CHAPTER 7

THE DEVELOPMENT OF SECONDARY INDUSTRIES THROUGH THE SUSTAINABLE UTILISATION OF REEDS AND FOREST TIMBER IN THE TEMBE ELEPHANT PARK, MAPUTALAND, SOUTH AFRICA.

J. A. Tarr[1], J. Y. Gaugris[1], M. W. van Rooyen[2] and J. du P. Bothma[1]

[1] Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002

[2] Department of Botany, University of Pretoria, Pretoria, South Africa, 0002

Short title: Reed hut prefabrication

Key words: Forest timber, Maputaland, *Phragmites australis,* Prefabricated huts.
Published in: *International Journal of Sustainable Development and World Ecology* In Press

SUMMARY

The harvesting of *Phragmites australis* reeds in the Tembe Elephant Park has to be managed pro-actively. Solutions to potential problems should be sought before they arise. This paper offers a potential solution to the problem of instating a winter-only reed harvest in the Muzi Swamp. The potential for manufacturing finished products such as prefabricated huts from sustainably harvested reeds and forest timber is examined and a cost estimate is presented. A prefabricated reed hut is three times cheaper than a similarly sized house made of bricks and cement. The manufacturing of finished products from the harvested material will add secondary value to the resource and also offer an alternative employment to harvesting reeds in the summer. The higher prices obtained for a processed article will also hopefully reduce the demand for the resource in its raw form, thereby increasing the perceived value of the resource and reducing wastage from raw materials that are not sold.

[1] Correspondence to: Jason Tarr, Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002.
E-mail: jason.tarr@tuks.co.za
Tel: +27 12 420-2338
Fax: +27 12 420-6096

INTRODUCTION

Poor rural communities in South Africa are hugely dependent on natural resources for subsistence use. In the past, natural resources could sustain small communities with additional resources coming from the planting of crops for their families. Rural development in South Africa in areas such as Maputaland in northern KwaZulu-Natal has increased the number of people needing a source of income to survive. Rural community members are no longer satisfied with a traditional subsistence livelihood and are looking for ways to increase their family's income through the harvesting, manufacture, and the sale of products from the environment. The raw materials are collected in the field for the production of arts, crafts and curios for the tourist market (Els 2000; Dernbach 2001). This craftwork, however, only supplies an income on an *ad hoc* basis and there are no guarantees as to the amount and regularity of the income earned. Tourists also only buy crafts that they consider to be "authentic" or truly Zulu (Van Wyk 2003). In a case like this the people with money, the tourists, hold a position of power over those that have none, the crafters. Tourists can therefore dictate to the crafters as to the price they would like to pay for the craftwork. The end result is that the crafters earn little income for an extremely labour-intensive production process (Van Wyk 2003). There are also no guarantees as to the sustainability of the natural resources being harvested. In many instances these craftworks are made of threatened hardwood species for which levels of sustainable utilisation have not yet been established.

The members of the Sibonisweni community, which neighbours the Tembe Elephant Park, harvest *Phragmites australis* reeds in the Muzi Swamp. Due to the seasonal nature of its growth *Phragmites australis* is a resource that can deliver high yields of raw material if managed appropriately and utilised in a sustainable manner. There is potential for the development of a lucrative market from the processing and manufacture of reed-related products. This paper attempts to highlight one of the

possible means of making reeds more valuable as a resource, other than from their sale as raw material.

