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Tanning hides and skins using vegetable tanning agents in Hukuntsi sub-district, Botswana

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This study was conducted to document the vegetable tanning agents used by rural tanners in Hukuntsi sub-district of Kgalagadi District, Botswana. A total of 57 artisan tanners were interviewed in 14 villages using a structured questionnaire from October to November 2010. Data were also collected by direct observation and interviewing of key informants. Data on types of skins tanned, vegetable tanning agents used, uses of tanned skins and experience of respondents in tanning were collected. These results showed that the majority of tanners were males. About 81.7% of the respondents said they have been involved in leather tanning for 5 to 30 years, indicating that the majority of the respondents were experienced in tanning. The two common vegetable tanning agents in the villages were *Elephatina elephantorrhiza* (*mositsane)* and *Terminalia cericea* (*mogonono*), with *mositsane* being the commonest due to its wide distribution in the country. The vegetable tanning agents were used alone or in combination with others to improve efficiency. The plant parts used for tanning in order of importance were barks, roots and tubers. Other tanning agents used were animal fat and brains. In this study, the popular skins tanned (71.9%) were those of smallstock (sheep and goats) and wild cats. According to the respondents, tanned skins were used for clothing, blankets, traditional attire, shoes and saddles that were sold to earn income to pay for food, transport, medical expenses and to buy school requisites for children. These results suggests that artisan tanning has an important role in poverty reduction and household food security.

Key words: Animal fat, brain, leather, skins, tannin, tanning

Introduction

Various techniques were employed over time to preserve and condition hides and skins. These included the use of animal fat, brain and other substances which were used purposely for softening and arresting putrefaction. The different techniques and methods continued until it was discovered that the skin could be made more resistant if treated with leaves and barks containing

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tannin (vegetable tanning). Therefore, modern tanning techniques employing the use of chemicals were developed to tan large quantities of hides and skins.

Vegetable tanning agent is considered the "green tanning agent" because of its biodegradation (Jianzhong *et al.*, 2009). According to Faxing *et al.* (2005) and Bi (2006), vegetable tanned leather has excellent fullness, moldering properties, wear resistance, air permeability and solidness; hence, it is of great significance to reduce chrome pollution in leather making process. Vegetable tanned leather is used in making heavy leather such as furniture leather, garment leather and shoe upper leather. Worldwide, researchers are paying particular attention to the use of vegetable tanning agents to replace chrome tanning agent and progress has already been achieved. Some plants are preferred for tanning over others due to the level of their tannin content. Tannin is found in various plants' parts such as tree barks, wood, fruits, pods, leaves, roots, tubers and many other plant parts, indicating that different plant parts are used in tanning.

Like other nations across the world, Batswana (Botswana nationals) have been involved in tanning skins for a long time. Tanning involves the use of brain, fat and tanning agents of vegetable or plant origin. A wide variety of vegetative tanning agents have for decades been used in Botswana and these still contribute immensely to artisan tanning in the rural villages. Although local tanners have not tested the various plants and plant parts for their tannin contents, practical experience has shown that some plants produce better tanning agents than others; hence their persistent use in tanning. These vegetative tanning agents dominate artisan tanning. Therefore, there is need to document information on vegetable tanning by rural communities.

Although tanning is practised by rural communities in Botswana, there is no documented information on vegetable tanning. Therefore, this study was undertaken to document information on the use of vegetable tanning agents in hides and skins tanning in Hukuntsi sub-district.

Materials and methods

A survey on artisan tanning was conducted in 14 villages of Hukuntsi sub-district in the Kgalagadi district. The sub-district was chosen due to its high number of people involved in artisan tanning in the district. Data on plants and other products used as tanning agents were collected using structured questionnaire which was administered to 57 artisan tanners from October to November 2010. Data were also collected through direct observations and by interviewing key informants. The sample size was taken from a group of known tanners within the sub-district. The main data captured in the questionnaire included demographic characteristics, experience in tanning, types of skins

tanned, uses of tanned skins, tanning agents used, other uses of tanning agents, as well as, the effectiveness of the tanning agents. Data were analyzed using Microsoft Excel. Descriptive statistics such as mean and percentages were used to summarize and present the results.

Results and discussion

The majority (94.7%) of respondents were males (Table 1). Female tanners (5.3%) comprised two youths aged 18 and 29 years and an elderly woman. Twenty-five males were aged >29 years while 29 respondents were aged between 26 and 29 years. According to Table 1, Inalegolo had the largest number of tanners (10) followed by Hukuntsi (7) and Ukwi (6).

Table 1. Number of tanners in villages by sex.

