

Harvesting and utilization of Marula (*Sclerocarya birrea*) by Smallholder farmers: A review



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Abstract

Marula tree has been classified as a multipurpose tree and very important to smallholder farmers in arid and semi-arid areas. Most farmers harvest fruits at ripe stage by picking from the ground. Few farmers harvest Marula fruits from the tree. Smallholder farmers also harvest tree bark and branches for several uses. Utilization of Marula has been a major income generation for smallholder farmers through selling of Marula juice, nuts and butter. Farmers also harvest non-timber forest products such as edible worms which they use for human consumption as relish and harvest die which is used for coloring fish harvesting nets. Marula is also used for provision of medicines where farmers harvest roots, bark and leaves for use in curing diseases. Farmers are recommended to harvest Marula tree in a conservation way so as to allow regeneration of the tree.

Keywords: Harvesting; Utilization; Marula; Smallholder; Farmers.

Introduction

Marula is one of the most important trees in marginal and dry areas of Zimbabwe due to its provision of many resources such as fruits, bark for medicine and curing of water. Harvesting of Marula is a very important aspect and needs close management to allow regeneration and continual growth of the tree. Most smallholder farmers harvest Marula fruits, tree parts and non-timber forest products for consumption. Utilization of Marula has been seen as the major income generating project for farmers as they produce several products such as juice, soda and butter together with oil. The fruits are round and oval drupe and 3-5 cm in diameter when mature [1]. They develop in clusters of three to five at the ends of twigs on a new growth [2]. After abscission, the colour changes to yellow, aroma develops, and the flesh softens. A skin covers the flesh or pulp and a stone inside, which is about 2-3 cm long with one to four cavities containing the seed [3,4]. Edible part of the fruit is very small compared to the fruit size and the average weight of the fruit is 18 g [2]. Female trees bear fruits that are plum-sized fruits with a thick yellow peel and a translucent, white and highly aromatic sweet-sour fruit which is eaten raw [3,4]. In most communities it is eaten raw like small mango or used to prepare juices, jams, preserves, dry fruit rolls

and alcoholic beverages [5]. The taste of the fruit is acidic and bitter but of pleasant flavor when fully ripe [6,3].

Harvesting of Marula

Harvesting of Marula needs permission from headman, village head and plot owners [7]. Chiefs, headmen and village heads do not grant permission for cutting down of Marula and ring barking as this causes drying of the tree in future thereby reducing Marula population [8].

Harvest Maturity

The trees produce flowers from September to November and bear fruit from January to March (Muok and Owuor, 2005). In the middle of the rainy season (February to March) the Marula fruit begins to drop from the trees in large quantities. The fruit is then pale green and ripens on the ground to a pale, waxy yellow colour around January to March or April (Maroyi, 2013).

Harvesting Methods

Harvesting is done by picking up the fallen fruit. The ripe fruit is normally collected from the ground by hand. Any fruit that is picked off the tree will be rejected to ensure the sustainability of

the product. A strict policy guiding the treatment and harvesting of Marula trees and fruit is in force in the Limpopo Province [7]. In Namibia, harvesting of fruits is the directive from village head and Chiefs to ensure that Marula fruits are harvested when ripe [8]. No-one is allowed to harvest the fruits even in wild without directive from the headmen. Villages are fined if their animals eat the fruits when the headmen give directive for harvesting of the fruits [8].

Collecting fruits from ground

Fruits may be harvested by anyone, although it is typically women who are involved in this task because are the one who process the fruits to produce juice. A general rule for all wild fruits allows the fruit to fall first and then harvested [7] (Maroyi, 2013). The advantage of this method is that there is no damage to the tree, and this allows tree growth rate to be maintained and prevention of diseases such as fungal infections. This also allows all ages group to have access to the fruits as they are collected from the ground. Collection of fruits from ground and process at home reduces recruitment because the seeds decocted to remove nuts which are used several uses. Another disadvantage of removing fruits from site is that the seeds will be heaped at homestead after processing and failing to produce seedlings. If seedlings emerge, they are destroyed by livestock (Muok et al., 2011). The ecology of the tree is also affected negatively due to failure in recruitment [9].

