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Research Application Summary

The state and status of Shea nut (*Vitellaria paradoxa*): Uses and conservation

Akatwetaba, D.[1], Egeru, A.[2,3] & Mugonola, B.[1]

[1]Gulu University, P. O. Box 166, Gulu, Uganda
[2]Regional Universities Forum for Capacity Building in Agriculture, P. O. Box 16811, Wandegeya, Kampala, Uganda
[3]Department of Environmental Management, Makerere University, P. O. Box. 7062, Kampala, Uganda
Corresponding author: akatwetabadeborah@gmail.com

Abstract

The Shea tree (*Vitellaria paradoxa*) is one of the most important indigenous trees occurring in at least 20 countries in the drylands of Africa running from the Sahelian in West Africa to East Africa. It is a non- timber tree that grows in the wild but socially and economically important to natural resource dependent communities as well as to industry for the range of products that can be derived from it. The t trees are spread in the dryland and sub-humid landscapes of eastern and northern Uganda. The fruits have traditionally been eaten while the dried kernel seeds are locally processed to produce vegetable oil and cake. Shea nut oil has a range of uses including: medicinal oil for treatment of skin and throat infections, cosmetics, cooking fat, and residual cake used as a livestock feed, wax, lubricant (machines and bicycles) and for soap making. Available evidencealso indicates that these numerous uses that the shea nuts have provide income from sale of various products. The traditional management practices used include: weeding, bush burning, pollarding, coppicing and pruning, by-laws set by local leaders like paying fines in form of goats if one is found cutting a shea nut tree. However, the shea nut trees are being threatened by increased demand for charcoal and the expansion of the charcoal belt to many dryland areas owing to perceived good charcoal quality that the shea nut trees provide. Like in other parts of Africa, the Government of Uganda has reinforced local traditional laws and by-laws with a ban on cutting of shea nut trees for charcoal production. This review paper has demonstrated the immense social, economic and cultural importance of the shea nut trees. It recommends increased sensitization of communities and enhancement of shea nut products value chain for maximum returns to rural communities; by so doing their conservation interests and actions on the shea nut trees will be increased.

Key words: Africa, communities, drylands, economy, livelihoods, resilience, sheanut, *Vitellaria paradoxa*

Résumé

The Shea tree (*Vitellaria paradoxa*) is one of the most important indigenous trees occurring in at least 20 countries in the drylands of Africa running from the Sahelian in West Africa to East Africa. It is a non- timber tree that grows in the wild but socially and economically important to natural resource dependent communities as well as to industry for the range of products that can be derived from it. The t trees are spread in the dryland and sub-humid landscapes of eastern and northern Uganda. The

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Introduction

Vitellaria paradoxa (shea tree) is one of the most important indigenous trees occurring in 21 African countries and supporting the livelihoods of some 16.2 million collectors and local processors (Naughton *et al*., 2015). It is a non-timber tree that grows in the wild but socially and economically important to people, especially women (Cottray *et al*., 2003). Occurring from West Africa through the Sahelian drylands of Sudan to Eastern Africa, the shea nut tree belongs to Sapotaceae family that grows in the wild in savannah lands and marginal dryland lands (Adeloye, 2017). Two species, namely *vitellaria paradoxa* and *vitellaria nilotica* exist. *Vitellaria paradoxa* is mainly produced in West Africa, while *Vitellaria nilotica* grows majorly in the Sudan, South Sudan and northern Uganda (Ferris, 2011).

Shea nut is immensely valuable to a range of persons especially women in many African countries where it occurs. It has been described as a women's tree owing to the greater participation of women in its value chain especially; collection and product development (Elias *et al*., 2006). The shea kernels are often processed with many traditional uses including: medicinal purposes, edible oil, soap and cosmetics. Meanwhile, its fruit pulp is rich in sugars, potassium and calcium (Maranz *et al*., 2004). Owing to the diverse medicinal benefits as well as industrial and economic returns associated with shea butter, the global demand for shea nuts has dramatically increased; this presents the real opportunity for communities in sub-Saharan Africa,. The real value of shea nut is in the manufacturing of luxurious cosmetics, pharmaceutical products as well as in the confectionary industries especially in the production of high value chocolates (Alander, 2004).

