



**Insights from
research-development:
Labs to markets**



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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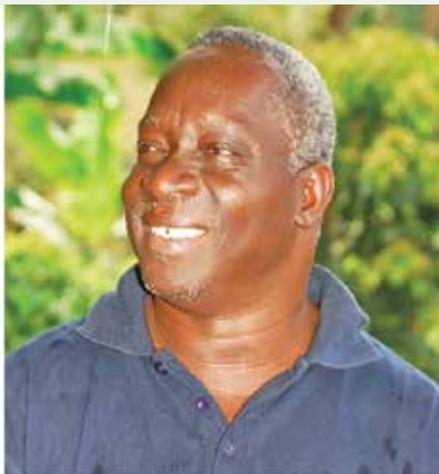
The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), through this publication series, *Bringing Science to Communities: Voices from the Field* (Vol 3.1), is showcasing the project RU/2018/CARP+/01 entitled “Scaling up African baobab food products valuation through enhancement 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 85 African Universities in 35 countries on the continent and with stakeholders. In this volume of the RUFORUM publication series, field stories related to some of the undertaken initiatives are told by sponsored students and by leaders (researchers, partner NGOs, etc.) of the project.

Therefore, evidences from Baobab value chains in supporting investments, policies and actions in Benin have been brought. Moreover, the initiative of creation of a platform of actors to enhance the value chains in the baobab sector has been



presented. Furthermore, research activities implemented by three sponsored MSc students and a PhD student have been summarized in a language accessible for communities. This included

- (i) food to food fortification with baobab resources: local solutions for better childhood nutrition,
- (ii) developing new Maize-Baobab mix flour for cooked dough preparation to local communities and food industries,
- (iii) enhancing the consumption of wild vegetables with ready to cook sauce from baobab leaf powder, and (iv) developing technical solutions to support baobab

plantations and baobab based horticultural systems. All these initiatives are already positively impacting actors in the baobab sector in Benin, and more impact are expected on the whole continent.

I kindly invite all readers to learn from this compilation of stories on baobab value chains and I hope it will be a reference in designing similar initiatives on other wild edible species in order to improve the well-being of local communities.

Prof. Adipala Ekwamu
RUFORUM Executive Secretary

Bringing evidences from Baobab value chains to support investments, policies and actions in Benin



Photo: From left to right: baobab fruit, baobab pulp and baobab leaves powder
(Photo Crédit Chadare; @Marché des entrepreneurs)

The food and nutrition vulnerability is a major issue in Sub-Saharan Africa with one in four people suffering from undernourishment. In Benin, food and nutrition security is still challenging with 9.6% of the population corresponding to 1.09 million of people living in food insecurity. To address this issue and take out local communities from critical food situation, the development of the value chains of wild edible resources positions prominently among the most viable and sustainable pro-poor interventions.

In this sense, researchers, policymakers and practitioners are constantly in search of local and innovative solutions including the development or enhancement of wild edible resource-based products, locally available and affordable. Scientific evidences are needed in this process to guide entrepreneurs while informing policy decisions, programmes and projects for dedicated and targeted interventions.

Literature shows that wild edible plant resources are excellent sources of nutrients and good starters for food-to-food fortification. They are locally hands-on and traditionally and historically used by local communities. Among these resources, the African baobab (*Adansonia digitata* L.) is remarkably famous not only for its high nutritional values but also for the growing interest of national and international market on baobab-based products.

The baobab products are a delicacy amongst local communities. For instance, either the pulp is consumed directly from the pod, or mixed with water as a refreshing beverage. “If the monkeys like it, men love it, that’s why its fruit is called monkey bread” said Mr. Sambieni, a local collector and processor of baobab product in Benin.

Since 2006, our research group has been conducting different investigations on baobab including on domestication (DADOBAT, 2006-2010), its use as agroforestry species to restore degraded lands (CORAF/WECARD, 2014-2016), the development of agro-ecological package for baobab leaves production

in smallholder farms (RU-GRG 135, 2015-2017), and food-to-food fortification using baobab pulp (RU-GRG 125, 2015-2017). Our biggest challenge, like, other research-development investigations around the world, was how to move the research outputs from the Labs to the market, engaging policymakers in designing conducive policies and programmes, and supporting local entrepreneurs to uptake and value the evidences in food industry.