Harvesting of Marula in Communal Lands

Harvesting of fruits by seeking permission from plot owners and village head is one of the methods used by several communities. People seek permission from plot owners to access fruits in their fields [8,2]. This method usually applies in communal lands. In Bushbuckridge, South Africa visitors are required to seek permission to harvest fruits in yards or farms of individual household. The advantage of this measure is to make a clear safeguard of household crops in the field since some may damage and others may steal crops [9]. Community members can object outsiders from harvesting Marula on communal lands because they fear rise of conflicts and other incidents threatening such as theft of household properties left in fields [8] (Maroyi, 2013). Similar rules apply in Namibia and Makhatini, South Africa as well as Mukwakwe, Zimbabwe with regard to harvesting of fruits in people's yards and farms, which are seen to be the property of members of that village or family [10].

The major problem is that some community members had no power to enforce community control in communal lands and the increased population had led to difficulties in identifying community members. This had led communal lands to be open access [8]. A major distinction is made between outsiders who should seek permission from headmen and community members who do not need to seek permission. Some community members harvest fruits in communal lands for outsiders charging them a certain fee [2]. This was seen as the disadvantage in harvesting

of Marula hence traditional leaders in Namibia imposed new rules that no one will harvest Marula without right from them or village head. All village members will harvest Marula at once on a prescribed time by headmen. Anyone found harvesting outside the prescribe time will be fine a heavy fine such as cattle [2]. Headmen invite all women to harvest and process the fruits to allow transparency as well as allowing all villagers to benefit equally.

Harvesting in Private, State and Municipal Lands

Harvesting of Marula in private, state and municipal lands is not clear but there is need to seek permission from private owners so that one can harvest fruits and even other tree parts required [8]. In Bushbuckridge, South Africa harvesting of fruits in conservation areas is not generally required although staff members in these areas may harvest and sell to outsiders. Denial of harvesting in these areas allows recruitment and nurturing of new seedlings thereby increasing Marula population (Muok et al., 2011). Municipal lands have been regarded as disputed areas hence they are now open to everyone. This reduces recruitment and growth of Marula tree as each and every one harvest in his/her way [8].

Harvesting of Marula bark and branches

Marula bark is widely used for its medicinal properties, as an insecticide, a food supplement, dye, as well as symbolically for traditional purposes [11]. Harvesting of bark is permitted on a limited basis by both customary and government laws although this varies from village to village (Maroyi, 2013). In Bushbuckridge, South Africa traditional authorities from Rolle and Thulamahashe permit bark harvesting from male trees only [8] whereas traditional authorities in Allande, Mwenzi, Chivi and Mberengwa do not differentiate the sexes of the tree [12,10].

Ring barking is not permitted as this kills the tree. The advantage of harvesting bark from males only is to secure females from ring barking as they are the ones which bear fruits [9]. The major disadvantage of harvesting from males only is that it is difficult to determine sexes of trees before they start to produce fruits (Muok and Owuor, 2005). Harvesting of bark has similar rules to harvesting of fruits [13] because there are strict rules and people need to seek permission first from village head [8]. In South Africa it is restricted that piece of bark harvested should be approximately 20 cm x 20 cm and only enough bark for immediate use should be harvested [7]. This is done to prevent overharvesting which may lead to death of the tree.

Cutting of Marula tree is not permitted as it is a taboo to cut fruit trees. In Zimbabwe, South Africa, Namibia and Malawi cutting down of Marula is prohibited but people do not usually obey the rules [9,10] (Maroyi, 2013). In Bushbuckridge (South Africa), the cutting of Marula is widespread because of increased local population and the influx of refugee [8]. Branches are cut for firewood, making spoons and maize stamps as well as to obtain

caterpillars which are found on the tree (Seed Awards, 2011; Maroyi, 2013). Lack of accessible alternative fuelwood caused an increase in cutting of Marula trees closer to villages. Pruning is prohibited in theory but in practice trees are pruned on homestead or to make way for telephone and/or electricity lines [6,9,10,]. In contrast to South Africa, Mozambique and Malawi, there is reduction in the cutting down of Marula in Namibia due to increased awareness among people as to the importance of trees (increased forestry education) and enhanced understanding as to the central role played by trees in stimulating rain [2]. Increased cooperation between government and traditional authorities which has led to improved control and enforcement as well as the introduction of more severe fines led to decrease cutting of *S. birrea* (den Adel, 2002; Mokgolodi et al., 2011).