Despite the economic and ecological benefits of the shea nut tree, it is one of the most endangered tree

species with its population reducing dramatically. This is owed to a range of factors including: charcoal burning, droughts, wildfires, subsistence agricultural expansion and changes in land tenure and use as well as decline in cultural values, practices and taboos that were used in ecological conservation (Byakagaba *et al*., 2011; Atalla, 2015). Further, there is an underlying conflict between women and men; while the shea kernel collection and gathering as well as the processing is primarily women based, charcoal burning on the other that is more destructive to the survival of shea trees is a male dominated activity (Atalla, 2015). While these challenges abound, the state and status of shea nut trees in the shea belt of as well as the uses and conversation issues are barely synthesised in the recent past considering the rapid transitions taking place regionally. This review article presents a synthesis of the state and status of shea nut trees in the shea belt and documents the uses and conservation practices.

Geographical spread and ecology of shea nut trees. The shea nut tree belt runs across the Sahel from West Africa to Eastern Africa covering 21 countries including: Burkina Faso, Cameroon, Benin, Central African Republic, Cote D'Ivore, Ethiopia, Congo, Democratic Republic of Congo, Gambia, Ghana, Mali, Nigeria, Senegal, Guinea Konakry, Guinea-Bissau, Sierra Leone, Togo, Sudan, Chad, and Uganda (Fig. 1). In Uganda, it mainly occurs in the dryland east, partly north eastern and the greater northern Uganda. The shea nut belt of Uganda is thus found in the following districts (Fig. 2): Abim, Adjumani, Amolatar, Amuria, Amuru, Apac, Arua, Budaka, Bukedea, Bulisa, Dokolo, Gulu, Kaabong, Kaberamaido, Katakwi, Kitgum, Koboko, Kotido, Kumi, Lira, Maracha Terego, Masindi, Moyo, Nakasongola, Nebbi, Oyam, Pader, Pallisa, Soroti and Otuke (Okullo *et al*., 2004).

Running through the Sahelian belt, the shea nut trees are principally a savannah based trees whose productivity and morphology is often influenced by the bioclimatic regions they subsist (Glèlè Kakaï *et al*., 2011). A land suitability analysis for shea nut trees across Africa revealed an expansive suitable belt of 3.41 million km2 across 23 countries (Fig. 3) with rural population of 112 million, including 18.4 million women collectors. Accordingly, this belt could be supporting an estimated 1.84 billion trees of which 1.07 billion are potentially those that have high stearin (Naughton *et al*., 2015). Wherever they occur, the shea nut trees, are light demanding species occurring in the savannah lands. They are characterised with extensive rooting that is critical for their survival during intermittent droughts in the savannahs and with a hardy bark that is essential in withstanding severe fire regimes (Orwa *et al*., 2009). It is further important to note that the shea nut trees survive for a considerably long time estimated to about 200-300 years. The tree's normal productive time commences after about fifteen years but the full fruit production is only attained at about 40-45 years (Karambiri *et al*., 2016). It is through this slow growth characteristic that makes it a unique tree that is highly endangered requiring greater and more stringent conservation efforts.

Shea production, products and uses. For centuries, Africa has been engaged in shea production, development of shea based products and evolved and innovated in its use for a range of functions both economic and cultural. As far back as 4300 years, during the reign of King Merenre of Egypt, shea butter commerce flourished and it is one of the few items that the Egyptians sourced from the southern countries; i.e. the Sudan (Wicker, 1998). Similarly, there is evidence of stearic acid found in the Egyptian mummies of 2600-3500 years ago; indicative of the use of shea butter nut gels in their processings (McCreesh *et al*., 2011). In west Africa, in parts of Burkina Faso, there are archeoligcal evidence that suggest to the early utilisation and production of shea nuts (Bello-Bravo *et al*., 2015).