In 2018, working on value chains enhancement our team generated series of evidences to inform entrepreneurs and policymakers on the state of the baobab value chains, the opportunities and imperatives to boost the development of the market for baobab-based products. Six value chains of baobab pulp and leaves were mapped, described and analyzed. The upgrade of baobab pulp processing generated more wealth— added value of the activity —between XOF 2,150 and 7,500 per kg of baobab pulp.

These value chains are more promising than the ones based on baobab leaves. There are also untapped opportunities for investments in baobab production either as plantation or in horticultural systems to support the ongoing market boom of the baobab-based products.

The outputs from our investigations were also used to design a roadmap for a multi-stakeholder's platform for baobab value chains in Benin.



For the coming months, our team is committed to think out of the box and will organize thematic trainings, exhibition, B2B (Business to Business) and B2C (Business to Consumer) events to facilitate dissemination, uptake and valorization of the evidences on baobab value chains.

Dr. Rodrigue Castro Gbedomon (Beninese) and Dr. Augustin Aoudji (Beninese) from the Faculty of Agricultural Sciences, University of Abomey-Calavi are part of the Benin's research group on baobab wherein they bring their expertise in natural resources economics, value chain analyses and in supporting evidence-use by policymakers and practitioners. They could be contacted at gbedomon@gmail.com and augustin.aoudji@gmail.com

Enhancing value chains in the baobab sector by creating a platform for actors



Bring all actors together in a platform is an excellent initiative because we have difficulties in getting access to raw material. The product is not always available. In addition, we are facing unfair competition from those who do not use good quality of pulp flour and sell their products at very low prices". » Said GOUGLA Paul, a Baobab pulp processor and trader in Parakou, Benin.

Nowadays, Benin market offers several opportunities to actors in the baobab sector due to the increasing demand of the baobab derived products.

In Benin, baobab ranks among the most used non-timber forest products (NTFP). Its organs are used by local people both in food and traditional medicine. The commercialisation of baobab derived products constitutes an important source of income for actors of the sector. However, several difficulties seem to mark the daily life of these actors among which are: (i) the low availability of pulp and leaves —the raw material —for processing (ii) the low

quality of marketed baobab products, and (iii) the low dissemination of information to easy flow of products. Appropriate solution are needed but require a collective action among actors of the sector. Thus, to create a framework for dialogue to strengthen business ties and collectively face the constraints experienced by the various links in the sector, the BAOCHAIN project funded by RUFORUM and Mastercard Foundation under the Community Action Research Programme PLUS (CARP+), and implemented by the Faculty of Agricultural Sciences of University of Abomey-Calavi (FSA/UAC), has initiated a support for the creation of a platform of actors in the sector.

Indeed, for several years teams of researchers from the Faculty of Agricultural Sciences (FSA) of University of Abomey-Calavi (UAC) have carried out various research works on the diversity of baobab in Benin, baobab production, baobab pulp processing and recently marketing of the derived products. From findings of some of these investigations, initiatives of planting baobab, transforming leaves and pulp of baobab, and of distributing various baobab derived products

have scaled up in Benin. These initiatives are being set up in a commercial context where baobab pulp is of a great value at the international scale. In that frame, a multidisciplinary team of the FSA/UAC made of three laboratories namely Laboratory of Applied Ecology (LEA), Laboratory of Biomathematics and Forest Estimations (LABEF) and Laboratory of Food Sciences (LSA), is implementing the BAOCHAIN project which aims at developing value chains in the baobab sector in Benin. This will support actors of the baobab sector in Benin to better take advantage of the sales opportunities of baobab products at both national and international levels. Given the constraints restraining the proper development of the sector above-mentioned, one of the expectations of this project is to bring stakeholders in the baobab sector, both direct and supporting actors, together in order to build a platform. This process of platform creation is led by the Centre for Intervention for Development (CIDEV NGO), one of the partner NGOs in the project.

