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INVESTIGATION OF INCOME-GENERATING OPPORTUNITIES FROM RIVER REEDS FOR MARIENTAL, NAMIBIA

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Phragmites australis

Sustainability

Community Development

Abstract

Mariental, Namibia experienced a severe flood in 2006, and the Mariental Flood Task Force concluded that the reeds need to be removed to reduce the flooding potential in the future. This report, prepared for the Desert Research Foundation of Namibia, investigated the potential of using reeds for income-generating activities. We investigated the characteristics of the reeds in Mariental, the market potential for reed products, and evaluated the interest of the stakeholders in participating in an initiative using the reeds. The results showed the reeds have potential for such activities. However, further research is necessary to determine the viability of this initiative. Several considerations should be addressed when starting this initiative in order to consider the opinions and concerns of the stakeholders.

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Authorship

Each group member contributed equally in the editing of this final report.

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Executive Summary

Improper natural resource management causes an array of environmental, social, and economic problems. A challenge related to natural resource management is that of invasive species. In Namibia, near the town of Mariental, an excessive amount of reeds (*Phragmites australis*) are growing in the Fish River downstream from the Hardap Dam. *Phragmites australis* has been classified as an invasive species by the *International Invasive Species Specialist Group (2006).* After a major flood in 2006 that caused N$100 million in damage, the Mariental Flood Task Force, an organization assigned to investigate the causes of the flood, determined that the reeds led to escalated flooding by reducing the capacity of the river (Gaeb, 2006; Mutorwa, 2008). As part of a plan to reduce the potential for flooding in the future, the Task Force recommended that the reeds be removed from the Fish River. If practical uses for the reeds for income-generating opportunities can be found, then additional sources of income will available to the local community, which will help with high unemployment rates, potentially reduce the risk of flooding, and turn this invasive plant into a valuable natural resource.

For a natural resource to be made valuable, an understanding of its characteristics and properties is necessary to determine the potential uses and apply a sustainable management plan. *Phragmites australis* is a widely distributed perennial grass that thrives in wetlands (Ikonen & Hagelberg, 2007). It can form dense reed beds that stretch for miles. Due to an extensive system of rhizomes, the stem of the plant running horizontally underground, the reeds can survive and recover from attempts to eradicate them through their stored nutrients below the surface. Ancient civilizations and modern cultures have found uses for reeds including, but not limited to, handicrafts, construction material, fertilizer, fodder, and biogas production.

In order for these uses to provide a long-term benefit to the local community, they need to be economically, socially, and environmentally sustainable. For economic sustainability, it is important to understand the structure and function of the local economy in order to determine where and how the uses of reeds can be incorporated into economy of Mariental and be profitable

in the future. Social sustainability requires that the local community has an interest in using the reeds, and that a potential business working with the reeds is managed in a way that incorporates the interests of the community. Finally, environmental sustainability ensures that a balance is maintained by harvesting strategically to ensure the future availability of the reeds and simultaneously minimize damage to the local ecosystem. Throughout this project, these concepts of sustainability were applied to determine if any uses were not sustainable for Mariental. The establishment of a Small-Medium Enterprise (SME) such as a Community-Based Organization (CBO) needs to incorporate all of these aspects into a business in order to be sustainable.

We focused our research on the social aspects of sustainable development, and conducted a general investigation of economic and environmental sustainability for each reed use. To determine the social sustainability of the project, three stakeholder groups were interviewed: representatives from several levels of government, two local farmers, and the residents of the community. These interviews determined each stakeholder's interest and concerns for this type of initiative. To determine economic sustainability of potential reed uses, the market potential for products was investigated by interviewing the owner of a hardware store and individuals currently selling reed products in Mariental, and owners of accommodations and craft shops in Windhoek. The environmental sustainability was important to investigate because the extensive spraying of the reeds with herbicide could influence what the portions of sprayed reeds can potentially be used for, as well as affect the future availability of reeds. We contacted the Mariental Municipality, the contracted sprayer, and several harvesters of reeds, as well as researching the chemical specifications to learn more about the herbicide and its effects to plants and their environment.

After reviewing all of this information, we have identified a list of uses of the reeds that are most feasible for the residents of Mariental to undertake, and developed recommendations for further steps that need to be taken before a business initiative using the reeds can be developed within the community. We investigated the characteristics of the reeds and determined that in addition to *Phragmites australis,* there is a second type of reed in Mariental which is taller, and

thicker. The sprayed reeds have been affected by the herbicide and are weaker and thinner than the unsprayed reeds. Overall, we determined that there are reeds in Mariental that can be used to make products. We also determined that overall the people in the informal settlements that we interviewed are interested in harvesting and making products out of the reeds. The government representatives that we interviewed are also interested in assisting with a reeds business initiative provided that they have available resources. The irrigation farmers living near the Fish River are also willing to cooperate with a reeds business initiative, as long as certain guidelines are followed when reeds are harvested near their property. Through interviews with businesses in Mariental and Windhoek, we determined that there is a market potential for reed products in the sector of craft markets and accommodations.

There are a few issues that should be further investigated before determining the feasibility of a reeds business initiative. We present recommendations for addressing these issues as well as recommendations for starting a reeds business initiative. A necessary step in further research is to investigate the effects of the spraying of the reeds being carried out by the Ministry of Agriculture, Water, and Forestry. The market potential for reed products should also be further researched. There is little market potential for reeds products in Mariental and if the products were to be marketed outside of Mariental, the logistics of transporting the products needs to be taken into account. Other markets for reed products should be investigated such as the agricultural sector for products such as compost and cattle fodder. One of the final steps will be to further investigate where to secure funding and other assistance.

