

## Local knowledge and use of *Marula* [*Sclerocarya birrea* (A. Rich.) Hochst.] in South-central Zimbabwe

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Received 14.02.13, revised 01.04.13

The aim of this study was to document indigenous knowledge related to the use of *Sclerocarya birrea* (A. Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro (*Marula*) in South-central Zimbabwe. One hundred and sixteen participants from 4 villages were interviewed between December 2011 and January 2012. Local communities in South-central Zimbabwe derive many benefits from *Marula*. The main product harvested by the participants was the fruit. The ripe fruits were eaten raw (100%), kernels were eaten raw (100%) or roasted (33.6%), fruit juice fermented to produce children's beverage (22.4%) or traditional beer (35.3%), making jam (14.7%), oil processing (8.6%) and added to maize, millet and sorghum porridge (4.3%). *Marula* has also medicinal uses and the leaves and fruits were browsed by livestock. This study calls for large-scale cultivation of *Marula* not only in South-central Zimbabwe, but also in neighbouring countries where the species occurs naturally and has the potential to positively affect local peoples' livelihoods.

**Keywords:** Local knowledge, Rural communities, *Sclerocarya birrea*, South-central Zimbabwe

**IPC Int. Cl.<sup>8</sup>:** A61K 36/00, A01D 7/13, A01D 7/00, A01D 23/08, A01D 5/00, A01D 20/00, A01D 11/00, A01D 1/00

*Sclerocarya birrea* (A. Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro (*Marula*) forms an integral part of the diet, tradition and culture of rural communities in southern Africa<sup>1</sup>. *Sclerocarya birrea* subsp. *caffra* is often referred to as the "tree of life" due to its ability to provide two fundamental human needs, namely, food and medicine<sup>2</sup>. It is a member of the Anacardiaceae, mango and cashew nut family. *Sclerocarya birrea* subsp. *caffra* occurs in east tropical Africa (Kenya and Tanzania), South tropical Africa (Angola, Malawi, Mozambique, Zambia and Zimbabwe) and southern Africa (Botswana, Namibia, South Africa and Swaziland) as well as Madagascar<sup>3</sup>. It is a medium-sized tree, 7-17 m in height, with a rounded, spreading crown, which stands leafless for several months of the year<sup>4</sup>. It occurs in well-drained, sandy and loamy soils; and is generally intolerant of frost<sup>3</sup>. Although *S. birrea* is considered primarily dioecious species (single tree with either male or female flowers only), occasional monoecious individual plants (bearing both male and female flowers) may occur<sup>1</sup>.

*Sclerocarya birrea* has been identified by a number of international and national organizations as a key species for domestication and agroforestry promotion to support nutritional, health and income security in

Africa<sup>1,5</sup>. Previous research in east and southern Africa on *S. birrea* showed that consumption of its fruits makes an important contribution to local diets and culture, and income generation from the sale of the fruits, thereby having a poverty reduction role especially for poorer households<sup>1,6,7,8,9,10</sup>. However, this species is not exploited to its full potential in Zimbabwe. The current investigation therefore, attempts to fill some of the gaps in indigenous knowledge related to the use of *S. birrea* subsp. *caffra* in South-central Zimbabwe emphasizing the ethnobotanical knowledge on the species and how this ethnobotanical knowledge has been maintained over the years.

### Methodology

#### Study area

Field studies were carried out in four villages: Gamwa, Gundura, Madziva and Shiku (Fig. 1), all located in South-central Zimbabwe. This investigation is part of a larger study aimed at documenting ethnobotanical knowledge in South-central Zimbabwe. People in the study area speak *ChiKaranga*, a dialect of the *Shona* language. The area lies in agroecological region 3, a semi-intensive agricultural region characterized by annual rainfall of

between 650-800 mm a year<sup>11</sup>, concentrated in the rainy season from November to March. In the hottest month, October, the mean temperature is 31°C, and in the coldest month, July, the mean temperature is 9°C. Severe mid-season dry spells and an unreliable start to the rainy season make the area marginal for maize, tobacco and cotton. Rainfall is the greatest physical constraint to agricultural production, falling during a single rainy season<sup>11</sup>, resulting in high risk of crop failure due to drought. Droughts are frequent and food insecurity is widespread. Soils are largely derived from granitic-gneissic rocks, giving rise to predominantly sandy soils, with a low water-holding capacity, low fertility, low pH, and deficiencies in nitrogen, phosphorus, and sulfur<sup>12</sup>.

