VOICES FROM THE FIELD

RUFORUM
Capacity Building in Agriculture

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Data sheet for baobab (Adansonia digitata L.)

Leaves' Production

RUFORUM
Capacity Building in Agriculture

Inspiring the next Generation of Scientists for Africa

Our Vision

Vibrant transformative universities to catalyse sustainable inclusive agricultural development to feed and create prosperity for Africa

Our Mission

To strengthen the capacities of Universities to foster innovations responsive to the demands of smallholder farmers and value chains through the training of high quality researchers, the output of impact-oriented research, and the maintenance of collaborative working relations among researchers, farmers, market actors, national agricultural research and advocacy institutions, and governments

Our Motivation

"Transforming agriculture in Africa requires innovative scientific research, educational and training approaches. The education sector needs to be more connected to the new challenges facing rural communities and needs to build capacity of young people to be part of the transformation of the agricultural sector". Reinforced by the Science Agenda for Agriculture in Africa

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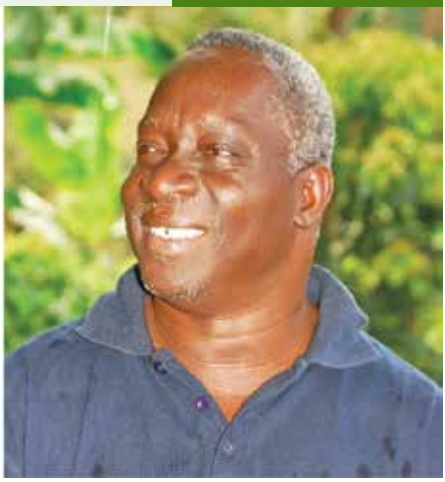
Implementing Partners

FOREWORD



The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), through this publication series, Bringing Science to Communities: Voices from the Field (Vol 3.1), is showcasing the project RU/2018/CARP+/01 entitled "Scaling up African baobab food products valuation through enhancement of their safety and value chains for food and nutritional security in Benin''. This project is implemented by the University of Abomey-Calavi (Benin) in the frame of the RUFORUM Community Action Research Programme PLUS (CARP+), which is an initiative supported by the Mastercard Foundation. The African Baobab, Adansonia digitata L. is a strategic indigenous tree species for sub-Saharan Africa.

Its pulp is highly nutraceutical and is used as food ingredient and dietary supplement in Africa, Europe and America. Its leaves are also highly nutritious and nutraceutical with increasing demand. Thus, because of the growing local/global market of the species derived products, it becomes imperative to structure its value chains (VC) which has been so far disregarded in many national state agendas; this is in spite of its demonstrated potential to promote pro-poor growth, especially women who are specialized in baobab products related activities.

In this context and based on outcomes of previous research activities on the species (e.g. RUFORUM-GRG projects 125 & 135), the current project has been developed. It aims to combine both participatory research and capacity building activities to set a conducive and sustainable scheme of valorization for the African baobab in Benin.

The project seeks to promote and nurture long term partnership between public research institutions, local communities, TVETs, NGOs, and private for-profit companies. It envisages to improve actors' revenue through better organization of the value chains while contributing to food security and nutrition of households as well as sustainable conservation of the species. Accordingly, through the development of the baobab value chains, this project will stimulate the local economy through the development of business aspects of farming, post-harvest handling and processing of baobab products.

After one year of implementation, it has generated some significant outcomes that need to be shared with the RUFORUM community – a network of 114 African Universities in 38 countries on the continent and with stakeholders. In this Vol. 3.2 of the RUFORUM publication series, a technical guide on African Baobab leaves production is provided. It builds on field stories that were published under Vol. 3.1 detailing experiences of moving research from the laboratories to the market. It demonstrates that through research novel technologies and processes can be provided that support sustainable production and utilization of African natural resources. I wish you a fruitful reading.

Prof. Adipala Ekwamu
RUFORUM Executive Secretary

Preamble

African baobab (Adansonia digitata L.) is an agroforestry species with a high potential in the fight against food insecurity and malnutrition in Africa. Pulp and leaves of baobab are the two most harvested products which highly contribute to farmers especially women's income and households food security reach in sub-Saharan Africa.