Local residents want the management of a reeds business initiative to be transparent, especially the financial aspects. The majority of the interviewees in the informal settlements want a community elected-committee that would run the business. The interviewees also suggested that a third party, such as a government institution, provide advice to the committee. Once the management is established then training will need to be provided to the residents on how to harvest the reeds safely, how to produce products out of the reeds, and also on skills relevant to business

management. These are the key considerations that should be addressed when establishing a reeds business initiative.

With the results presented in this report, it is hoped that further research will be done to determine the viability of this initiative and that a successful reeds business initiative will possibly be started in Mariental. This report will be instrumental in determining how the reeds growing in the Fish River can be properly utilized, and thus reduce the threat of flooding in Mariental and provide a new economic opportunity for the community.

Chapter 1. Introduction

Improper natural resource management causes an array of environmental, social, and economic problems. One way to properly manage a natural resource is to use it in a way that sustainably benefits the community. A challenge related to natural resource management is that of invasive species and how to utilize them. According to the United States Department of Agriculture (1999), an invasive species is defined as an organism that is "non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health" (About NISIC). An example of such a species is Kudzu, a type of vine that grows primarily in the southern United States. It invades woodland communities with debilitating effects on the local ecosystem (Blaustein, 2001). In Namibia, invasive bush encroachment reduces the growth of grasses and other species, causes a reduction in biodiversity and prevents renewal of underground water resources (Schultz, 2009). Such species are normally treated as pests, but if managed properly, they can be a valuable natural resource. Recent research has shown that Kudzu can be used to reduce alcohol consumption by ingesting capsules of its extract (Cromie, 2005) and the Desert Research Foundation of Namibia (DRFN), is investigating ways to manage bush encroachment in Namibia through the CBEND (Combating Bush Encroachment for Namibia's Development) project. One of the goals of the CBEND project is the manage bush encroachment by establishing gasification stations where harvested invader bush can be converted into energy. Investigation into proper natural resource management can help address a wide range of social, economic, and environmental problems caused by invasive species.

In Namibia, near the town of Mariental, an excessive amount of reeds (*Phragmites australis*) are growing in and alongside the Fish River downstream from the Hardap Dam. *Phragmites australis* has been classified as an invasive species by the *International Invasive Species Specialist Group* (2006). This plant currently has little value for the people of Mariental because not many individuals or businesses are currently using the reeds (Clarence Mazambani, personal communication, March

24, 2009). The Mariental Flood Task Force (MFTF), a committee appointed to address a flooding problem, has determined that the reeds contributed to a major flood in 2006 that caused N$100 million in damage (Gaeb, 2006). The MFTF concluded that these reeds need to be removed from the river channel in order to reduce the risk of future flooding. The Task Force decided to apply herbicide in an attempt to eliminate them, but the costs are extremely high, and little has been done to physically remove the dead reeds (Mariental Flood Task Force, 2008). One way of managing this natural resource is by establishing a way to generate income in Mariental by using the reeds. Finding a practical use for the reeds for income-generation could provide an alternative source of income for the local community, which is suffering from high unemployment, possibly reduce the potential for flooding, and turn this invasive plant into a valuable natural resource.

People from other countries and ancient civilizations have found ways to use this species of reed for profit or other benefit. The characteristics of these reeds vary from region to region, and the properties of reeds determine how they can be used. There are many possible uses of reeds, from compost and cattle fodder to baskets and mats. Markets for the various products made from the reeds include sectors such as agriculture and tourism. The DRFN and the Habitat Research and Development Centre (HRDC) have sponsored studies on using the reeds for biogas production (Helbig, 2008; Wienecke, 2008), but the studies have concluded that this option is not economically feasible for the town of Mariental.

The DRFN is working to determine management strategies for the reeds other than spraying them with herbicide. Uses for the reeds exist that could provide income for the residents of Mariental, but the most feasible uses for the reeds in the Fish River are unknown. Uses that require large-scale production may not be possible due to limited infrastructure in the town and the limited area in which the reeds grow. Since this region has a high unemployment rate, many people may be interested in participating in a business initiative involving reeds. Utilizing the reeds could also lead to a reduced risk of flooding if the growth of the reeds is controlled by a sustainable harvest. Although literature exists on ways to solve unemployment and how to deal with invasive water

reeds, research has not been conducted on the process of managing the reeds to assist in reducing unemployment.

This project's goal was to identify uses for the river reeds growing near Mariental for income-generating activities that would benefit the residents of Mariental and determine how using the reeds can be incorporated into the local economy through a business initiative. In order to achieve this goal, we determined the characteristics of the reeds through interviews with people that currently harvest or previously harvested reeds in the Fish River, by direct observation, and by reviewing relevant literature. To determine the market potential for each use, we contacted various businesses, including lodges and craft centers, in Mariental and Windhoek to assess their interest in purchasing reed products. Another important aspect of our research was to assess the interest of the Mariental community in using the reeds and their concerns that could affect the social sustainability of this initiative. By analyzing the information that we gathered we have identified which reed uses have the potential to generate income and provided basic recommendations for how a business initiative could be started in Mariental. Furthermore, we presented our results and recommendations to the Mariental community and received their feedback. This project was instrumental in determining how the reeds growing in the downstream channels below the Hardap Dam can be properly utilized to provide an alternative to spraying the reeds with herbicide, and provide a new economic opportunity for the community.

Chapter 2. Background

In order to identify feasible uses of reeds for income-generating activities in Mariental, it is important to have a thorough understanding of several topics that influence how the natural resource should be managed. We must first discuss the situation surrounding the reeds in Mariental to understand the context of our research. Next, the resource itself must be understood as well as the potential uses for the resource, based on how it is used around the world today and how it has been used in the past. Another topic to consider when discussing natural resource management is sustainable development. Sustainable development involves community-level progress in economic, social, and environmental sectors to ensure that income-generating activities from the natural resource in Mariental will continue to benefit future generations. Since the hopeful outcome of this research is to establish a reeds-related business, one must also understand how income-generating activities operate in Namibia and what associated problems need to be considered for such an initiative. Before we detail how these topics can be applied to managing the reeds, we will first discuss the situation involving the Fish River and Mariental and what role the reeds potentially had in contributing to the flood of 2006.