Subsistence agriculture is the mainstay livelihood of the population in South-central Zimbabwe. Maize cultivation is the main activity, with other grains such as sorghum and millet being planted by most households as insurance against poor rains, which in some years are inadequate to produce a good maize crop. Subsistence grain crops are supplemented by household vegetable production, e.g. pumpkins, *covo*, rape, cabbage and beans. Residents of South-central Zimbabwe use cattle and donkeys to plough their fields, and as a means of transporting people and goods to and from the local markets. The area is

characterized by savanna grassland and savanna woodland types of vegetation with dry deciduous thickets in some parts. The woodlands provide building poles, fuelwood, edible fruits, tubers and thatching grass. The dominant plant species are *Brachystegia spiciformis* Benth., *Julbernardia globiflora* (Benth.) Troupin, *Colophospermum mopane* (J. Kirk ex Benth.) J. Kirk ex J. Léonard, *S. birrea*, *Acacia* spp., *Combretum* spp., *Dichrostachys cinerea* (L.) Wight & Arn., *Strychnos* spp., *Termanalia sericea* Burch. ex DC. and dense riverine thickets of mixed species along the major rivers. Dominant grass species include *Hyparrhenia* spp., *Eragrostis* spp., *Heteropogon* spp. and *Digitaria* spp.

#### Data collection

Prior to any contact with the local people, the study and its objectives were introduced to the local traditional leaders. Once the traditional leaders granted permission to proceed, individuals were approached for participation. Twenty nine randomly selected individuals from each of the four villages were interviewed between December 2011 and January 2012. Verbal informal consent was obtained from each individual who participated in the study and the researcher adhered to the ethical guidelines of the International Society of Ethnobiology ([www.ethnobiology.net](http://www.ethnobiology.net)). The aim and purpose of the investigation was explained to all participants. Interviews were conducted individually whenever possible in an attempt to avoid any direct influences from third parties and to ensure that the data supplied by the participants were as direct and reliable as possible<sup>13</sup>. The participatory rural appraisal (PRA) methods<sup>14</sup> and questionnaires were used to systematically collect data on ethnobotanical knowledge on *S. birrea* within each of the four villages. Semi-structured and open ended interviews, conducted in Shona, sought answers to the questions listed in Table 1. Other aspects investigated by the questionnaire included demographic characteristics of the participants, household information on livelihood

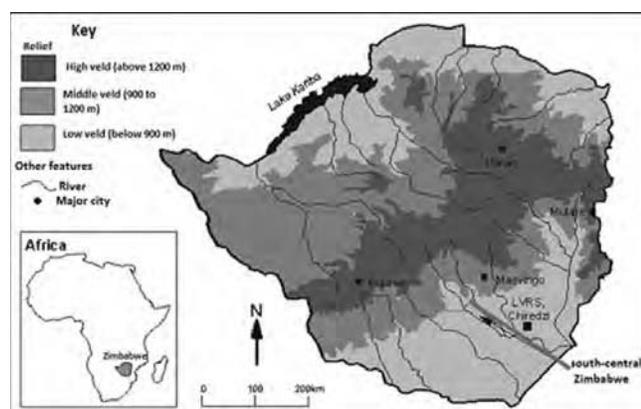


Fig. 1—Geographical location of the study area, map modified from<sup>15</sup>

Table 1—Questions used to guide the semi-structured interviews with local people in South-central Zimbabwe

#### Questions

- 1 What benefit do you derive from *S. birrea*?
- 2 Is *S. birrea* population increasing or decreasing?
- 3 Did the interviewee engage in collection of *S. birrea* products, currently or formerly?
- 4 What did the interviewee believe was the cause of any perceived increase or decrease in populations of *S. birrea*?
- 5 Are there any traditional rules on the use of *S. birrea*?
- 6 Had the interviewee practised traditional methods of conserving *S. birrea*? If so, when, where and under what circumstances?

activities, incomes, patterns of expenditure, education, use of *S. birrea* and perceptions on its conservation in South-central Zimbabwe.

#### Data analysis

The majority of the data collected in this study were descriptive in nature, therefore, they were explained directly. Interview data were coded and sorted into themes. Inconsistencies and unique statements were noted and given particular attention. Recurrent themes were uncovered in this investigation by a process of systematic content analysis. In its broadest sense, this involves the generation of quantitative descriptions<sup>16</sup> to its ability to help researchers draw inferences from a text by breaking that text into discrete units of manageable data that can then be meaningfully reorganized<sup>17</sup>.

## Results and discussion

### Socio-economic characteristics of the participants

Table 2 shows the demographic characteristics of the participants. Of the one hundred and sixteen participants, 56% were female and 44% were male. Their ages ranged from 16-89 yrs, with 46 yrs as the median. The majority of participants were married (65.5%), 20.7% widowed, 7.8% single and 6% divorced (Table 2). The majority of the participants (57.8%) were educated up to primary level, while 18.1% had attained secondary education, 1.7% had attained tertiary education and 22.4% were illiterate. More than three quarters of the participants (82.8%) were unemployed, surviving on less than \$100 a month (Table 2). A very small proportion of the participants had constant income as civil servants (3.4%) and pensioners (6.0%) and their income was more than \$150 a month (Table 2).