The reeds are harvested by hand and permits are issued to community members who belong to the Sibonisweni Reed Cutters Association. The current levels of utilisation in the Muzi Swamp are not threatening to decimate the reed beds. Evidence suggests, however, that the present harvesting regime has negatively affected the reed quality in the harvesting area of the Tembe Elephant Park. Harvesting at the incorrect time of year is depleting the below-ground resources stored in the rhizomes and the reeds are not allowed enough time to recover between the harvests (Tarr *et al.* 2004). A winter-only harvest of the reed beds would improve the condition of the reed beds because the mobilisation of nutrients, produced in the summer months, from the above-ground parts of the reed to the below-ground parts would be complete (Van der Toorn and Mook 1982). Harvesting cessation in the summer months will enhance the production of better quality reeds than what are currently being produced and harvested in the Muzi Swamp (Ostendorp 1989; Weisner *et al*. 1989; Tarr *et al*. 2004). The Tembe Elephant Park management have tried to encourage a winter harvest without success. Harvesters prefer a year round collection of reeds rather than condensing the harvest into the winter months when the aerial parts of the reeds are dormant. This is possibly due to the time that they would be idle in the summer months when not harvesting reeds, as it would seem to them that they are unemployed during this time. There are also social aspects to consider with regard to reed harvesting. While collecting reeds and other such resources people have a chance to interact and discuss important personal and community-related issues. This is especially important for rural African women who generally have no formal forum for discussion (Kloppers, pers comm.)[1]. This type of social interaction is an important part of African culture. Another rural

[1] Dr. Roelie Kloppers, TFCA Communications Co-ordinator, Ndumo-Tembe-Futi TFCA
E-mail: kloppers@mweb.co.za

community with close ties to the Tembe Elephant Park is the Manqakulani community. They have established a community conservation area, known as the Tshanini Game Reserve, in an attempt to encourage economic development in the area through ecotourism. With the permission of the local authority, the timber in that area is utilised for the construction of houses. Gaugris (2004) established the sustainable levels of this community stewardship for a range of highly desirable hardwood species for the Tshanini Game Reserve and Manqakulani area. Because of the similarity between the vegetation of the Tshanini Game Reserve and the Tembe Elephant Park (Gaugris 2004), the assumption was made that many of the species in the Tembe Elephant Park can be harvested sustainably, the numbers of which were calculated similarly to that of the Tshanini Game Reserve (Gaugris 2004).

The methods used in this article are based on the findings of the sustainable utilisation potential of *Phragmites australis* and forest timber hardwood in two different studies by the first two authors. The aim of this paper was to investigate the initiation of a form of secondary industry in the communities surrounding the Tembe Elephant Park. This type of industry could be practised at a time when it is suggested that reed harvesting should be halted so that the reed beds can be rested in the summer months. The unemployment and social interaction issues can also be addressed in this way. Making and selling prefabricated huts will generate income and bring community members together in the shared tasks performed whilst making the products. This elaborate form of utilisation of the sustainably collected natural resources from the area, and subsequent manufacture of finished products will add value to resources that are currently being used in their most raw form.

The making of reed and forest timber prefabricated panels for use in hut building was examined specifically. The cost of building a hut from western building materials is compared with the cost of building a hut made of ready-made panels manufactured from locally sourced materials and labour. Admittedly the calculations,

measurements, building methods and quantities of the natural resources used to describe the building of the individual panels are based on the authors' somewhat limited practical experience but feel that these estimates are an adequate starting point. Sufficient time spent researching and surveying within local communities, as well as interaction with local community members, alludes to an accurate account of the practicality of the concept. The suggestions and recommendations with regard to the prefabricated huts are based on personal observation and empirical evidence. While the authors have not actually built the suggested panels and huts they believe that the dimensions, quantities and practical application of the concept are sound because they are based on what actually happens in the community (Gaugris 2004).

STUDY AREA

The Sibonisweni community borders the Tembe Elephant Park to the southeast (Figure 1). Many of these community members have lived in the Tembe Elephant Park before its proclamation as a wildlife reserve in 1983. Part of the relocation agreement was that members of the Sibonisweni community would still be allowed to harvest *Phragmites australis* reeds from the Muzi Swamp within the Tembe Elephant Park. Reed harvesting provides a substantial supplement to the household income in the area. The total value of reed bundles harvested in the Muzi Swamp in 2000 was approximately ZAR 80 000 (Browning 2000). Should all the bundles be sold this would amount to a substantial revenue augmentation in a region where the mean annual income per household is ZAR 6 000, most of which comprises state pensions (Els & Bothma 2000; Van Wyk 2003).