2.1 The Fish River and Mariental

In order to determine how the reeds should be managed, it is necessary to understand the situation in Mariental involving the Fish River, the Hardap Irrigation Scheme, and the reeds. The Fish River flows past the town of Mariental and is utilized by local farmers through the Hardap Irrigation Scheme. The climate of Namibia, specifically the Hardap Region where Mariental is located, affects several characteristics of the Fish River. The Fish River has flooded the town in the past, and the reeds may have played a role in these floods. By understanding the region near Mariental, one can understand how the Fish River affects the community, the role of the Hardap Dam, and why plans are in place to remove the reeds.

2.1.1 Climate and the Fish River

The Fish River flows through the central part of southern Namibia, passing by the town of Mariental. It flows southward into the Orange River (Heyns, Montgomery, Pallett, & Seely, 1998). The Fish River is an ephemeral river, as are all of Namibia's internal rivers. An ephemeral river flows for only a few days, weeks, or months, after periods of heavy rainfall. Some years, there may be little or no flow in ephemeral rivers. Since Namibia has an arid-semiarid climate, it receives very little rainfall and only seasonally, usually in mid-summer from December to March. The national average annual rainfall in Namibia is approximately 270 millimeters (mm), making it the driest climate in sub-Saharan Africa (Sweet, 2008). In such dry climates, the intensity of the rainfall varies yearly and by location. In the Hardap Region, where Mariental and the source of the Fish River are located, the rainfall varies from 67-352 mm per year. The intensity of the rainfall each year affects the amount of runoff into the ephemeral rivers. The Fish River receives the highest runoff of Namibia's ephemeral rivers. It also has the largest dam of the 12 major dams that are located in the country, the Hardap Dam. Though the southern region of Namibia is dry, there has been abundant reed growth in the Fish River since the dam was built and the irrigation scheme was established (Van Langenhove, 1989, p.1).

2.1.2 Hardap Irrigation Scheme

The Hardap Dam is part of the Hardap Irrigation Scheme. The dam is located 20 km upstream of Mariental, and west of Rehoboth (Muir, 2008). It was constructed in 1962 by the Namibian Government, and the irrigation scheme was completed in the early 1970s (Biggs, 2008). They were built to aid the economy of the southern region of the country by providing a water supply for local businesses and a means to produce food.

More than 90% of the Hardap Irrigation Scheme uses flood irrigation (Biggs, 2008). Irrigation ditches are located along the edges of the fields or crops with the highest elevation. In the Hardap region the irrigation ditches are made from concrete lined canals to reduce water loss. The water

from the irrigation ditches is diverted into irrigation beds within the fields to water the crops. This method is not the most effective because the end of the field closest to the ditches receives the most water for the longest period of time. Salts and fertilizers that are on the land are then flushed out into the river with the drainage water from the irrigation system, which may contribute to the growth of the reeds (Van Langenhove, 1989).

The Hardap Dam is surrounded by hilly terrain, but downstream from the Dam the land is flat, so the town of Mariental is located in a floodplain of the Fish River (Muir, 2008). Although the Hardap Dam can help prevent flooding by containing some natural flood runoff, NamWater has stated that it was not designed for this purpose (Muir, 2008). The purpose of the dam is to provide water to the irrigation farms and the dam is not operated to control flooding. Due to periods of significant rainfall and the capacity of the Hardap Dam, excess water must be released from the dam so that it does not overflow and possibly collapse the dam. If a significant amount of water behind the dam is released, there is a potential for the town of Mariental to experience flooding.

2.1.3 Flooding in Mariental

Due to higher than average rainfall in certain years in the past, the Fish River has flooded, affecting both the Hardap Irrigation Scheme and the town of Mariental. Flooding occurred in Mariental in the 1904/05, 1908/09, 1922/23 and 1933/34 seasons (Muir, 2008). These floods occurred before the dam was built. After the dam was built, flooding occurred in the 1971/72, 1988/89, 1999/2000 and 2005/06 seasons.

The flood of February 2006 was particularly devastating for Mariental. It was the largest flood since 1972 and the third largest flood since recording of river flow began in 1904. According to Muir (2008), the total volume of the flood was 458 million cubic meters, approximately 1.7 times the capacity of the Hardap Dam (p. 13). Major flooding occurred in Mariental when, on 26 February, water was released from the dam to reduce the amount of water behind the dam to 70% of its capacity. This action was taken to prevent a dam break which would have resulted in much more damage to the town. The flooding in Mariental occurred when excess water from the Fish River

pushed back the Dabib River, a tributary of the Fish River that runs to the north of the town. This caused the water to rise in the Fish River, which then overflowed the banks and flooded the town (p. 43) See **Figure 1** for a map of the Mariental region and Dabib River. The flood caused damage to all aspects of infrastructure including sewer systems, power, and roads and sidewalks. The flood also damaged many homes and businesses. Losses were also reported due to damage on the irrigation farms related to lost crops and erosion. The total amount of verified insurance claims related to flood damage was N$141,672,269 (p.50).