### *S. birrea* benefits as perceived by local people

All the participants regarded *S. birrea* as an important source of their livelihood needs such as aesthetic value, fodder, food, fuelwood, medicine, shade and utility timber used for making crafts (Table 3). The main product harvested by the participants was the fruit. The ripe fruits were eaten raw (100%), kernels were eaten raw (100%) or roasted (33.6%), fruit juice fermented to produce children's beverage (22.4%) or traditional beer (35.3%), making jam (14.7%), oil processing (8.6%) and added to maize, millet and sorghum porridge (4.3%) (Table 3). The wide uses of the fruit and kernels of *S. birrea* recorded in this study support

earlier findings that the species is an important component of the rural diet in several areas where it is found<sup>1,2,18</sup>. In many instances full-time engagement in forest-related activities has either lifted participant households out of poverty, or ensured that they have never been close to poverty<sup>19</sup>. *Sclerocarya birrea* leaves and fruits were eaten by cattle and goats, a use category mentioned by 13.8% of the participants (Table 3). *Sclerocarya birrea* wood was used for carving light weight utensils which included drums, mortars, plough wheels, traditional wooden bowls and decorative curios. Participants mentioned that the use of *S. birrea* crafts is declining due to availability of modern substitutes, but some of the crafts were still used during cultural events such as marriages and other traditional ceremonies. The crafts have also been commercialized and sold to motorists and

Table 2—Socio-demographic characteristics of participants interviewed in South-central Zimbabwe

Characteristics	Number	%
Gender		
Female	65	56.0
Male	51	44.0
Age (years)		
16-25	8	6.9
26-35	14	12.1
36-45	23	19.8
46-55	29	25.0
56-65	19	16.4
66-75	13	11.2
76-85	7	6.0
>86	3	2.6
Marital status		
Single	9	7.8
Married	76	65.5
Divorced	7	6.0
Widowed	24	20.7
Highest level of education		
No education	26	22.4
Primary	67	57.8
Secondary	21	18.1
Tertiary	2	1.7
Occupation		
Unemployed	96	82.8
Civil servant	4	3.4
Pensioner	7	6.0
Other	9	7.6
Combined monthly income		
Less than \$50	51	44.0
\$50-\$99	47	40.5
\$100-\$149	3	2.6
\$150-\$199	4	3.4
More than \$200	11	9.5

Table 3—Dependence of the local people on *S. birrea* in South-central Zimbabwe. The answers were grouped into broader categories. 116 participants answered the questions but some participants gave multiple answers

Questions	Gamwa n=29	Gundura n=29	Madziva n=29	Shiku n=29	%
What benefit do you derive from <i>S. birrea</i> ?					
Added to maize, millet and sorghum porridge	0	2	1	2	3.4%
Aesthetic	0	0	2	0	1.7%
Edible kernel eaten raw	29	29	29	29	100%
Edible kernel eaten roasted	8	11	5	15	33.6%
Fermented juice used as a beverage by children	6	5	8	7	22.4%
Fermented juice distilled into beer	9	9	10	13	35.3%
Firewood	2	0	1	4	6.0%
Fodder	4	2	6	4	13.8%
Jam	3	3	5	6	14.7%
Oil	3	1	4	2	8.6%
Ripe fruit eaten raw	29	29	29	29	100%
Shade	1	1	0	2	3.4%
Utility timber used for making crafts and wood utensils	6	2	4	3	12.9%

Table 4—Medicinal applications of *S. birrea* in South-central Zimbabwe

Disease	Parts used	No. of citations	Dosage and preparation	Similar uses reported in literature
Cold and flu	Leaves	5.2%	Leaf decoction taken orally thrice a day	Bark and root decoction taken by mouth as a remedy for cough, fever and throat infections in Malawi, South Africa and Zimbabwe <sup>22,23,24</sup>
Diarrhea	Bark	6.0%	Bark decoction taken orally thrice a day	Decoction of stem, bark and taken orally as a remedy for cholera, dysentery and diarrhea in South Africa and Zimbabwe <sup>22,25,26</sup>
Sore eyes	Roots	2.6%	Roots boiled and steam directed into eyes	Steam from boiled roots used as a remedy for sore eyes in Malawi and Zimbabwe <sup>22,27</sup>
Toothache	Bark	1.7%	Bark extract applied on affected teeth thrice a day	Stem and bark extracts applied on teeth <sup>28</sup>

tourists along highways. It was also mentioned that *S. birrea* was used for firewood (6.0%), maintained and nurtured in home gardens and agricultural fields as shade (3.4%) and for aesthetic values (1.7%).