Thus, CIDEV ONG conducted a field diagnosis in order to gather and analyse opinions of actors of the sector and record their expectations regarding the creation of such a platform. The diagnosis allowed (i) to have the opinion of all categories of actors on the initiative of such platform, (ii) to identify the key actors wishing to be part of the platform, (iii) to record the propositions of actors regarding the characteristics of the platform (legal status, administrative level/organisation, objectives, fields of intervention, intervention mechanism, etc.), and the urgent actions to be carried out during the first two years of existence of the platform.

Next to this diagnosis, a multi-stakeholder workshop bringing together representatives of the BAOCHAIN project, producers/collectors of baobab fruits/leaves, traders of pulp and baobab leaves, baobab pulp processors, distributors of

finished products, as well as representatives of the ministry in charge of agriculture, was organized in Dassa-Zoumè. During this workshop, the creation of the platform has been officially launched. A management committee has been set up and a two-year priority action plan has been developed.

This platform is a framework for dialogue between actors of the various links that have a stake for the development of the baobab sector and which share the ambition of its development. Its essential role is to look after the collective interests of the sector by offering each category of actors a space to negotiate their own interests. Its goal is to federate at best all the actors of the sector, to reinforce their capacities and to improve the productivity and the competitiveness of the baobab derived products.

The action plan prioritizes that in the short term, in two years, the consolidation of the platform is ensured through the formalization of its legal status and the mobilization of the maximum number of actors in the sector; an effective communication system is set up within the platform to facilitate the dissemination of information, the visibility of the products of the sector and of the various categories of actors in the sector is strengthened.

Mr. Dieudonné Konnon (Beninese) is the Coordinator of CIDEV NGO, a partner in charge of organisation of baobab's actors in the frame of the BAOCHAIN project. Dr Achille Hounkpevi, from Laboratory of Biomathematics and Forest Estimations, Faculty of Agricultural Sciences is one of the representatives of the BAOCHAIN Project who attended the actors' workshop to launch the platform creation initiative. They could be contacted via dkonnon13@gmail.com and hounkpeviachille@gmail.com.

Food to Food fortification with baobab resources: Local solutions for better childhood nutrition



Micronutrient deficiencies is still one of the main health problems in Benin and the most important vulnerable groups are the under five years old children and women in reproductive age particularly in rural area. After six months of breastfeeding, the majority of diet consumed by these children are cereals porridges generally poor in micronutrients. These porridges complementary foods are mainly formulated with cereals (maize, sorghum, millet, fonio, rice), legumes (soya, groundnuts) and some other protein sources (dry fish, milk powder).

Is it possible to enrich these cereals porridges complementary food with micronutrients using local available resources? During my Master study in Benin especially in Sudanian zone, I worked on complementary food supplement formulation based on baobab fruit pulp for under five years old children.

The idea was declined from my field survey experiences through Ruforum BARINGA (RU 2015 GRG 125) project where I was junior

scientist research. This project aimed at designing food to food fortification formula using baobab fruit pulp and moringa leaf powder as local food fortificant to alleviate micronutrients' deficiencies among under-five year old children and women in reproductive age.

The designed food fortification formulas were found to be rich in bioavailable iron, calcium and zinc but their acceptability was still low due the green color of moringa leaf powder and its strong flavor. To improve the acceptability of these formulas, the option of complementary food supplement formulation using a low quantity of moringa leaf power was proposed.

This complementary food supplement was formulated using baobab fruit pulp, moringa (*Moringa oleifera*) leaf powder and "Koata" (*Cochlospermum tinctorium*) root powder. The formulation objective was to cover at least 50% of daily recommended iron intakes of 6 to 12 months old children through ten grams (10g) daily consumption of the designed complementary food.

The moringa leaf powder was commonly used for its nutritional value. As for *C. tinctorum* root powder, it is known to be rich in some bioavailable micronutrients particularly iron. It is highly used by population in northern Benin as substitute for dry tomato to make sauce during their culinary process.

The formulated complementary food supplement nutritional values were assessed to check whether it meets the expected nutritional values.

The acceptable substitution level of the formulated complementary food supplement was evaluated through acceptability test and comparison test at the Laboratory of Food Science at the University of Abomey-Calavi with semi trained panelists.

