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The BAOFOOD project: Enhancing local food security and nutrition in Eastern Africa with the baobab tree

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Abstract

The baobab tree (*Adansonia digitata* L.) is found throughout the drier parts of sub-Saharan Africa. Particularly though the use of its highly nutritious fruits, but also its leaves and other parts of the tree it can make a positive contribution to family nutrition and food security – either directly or indirectly though income generation. The latter pathway is receiving increasing attention, following the acceptance of baobab fruit pulp as a novel food ingredient in both the US and Europe. In addition, baobab food products are of significant and increasing importance in a number of local African markets. These growing markets may offer additional income opportunities for baobab producers throughout Africa. However, in Eastern Africa, particularly Kenya and the Sudan, the opportunities baobab trees offer to improve local nutrition and livelihoods have largely been neglected.

The BAOFOOD project, which is funded by BMEL under its "Research Cooperation for Global Food Security and Nutrition" and runs from 2016 to 2019, aims at promoting the domestication, market development, processing and consumption of baobab for the improvement of food security, nutrition and rural livelihoods in these target countries. Addressing the identified bottlenecks of inconsistent quality in plant materials, lack of cultivation and processing technologies or underdeveloped market chains research activities will touch on all parts of the value chain. The geographical range of baobab tree species as well as phenological variations are being assessed in order to preserve and protect the baobab tree as a natural resource while simultaneously developing viable recommendations for the sustainable cultivation and domestication of these trees. The nutritional value of baobab fruit and leaves are being analyzed and the

effect of baobab products on the food supply and the economic situation of local populations investigated in order to predict how increased commercial use will impact the project region. Extensive target group and market analyses in Kenya and Sudan are planned to explore the market demand and potential for new baobab-based products. The ultimate goal is to then produce those products with the most demand and potential in a local pilot production facility.

Keywords: Baobab (*Adansonia digitata* L.), Food security, Underutilized plant species, Nutrition, Kenya, Sudan

Introduction

Baobab (*Adansonia digitata* L.) is a multipurpose tree naturally occurring throughout the drier parts of Sub-Saharan Africa (SSA), which are hot spots of food and nutritional insecurity and socio-economic marginalisation (IFAD 2011). The species, of which many parts can be used as food (see e.g. Gebauer et al. 2016; Sidibe and William 2002), has an important role in contributing to family nutrition and food security as well as to cash income generation (Jamnadass et al. 2011; Adam et al. 2012), particularly for marginalised rural communities. Baobab can also provide medicine, bark for making ropes and baskets, and material for tools and handicrafts (Wickens and Lowe 2008).

With regards to baobab as a food source, the pulp of the baobab fruit is of particular nutritional value, particularly for calcium and vitamin C (Stadlmayr et al. 2013). Furthermore, it has pre-biotic and antioxidant functions and high dietary fibre contents (Gebauer et al. 2002). Apart from the fruit pulp, also leaves, young roots and oil from the seeds are eaten, either regularly or in times of food scarcity. In addition, baobab parts are being processed by local communities into diverse products such as juice, sweets and snacks (Gebauer et al. 2014). However, some edible parts of baobab contain anti-nutritional components such as tannins, particularly the seeds (Addy

et al. 1995). A high variability of nutrient contents is reported in baobab pulp (Stadlmayr et al. 2013), which may occur also with regards to anti-nutrients. This variability offers the potential to select baobab trees with highest nutrient and lowest anti-nutrient contents for future domestication. The naturally low water content of the fruit pulp allows for its long-term storage and later consumption in times of need and makes its transport to domestic and international markets easy (Gruenwald and Galizia 2005). There is an increasing international demand for baobab products after the 2008 EU acceptance of baobab as novel food, which was initiated by Phytotrade (Wilkinson 2006).

However, the great potential that baobab can have on improving local diets and livelihoods is not yet fully recognized in Eastern Africa. Value chains and marketing pathways are poorly developed and the species is largely neglected by research, development and extension institutions. Consequently, little information is available regarding the abundance and productivity of baobab trees in Eastern Africa including the present contribution of baobab to local diets, food security and income generation. Knowledge and capacity of communities on sustainable baobab utilization seems to be low. At this point in time extension services and/or private sector stakeholders do not promote technologies for sustainable baobab management, processing and utilization at significant scale. Traditional processing technologies may have the potential to be improved; however, the impact of processing on nutritional value of the end product needs to be investigated.

