



Hans H. Ruthenberg-Graduierten-Förderpreis 2015/

Hans H. Ruthenberg Award for Graduates 2015

Sahrah Fischer “The baobab (*Adansonia digitata* L.) in southern Kenya — A study on status, distribution, use and importance in Taita-Taveta County“, University of Hohenheim, 2015

Supervisor: Prof. Dr. J. Sauerborn

Summary

Baobab (*Adansonia digitata* L.) is a multipurpose, drought resistant, fruit-bearing, wild savannah tree, and is endemic to arid and semi-arid lands of Sub-Saharan Africa. As a multipurpose tree all parts of the baobab can be used for food, fodder, medicine, handicrafts, fertilizer, and shelter. Baobab often has a cultural or religious value. It also provides habitats for many wild animals, as well as other ecosystem services such as carbon sequestration, soil enrichment, air and water quality improvement and biodiversity conservation. The baobab could provide important nutrients to households in SSA in food scarce times through its high concentration of micronutrients in the leaves and in the fruits. Furthermore, food and other products of baobab could be sold for alternate income. Locally it has the potential to be used as a coping strategy during food scarce times as it bears fruits during the dry season and the pre-harvest time. The high concentration of nutrients (mainly vitamin C and other micronutrients) has been recognized on an international level, triggering export from mainly western and southern Africa to the European Union (EU) and United States of America (USA), where mainly baobab fruit pulp is marketed as a "superfood".

The increasing export and popularity of baobab in the EU and USA have triggered concern for the baobab populations in Africa, as scientists have found a lack of juvenile baobabs leading to potentially decreasing stands. Since baobabs are wild trees and not domesticated, local food and nutrition security, particularly regarding children, could become a problem if export increases to the point where all available fruits are sold and therefore none are left for home consumption. In Kenya, little to no research has been done on the baobab population. Although there is some information available on the general distribution of the species, little is known about abundance, stand structure, possible threats to the genetic resources and the level of importance of the trees to local communities. Studying the distribution of baobab is important as it would contribute to conserving genetic resources by evaluating whether or not the baobab is threatened or endangered. It is imperative to evaluate the importance and use of baobab on a household level in order to understand, if and to what extent, baobab can, or is being used to improve household food and nutrition security, and livelihoods.

The main aim of this study is to document the distribution and possible change in abundance of baobab populations and their status in Taita-Taveta County, located in the Coast Province of Kenya. The results of this study can be used by scientists, extension and development

agencies, policy makers, the private fruit processing sector, and farmers to develop a viable baobab value chain. It will aid in identifying threatened populations for conservation and superior mother trees for domestication and to develop approaches for improved tree management, use, and conservation. The main aim is split into four objectives (1) Map the distribution of baobab trees in a defined area to find any patterns or differences in distribution; (2) Evaluate, whether the baobab population is threatened by a lack of rejuvenation, over-utilization, and/or pests and diseases; (3) Record the perceptions of farmers and communities towards baobab abundance and use; (4) Assess whether there have been any changes in distribution and abundance of the baobab population over the last 30-50 years. The study can be considered an exploratory baseline survey of the baobab population in Taita-Taveta County.

Taita-Taveta County was chosen as a research site as it provides a high diversity in landscapes and land usage to study the distribution of baobab trees. These were for example, hilly landscapes (Taita Hills), and lowlands, as well as natural parks (protected areas) and more intensively used land. The sample area was constructed as a buffer around the main road dissecting a part of Taita-Taveta, and covered an area of about 2015 km².