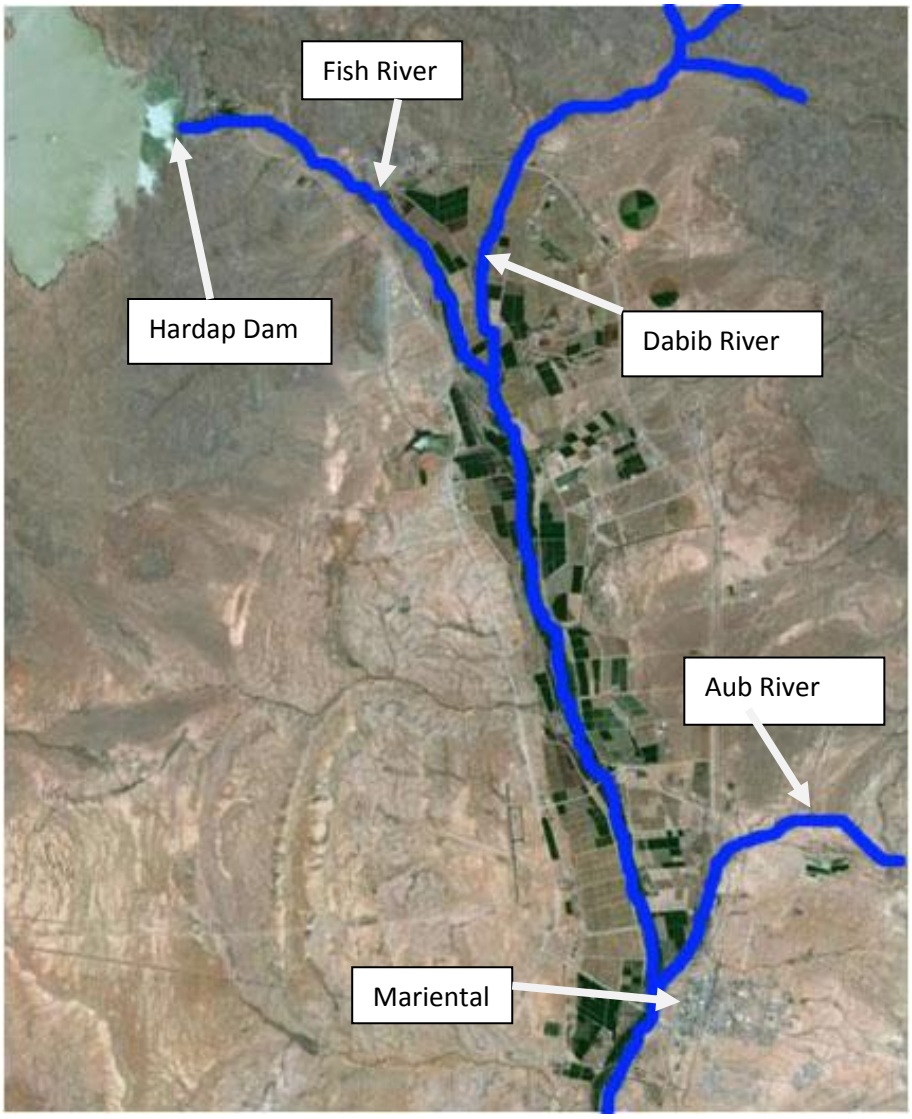

Figure 1: Map of Mariental Region (Google Maps, 2009)

In response to this 2006 Flood, the Ministry of Agriculture, Water and Forestry (MAWF) and the Department of Water Affairs initiated the formation of the Mariental Flood Task Force (MFTF)

(Mutorwa, 2008). According to the Final Report of the Mariental Flood Task Force, the Task Force is comprised of officials from different ministries, officials representing the Mariental community such as representatives of the Hardap Regional Council, the Mariental Municipality, representatives from the private sector, and a team of experts (Mutorwa, 2008). The Task Force's purpose was to determine the causes of the 2006 Flood, evaluate the damage caused by the flood, and to make recommendations to reduce the risk of future floods. Among other things, the Task Force reviewed and improved upon Namwater's Flood Control Plan at the Hardap Dam and facilitated the development of a Flood Management Plan at the Municipality. After thoroughly investigating the flooding problem in Mariental, the Task Force proposed several options to reduce flood damage in the future. Some of these options included relocating different parts of the town, relocating the B1 highway, or building a dyke along the Fish River. The option that was chosen to be the most cost-effective was Option Six.

Option Six includes the following provisions (Mutorwa, 2008, p. 7):

- Raise the dam wall by 10.4 m to increase the capacity of the dam and reduce the 1 in 100 year outflow flood peak
- Raise existing concrete ogee spillway
- Remove the sluice gates and close off 3 of the 4 openings
- Increase the spillway capacity
- Raise auxiliary embankments
- Clear reeds from the river bed downstream of dam wall to increase the flow capacity of the river channel
- Construct an embankment in town to protect against flooding from the Dabib River

The total cost for implementing Option Six, including repairs to government infrastructure and hiring consultants to investigate implementation was estimated to be N$492,750,000.

Controlling the growth of the reeds in the Fish River is a major part of Option Six. The MFTF wants the reeds removed from the critical stretch of the Fish River, which is from the Hardap Dam to

Mariental. Both the Final Report of the MFTF and the Consultant Report (Muir, 2008) show that the community was very concerned about the reed growth and believed that the reeds were a major cause of the flooding (Mutorwa, 2008; Muir, 2008). The consultant report supports this opinion and states that the growth of the reeds in the Fish River may be a contributing factor to flooding in the area. The report also recommends that the removal of the reeds be a continuous effort and a team of workers be hired full-time to clear the reeds from the river. Currently, no document states that such actions have been taken.

The Task Force discussed several options to remove the reeds from the Fish River, including dredging the river to increase its capacity, but the MAWF decided to spray the reeds with herbicide. The reeds were sprayed in April of 2008 and in November of 2008. The next spraying is scheduled for May of 2009. According to the Final Report of the MFTF, the flood irrigation methods used by the farmers in the Hardap Irrigation Scheme may contribute to excess reed growth and more efficient methods of irrigation may diminish the growth of the reeds (p. 11). Since the MAWF is planning to remove the reeds, the availability of the reeds in the future may be a problem for a reeds business initiative. The quantity of reeds will affect which uses of reeds will be feasible.