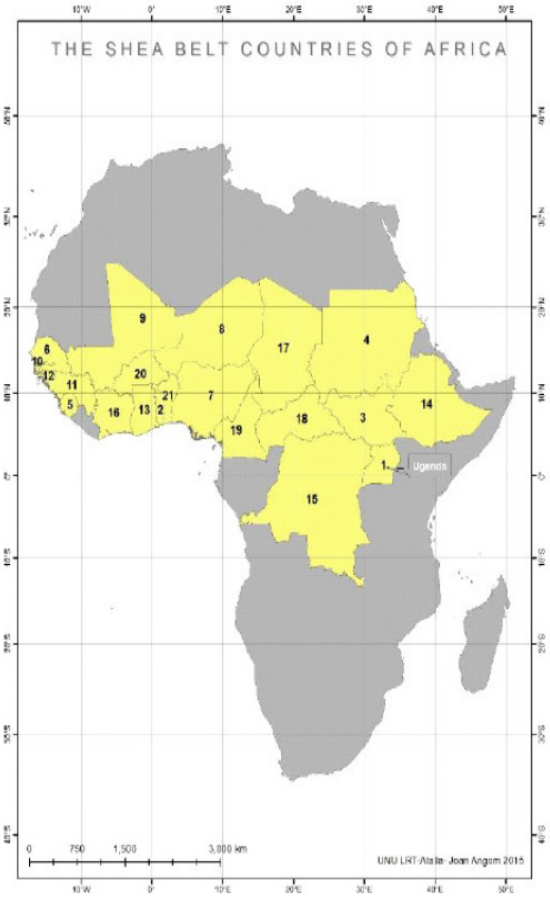

Figure 1. Map of Africa showing the Shea Belt of Africa

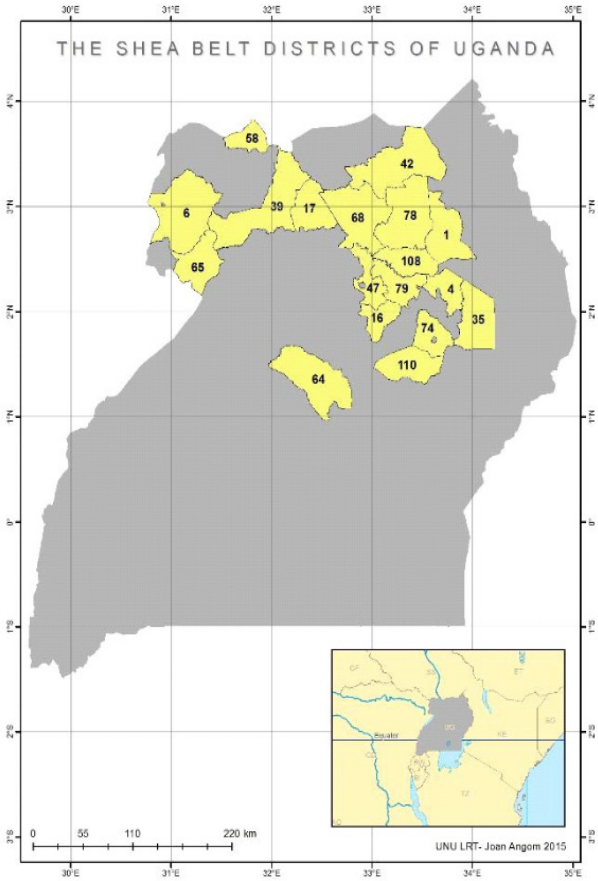

Fig. 2 Map of Uganda showing the shea belt

Key to countries in Africa
1.Uganda 4.south sudan 7 nigeria 10.Gambia2.Togo 5,sierra leon 8. Niger 11.guinea3.south sudan 6.senegal 9.Mali 12Gunia 13 Ghana 14Ethiopia 15.Congo DRC 16Cote d'voire Chad 18 Central Africa Republic 19 Cameroon 20. Bukina Faso 21. Benin
Key to districts in uganda
1.Abim 78. Agago 39 Amuru 6.Arua 16.Dokolo 17.Gulu.42. Kituguu 42.Lira 65.Nebbi 108.Otuke 68.Pader 35.Katakwi 74.soroti 79 Aleblong 4. Amuria 58 .Moyo 110. Serere

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occurs, appart from the management processes, shea production is dependent on those trees growing in the wild and regenerating through the natural processes because the shea nut trees are generally effective of regeneration without deliberate planting. Some planting techniques have been tried such as grafting but the natural regeneration remains the most releied upon esoecuially by rural communities.