Over exploitation of those plant parts added to low natural regeneration of the species put at risk the remaining populations of the species. Among sustainable alternative for conservation is the domestication / cultivation of the species for its leaves and fruits. The present data sheet describes the technical route for organic farming of baobab seedlings for their leaves.




1. Description of Baobab

Common names for Baobab

Language	Common Name
English	African baobab, baobab, monkey bread tree, Ethiopian sour gourd, cream of tartar tree, Senegal calabash (fruit), upside-down tree
French	Baobab, pain de singe (fruit), arbre aux calebasses, arbre de mille ans, calebassier du Sénégal
Fon/ goun	Kpassa
Yorouba/ nagot	Osché
Dendi	Kôô
Bariba	Sônbu
Ditammari	Moutomu

Other local names can be found in Assogbadjo et Loo (2011) et Rahul et al. (2015)

Botanical description of Baobab

Adansonia digitata is a dicotyledonous and agroforestry species native to tropical Africa, belonging to the Malvaceae family. Made of a spongy mass, the trunk is irregular in the shape of a belly bottle. The crown is spread with huge white leaves and grouped at the end of the branches. It is a massive deciduous tree of20 to 30 m high with 3 to 9 m in diameter at adult age (Rahul et al., 2015). A. digitata normally lives for about 500 years, but it is believed that some trees are up to 5000 years old (Namratha and Sahithi, 2015). The bark is smooth, grey with blue reflections or crimson. Baobab tree produces an extensive lateral root system until 50 m from the trunk. The roots tips are often in the form of tubers. But the main roots of old trees are relatively shallow and rarely extend beyond 2 m depth. Therefore, they are very sensitive to strong winds and can be uprooted by storm (Sidibé and Williams, 2002). Leaves of young trees are usually simple.

Adult trees begin each season by producing simple leaves followed by 2-3-leaflets leaves; mature leaves of about 5 to 9 leaflets (5-16 x 2-6 cm) lengthily petiolate (8-16 cm), to 13-20 pairs of secondary veins, whole or denticulated limb appears later. The flowers are white, large (10-20 cm), pendulous from a peduncle up to 1 m length, solitary or paired in the leaf axils, hermaphrodite, with many white stamens with an ovary of 5-10 boxes and produce capsules inside which there are many seeds surrounded by a foury pulp (Diop et al., 2005). Flowering appears before the rainy season. Pollination is mainly insured by bats.




2. Uses & nutritional importance of Baobab leaves

Uses of Baobab leaves

Fresh leaves of Baobab are widely used as vegetable in sauce preparation. They are used either as :

- Spinach or spice
- dried powder


Nutritional importance of Baobab leaves

Baobab leaf is an excellent source of calcium, iron, potassium, magnesium, manganese, molybdenum, phosphorus, and zinc, pro-vitamins A and C and vitamin B2. It contains 13-15% protein, 60-70% carbohydrate, 4-10% fat and around 11% fibre. Energy value varies from 1180 to 1900kJ/100g of which 80% is metabolized energy (Becker, 1983 ; Yazzie et al., 1994 ; Nordeide et al., 1996 ; Sidibé et al., 1996 ; Gebauer et al., 2002 ; Chadare et al., 2009; De Caluwé et al., 2010; Yusha'u et al., 2014).

Leaf is used as a panacea, that is to treat almost all diseases and specific documented uses including the treatment of malaria, tuberculosis, fever, microbial infections, diarrhoea, anaemia, dysentery, toothache, etc. (Adanson, 1771; Watt and Breyer-Brandwijk, 1962; Sidibé and Williams, 2002 ; El-Rawy et al., 1997; Nguta et al., 2010 ; Kamatou et al., 2011).