Now that we have discussed the context of the reeds problem and what has been planned for future removal of the reeds, we can discuss the reeds themselves. Understanding the characteristics of the reeds and all of their potential uses is important in determining the most feasible uses for the residents of Mariental.

2.2 Reeds and Their Uses

Reeds are a type of perennial plant belonging to the grass (Poaceae) family that is found in wetlands (Reed, 2009). They consist of culms, which is the stalk or shoot of grasses that are typically jointed and hollow, and rhizomes, which are the stem of the plant running horizontally underground. Some of the reeds have inflorescence, or flowers at the top of the culms. There are several species

of reeds in southern Africa including *Phragmites australis*, *Phragmites mauritianus*, and *Arundo donax* (Russell, 1990). A summary of the properties of these reeds is shown Table 1.

Table 1: Properties of Reeds in southern Africa (Russell, 1990)

Reed Type	Average Height (mm)	Leaf Size (mm)	Inflorescence Length (mm)	Flowering Season	Distinguishing Properties
Phragmites australis	600 - 4000	350 long 35 wide	120-400	December – June	-culms solitary -flowers compact -locally dominate in riverbeds
Phragmites mauritianus	Up to 5000	300 long 30 wide	200-400	January – June	-culms tillering (shoots branching from base of original stalk) -flowers broad -locally dominate in riverbeds
Arundo donax	Up to 3000	700 long 80 wide	300-600	February – April	-seldom flowers at high elevations -flowers compact with ascending branches -infrequent

The only species of reed that is confirmed to be in the Fish River in Mariental is *Phragmites australis* (Van Langenhove, 1989). *Phragmites australis*, the common reed, is classified as a "worldwide weed" (Wiersema, 1999) and as a result has been available for use by different peoples in various climates. We will further discuss the physical characteristics of these reeds, how the reeds can be harvested, the general uses for the reeds, and case studies on how different cultures have used the reeds. This information is necessary in order to determine the full potential of using the reeds in Mariental.

2.2.1 Characteristics of Reeds

Phragmites australis is a widely distributed perennial grass that thrives in wetlands. Although it is found globally, the properties of the reed vary from region to region depending on air

and water temperature, humidity, and content of nutrients in the soil (Ikonen & Hagelberg, 2007). It can grow in variable soils with a pH range of 3.6-8.6, but prefers soil rich in potassium, calcium, and phosphorus ions. The reeds flower for up to three months a year, typically in mid-summer; blossoms are light brown to purple in color (see Figure 2). Cross-pollination by the wind can occur, but the majority of reproduction is asexual and occurs by rhizomes. (Refer to Table 1 above for more properties of *Phragmites australis*).

Figure 2: Phragmites australis in the Fish River in Mariental

The rhizomes of *Phragmites australis* can reach up to twenty meters in length and penetrate two meters deep, with roots branching farther off from that (Ikonen & Hagelberg, 2007). They can live for approximately three to six years. Buds develop at the base of the vertical shoots late in the season (ISSG, 2006). The buds then mature and grow about one meter horizontally before growing upward and developing into more vertical shoots. The reeds start growing in the spring and reach their maximum height around mid-summer (Francis, 2004). The reed shoots can grow up to 4cm per day during the optimal growing season. Because they are spread by rhizome growth, the reeds typically form dense reed beds with approximately 200 shoots per square meter (Van Driesche,

2002). The reed beds can stretch for miles and can cause problems by blocking the flow of water in waterways.

Phragmites australis is commonly considered an invasive species, and several methods have been investigated to attempt to control its spread including cutting, burning, and applying herbicides. Due to the extensive rhizome system, the reeds can survive and recover from attempts to eradicate them through their stored nutrients below the surface. This can create difficulties for eliminating the reeds completely but could be beneficial in utilizing the reeds for sustainable economic development.

2.2.2 Harvesting Reeds

Phragmites australis can be harvested by cutting it by hand or using heavy machinery. In the Tembe Elephant Park in South Africa, harvesters use machetes (pangas) to cut the reeds each day (Tarr, 2004). Other common tools used to cut the reeds are scythes and sickles. When harvesting the reeds, cutting must occur above the waterline or the reeds may die from lack of available oxygen (Ikonen, I., & Hagelberg, E., 2007).

In the Okavango delta of Botswana, reeds are harvested by hand with a sickle (Mmopelwa, 2005). Harvesting takes place while the water level of the river is low. The reeds are reached by boat and then brought to shore to be transported. After the reeds are harvested, they are typically hung up or laid out to dry in the sun. Further details on this harvesting process are discussed in the following case study conducted by Mmopelwa.

Case Study: Reed Harvesting in the Okavango Delta, Botswana

In the Okavango Delta, reeds are harvested from wetlands that are on community property, a situation similar to that in Mariental. The three villages studied were Shakawe, Etsha-13, and Shorobe. The harvesting of reeds was listed as a major source of income in all villages. Women are the primary harvesters of reeds. In Shakawe, reeds were harvested between August and December.

At Etsha-13, the harvesting period is between December and February, when flood levels have risen. Reeds were harvested between August and January in Shorobe. In all villages, reeds were harvested with a sickle and made into bundles for transportation. Wooden boats are used to gather the reeds that are in deeper water and move them to shore. The reeds are typically hung up or laid out to dry after being harvested. Table 1 summarizes data acquired from the three villages pertaining to the harvesting of the reeds: the harvesting period for the reeds, the distance travelled to the harvesting site, the amount of time spent harvesting by one person in one year, the number of bundles harvested by one person in one year, the size of the bundles produced, and the price of the bundles (p. 332).