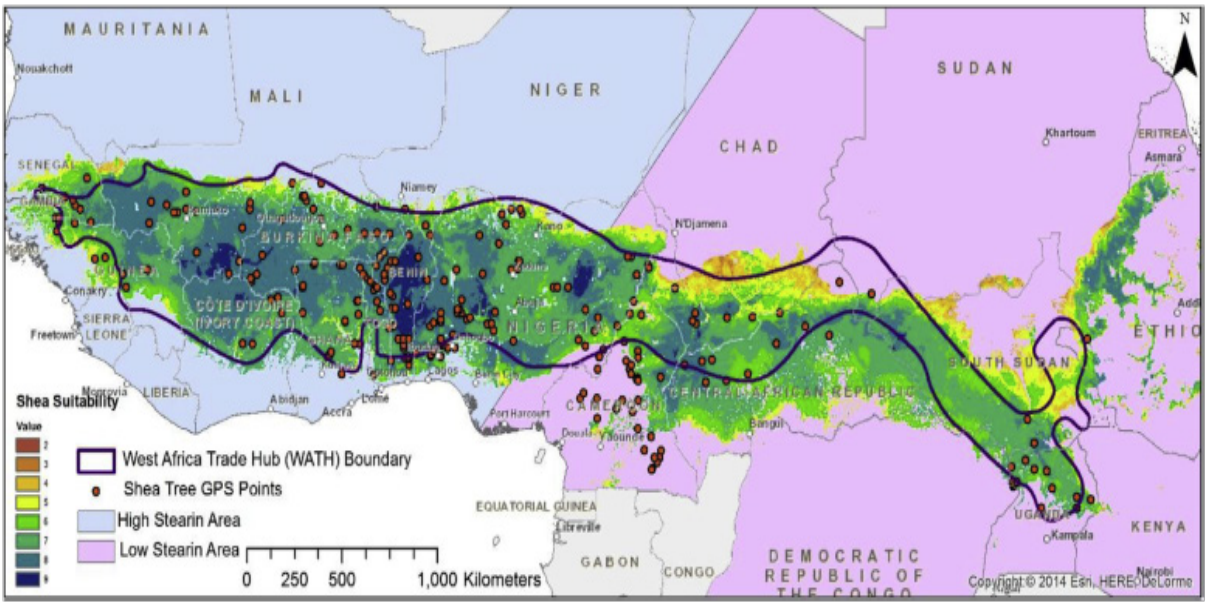

Figure 3. Comparison of various shea distributions with land suitability model (Adapted from: Naughton *et al*., 2015).

Shea trees provide flowers, fruit pulp, leaves and sprouts and shea kernels; it is the post-harvest processing that increases the shear number and value of products that emerge. Shea nuts are processed into shea butter; this is used as vegetable fat among rural communities. From the exported shea nuts, in the European countires and Americas, the shea nuts find an entry into industrial processes as such it is used in confectionaries particualry the production of high value chacoalates (Maranz *et al*., 2004). In the early stages, the fruits (See picture) is eaten while fresh while the flowers may at times be processed into fritters depending on the experience and interest of given communmities It has also been noted that the leaves and sprouts of shea nut trees serve as forage and the pigs and sheep often feed on the surgary pulp of ripen fruits on the ground (Orwal *et al*., 2009).

Communities devised mechanims of harvesting the latex from the shea trees (Omujal, 2009) and this latex produced traditionally strong glue from its heated mixture with palm oil and it can be obtained from the bark of the trees and used as a chewing-gum base although it does not have pleasant taste. It was reported that washing improves the taste but detracts also the chewing quality of the gum and that the sap has been traditionally used to prepare punctured drums. Ashes from burnt wood are commonly used as the dye (Orwa *et al*., 2009). Several other parts of shea trees such as the bark extracts are used for medicinal purposes including healing skin irritations and the root extracts are used by the Jukun people of northern Nigeria as a poison (Falana *et al*., 2016; Mannikuu and Peker, 2017). Additionally, the bark infusions have several antimicrobial properties that have been found to be effective against Sarcina lutea and Staphyllococus aureus (Orwal *et al*., 2009).

Figure 4. Women at Lacek-Ocot market on the Gulu-Kitgum road, Uganda selling shea fruits and oil

In the savannah parklands where the shea trees occur, additional ecological benefits are harnessed interms of pollination servives as well as honey production as the communities set-up bee hives for honey productions. In Uganda for example, some of the high quality honey comes from the shea belt areas of northern Uganda especially Arua district. It is however noticeable that in the case of Uganda, the full range of benefits of shea nuts and trees are not fully exploited as many communities are simply price takers whose roles are within the lowe levels of the shea and products value chain (Okullo, 2004; Atalla, 2015).