Location	Female	Male	Total
Maretshwane	0	5	5
Ukwi	0	6	6
Make	0	4	4
Inalegolo	1	9	10
Monong	0	2	2
Phuduhudu	0	3	3
Ncaang	0	5	5
Hukuntsi	1	6	7
Lokgwabe	0	3	3
Zutshwa	1	2	3
Hunhukwe	0	2	2
Ngwatle	0	1	1
Lehututu	0	2	2
Kang	0	4	4
Total	3	54	57

About 75.4% of the respondents said that tanners in the previous years were males while the remainder (24.56%) said that tanning was not gender specific. None of the interviewees in the present study mentioned that females were involved in tanning of hides and skins, indicating that tanning is the domain of males. This finding could be ascribable to the fact that traditionally, women are involved in carrying out household chores while males herd livestock and hunt wild animals; hence their involvement in tanning hides and skins. Another reason could be that tanning is quite physical; hence lack of participation of women in this activity. However, women are usually involved in the purchase of tanned leather to make garments and artifacts.

According to Table 2, the length of time the respondents were involved in tanning ranged from 2 to >30 years. About 21% of the respondents said they have been engaged in tanning for 5 to 10 years, 21.1% for ≥30 years and 19.3% for 1 to 5 years. The respondents that had been tanning hides and skins from 5 to >30 years accounted for 81.7%. These results clearly indicate that the majority of the respondents were experienced in tanning. However, two respondents did not state the number of years they have been involved in tanning probably because of their inability to recall when they begun to get involved in tanning.

Table 2. Number of years spent tanning.

No. of years in tanning	No. of respondents	Percentage
1-5	11	19.3
5-10	12	21.1
10-15	7	12.3
15-20	6	10.5
20-25	5	8.8
25-30	2	3.5
≥30	12	21.1
Total	55	96.6

Table 3 showed seven common plants used for tanning in the villages. All tanning plants except mimosa are indigenous to Botswana. Mimosa which is a commercial product from South Africa was introduced to artisan tanners by the Hides and Skins Section of the Ministry of Agriculture. The majority (82.5%) of respondents in the present study mentioned that they used more than one tanning agents. About 95% of the respondents said that they used *Elephatina elephantorrhiza* (mositsane) as a tanning agent followed by *Terminalia cericea* (mogonono) at 40.4%. For all the respondents that mentioned mogonono as a tanning agent, mositsane was also listed as another tanning agent, indicating that these are used simultaneously probably to achieve better results. *Diospyros lycioides* (letlhajwa), *Ziziphus mucronata* (mokgalo), and *Boscia albitrunca* (motlopi) were mentioned by one respondent as tanning agents. These tanning agents were either used as stand-alone tanning agents or as combinations with *E. elephantorrhiza* or *T. cericea*.

Mositsane appears to be a common tanning agent because it is widely distributed in the country. Twenty-four (43.6%) respondents mentioned that mositsane is also used for medicinal purposes in both livestock and humans. Other tanning agents include animal brain, fat and bone marrow, which were used mainly to lubricate the skins before the vegetative tanning agents could be applied. Another tanning agent in the form of a mixture of wood ash, salt, water

and animal brain known locally as sebube was mentioned by three respondents in Ukwi. The respondents said they used salt and ash to arrest putrefaction while the brain lubricated the skins. The respondents said they used the mixture on dry skins after which *E. elephantorrhiza* or *T. cericea* would be used. From Table 3, it is clear that the common plant part used in tanning is the bark followed by the roots. It appears that the bark has high tannin content compared to other plant parts.

Table 3. Common plants used for tanning.

Local Name	English name	Botanical name	Part used	Other uses
Mositsane		*Elephatina elephantorrhiza*	Tuber	Medicinal purposes
Mogonono	Silver cluster-Leaf	*Terminalia cericea*	Bark	Tying thatch grass, making chairs and mortar
Moretlwa		*Grewia flava*	Bark	
Mokgalo		*Ziziphus mucronata*		
Motlopi		*Boscia albitrunca*	Bark	
Letlhajwa	Star apple/monkey plum	*Diospyros lycioides*	Root	
Mimosa		*Albizia julibrissin*	Bark/root bark	

The finding on the use of *D. lycioides* roots to tan hides and skins in this study (Table 2) is in disagreement with Rambuwani (2005) who reported the use of the bark for tanning purposes. The differences in results probably indicate that different plant parts are used in tanning as tannin is found in various plant parts such as tree barks, wood, fruits, pods, leaves, roots, tubers and many other plant parts.