The Tshanini Game Reserve of the Manqakulani community is situated approximately 6 km due south of the Tembe Elephant Park, and the village where the people reside lies east of the reserve in an area bordering the Muzi Swamp. This southern part of the Muzi Swamp is not inside the Tembe Elephant Park and the resources found there are not afforded protection through controlled use.

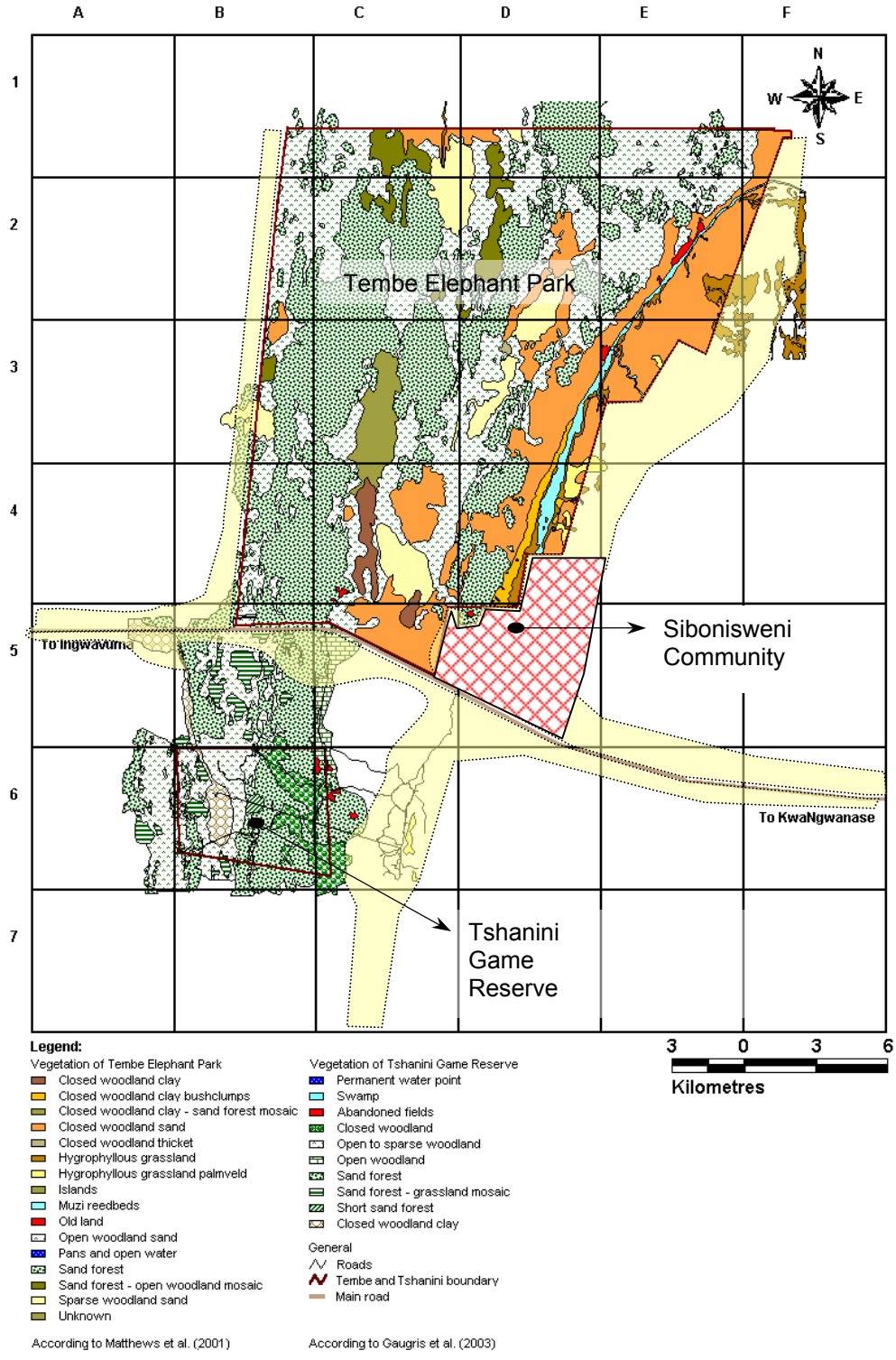

Figure 1: Grid map of the study area including the Tembe Elephant Park and the Tshanini Game Reserve area, northern Maputaland, KwaZulu-Natal province, South Africa. The area shaded in yellow indicates where human development is expected to occur in the next 50 years.