#### Medicinal use of *S. birrea*

Four human diseases were reported to be treated with *S. birrea*, among them were cold and flu, diarrhea, sore eyes and toothache (Table 4). Plant parts used as remedies included bark, leaves and roots (Table 4). These medicinal applications in South-central Zimbabwe are consistent with previous findings<sup>20,21</sup> who concluded that extract of bark, root and leaves of *S. birrea* had significant effect on bacterial growth. The therapeutic claims documented in this study are well supported by literature (Table 4), with the bark and leaf extracts having anti-diarrheal, anti-diabetic, anti-inflammatory, anti-septic, anti-microbial, anti-plasmodial, anti-hypertensive, anti-convulsant and anti-oxidant properties<sup>21</sup>. These pharmacological properties of *S. birrea* make the

medicinal uses of the species documented in this study and similar therapeutic claims in previous studies credible.

#### Perceptions on availability of *S. birrea*

A decline in *S. birrea* population in South-central Zimbabwe was ubiquitously perceived, with almost all participants (95.7%) reporting that the species numbers were declining (Table 5). The remainder (4.3%) indicated that there were few households planting *S. birrea* in their home gardens, as well as passive protection and nurturing of self-seeded recruits of the species in home gardens and agricultural fields (Table 5). There was also an increase of about 10% (68.1% current collectors against 57.8% past collectors) in the collection and use of *S. birrea* in South-central Zimbabwe (Table 5). The major difference between past and present *S. birrea* collection is that the commercial utilization of the species products was small in scale in the past. Interviews with participants revealed that in bad agricultural years,

Table 5—Views given by participants in South-central Zimbabwe towards population dynamics and conservation needs of *S. birrea*. The answers were grouped into broader categories. 116 participants answered the questions and some gave multiple answers

Questions	Response (%), n=116
Is <i>S. birrea</i> population increasing?	0
Is <i>S. birrea</i> population decreasing?	95.7
Did the interviewee engage in collection of <i>S. birrea</i> products currently?	68.1
Did the interviewee engage in collection of <i>S. birrea</i> products in the past?	57.8
What did the interviewee believe was the cause of any perceived increase or decrease in populations of <i>S. birrea</i> ?	
Carving	19
Deforestation	9.5
Drought	12.9
Land clearing for settlement and cultivation	20.7
Not adhering to traditional rules	6.0
Passive protection and nurturing of self-seeded recruits	4.3
Are there any traditional rules about the use of <i>S. birrea</i> ?	24.1

most adults and children engage in *S. birrea* collection as an alternative livelihood strategy.

The factors responsible for the decline in *S. birrea* populations were both anthropogenic (carving, deforestation, not adhering to traditional rules and land clearing for settlement and cultivation) and natural drought. Carving (19%) and land clearing for settlement and cultivation (20.7%) were mentioned as the main causes of the decline in *S. birrea* populations (Table 5). A small proportion of the participants (6%) felt that *S. birrea* populations were declining due to ignoring traditional rules and taboos that govern plant resources in South-central Zimbabwe (Table 5). Participants mentioned that *S. birrea* in grazing areas, abandoned homesteads and agricultural fields were accessible to all villagers. About a quarter of the participants (24.1%) mentioned that traditional leaders prohibit residents from cutting down *S. birrea* in both wild and arable land. These results correlate strongly with the findings of McGregor<sup>18</sup> who found that *S. birrea* as a preferred fruit tree is generally less heavily cut in Shurugwi district, Zimbabwe. Traditional rules and taboos have helped to ensure the survival of valuable timber species and fruit trees in Zimbabwe<sup>18</sup>.

### Conclusion

This study showed that *S. birrea* contributes to various forms of livelihood needs of local people in South-central Zimbabwe, supporting findings obtained in similar studies done in South Africa<sup>1</sup>. By providing different products and services, *S. birrea* is conserved and nurtured in home gardens and agricultural fields for its multipurpose properties. Cutting down *S. birrea* is a taboo among rural

villagers in South-central Zimbabwe. But increased harvesting of *S. birrea* fruits leads to removal of seeds from the population and this will lead to reduced recruitment and even loss of genetic material in the long term. The growing local and international demand for *S. birrea* products calls for large-scale cultivation of the plant not only in Zimbabwe, but also in neighbouring countries where the species occurs naturally and has the potential to positively affect local peoples' livelihoods. This approach will promote sustainable use and conservation of *S. birrea* genetic resources in its areas of natural occurrence.

### Acknowledgement

I am grateful to the residents of South-central Zimbabwe for sharing their knowledge on *Sclerocarya birrea*. I would like to thank anonymous reviewers for their constructive comments.

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