Table 2 : Reed Harvesting Data for Three Villages in the Okavango Region (Mmopelwa, 2005).

	Shakawe	**Etsha-13**	**Shorobe**
Harvesting period	August – December	December - February	August - January
Distance travelled	2 km	7.5 km	20 km
Bundles/year/person	126	43	516
Hours/year	336	171.2	516
Bundle size	800mm	800mm	400mm
Bundle price (US$)	$4.08	$4.08	$2.12

In Shakawe and Etsha-13, reed harvesters travel to the site two days per week. In Shorobe, the harvesting site is 20km away, and they must hire transportation to the site. Once there, they stay for two and a half months and spend six days per week harvesting. Once harvested, bundles are sold in local markets. The buyers of the reeds include safari companies and people from places where reeds are unavailable. Several factors affect the quantities of reed bundles. These factors include the frequency and length of flooding periods, the water level, the number of workers, the distance to the site, and the demand for reed bundles. These data are useful because they provide an example of how reeds are harvested elsewhere in the southern African region.

The previous case study conducted in Botswana focused on small scale harvesting by hand. In order to harvest *Phragmites australis* on a larger scale, the Finnish "Aquatic Plant Harvester RS 2000" has been used in Sweden (see Figure 3) (Hansson & Fredriksson, 2004). It is a floating machine driven by two paddle wheels. A floating machine was chosen since it will not damage the rhizomes underground which would limit future reed growth. The machine can cut 2.5 m wide and carry up to 2500 kg of reeds. A conveyor belt on the back dumps the reeds onto the shore. Other large-scale methods also exist. A case study written by Cruz (1978) focuses on large-scale harvesting of reeds for production of paper products in the Danube River Delta in Romania in 1978. Three different types of machinery were used to harvest the reeds depending on the type of marsh environment that they were growing in. Amphibious vehicles such as air boats and vehicles with ballooned tires and machinery with crawler tracks were used to harvest 125,000 tons of reeds annually. More details on this reed harvesting can be found in the following summary of the case study. While this large-scale harvesting may not be feasible in Mariental, it is important to consider all reed harvesting techniques.

Figure 3: Aquatic Plant Harvester RS 2000 (RS Planering Ltd, 2008)

Case Study: Reed Harvesting for Paper Production in the Danube River Delta, Romania

Phragmites australis are often used in unprocessed form for crafts or construction, but the plant can also be processed into cellulose for use in paper production. In the Danube Delta of Romania, large-scale reed harvesting took place from 1950 to 1990 (Nevel, Hanganu & Griffin, 1997). Cruz (1978) studied how the reeds were harvested during this time.

In 1978, when reed harvesting for paper production was at its height, there were 190,000 hectares of wetland which yielded 125,000 tons of reeds annually (Cruz, 1978, p. 46). The reeds were harvested using three different models of heavy machinery, each adapted to the three different varieties of marshland within the delta. These three environments are natural reed swamps, floating islands, and high marsh (p. 47). In natural reed swamps, the roots of the reeds are planted firmly in the soil and are flooded in the spring as snowmelt accumulates upstream. The reeds in these areas were harvested by air boats. Floating islands are a community of reeds that have broken off from the mainland. Their roots form a "dense mat" underwater and trap silt particles. Over time, these communities can grow up to 400 hectares or more (p. 48). The reeds on floating islands were harvested by machines with ballooned tires. In high marshes in the Danube river delta, reeds grow on stable ground. During the harvesting period, high marshes were artificially flooded with a system of pumps and locks. The high marsh environment can support machinery with crawler tracks for harvesting the plants. The reeds were harvested between November and March and, once cut, were shipped to a cellulose plant in Bralia. This was a large-scale project. Investment in machinery alone amounted to $16 million, and the factory in Bralia paid about $85 per ton of raw reed. This was considered "somewhat high, indicating some kind of government subsidy of reed production" to stimulate economic growth in the area (p. 49).

While these harvesting methods were profitable, they were found not to be sustainable (Nevel, Hanganu & Griffin, 1997). In order to increase reed production, systems of dikes, canals, and locks were created to regulate the river flow. However, this disrupted the natural environment of the river delta, and interfered with natural flooding that would have otherwise replenished nutrients

in some areas of the delta. Other areas were polluted with excess nutrients from contaminated river water. By 1996, reed production had decreased from 226,000 metric tons in 1964 to 30,000 metric tons (p. 121).

After the reeds have been harvested, different steps can be taken to store or process them. In the Okavango Delta of Botswana the reeds are typically hung up or laid out to dry in the sun after being harvested (Mmopelwa, 2005). Another approach is to chop the reeds to enable easier transport and storage. Researchers in Sweden have determined that machines designed to chop typical agricultural materials won't work on the reeds due to their length (Hansson & Fredriksson, 2004). Instead, their study used a Doppstadt brand machine for decomposition in composting plants.

Depending on the region the reeds are located in, their properties can vary, potentially altering the uses for the reeds. However, within any given region the reeds need to be harvested at different times of year depending on their intended use. In the growing season the stems will be soft and ripe, but typically are harder and dry in the other months (Hansson & Fredriksson, 2004).

2.2.3 Uses of Reeds

For centuries, people around the globe have been finding numerous uses for *Phragmites australis*. Some of these include musical instruments, fishing rods, arrowheads, smoking equipment, paper, food products, medicinal uses, biogas, wastewater treatment, construction materials, and domestic items (Kiviat, 2001; Ikonen & Hagelberg, 2007; Cruz, 1978). Because the reeds are hollow, they have been used for whistles and pipes. The roots and young shoots have been eaten, either raw or cooked, though they don't have much nutritional value. The reeds have been used in the production of paper since they are a good source of cellulose. In the past, they were thought to treat illness, including cholera, fever, vomiting, and sores, but have not been proven to have actual medicinal value. The reeds can also be used as a compost material, due to their high phosphorus

content, if manure is added and kept in a hot pile (Timothy Abbott, personal communication, February 6, 2009).