Consequently, the reeds in the Muzi Swamp outside the Tembe Elephant Park are few and of a poor quality, making them undesirable for harvesting. Much of the Muzi Swamp outside the conservation area has been converted to agriculture because of the relatively moist and fertile soils that the swamp conditions afford. These land-use trends are also reflected in the Sibonisweni community. The areas shaded in yellow (Figure 1) indicate where human settlements are expected to expand to within the next 50 years.

METHODS

Baseline data on the extent and implications of reed use within the Sibonisweni community were obtained by conducting interviews with members of the Sibonisweni Reed Cutters Association and through quantitative information obtained in questionnaire surveys. Information such as the mean number of bundles of reeds required in the construction of a hut, the price per bundle of reeds, where there reeds were bought, and preferences in the type of material used in construction were gathered from questionnaires. The game rangers at KwaMsomi Scout Camp noted the number of bundles harvested per annum. Reed bundle characteristics were measured from a sample of the harvested bundles as they were removed from the Tembe Elephant Park. Reed characteristics, such as the mean reed diameter, mean reed height and the mean number of reeds per harvested bundle were recorded. Each year the total number of bundles of reeds harvested and their mean morphometric characteristics were therefore quantified.

If the revised management strategy for the Muzi Swamp were to be accepted by the Sibonisweni community and Tembe Elephant Park management, then 6714 reed bundles can be harvested in the first harvesting season. It was calculated that there were 508 (SD ± 162) reeds per reed bundle, that the mean basal diameter of the reeds was 10.17 mm (SD ± 1.59) and that the mean reed height was 2.46 m (SD ± 0.45). By using these parameters the number of reeds that it would take to

construct a 2 X 2 m reed panel that is three layers of reeds thick could be calculated. The layering of the reeds is necessary to create a robust panel and to improve its wind- and waterproofing qualities. The number of reeds needed to construct a 2 m length of three-layered panelling would be 590 reeds. It would therefore require 12 m of reed panelling to construct a typically sized hut of 2.0 X 4.0 m. This implies that the total number of reeds required to construct the panels for one hut would be 3 540, or seven harvested reed bundles.

According to Gaugris (2004), the proposed harvesting rate for poles of a diameter ranging from 50 to 80 mm for selected tree species equates to approximately 16 poles per hectare. The Tshanini Game Reserve is considered a current benchmark for the eastern Sand Forest vegetation type as it has not been significantly utilised either by humans or animals (Gaugris *et al.* 2004). In the Tembe Elephant Park, the Sand Forest has been utilised by large herbivores, especially the elephant *Loxodonta africana*. The harvesting rate for the Tembe Elephant Park should take the potential impact by large herbivores into consideration, and it is therefore suggested that the Tshanini Game Reserve's harvest rate of poles should be halved when calculating sustainable harvesting rates for the Tembe Elephant Park.

Matthews *et al*. (2001) determined that the extent of the Sand Forest vegetation type in the Tembe Elephant Park is approximately 4 500 ha. If a minimum area of 1 933 ha of the Sand Forest in the Tembe Elephant Park is set aside for complete preservation as suggested in Gaugris (2004) then harvesting should only be allowed on the remaining 2 567 ha. This area takes into account the additional precaution, suggested by Gaugris (2004), that the Sand Forest patches that are less than 200 ha in size should not be harvested.