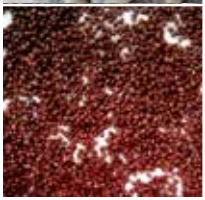


3. How to cultivate baobab fresh leaves

Seeds' collection

Collect/extract viable seeds (those that submerge after soaking in water) from mature fruits. For this, it is necessary to break the capsules, extract the seeds coasted with pulp and wash everything in water at room temperature to extract the seeds






Seeds' pre-treatment

Put the viable seeds in a container of boiling water for 48 h.

Soil preparation

- Clear the site and make the plots
- Add fertilizer : 300 kg/100 m2 of poultry dropping or 900 kg/100 m2 of cow dung
- Sow at 15 × 15 cm spacing

Sowing of pre-treated seeds

Sow directly 2 seeds to approximately 2 cm of depth per seed hole. Next to sprouting, the seedlings are thinned out and only the most vigorous seedling is kept per seed hole.

Leaves harvesting

- Harvesting frequency: 45th day after planting following by monthly harvests.
- Harvesting technics: harvesting all leaves but sparing the terminal buds.

The average leaves biomass production is 41.62 ± 1.16 kg of dry matter per 100 m2 (equivalent to 157.29 ± 4.38 kg of fresh leaves per 100 m2).

Crop maintenance

- Watering: do copiously according to the need of the sites and the seasons.
- Weeding: if necessary.
- Control of pathogens: if necessary with botanical extracts of neem leaves.

Fiche technique pour la culture de feuilles fraîches du baobab (Adansonia digitata L.)

Préambule

Le Baobab africain (Adansonia digitata L.) est une espèce agroforestière de haute potentialité dans la lutte contre l'insécurité alimentaire et la malnutrition en Afrique. La pulpe du fruit et les feuilles du baobab sont les deux produits clés moissonnés qui contribuent fortement aux revenus des agriculteurs particulièrement des femmes et à la sécurité alimentaire des ménages en Afrique subsaharienne.

La surexploitation de ces produits couplée à la faible régénération naturelle de l'espèce menace la survie de ses populations. Une des solutions alternatives durables pour la conservation est la domestication/culture de l'espèce pour ses feuilles et fruits. Cette fiche technique décrit les techniques de culture biologique des plantules de baobab pour leurs feuilles.




1. Description du Baobab

Noms communs du Baobab

Langue	Nom commun
Anglais	African baobab, baobab, monkey bread tree, Ethiopian sour gourd, cream of tartar tree, senegal calabash (fruit), upside-down tree
Français	Baobab, pain de singe (fruit), arbre aux calebasses, arbre de mille ans, calebassier du Sénégal
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Dendi	Kôô
Bariba	Sônbu
Ditammari	Moutomu

D'autres appellations peuvent être trouvés dans Assogbadjo et Loo (2011) et Rahul et al. (2015)

Description botanique du Baobab

Adansonia digitata L. est une espèce dicotylédone et agroforestière originaire de l'Afrique tropicale, de la famille des Malvaceae. C'est un arbre de 20 à 30 m de haut ayant 3 à 9 m de diamètre. Constitué d'une masse spongieuse, le tronc est irrégulier en forme de bouteille ventrue. La cime est étalée avec d'énormes branches et feuilles groupées à l'extrémité des rameaux. A. digitata est un arbre à feuilles caduques et massives, haut de 20-30 m avec un diamètre de 2-10 m à l'âge d'adulte (Rahul et al., 2015). A. digitata vit normalement pendant environ 500 années, cependant quelques pieds de 5000 ans ont été inventoriés (Namratha et Sahithi, 2015). L'écorce est lisse, grise avec des reflets bleus ou purpurins. A. digitata produit un système latéral étendu de racine jusqu'à 50 m à partir du tronc. Les bouts de racines sont souvent sous forme de tubercules. Mais les racines principales de vieux arbres sont relativement peu profondes et se prolongent rarement au-delà de la profondeur de 2 m. Par conséquent, elles sont très sensibles aux vents forts et peuvent être déracinées par l'orage (Sidibé et Williams, 2002). Les feuilles de jeunes arbres sont généralement simples. Les arbres d'adulte commencent chaque saison en produisant les feuilles simples suivies des feuilles de 2-3 folioles ; les feuilles mûres d'environ 5 à 9 folioles (5-16 x 2-6 cm) longuement pétiolées (8-16 cm), à 13-20 paires de nervures secondaires, à limbe entier ou denticulé apparaissent plus tard. Les fleurs sont blanches, grandes (10-20 cm de long) pendantes au bout d'un pédoncule pouvant atteindre 1 m de longueur, solitaire ou par paire, hermaphrodite, et de nombreuses étamines blanches avec un ovaire de 5 à 10 loges et produit des capsules à l'intérieur desquelles se trouvent de nombreuses graines entourées d'une pulpe farineuse (Diop et al., 2005). La floraison se fait avant la saison des pluies. La pollinisation est principalement assurée par des chauves-souris