The reeds can be used for a variety of construction materials including roof thatching, fencing and insulation. Roof thatching is probably the most well known and widely used application of reeds. In Denmark, Sweden, Germany, and Holland, reed roofs are popular and a growing market (Ikonen & Hagelberg, 2007). According to *Thatching: a Handbook* "...there are some uncultivated wild grasses and a few specially managed types which have primary economic value as thatch. The most durable is *Phragmites australis* (water reed), which can last up to a hundred years when correctly used," (Hall, 1988, p.3). In order to use reeds for thatching they must be harvested when they are bright yellow, straight, hard, and of uniform length, so they are typically harvested in winter.

Another common use for reeds is cattle fodder. The nutrient content of the shoots is low during the winter because the nutrients are stored in the rhizomes (Ikonen & Hagelberg, 2007). The nutritional value is greatest about midsummer, when the flowers appear. It is necessary for the leaves and shoots to be soft and ripe or the cattle will not eat them. When the reeds aren't ripe, they can be difficult for the animals to digest. Cattle, horses, and small stock prefer eating younger shoots (Helbig, 2008). If the animals are to be herded through the reeds, it must be done properly so the reeds aren't trampled. Another alternative to prevent damage to the reeds is harvesting them first and using stall feeding.

In some countries in Europe, including Estonia, Finland, the Netherlands, Hungary, and Romania, reeds have been utilized for energy on a small scale (Ikonen & Hagelberg, 2007). If the reed is harvested during the summer and is green and ripe, it can be used for biogas, and when harvested in the winter, it can be burned in the form of pellets, briquettes, or whole bales. *Phragmites australis* has been proven to be suitable for the production of biogas, in which organic matter is digested in the absence of oxygen to produce methane (Helbig, 2008). Fertilizer is

produced as a byproduct and can be used on the fields. Production of biogas can be expensive, requiring technology for a conversion plant, and therefore isn't feasible for Mariental (Helbig, 2008).

Another possible use for the reeds is wastewater treatment. One benefit of using the reeds for wastewater treatment is that the reeds are capable of absorbing heavy metals (Southichak, 2006). The reeds can be used in constructed wetlands to help purify water. Reeds are planted in gravel or sand, and wastewater is sent through the reed bed using either horizontal or vertical flow. Through natural biological and chemical processes including microbial respiration, the reeds reduce concentrations of solids, carbon, nitrogen, and phosphorus in the water. Constructed wetlands can be effective in small communities since they are relatively simple and require minimal energy input. However, since using the reeds for wastewater treatment involves relocating the reeds, it most likely will not be a sustainable solution to reducing flooding potential of the river in Mariental.

An ancient use of reeds can be found in the Tigris-Euphrates river delta in Iraq. The Madan tribes, or Marsh Arabs, have been living in the marshes for centuries. They have found a wide variety of uses for the *Phragmites* reeds that dominate the marsh environment, including mats, baskets, pipes, boats, cradles, pens, bird blinds, poles, soap, boxes, looms, and bandages (Ochesenschlager, 2004; Thesiger, 1964).

Reeds and other natural materials have been used to construct handmade products across the world. Some of these products include baskets, mats, brooms, window shades and other domestic decorations. By looking at the details of who produces these reed products in other areas, we can better determine which use might best fit into the economy of Mariental. In the Limpopo region of South Africa, most reed mat producers were older, had pensions, and considered making reed mats as a supplementary economic activity. The details of this case study can be found below.

Case Study: Natural Products in Limpopo, South Africa

A case study was conducted in the Limpopo region of South Africa by Shackleton, Campbell, Lotz-Sisitka, and Shackleton (2007). The study focused on three villages, each of different economic standing, and compared the production and sale of different natural products, including reed mats.

For the making of reed mats, the reeds are harvested seasonally from wetlands. The mats are then stored year-round and sold in local markets. The same people who harvest the reeds and produce the reed mats also sell the reed mats. This trade is important in the region studied, as the majority of the households are below the poverty line. The authors also noted that trade in these items was one of the few options available to the poor, especially women, for income generation. The producers of reed mats were generally older and had pensions. Thus, the production of mats is mainly seen as a supplementary source of income. A main reason that women entered the trade was economic hardship brought on by illness or death in the family or job loss. Others liked the advantage of being able to work from home. There are several advantages to trade in natural products. The supplementary income fosters independence and a decreased reliance on donations or a social safety net. The authors noted a "low barrier to entry" in the trade, so that those with little other marketable skills or opportunities, such as women, could participate in the trade.

Regardless of how the reeds can be used, it is important to consider sustainability when using them. If sustainability is not addressed, any potential reed use, regardless of how practical, will not be successfully maintained.

2.3 Sustainable Development

Once the potential uses of reeds are known, it is important to understand Sustainable Development (SD) in order to have a long-lasting business that utilizes the reeds. A large amount of literature on SD exists; perhaps the most cited being *Our Common Future*, also known as the Bruntland Report (Bruntland, 1987). SD is described by the Bruntland Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (p.43). This definition of SD was the first description to be commonly used and is still used by many researchers worldwide. It conveys that SD is development that has a long-lasting positive impact on a community. This is precisely the definition of SD that will be used for this project.