Use of Marula

Marula (*Sclerocarya birrea* subsp. *caffra*) is one of the most important sources of income for primary producers in south-central Zimbabwe (Maroyi, 2013) and other southern African countries such as Botswana, Namibia, South Africa and Mozambique [14]. Marula is one of the commonly utilised indigenous wild fruit in Africa together with *Adansonia digitata* (Shackleton et al., 2001; Seed Awards, 2011). Marula is considered a multipurpose tree since its fruit kernels are eaten or used for oil extraction [3]. Marula provides medicine, food, fodder and fuelwood [10].

Marula Kernels

The kernels are usually used to supplement the diet during winter season, and they are regarded as delicacy in regions of the tree's natural habitat [3]. Marula kernels can be used to make good snacks and consumed raw or roasted (Orwa et al., 2009) as well as for the purpose of adding unique flavour to the food [9,10]. Nuts can be mixed with vegetables, meat or ground by pounding to form cake before consumption (Shackleton and Shackleton, 2005). In some households, the ground nuts are used in baking traditional breads [3]. Nuts can be used to produce nut oil which is used for cooking or for cosmetic purposes and preservatives (du Plessis, 2002; [2] Maroyi, 2013).

Wood

Wood from Marula trees is used for making kitchen utensils, fencing poles as well as fuel wood for cooking [13,10] Maroyi, 2013). Marula wood has been traditionally used for carving pestles and mortars, bowls, drums, beehives and stools [5] and even, in some areas (for example, Malawi), for making canoes. In Madagascar the wood is used to make ox wagon wheels, it is soft, splinter free wood that is easily carved, but tends to be susceptible to infestations of woodborer [1]. In Mberengwa (western Zimbabwe) marula wood is used to make utensils, and in the Mutanda Resettlement Area, Zimbabwe, *S. birrea* formed one of the three most popular species for making musical instruments [10].

In the region bordering the Kruger National Park in South Africa, *S. birrea* forms the highest volume of wood used in the growing local woodcarving industry [15]. Trees are harvested to carve animal figurines (giraffes, leopards and antelope) ranging in size from less than 30 cm to more than 2 m tall. This has been also reported in Zimbabwe (Seed Awards, 2011; Maroyi, 2013). Other uses of wood include furniture, panelling, flooring, laminated products, box shooks and manufactured articles such as shoe heels and also used for making tomato boxes and toilets seats [10].

Marula Bark, Roots and Leaves

Bark is mixed with other medicinal plants by traditional healers to treat various illnesses such as syphilis, leprosy, dysentery, hepatitis, rheumatism, gonorrhoea, diabetes and malaria [1]. Bark that is particularly gathered before the first flush of the leaves [16,4]. Roots and leaves can be used to treat menstrual problems, tooth pain and ulcers [16]. Figure 1 Dried Marula bark. Source: Kugedera (2014). Marula has wide range of medicinal uses which are mostly principled to diseases such as dysentery, cold cough and ulcers [4]. Other diseases cured using Marula leaves, bark and roots includes malaria, menstrual problems and diarrhoea. To some extent barks and roots are used to stop pain of tooth [4].



Figure 1: Dried Marula bark. Source: Kugedera (2014).

Other Uses of Marula

Fruit skins removed are dried under the shade to maintain its yellow green colour. The skin can be processed into glue, soap, ointment, achar and vinegar (Colin, 2007) [3,4]. Marula fruit skin is ground and mixed with white powder to make soda which is used for baking and cooking (Seed Awards, 2011). Salad dressing and jam can also be made from Marula fruits and they are a good source of vitamin C (Seed Awards, 2011). Marula fruits and leaves serve as cattle and wildlife fodder especially during drought periods. The leaves are nutritious and will contribute to a healthy diet for livestock. During extended drought periods when there is no grass the Marula leaves serve as a fodder bank for livestock [4]. Marula trees also give good shade in streets and parks in urban areas as well as in field plots for farmers [4]. The bark can also be used to make a light-brown dye [17-19].

Conclusion

Harvesting and utilisation of Marula has been a major issue in management of wildlife resources such as trees. Harvesting of Marula tree needs close monitoring to prevent over harvesting and overuse of the tree to allow sustainable use. Harvesting of fruits, bark and roots needs close attention as this may damage the tree and prevent its growth. Utilisation of Marula has been seen as the major income generation for most smallholder farmers in dry and marginal areas of Zimbabwe.

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