RESULTS

Preliminary results suggest that it is possible to harvest a maximum of 20 530 poles in the 50–90 mm size class per year in Tembe Elephant Park, this size class being favoured for hut construction (Gaugris 2004). The estimated requirement to build one hut is 50 poles, which consists of six anchor poles, eight roof supports and 36 poles for the construction of the panel frames. Based on the known annual sustainable harvesting rates, a total of 410 huts can be constructed from the available natural resources annually. The harvested trees should be reduced to standard length poles of 2.5 m, debarked, and treated against termites and various other wood damaging insects. Harvested reeds should also be treated to prevent termite damage. To maximise the harvest output, the remaining usable length of each harvested tree should be equally treated and prepared, as it could be used in the assemblages where short lengths are required.

In the above evaluation, the harvesting of poles is only estimated for Tembe Elephant Park, and therefore the number of poles, and not the number of reeds that can sustainably be harvested is the limiting factor. The reeds harvested by the Sibonisweni reed harvesters would be enough to construct 960 huts, or 5 760 panels, per annum.

The value of the harvested materials is currently estimated to be 20% of the cost of bought materials. It is estimated that the value of a thin (50<70 mm), harvested pole is ZAR 6, while the value of a thick (70<90 mm), harvested pole is ZAR 12. The manufacture of the huts would require 44 thin poles for use in the panels and the roof supports. The anchor supports for a hut would comprise six thick poles. An illustration of the proposed panels showing the number of poles needed is given in Figure 2. This means that the total value of the poles used in the hut would be ZAR 336. The value of a total of seven reed bundles needed to manufacture the reed panels for a hut would be ZAR 175 at a cost of ZAR 25 per bundle. The estimated cost of sundry materials required for a single hut is ZAR 100. This includes

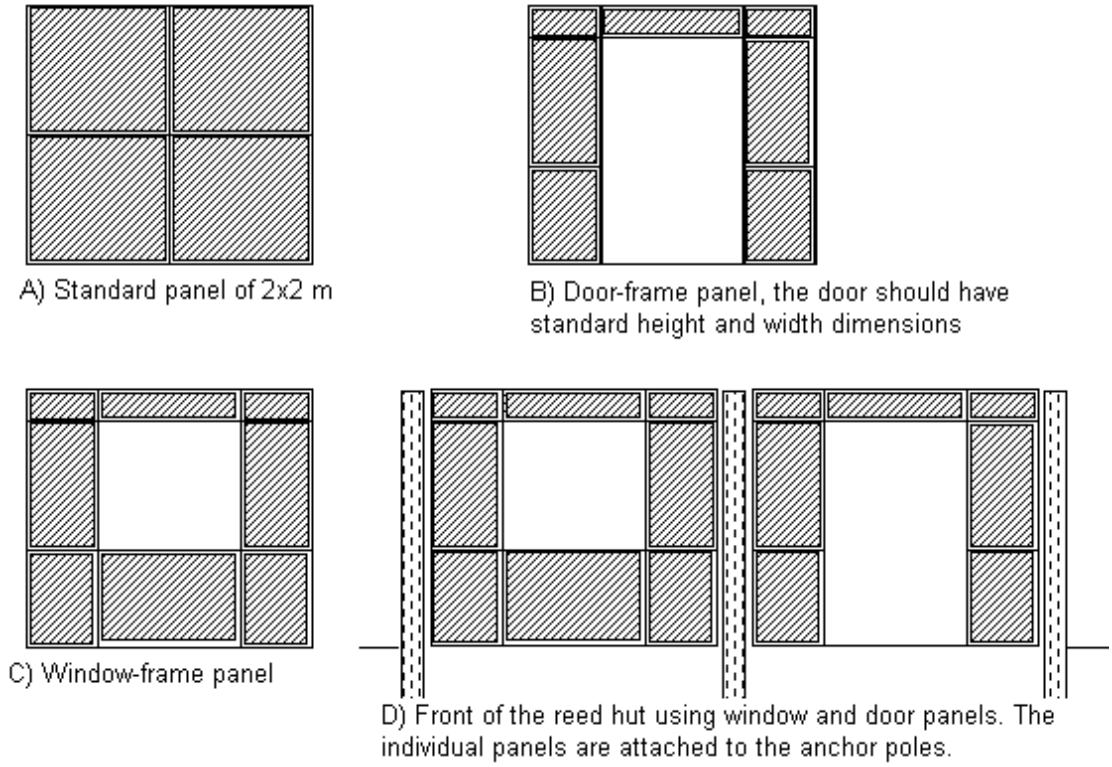

Figure 2: Illustration of the proposed prefabricated reed and forest timber panels to be used in hut construction.