The acceptable level was tested with the local population of Northern Benin to assess their acceptability of the complementary food through fermented maize and sorghum porridge which are usually consumed by the under five years old children as household complementary food.

The smell, taste, flavour and texture were assessed through the sensorial test.

The under five years old children accepted the formulated complementary food supplement and can successfully consume 10g and more per day.

At the end of this present study, it appears that despite the cereal based complementary food supplement usually consumed were poor in micronutrient, the local resources could be very useful to improve their micronutrient content.

The present study showed that the baobab fruit pulp, moringa leaf powder and *C. tinctorum* root powder could be useful to improve nutritional values of the complementary food.

Additionally, the use of this local resource doesn't affect the sensorial quality of the complementary food and the formulation could be done easily by the local population. Nevertheless, it will be interesting to assess the bio-digestibility of the formulated complementary food supplement and to develop a multiple micronutrient complementary food supplement using the local resources.

Kevin Finagnon Toyi FASSINOU from Benin (West Africa) was a RUFORUM MasterCard Foundation Scholarship beneficiary under the BAOCHAIN project (CARP+) as a MSc student.

He completed a Master of Science degree at the Faculty of Agronomic Science (speciality Food Science and Nutrition). Kevin is highly interested by the promotion of local food, and the use of local resources to improve nutritional status of under five years' children and of women in reproductive age. He can be contacted via ffinagnon93@gmail.com



Developing new Maize-Baobab mix flour for cooked dough preparation to local communities and food industries



In the world, consumers are becoming more demanding on the quality of their diet. The new tendency is to consume nutraceutical and natural foods. Food habit surveys revealed that consumers are able to pay more if the quality of the commercialized products is improved in terms of contribution to health improvement. As such, Food processing units have to be in adequacy with these consumer's needs.

Food processing has always been my passion. Since my bachelor level I specialized in food sciences where I decided to set my own business. Closed to my bachelor graduation in 2013, I started commercializing fruit beverages (pineapple juice, mango nectar) and products like "aklui", baobab pulp, for developing in advance my own consumer network.

At a later stage, baobab nectar was my favorite. I succeeded in developing a formula in adequation to consumer needs. Doing my Master degree, I worked on the improvement of pasteurized pineapple juice quality produced in

Benin. This has expanded my knowledge and capacities in processing of fruits and vegetables, food sciences domain that I wish my business focus on.

Based on my professional and research experiences, and on findings on health promoting capacity of baobab foods, my PhD research focus among others on the development of new products derived from this species (*Adansonia digitata*) according to identified needs on the value chain that is compatible with food habits. As such, maize-baobab mix was developed using baobab pulp and maize flour.

Maize is the most produced cereal in the world; three hundred million people depend on maize as their main food crop in Africa. It is a staple food with consumption of 450g/person/day. In Benin, it is mostly consumed as cooked dough. Maize based foods design seems to lead to a great market.

Moreover, acidic foods such as “Ogui”, “koko” “Gari”, “Attieke”, “Gowé” compound the diet of Benin and West African countries consumers. Developed maize-baobab mix product offers the characteristics of acidic foods without being fermented.

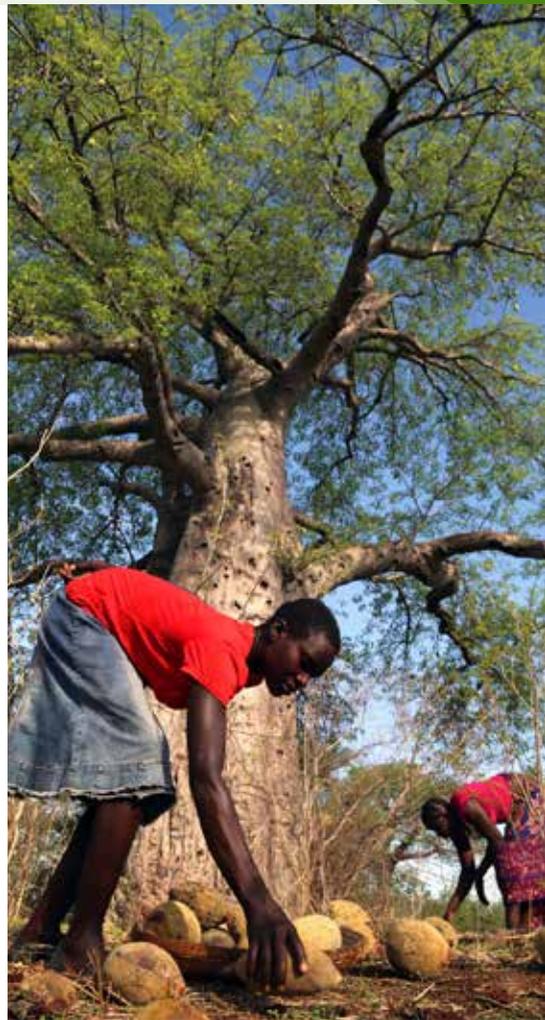
After evaluating the potential acceptability of this product, based on literature, I set the experimental design using a simplex Scheffe mixture design with baobab pulp and maize flour as main ingredients. Maize flour and refined baobab pulp were mixed following the design.