2. Utilisations & importance nutritionnelle des feuilles du Baobab

Utilisations des feuilles du Baobab

Les feuilles fraîches du Baobab sont largement utilisées comme légume dans la préparation de sauce. Elles sont utilisées soit sous forme :

- d'épinard
- de poudre séchées


Importance nutritionnelle des feuilles du Baobab

La feuille du baobab est une excellente source de calcium, fer, potassium, magnésium, manganèse, molybdène, phosphore, zinc, pro-vitamines A et C et vitamine B2. Elle contient 13-15% de protéine, 60-70% de glucide, 4-10% matière grasse et environ 11% de fibre. La valeur énergétique varie de 1180-1900kJ/100g dont 80% est l'énergie métabolisée (Becker, 1983 ; Yazzie et al., 1994 ; Nordeide et al., 1996 ; Sidibé et al., 1996 ; Gebauer et al., 2002 ; Chadare et al., 2009; De Caluwé et al., 2010; Yusha'u et al., 2014).

La feuille est employée comme une panacée, c.-à-d., pour traiter presque n'importe quelle maladie et les utilisations documentées spécifiques incluent le traitement du paludisme, tuberculose, fièvre, infections microbiennes, diarrhée, anémie, dysenterie, odontalgie, etc (Adanson, 1771; Watt and Breyer-Brandwijk, 1962; Sidibé and Williams, 2002 ; El-Rawy et al., 1997; Nguta et al., 2010 ; Kamatou et al., 2011).

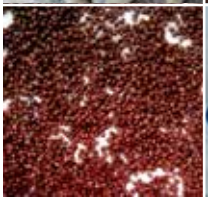


3. Comment cultiver les feuilles fraiches de Baobab

Collecte des graines (semences)

Recueillir/extraire les graines viables (celles qui submergent après trempage dans l'eau) des fruits mûrs. Pour cela, il faut casser les cabosses, extraire les graines enrobées de pulpe et laver le tout dans de l'eau à température ambiante pour extraire les graines après avoir.






Pré-traitement des graines

Tremper dans un récipient les graines viables dans l'eau préalablement chauffée à l'ébullition puis laisser jusqu'au refroidissement pendant 48h

Préparation du sol

- Défricher les terres puis confectionner les planches
- Fertilisation : 300 kg/100 m2 de fiente de volaille ou 900 kg/100 m2 de bouse de vache
- Densité de semis : 15 × 15 cm

Semis des graines pré-traitées

Semer directement 2 graines à 2 cm de profondeur par poquet. Seuls les plants vigoureux sont maintenus après émergence des graines en raison d'un plant par poquet

Entretien

- Arrosage : fait copieusement selon le besoin des sites et les saisons.
- Désherbage : en cas de besoin.
- Lutte contre les agents pathogènes : au besoin avec les extraits botaniques de feuille de neem.

Récolte des feuilles

- Fréquence de récolte : 45ième jour après semis suivie des récoltes mensuelles.
- Technique de récolte : Récolter sur pied en épargnant les bourgeons terminaux.
-

La production moyenne de biomasse foliaire est 41,62 ± 1,16 kg de matière sèche par 100 m2 (équivalent à 157,29 ± 4,38 kg de feuilles fraîches par 100 m2).

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