nails, binding material, nuts, bolts and creosote for the treatment of the poles. The cost of corrugated-iron roofing is estimated at ZAR 50 for a 0.7 x 2.5 m panel. Six of these panels would be required for sufficient roofing, totalling ZAR 300. The hut would also include a window (ZAR 195) as well as a door (ZAR 110). The labour cost for one person to erect the hut would be ZAR 45 per day, or a total cost of ZAR 90 for two people for one day. The total value of the materials and the labour used for the erection of the hut will therefore be ZAR 1306.

In comparison, the cost of building a house of similar size that is made of cement blocks, roof supports and corrugated-iron roofing would cost approximately ZAR 6 500. Such a house would be 4 m x 3 m x 2.3 m in size, a total of 12 m^2 and therefore will be 4 m^2 larger than the proposed prefabricated reed huts. The price quoted includes ZAR 1 500 labour for the builder, two windows, a single door, and six corrugated iron sheets. Calculations based on the cost of materials for a concrete-block house of the same size as the proposed prefabricated reed huts would total ZAR 4 333.33. This is more than three times the cost of a completed house made of natural, renewable resources. The main difference lies in the cost of labour. Man-hours in an economically challenged area such as Maputaland are not worth as much as skilled labour in urban areas in other parts of South Africa. The lack of employment opportunities in the region means that families have time to spend building their own houses. Builders are rarely employed to build a house on behalf of others because it is simply too expensive.

Although the cost of a completed house made from natural renewable resources is cheaper than the cost of modern building materials, the preference is still to live in a house made of concrete even if it is not professionally built. It might seem unique and quaint for tourists to spend a few nights in a reed hut whilst on holiday, but to live permanently in a reed hut has its drawbacks. This does not mean, however, that there will be no local market for prefabricated reed and forest timber huts. In any given household in the Maputaland region there is more than a single

dwelling. The household head's main room can still be built of cement blocks but there might well be a demand for secondary reed and forest timber dwellings that are used as sleeping quarters for extended family, kitchens or grain stores (Gaugris 2004). Furthermore, the people in the communities perceive the cost of building a brick house as prohibitive at present (Mthembu, pers comm.)[2] The demand for reed panels can also potentially reach further than the local market. There is also an increasing trend in the use of non-permanent structures for tourist accommodation. This is especially evident in the national and provincial parks and reserves within South Africa. Non-permanent structures are less intrusive, merge more effectively with, and are less disfiguring to the natural environment. Reed huts would be a perfect alternative to tourist facilities made from non-biodegradable materials.

Reed panels are also used in the urban environment to improve interior and exterior décor. Reed panels are sold in Europe at around ZAR 300 m^{-2} (www.thatch.co.uk/trolleyed). Beachfront concession stands (Figure 3) are also sold as "kits" where the structures are pre-manufactured and then assembled on site (www.greenbuilder.com/thatch/concstand). Many other practical and useful interior décor items are available on the market, and are sold at a much higher price than unprocessed reed bundles. The problem for the people living in the Maputaland region is their lack of business acumen, resulting in an inability to penetrate these lucrative markets.

DISCUSSION

A major concern for the conservation areas in South Africa is that they rarely offer value to people directly neighbouring them. This brings about conflict between local rural communities and wildlife managers. Viable partnerships between neighbouring communities and, specifically, South African National Parks, need to be promoted.

[2] Mr Thabani Mthembu, Field assistant, School of Environmental and Life Sciences, University of KwaZulu-Natal, Tembe Elephant Park Research Station, +27 72 143 8983.