The BAOFOOD project approach

The BAOFOOD project, which is funded by BMEL under its "Research Cooperation for Global Food Security and Nutrition" and runs from 2016 to 2019, aims at promoting the domestication, market development, processing and consumption of baobab for the improvement of food security, nutrition

and rural livelihoods in the target countries Kenya and Sudan.

In order to ensure a sufficient and sustainable supply of highly nutritious baobab products for the local communities in the target regions the research activities will touch on all parts of the value chain, from biological and ecological enquiries into the baobab tree, to the production, marketing, and consumption of baobab foodstuffs and products (Fig. 1).

Fig. 1: Baobab value chain (from left to right/top to bottom: Baobab fruits and harvesting thereof; baobab fruits on local markets; baobab fruit processing; locally available baobab products at retail level). © Authors' photographs.

In more detail, the BAOFOOD project will

- Assess the distribution and variability of baobab in the target region and its potential future change in order to preserve and protect the baobab tree as a natural resource, while at the same time developing viable recommendations for the sustainable cultivation and domestication of the baobab for commercial use (work package 1).
- Analyse the nutrient content of raw and processed baobab products from the project region as well as the effects of different processing technologies with the ultimate aim to develop improved, marketable baobab products (work package 2).
- Investigate the current contribution of baobab raw and processed products to local diets, food and nutrition security and income generation in Kenya and the Sudan (work package 3).
- Conduct extensive consumer, market, and supply chain analyses in Kenya and Sudan to explore the demand and potential for baobab-based products as well as identify critical points constraining the current performance (work package 4).
- Build capacities of local communities on sustainable baobab management and processing and raise their awareness on the value of baobab products for family nutrition by provision of extension services and a community-based demonstration plant for production and processing of baobab products (work package 5).

Knowledge will be (a) generated and captured from existing literature, sources of traditional and local knowledge, field and laboratory/workshop research; (b) shared, disseminated and communicated through academic training (student theses), workshops, conferences, publications and databases; and (c) utilised through prototype

food products, implementation of a pilot project in Kenya and best practices in baobab management and processing for regional and international networks. The data, results and technologies created in this project will be made publicly available.

Conclusions and outlook

The project addresses the possible contribution of baobab production, processing, marketing and consumption to sustainably improve livelihoods, food security and nutrition security in the local rural communities of Kenya and Sudan. By establishing a community-based pilot production of sample baobab products in Kenya it actively promotes baobab as an excellent natural source of nutrient-dense food and for income generation in marginalized and food insecure rural areas. The development of baobab products combined with community-based value addition has the potential to lift rural communities out of poverty by integrating them into markets. Market-oriented production contributes to economic growth and welfare gains via multiple pathways (Barrett 2008), which has been recognised by development agencies as shown by a plethora of value chain development initiatives and guidelines (Donovan et al. 2013). Feasibility studies show that small enterprises based on products of baobab and other indigenous fruit trees are profitable in SSA (Joordan et al. 2007). Yet, very few baobab products are available in Eastern Africa, even fresh baobab fruits or baobab pulp can hardly be found at the markets, which are dominated by exotic fruits such as mango and avocado (Gebauer and Osman 2004, Oduol et al., 2013).

Furthermore, the project will work towards sustainable utilisation and conservation of baobab resources through the identification of mother trees for domestication that have superior fruit characteristics and adaptability to increasing climate variability. Domestication could be a viable strategy to sustain the requested supply of raw material and to reduce any possible competition between subsistence and commercial use of this resource (Buchmann et al. 2010). This is of particular importance in the face of increasing climate variability, which may influence the occurrence and abundance of baobab trees (Cuni Sanchez et al. 2011). Using the natural variability within the species may help to select mother trees for domestication that not only have superior fruit yield and quality but may also be able to cope with the future climate and can be introduced in target areas (Dawson et al. 2011; Jamnadass et al. 2011). Furthermore, the lack of natural regeneration observed by several authors in different countries in SSA leads to ageing of the natural baobab populations (e.g. Assogbadjo et al. 2005; Venter and Witkowski 2010; Cuni Sanchez 2011). This may lead to reduced fruit productivity and a loss of valuable genetic resources in the long-term. Sustainable utilisation and conservation of baobab should, therefore, be promoted.

Through making project results and technologies publicly available, as well as networking with baobab researchers and processing initiatives outside the immediate project region, the project will open opportunities for further international research and cooperation on sustainable baobab utilization. Further information and regular updates on the BAOFOOD project can be found on the projects website at www.baofood.de.

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