A mixed methods approach was used for the study, including both qualitative and quantitative data. The first method used to map the distribution of baobabs throughout the sample area was a stratified systematic transect survey. The sample area was stratified into three different strata, based on land use intensity. The three strata were the (1) National Park (protected area) (NP), representing the lowest form of land use intensity in the shape of government or privately owned land that is not accessible to the local human population; (2) the Anthropogenically Affected Area (AAA), representing the middle form of land use intensity, and represents land used for agriculture as well as bushland and village land; and (3) the Sisal Plantation (*Sisal*) representing the most intense form of land use, as the sisal (*Agave sisalana*) is often planted in monocultures, the land is privately owned and therefore not accessible to the local human population. In total 49 transects (3x0.5 km) were systematically placed throughout the sample area. The number of transects per strata was calculated proportionally by area covered of the strata. The transects were all covered on foot. When a baobab tree was found inside the transects the location was marked using the GPS, and other indicators such as diameter at breast height (DBH), height, crown width, presence of leaves or fruits, etc. measured. The second part of the data collection involved a household survey. Per transect about two respondents were chosen. The household survey involved general socio-economic questions as well as questions regarding the presence of small baobabs, uses and frequency of use of baobab, and importance of baobab. In total 46 household surveys were done covering the entire sample area. The third part of the data collection involved focus group discussions (FGDs), defined by either high or low baobab density areas. The FGDs were focused on the village elders and were used to gather information on past uses, changes in distribution and frequency, as well as any traditions regarding the baobab trees. In total 12 FGDs were done in six different locations, three representing high baobab density areas and three in low baobab density areas. The FGDs in each location were split into two groups, separated by gender.

In total, 440 baobab trees were mapped and measured. The baobabs were divided into small (DBH<1m) and large (DBH≥1m) trees. Most baobabs were found in the AAA, which also showed a statistically significant higher number of baobab trees than the other two strata. In addition, the AAA also showed a higher number of small baobabs (229 small baobabs) than large baobab trees (185 large baobabs), which was not the case in the other strata. In total the baobab trees in the area showed a strong clustered growth, which seemed to be related more

too environmental conditions than to the land use intensity. The two clusters were found on either end of the sample area, one in the area of Taita, and one in the area of Taveta, leading to the division into high and low density areas. The mean density of the two clusters (high density area) was 0.439 baobabs/ha and 0.618 baobabs/ha respectively, compared to the mean density of the area in between the clusters (low density area), which was 0.004 baobabs/ha. No diseases were observed on the trees, however 21% of all baobabs were observed to having "stunted growth". The "stunted" baobabs were found mainly in the area in Taveta, which also contains a high percentage of livestock. Therefore stunted growth of baobabs are considered to be an effect of high livestock browsing. Though stunted baobabs were described by respondents as slow growing it is assumed that they are able to reach maturity as they were found in different heights and therefore retain the ability to grow.

In total 27 different uses were mentioned using six different baobab parts. While the food use is the most important and diverse (mainly regarding the fruit pulp), most of the other uses have become out-dated and have been substituted by other products. The baobab is mainly used during the dry period before the short rains (July-October), and the main period of baobab consumption coincides with the "hunger gap" defined by the respondents. The baobab was described as being used as a coping strategy and as emergency food and fodder. Due to the main period of use the baobab is seen as a poor-mans-food, and is therefore not consumed as often. The most common use of baobab is the candy "mabuyu" which is made by rolling the fruit pulp in sugar, food colour, and spice, and is mainly consumed by children, therefore also giving it the reputation of being food for children. The respondents also mentioned that baobab is subject to both traditional laws and beliefs as well as a Kenyan law that protects it from removal.

However, both the law and belief only cover large baobabs, and small baobabs can be freely removed. The general importance of baobab to the local people depended strongly on the commercial value, mainly through the sale of mabuyu.

During the FGDs no significant changes in the baobab population were mentioned. Small changes occurred and were both decreasing and increasing in nature. The main decreasing factors mentioned included construction and infrastructure, which was seen as a very decreasing factor as large and small baobabs were removed. The main slightly decreasing factor was described as agricultural expansion, as small baobabs are removed when found in the cropland. Human population increase was mentioned as both an increasing and decreasing factor, as a higher population was equated with higher consumption while also implying increased agricultural expansion. Consumption was mentioned as an increasing factor both for humans and wildlife such as monkeys.

In conclusion, the baobabs in Taita-Taveta represent a healthy rejuvenating population, and occur in clusters. The patterns in distribution between high and low density areas were mainly attributed to environmental factors, wildlife interactions, human impact, and commercial value of the baobab fruit pulp. The baobabs are underutilized as only the fruits are harvested, and even these not in large amounts. The stands could be subject to greater exploitation, and could be used as an important coping strategy as well as for alternate income during food scarce periods. The baobab has lost importance for the local human population, mainly due to substitution of most uses and the lack of commercial value, which also seems to be connected to a lack of knowledge about the baobab market. There is a very high interest however in new marketable baobab products. The use and value of baobab should however be rehabilitated with care to avoid removing the important source of nutrients from its main consumer, which are children.