymnothrix* A.Braun & C.D.Bouché; *Penicillaria gymnothrix* A. Braun & Bouché; *Penicillaria leucostachya* Klotzsch ex A.Braun [Invalid]; *Penicillaria leucostachys* Klotzsch; *Penicillaria nigricans* A.Braun [Invalid]; *Penicillaria nubica* Müll.Berol; *Penicillaria perrottetii* Klotzsch ex A.Braun; *Penicillaria perrottetii* Müll. Berol.; *Penicillaria sieberiana* Schltdl.; *Penicillaria socia* A.Braun & C.D.Bouché; *Penicillaria speciosa* A.Braun & C.D.Bouché; *Penicillaria stenostachya* Klotzsch ex A.Braun & C.D.Bouché; *Penicillaria vulpina* A.Braun & C.D.Bouché; *Penicillaria vulpina* Müll. Berol.; *Pennisetum americanum* subsp. *stenostachyum* (Klotzsch ex A.Braun & Bouche) Brunken; *Pennisetum americanum* var. *vulpinum* (A.Braun) Chiov.; *Pennisetum barteri* Stapf & C.E.Hubb.; *Pennisetum calostachyum* Rogeon; *Pennisetum chevalieri* Stapf & C.E.Hubb.; *Pennisetum dalzielii* Stapf & C.E.Hubb.; *Pennisetum glaucum* subsp. *sieberianum* (Schltdl.) Stapf & C.E.Hubb.; *Pennisetum gymnothrix* (A.Braun & C.D.Bouché) K.Schum.; *Pennisetum nigricans* T.Durand & Schinz [Invalid]; *Pennisetum nigricans* var. *perrottetii* (A.Braun) T.Durand & Schinz; *Pennisetum nigricans* var. *stenostachyum* (Klotzsch ex A.Braun) T.Durand & Schinz; *Pennisetum nigritarum* var. *leucostachyum* T.Durand & Schinz [Invalid]; *Pennisetum niloticum* Stapf & C.E.Hubb.; *Pennisetum orthochaete* Stapf & C.E.Hubb.; *Pennisetum perrottetii* (A.Braun) K.Schum.; *Pennisetum perspeciosum* Stapf & C.E.Hubb.; *Pennisetum perspeciosum* var. *lynesii* Stapf & C.E.Hubb.; *Pennisetum plukenetii* f. *depauperata* A.Braun; *Pennisetum plukenetii* f. *media* A.Braun; *Pennisetum robustum* Stapf & C.E.Hubb.; |

# Appendix - Synonyms



| | | |
|---|---|---|
| *Pennisetum sieberianum* (cont.) | | *Pennisetum sampsonii* Stapf & C.E.Hubb.; *Pennisetum sclerocladum* Stapf & C.E.Hubb.; *Pennisetum spicatum* var. *compactum* (A.Braun & Bouche) T.Durand & Schinz; *Pennisetum spicatum* var. *cordofanum* (A.Braun & C.D.Bouché) T.Durand & Schinz; *Pennisetum spicatum* var. *gymnothrix* (A.Braun & C.D.Bouché) T.Durand & Schinz; *Pennisetum spicatum* var. *nubicum* (C.Muell.) T.Durand & Schinz; *Pennisetum spicatum* var. socium (A.Braun & C.D.Bouché) T.Durand & Schinz; *Pennisetum spicatum* var. *speciosum* (A.Braun) T.Durand & Schinz; *Pennisetum spicatum* var. *vulpinum* (A.Braun) T.Durand & Schinz; *Pennisetum stenostachyum* (Klotzsch ex A.Braun) Stapf & C.E.Hubb. [Illegitimate]; *Pennisetum vulpinum* (A.Braun) Stapf & C.E.Hubb.; |
| *Sorghum bicolor* subsp. *verticilliflorum* | 11 | *Sorghum verticilliflorum* (Steud.) Stapf; *Sorghum brevicarinatum* Snowden; *Andropogon sorghum* (L.) Brot. var. *aethiopicus* Hack.; *Andropogon sorghum* (L.) Brot. subsp. *vogelianus* Piper; *Sorghum vogelianum* (Piper) Stapf; *Sorghum usambarense* Snowden; *Sorghum macrochaeta* Snowden; *Sorghum bicolor* (L.) Moench subsp. *arundinaceum* (Desv.) de Wet & J. R. Harlan ex Davidse; *Rhaphis arundinacea* Desv.; *Sorghum virgatum* (Hack.) Stapf; *Sorghum stapfii* (Hook. f.) C. E. C. Fisch.; *Holcus sorghum* L. var. *effusus* Hitchc.; *Andropogon arundinaceus* Willd.; *Andropogon sorghum* (L.) Brot. var. *virgatus* Hack.; *Andropogon sorghum* (L.) Brot. var. *effusus* Hack.; *Andropogon verticilliflorus* Steud.; *Sorghum pugionifolium* Snowden; *Holcus sorghum* L. var. *verticilliflorus* (Steud.) Hitchc.; *Sorghum arundinaceum* (Desv.) Stapf; *Sorghum lanceolatum* Stapf; *Sorghum aethiopicum* (Hack.) Rupr. ex Stapf; *Andropogon stapfii* Hook. f. |
| *Solanum anguivi* | 12 | *Solanum indicum* L.; *Solanum indicum* var. *lividum* (Link) Bitter; *Solanum indicum* var. *maroanum* Bitter; *Solanum lividum* Link; *Solanum scalare* C. H. Wright; *Solanum sodomeum* L. |
| *Solanum dasyphyllum* | 13 | *Solanum duplosinuatum* Klotzsch |