Physico-chemical parameters were collected and revealed an optimal value of the two ingredients. After being cooked and eaten, the dough was well appreciated with shared positive opinions. This acceptability test will be extended to a wide range of population for possible adjustments.

Next challenges toward this research work are to evaluate the functional components preserved in the cooked dough as well as the technological aptitudes, nutritional and pasting properties of the flour during storage.

Vitamin C and nutraceuticals of the dough will potentially contribute to improve the nutritional status of consumers. In addition, vitamin C can increase the bio-accessibility of minerals which are naturally complexed in some cereals, legumes, fruits and vegetables.

The maize-baobab mix flour will certainly contribute to reducing micronutrients deficiencies in Benin and in West African countries. Mechak Ahotondji Gbaguidi (Beninese) holds a Bachelor and a Master degree in Nutrition, Technology and Food Sciences at the Faculty of Agronomic Sciences of the University of Abomey-Calavi.



He is currently a RUFORUM MasterCard Foundation Scholarship beneficiary, pursuing PhD studies in Food Sciences at University of Abomey-Calavi (Benin) in the frame of the BAOCHAIN project (CARP+).

Mechak has the dream to become a leader in Baobab processing sector on local and regional markets, and therefore contribute to poverty alleviation and to jobs creation. He can be contacted at gmechak89@gmail.com

Revolutionizing the consumption of wild vegetables with ready to cook sauce from baobab leaf powder



Ensuring food security in the world is one of the greatest challenges that the world community is currently facing. The situation is more critical when Africa is of concern where 43 countries have been cited to be low income and food-deficient. These countries face many significant political, economic, social and environmental constraints leading to questionable strategies and mitigated results. By the way, several efforts are being made and some progress noted in improving food security. All this leads me to investigate on the use of locally available and nutrient-rich resources for food security and nutrition in Benin. Wild vegetables play an important role in the diet of both rural and urban inhabitants in Benin. They remain the cheapest source of protein, vitamins, minerals and essential amino acids for the proper maintenance of human health.

Local people sometimes use these vegetables as income generator, which provides an opportunity for alternative livelihood option as well. In particular, leafy vegetables are considered as a rich source of the highly needed body micronutrients (Vitamin A, Iron, Calcium, Zinc,

etc.). For my master research in Food Sciences and Technologies at the Faculty of Agronomic Sciences at the University of Abomey-Calavi (Benin), I worked on the valorization of the baobab leaves through the “Development of a « ready to cook » seasoned baobab leaf powder” in the frame of the BAOCHAIN research project entitled: “Scaling up African baobab food products valuation through enhancement of their safety and value chains for food and nutritional security in Benin”, through the RUFORUM Community Action Research Programme (CARP +).

The young baobab leaves are available during the rainy season and scarce in the dry season. Thus, the local population dried and powdered them using local practices. Due to the traditional drying conditions (sun drying and shade-drying at ambient air during a long time), the quality of the leaf powder is uncertain. Thus, through my study I worked on how to increase the leaf powder quality and formulate a seasoned powder with the increased leaf powder to meet nutritional requirements of consumers.