Besides tanning, vegetable tanning agents have other uses in humans and livestock production. The study of Moreki (1997) reported that eye infections in chickens were treated with water containing exudates from the leaves of *Pseudognaphaium luteo-album* and root powder from *D. lycioides*. In addition, *D. lycioides* are chewed by humans to clean teeth. According to Moshi and Mbwambo (2005), the leaves of *T. sericea* have traditionally been used as a popular folk medicine for treating bacterial infections. The study of Mochizuki and Hasegawa (2007) suggested the possible use of sericoside (a traditional herbal saponin from *T. sericea*) in treating acute inflammatory disease such as inflammatory bowel disease (IBD) in humans. Furthermore, tanning plants were used for furniture such as traditional wooden chair or spoons.

The majority (71.9%) of the respondents mentioned that the skins from wildcats and smallstock were the most tanned while 14% of the respondents said that hides were also tanned. Twenty respondents said that they tanned smallstock (sheep and goats) skins followed by wildcat skins (14), wildcats and smallstock skins (7), other domestic animals and wild animals (6 each) while

the least, (4) was for wild animals and domestic animals. Tanned skins came from wild animals (springboks and wildcats skins especially jackals) and smallstock. Elliott (1995) mentioned that pastoral farmers used to kill wild animals for food and to protect their livestock. It is, therefore, not surprising that wildcat skins were widely tanned in this study. Usually, wild dogs and wildcats (cheetahs, lions and jackals) are the common predators of livestock; hence they are killed to protect stock. The respondents said they tanned skins because the skins were readily available, they are easy to tan than hides, wild animals were abundant around the villages and there were no restrictions on hunting by government, and it is easy to make goods out of the skins than hides. Some skins such as those of wild cats are attractive and fetch prime prices. According to the respondents, tanned skins were used for clothing, blankets, traditional attire, shoes and saddles for horses.

According to Koloka and Moreki (2010), hides and skins in Botswana are used by artisan tanners, hides collectors, hides and skins exporters and individuals for domestic uses such as traditional mats and whip lashes. Therefore, the market for artisan tanned skins ranges from individuals, hotels, tourists, curio shops and government. Although the market for leather products is vast the products are not easy to sell as they are expensive. Producers are also faced with the challenges of meeting the demands when large volumes of artifacts are required. This is as a result of lack of modern tanning equipment and hence the production cycle is long. Furthermore, the quality of artifacts is at times not up to international standards resulting in them not being exported despite being highly demanded by tourists.

Training of artisan tanners

A total of 95 respondents participated in vegetable tanning, hides improvement and basic leather works courses conducted by the Hides and Skins Section. This was achieved through workshops and field courses aimed at improving the quality of hides and skins, value addition and product development. About 82.1% course participants were males and the remainder females. It is clear from Figure 1 that the popular courses were hides improvement and vegetable tanning. After attending these courses, artisan tanners are able to produce better quality artifacts which are sold locally and internationally. In addition, tanners are taught how to use commercial tanning agents such as mimosa and lime which enable the removal of hair without damaging the leather grain which is the most valuable part of leather. This in turn increases the returns, thus contributing to poverty reduction and improved food security in furtherance of Millennium Development Goal No.1 (to eradicate extreme hunger and poverty) and Botswana's Vision 2016.

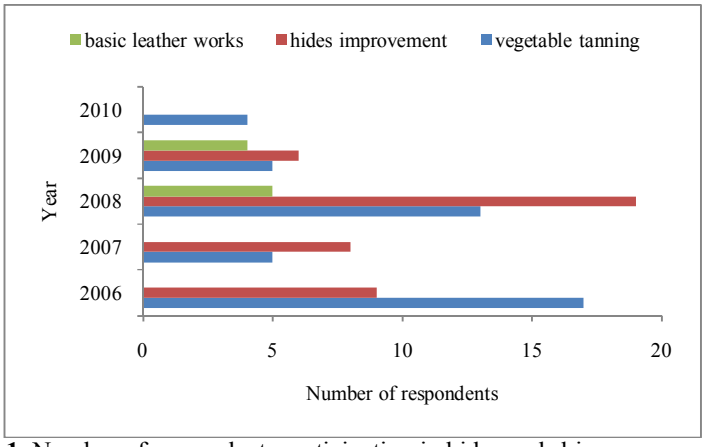

Fig 1. Number of respondents participating in hides and skins courses.

A comprehensive study should be conducted in other parts of the country to identify and document tanning plants used by rural tanners. A scientific research on the extent of tannin and the level of tannin should be conducted on local tanning agents to explore the possibilities for commercialization or planting. *Elephatina elephantorrhiza* was the common vegetative tanning agent across the villages due to its wide distribution. The common plant part used in tanning is the bark followed by the roots. It appears that the bark has high tannin content compared to other plant parts**.** The extension service plays an important role in imparting knowledge and skills to the tanners across the villages in Sub-district.

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