Figure 3: Beachfront concession stand made from reeds and thatching material, an example of what could be made with sustainable natural resources available in the Tembe Elephant Park.

The dual objectives of which should be to improve economic conditions whilst instilling among the communities a culture of conservation (Mandela 2000). Improvements to standards of living and infrastructure in poor communities neighbouring protected areas and private game ranches are essential if the reserve in question is to remain viable as an asset to the country as a whole (Els and Bothma 2000). Barrow and Fabricius (2002) concur that natural resources must contribute to people's well-being and that local people must be involved in their management:

The ground rules have changed: no protected area is an island, and people and conservation cannot be separated…Ultimately, conservation and protected areas in contemporary Africa must either contribute to national and local livelihoods, or fail in their biodiversity goals (Barrow and Fabricius 2002).

There have to be tangible benefits to neighbouring communities to justify excluding large areas of land from human use. One of the ways to change the negative attitude towards wildlife reserves is to sustainably utilise some of the vast resources within its protected boundaries. The problem in the past has been the lack of data available to scientifically quantify a sustainable harvest of certain resources. Once the quantity of the resource that can be harvested without doing irreparable damage to the environment has been established, these resources should be put to good use. This can be achieved by converting natural assets into financial assets.

To merely harvest a resource and sell it as a raw material is not acceptable. The raw, harvested material has to be processed so as to add value to it. Reeds should no longer only be sold as unprocessed bundles for a meagre sum. If the reed bundles were to be processed as described above and the prefabricated huts were sold for around ZAR 2 000, still less than half the cost of materials of a concrete-block hut, the value added to the reeds by manufacturing a product would be ZAR 644.00. This equates to an additional ZAR 92.00 per reed bundle. The value of the

reed bundles would then represent ZAR 117.00 as opposed to the original ZAR 25.00 per unprocessed reed bundle. The above figures ignore the value of the poles, for which there are no data on the market-related price, as poles have not yet been utilised on a commercial basis. Even taking into consideration the value of the poles the value of the reed bundles would still be significantly improved. The processing and subsequent increase in value per harvested bundle might protect the resource from overutilisation and misuse. Community involvement in the monitoring, management and setting of harvesting quotas will hopefully quell any fears of an increased demand in the resource that now fetches a higher price and generates more income than it did in the past. Interactive participation by local communities in using and protecting natural resources will reverse the historical mistrust in the conservation authorities. Quotas and regulations regarding the utilisation of resources will to a degree be self-imposed and easier to assimilate (Fabricius 2004).

Excess reeds from the quota offered and that were not used for the manufacture of prefabricated panels would still be sold in their raw form. Trees must, however, not merely be cut down and sold as untreated poles. They also need to be processed as part of a finished product to increase their value. If the demand for prefabricated panels is less than anticipated then the quota should not be harvested. The trees should only be harvested as and when they are needed, and not stockpiled, because the poles were not previously sold in their raw form.

CONCLUSIONS

The manufacture of prefabricated reed and forest timber huts may not be the panacea for the Sibonisweni community and the Tembe Elephant Park. There are no doubt more complex problems and issues resulting in conflict situations between community members and Tembe Elephant Park management. It is hoped, however, that a recommendation such as the above one will alleviate certain problems relating to sustainable use issues of the natural resources within the park. If the Sibonisweni community and the Tembe Elephant Park management were to agree to such a programme then the entire harvesting quota of reeds could also be harvested in the winter months. Manufacture of the prefabricated panels could largely take place in the summer months, thereby ameliorating the negative effects of a summer harvest on the reed beds in the Muzi Swamp, and result in an overall improvement in the reed quality. Moreover, by processing the raw resource the community can expect to receive larger financial benefits per harvested unit. Increasing the value of the resource will hopefully instil a greater respect for it, encouraging a community culture of conservation for the resource. Ultimately, it should be the community that sets the harvesting quota based on their own monitoring and insight as to how much the reed beds can offer whilst still providing for them in the future.