During my field work, I collected baobab leaves from the farms and dried them in an oven at different temperatures and time. The dried leaves were grounded and analysed determining the dry matter content, the color and the gelling property which represent the quality attributes of the powder. The optimal drying scheme selected help to reduce significantly the drying time and can be used to produce baobab leaf powder with desirable characteristics.

Seasoned powder from the optimized leaf powder, powdered spices and seasonings and salt were used to formulate the seasoned baobab leaf powder. The formula of the seasoned leaf powder was defined after a follow-up process of the sauce preparation at Dassa-Zoumè (one of the municipalities in Centre Benin) to make a desirable sauce.

An acceptability test was performed and showed that the sauce has been well appreciated by the consumers. Analyses showed that the seasoned powder has an interesting iron content. Consumption of such a sauce can be recommended for the vulnerable people

(preschool children, pregnant women, and women of reproductive age) associated with vitamin C source to increase iron absorption.

Further investigations should focus on other minerals content such as Calcium and the storability of the seasoned powder to ensure no or limited modification in organoleptic characteristics over storage. The combination of the leaf powder and the spices is time-saver but also contribute to reduction of the sauce preparation cost for the consumers. This type of the product can easily be accepted by supermarkets, and introduced on regional and international markets for food security and nutrition reach in Africa.

Ms Yéba Omondélé Vanessa IDOHOU (Beninese) completed her Master degree in Food Sciences and Technologies at the University of Abomey-Calavi (Benin). She can be contacted through: Tel: +229 66-42-10-59/ Email : vanidohou@gmail.com.

Developing technical solutions to support baobab plantations and baobab based horticultural systems



Sub-Saharan Africa is one of the regions in the world where Human Development Index (HDI) is the lowest (e.g. 0.502 in 2015), showing the precarious situation of this region. Benin is a sub-Saharan country with an estimated population of 10 880 000 inhabitants. Poverty remains widespread in Benin: national poverty rates were 37.5% in 2006, 35.2% in 2009 and 36.2% in 2011. The most vulnerable households affected by food insecurity are those which have only agriculture as source of income. Female-headed households experience lower levels of poverty (28%, compared to 38% for male-headed households), though women remain more vulnerable and continue to suffer from a lack of economic opportunities.

Promoting Agroforestry Tree Species (ATS) have been identified as one of the keys to sustainably fight poverty and food insecurity. Actually, ATS are used traditionally for their food, fibre, fodder, oil or medicinal properties, but have yet to be adopted for agri-business. They have the potential to contribute to food security, nutrition, health, income generation and environmental services. The rising human

population has increased pressure on some of them, so that the widely available resources are no longer capable of supporting the rising demand. It therefore becomes a must to shift to cultivation/plantation instead of only relying on ATS saved in croplands/traditional agroforestry systems. Poor value chain promotion, limited market development, inadequate policies and lack of knowledge on cultivation, breeding, etc. are the major problems limiting the optimal use of ATS. Because the widely available resources from some ATS are not sufficient to sustain the growing demand, it has become essential to develop and experiment sustainable production methods based on ecologically sound agricultural practices and beneficial to farmers.

One of the most important trees in the region is the multipurpose baobab, *Adansonia digitata* L., an ATS very common in Africa. Regional consultations organised by the International Centre for Underutilised Crops (2002) have given high priority to enhanced research and development of baobab. Bioversity International classified baobab tree among the 10 top agroforestry tree species to be conserved and



domesticated in West Africa largely because of its value in food preservation. In Benin (2017), baobab tree was classified as one of the 10 top priority Non-timber Forest Products (NTFP) species to be valued due to its economic potential and the regional importance. National research efforts, especially in Benin, Nigeria, Burkina-Faso, Mali and Senegal have provided data on food values, agronomy, ethnobotany knowledge, ecology and genetic diversity of baobab. In many African countries, especially in West Africa, rural people rely on the variety of nutritional and medicinal products provided by the tree. In Benin, baobab is ranked as the first most important traditional leafy vegetables in the arid zone of Benin.