Shea trees conservation, strategies and challenges. In countries where shea nut grows, natural regeneration is the most trusted practice to achieve a large population of trees (Bofa, 1995). Natural regeneration is advantageous in that it doesn't impose additional costs in terms of buying seeds. In addition, regeneration allows enrichment of parkland. This process is easy to apply compared to tree planting and is cheap and requires little enforcement (SAFORGEN, 2011). This is particularly because societies across the shea nut belt have traditionally exercised the use of fallow areas as an important land management that supports conservation as well as influences the shea yield (Aleza *et al*., 2018). In the recent times, some attempts to move beyond the traditional practices to breeding and farm based approaches aimed at facilitating shea domestication and growth. According to Dianda *et al*. (2007); seedlings supplied with N and P fertilizers were found to have better growth paramters including a higher collar diameter and height compared with non-fertilized plants. At the same time, the combined application of N and P fertilizers improved shoot, root and whole plant dry weights.

In maintence of the shea trees stands, pollarding and pruning are management practices carried out to conserve the shea trees (Gwali *et al*., 2015). Important within the pollarding and pruning practice is selective on-farm retention during cultivation (Gwali *et al*., 2012). In recognition of the pressing need for land for agriculture, traditional justice system including the use cultural practices and a

stronger involvement of the the community in conservation has been championed (Lufumpa, 2005). In northern Uganda, local communities are given a central role in conservation and usually carry out careful progpagation and management of shea trees.

Although shea butter tree is protected by laws governing forests and other natural resources in most countries, the trees are cut, especially when clearing land for cultivation and harvesting wood for charcoal. This has lead to decline in the number of trees in the conservation areas. Conservation efforts of shea nut tree are threatened by two forms; the threats that affect the old trees and one that affects the young ones. For the mature shea trees; human prssure activities such as cutting down trees for firewood, burning and clearing of land for agricultural activities like growing of cotton in Northern Uganda. Other factors threatening mature shea butter trees are strong winds which destroy flowers and uproot trees especially those that have been weakened by prolonged drought; high temperature and smoke reduce bees' activity, and periods of hot weather and late bush fires in are also responsible for reducing pollination and consequently affecting fruit production. Furthermore, parasites of the genus Tapinanthus and wood-boring beetles weaken the trees over time and reduce fruit production (Saforgen, 2011).

Young shea butter trees are threatened by recalcitrant seeds, long juvenile period, long maturity period and relative lack of successful studies on vegetative propagation, very low outreach to farmers for improved planting material further constrain conservation efforts for shea trees (Boffa, 2015). It has ablso been recoganised that the seasonal surges in the catapillers especially the Cirina butyrospermii often tend to adversely defoliate shea butter trees from seedlings to mature trees, particualrly during the onset of new leaves. At the same time, the larvae of Mussidia nigrioella and Certitis silvestrii also feed on the pulp of mature shea trees further reducing the benefits that would accrue from the shea nut trees (Okiror *et al*., 2012). Lastly but not least, the land tenure system plays a key role in shea butter conservation for instance; in the shea nut belt of northern Uganda, customary land tenure is the recognised type of land ownership (Gwali *et al*., 2011). This system recognises the rights of individuals to possess the land and till the land under the care of the family, clan or community. (UNU-LRT, 2016) asserted that under this sytem, some natural resources such as shea trees are common property and belong to the whole community rather than the individuals. Such perpespectives further undermine the conservation effort towards protecting the shea trees.

Conclusion

The shea nut tree is a non-timber tree that grows in the wild but socially and economically important to people, especially women. This review paper has shown the considerable spatial distribution of the shea nut tree across 20 African countries that mainly subsist in the dryland landscapes. It has also been demonstrated that the shea tree has a range of benefits ranging from the cultural relevance such as for traditional ceremonies to commercial interests such as the production of cosmetics and other medicinal uses. Within these range of products and value proposition lies the constant challenge of conserving the share nut trees. Accordingly, a combined application of rules and guidelines relating to shea nut conservation need to be championed.

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