Livelihood strategies need to be modified to meet the needs of a rapidly growing population and monetary based economy. A subsistence economy in rural South Africa can possibly maintain small, isolated communities for a period of time as it has done for centuries. It will, however, ensure that such communities are neglected while other more innovative communities develop into thriving economically independent units. Community-based natural resource management programmes can be used effectively to raise living conditions, improve education levels and build capacity amongst the rural poor.

ACKNOWLEDGEMENTS

The authors would like to thank the Sibonisweni and Manqakulani communities for their support and assistance for the duration of the study. We would also like to thank the Tembe Elephant Park staff and Ezemvelo KwaZulu-Natal Wildlife for their logistical support. Thanks also go to the National Research Foundation who provided financial support under Grant Number 2047386.

REFERENCES

Barrow E and Fabricius C. 'Do rural people really benefit from protected areas: Rhetoric or reality? Parks 2002;12:67-79.

Browning TC. Preliminary study of the socio-economic value of *Phragmites* reeds to the people neighbouring Tembe Elephant Park, KwaZulu-Natal. BA (Hons) Unpublished Report. Pretoria: University of Pretoria;2000.

Dernbach J. From Rio to Johannesburg, implementing sustainable development at the global and local scale. In: Recommendations for achieving Sustainable Communities, Science & Solutions. Report from the second National Conference on Science, Policy and Environment. Washington, DC, The United States of America: National Council for Science and the Environment Smithsonian National Museum of Natural History; 2001:46-50.

Els H. Maputaland Conservation-Based Community Development and Research Programme, praxis orientated programme in multi-institutional and multi-disciplinary research co-operation. Programme presentation and planning report. Pretoria: University of Pretoria; 2000.

Els H and Bothma J du P. Developing partnerships in a paradigm shift to achieve conservation reality in South Africa. Koedoe 2000;43:19-26.

Fabricius C. The fundamentals of community-based natural resource management. In: Fabricius C, Koch E, Magome H and Turner S, eds. Rights, Resources & Rural Development: Community-based natural resource management in Southern Africa. London: Earthscan; 2004:3-44.

Gaugris JY. Sustainable utilization of plants in the Manqakulane Conservation Area, Maputaland, KwaZulu-Natal. MSc (Wildlife Management) Dissertation. Pretoria: University of Pretoria; 2004.

Gaugris JY, Matthews WS, Van Rooyen MW and Bothma J du P. The vegetation of Tshanini Game Reserve and a comparison with equivalent units in the Tembe Elephant Park in Maputaland, South Africa. Koedoe 2004;47:9-29.

Mandela N. Reflections on 100 Years of conservation. In: Joseph E and Parris D, eds. Visions of change. Social Ecology and South African National Parks. Johannesburg:Branko Brkic; 2000:9-13.

Matthews WS, Van Wyk AE, Van Rooyen N and Botha GA. Vegetation of the Tembe Elephant Park, Maputaland, South Africa. South African Journal of Botany 2001;67:573-594.

Ostendorp W. 'Die-back' of reeds in Europe - A critical review of literature. Aquatic Botany 1989;35:5-26.

Tarr JA, Van Rooyen MW, and Bothma J du P. The response of *Phragmites australis* to harvesting pressure in the Muzi Swamp of the Tembe Elephant Park, South Africa. Land Degradation and Development 2004;15:487-497.

Van der Toorn J and Mook JH. The influence of environmental factors and management on stands of *Phragmites australis* I. Effects of burning, frost and insect damage on shoot density and shoot size. Journal of Applied Ecology 1982;19:477-499.

Van Wyk I. "Elephants are eating our money": A critical ethnography of development practice in Maputaland, South Africa. MA (Anthropology) Dissertation. Pretoria: University of Pretoria; 2003.

Weisner S.E.B and Granéli W. Influence of the substrate conditions on the growth of *Phragmites australis* after a reduction in oxygen transport to below-ground parts. Aquatic Botany 1989;35:71-80.