The species has great economic importance; a market investigation showed that commercialisation of baobab pulp generates up to US\$ 30,000 per year for 130 households of Malanville (north of Benin) involved in that

business. Every part of the baobab is used: roots, bark, wood, leaves, flowers, capsules, gum, seeds, and fruits. Among the 300 uses that have been identified, the tree provides nutritious food, livestock fodder, fibre, medicine, and income to local people.

The baobab tree also provides other ecosystem services especially supporting services. Bio-chemical content analysis of the tree organs showed the presence of proteins, amino acids, iron, vitamins C, A, E and F (abundant compared to daily needs) within its organs, especially leaves. In the north and central Benin, baobab is said, when regularly consumed, to give stoutness and facilitate good growth, dentition and bones' solidification in the children.

According to certain communities, baobab leaves have curative, regulative and stimulative properties besides food qualities and are sometimes used as nutraceutical. Due to this nutritional importance, pruning of baobab tree is so high that only a few fruits are produced per tree.

The leaves are generally consumed fresh in sowing period but in dried form (common practices in the arid zone) in dry season. This practice leads to forced harvest of all the leaves that may affect fruit and seed production of the species as found for some tropical species.

The big challenge the species is facing is a high risk of extinction in the wild where it is threatened in addition to high pruning by bush fire (seedlings), grazing and lack of natural regeneration. Conservation and domestication strategies of baobab genetic resources consist in the proper management option to obtain sustainable benefits for present and future generations. Consequently, finding a pathway for propagating baobab in rural areas, especially in smallholder farming systems to satisfy the daily demand of baobab leaves will not only allow protecting the species but also help in fighting food insecurity and poverty.



Since year 2015, steady research commitment has been engaged to develop relevant knowledge products to sustainably use of baobab products. Specifically, we sought to (i) develop agro-ecological practices for producing healthy baobab leaves as vegetable for consumption, and (ii) the best way to graft baobab tree for precious fruiting.

We found higher fresh and dry weights of harvested leaves, when baobab seedlings were produced applying 30 t/ha of poultry dropping or 90 t/ha of cow dung with 20 × 20 cm sowing density and monthly harvests for

leaves biomass production. Technical guidelines have been produced and currently being used to build capacity of farmers, extension services, agricultural entrepreneur (see http://baochain.labef-uac.org/wp-content/uploads/2019/05/FT-Baobab_Online-version.pdf).

The cultivation of baobab will not only help to reduce the pressure on the natural populations of baobab trees but also to cover the growing demands of the population for baobab products. However, when reproduced by seed, the first flowers of the baobab appear 8 to 23 years later and the young trees may not be identical



to the parental ones that is showing similar traits with the mother tree. Vegetative propagation is the type of propagation that uses fragment of the vegetative system to propagate the plant. Grafting is one of the most commonly used technique to reduce time to flowering and fruiting.

Grafted seedlings have the advantage of having identical characteristics as the mother tree and show a shortened period to fruit production as they may start flowering less than five years after grafting.

The advantages of these methods are: the quality of the new tree is assured, the time required for the tree to fruit is usually less than for seed-propagated trees, and the trees remain relatively short in stature, facilitating management and harvesting. We tested two grafting methods including (i) the top cleft method and the side veneer method. We found that lateral grafting using grafts of diameter between 1 and 1.5 cm gave the best performance.

Current perspectives include using different growth hormones with both grafting and other

methods to see if the use of growth hormones has a significant effect on the performances of these vegetative reproductive methods.

These studies have been carried out by Mr HOUNSOU-DINDIN Guillaume (MSc in 2017) and Ms AGBOHESSOU Mariette (MSc in 2019) who are all Beninese. They all completed their Master degree in Forestry and Natural Resources Management at the University of Abomey-Calavi (Benin).

Ms AGBOHESSOU Mariette is a grantee of the Tony Elumelu Foundation entrepreneurship programme 2019 (<http://baochain.labef-uac.org/one-of-our-grantees-is-selected-for-the-tef-entrepreneurship-programme-2019/>) on a project for baobab leaves production.

Both were grantees of research project that were funded by RUFORUM. They can be contacted through: Tel: +229 96661428 / Email: guillaumehd@gmail.com (Guillaume) or Tel: +229 96155825 / Email: magbohessou@gmail.com (Mariette).



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