A general method for completing a SD project is to separate the development into three equally important areas, economic development, social development, and environmental conservation (IUCN, 2006, p. 2). These three areas are often dealt with individually, with equal importance being placed on each. If each area of SD is not given equal consideration, then the development project cannot provide a lasting solution. The means to accomplishing SD has become known as Environmental Impact Assessment (EIA) (Downs, 2008). EIA is an assessment of the impact of a proposed project on the natural environment. It is one of the most general approaches used when developing sustainably; however, there are more specific techniques.

Timothy J. Downs (personal communication, February 17, 2009), professor at Clark University's International Development, Community, and Environment (IDCE) Department, advocates a modified form of Environmental Impact Assessment. In this model, the developer first identifies key people and organizations that serve to benefit from the project (these people are called stakeholders). After determining a variety of possible solutions, the developer and stakeholders then compare the various solutions by examining the ecological, economic, political, cultural, and environmental impact of each. This definition considers two extra elements, cultural and political sustainability. Although this view is certainly valid, it is sufficient to just focus on the economic, social, and environmental impact of using the reeds. This is because the local ecology can be considered an environmental aspect, and likewise, the term social encompasses both political and cultural factors.

From the previous discussion, it is clear that the problem faced by Mariental is one of sustainable development. The reeds clogging the channels downstream from the Hardap Dam are a natural resource that is not being utilized. Furthermore, they have been linked to severe flooding and damage to Mariental. Thus, for this project, development will be defined as determining the most feasible and sustainable reed uses, and subsequently incorporating these uses into the local economy of Mariental. It is important to ensure that the recommended uses are economically, socially, and environmentally sustainable. This means that every recommended reed use should be

ensured to be a long-term solution for Mariental, one that the community agrees with, is financially beneficial for the community, and has the least negative impact on the environment. As a result, recommended reed uses should benefit the residents of Mariental in the present day, while not hindering future generations.

2.3.1 Environmental Sustainability

Environmental sustainability is especially important to consider in developing or poorer nations (UNFPA, 2008). Communities in these situations may lack the financial and managerial assets to appropriately deal with environmental challenges. Developing nations may also face increasing populations and widespread poverty, such as in Namibia, which makes environmental sustainability of greater importance especially when discussing the availability of a natural resource. In Mariental, finding uses for the reeds will hopefully provide jobs for members of the community and may assist to reduce the flooding, but in order for the business to succeed, the growth and harvesting of the reeds needs to be sustainable.

In order to maintain sustainability it is necessary that there are always reeds of good quality present in the Fish River to be harvested and used. Therefore, it is necessary to not over-harvest the reeds. In Maputaland, South Africa, the reeds were harvested extensively by the local people for building, fencing, thatching and craftwork (Van Rooyen, Tosh, Van Rooyen, Matthews, & Kellerman, 2007). The reed beds are now depleted and not producing quality reeds. A study was conducted by Van Rooyen et al. (2007) to investigate why this occurred and how to improve the sustainability of the harvesting. It was determined that harvesting the reeds reduced the mean reed diameter and height over time. If the reeds are harvested early in the growing season, fewer nutrients will be returned to the rhizomes resulting in diminished regrowth. The study also determined that burning the reeds in the dormant season actually increased reed diameter. It was recommended that the ideal time to harvest reeds is after the active growth period because then the nutrients have been transferred to the rhizomes and new shoots can grow the following season. This study also

suggested that rotational harvesting should be implemented so that the reeds have time to fully grow before they are harvested again.

A threat to the future availability of the reeds is the Mariental Flood Task Force decision to remove the reeds completely between the Hardap Dam and Mariental. The Task Force decided that the reeds should be sprayed with herbicide and then burned in order to eliminate the reeds from the Fish River to help reduce flooding potential. The reeds were sprayed with herbicide twice in 2008, with plans to spray again in May 2009. The Ministry of Water, Agriculture, and Forestry approached the Hardap Irrigation Scheme farmers about getting their assistance with burning the reeds after they have been sprayed. It will take up to five years of continuous spraying of the reeds in order to eliminate them. Since they are an invasive species, after a few sprayings, the reeds will still be able to grow back due to their extensive root system and stored nutrients. If the herbicide is successful and a majority of the reeds are eliminated, then using the reeds would not be sustainable for income. However, if the spraying does not completely eliminate the reeds, they will grow back and be available for future harvesting.

Another aspect of environmental sustainability is making sure the ecosystem and biodiversity associated with the reeds is not disturbed or damaged in any way. If harvesting the reeds alters the current ecosystem, this could affect the growth of the reeds or affect other elements of the ecosystem in a negative way. Reed beds can provide shelter to several organisms due to their dense growth, and are a common nesting area for birds (Ikonen & Hagelberg, 2007). In Finland, birds use dead reeds to build nests high above the water line in the reed beds. Also, most species that inhabit the reeds are shade tolerant due to the canopy decreasing the amount of available light. By removing the reeds a habitat for these animals is potentially destroyed, affecting the ecosystem.

2.3.2 Economic Sustainability

An understanding of the economy, in particular, of sustainable economic development (ED), is vital to the proper implementation of any sustainable development project. Sheffrin (2003)

defines ED as the process an organization takes to increase the financial well-being of its people. This is certainly a valid description of ED, however, this definition should be further developed and refined before it is applied to any given development problem, including the situation in Mariental.

Key Economic Concepts

An abundance of literature exists concerning modern economics. However, there are a few basic definitions and concepts that are crucial to developing a suitable description of sustainable ED. It is important to define terms such as producer and profit, and to discuss the concept of markets and market potential. This will provide an adequate background for future discussions of the current economic state of Mariental, as well as for analysis of uses for the reeds.

According to Webster's Encyclopedic Dictionary (1996) a producer is "any person or organization that creates economic value, or produces goods and services" (p. 1544). This definition effectively and concisely conveys what a producer does. It also introduces the idea of economic value. For this project, creation of economic value is taken to be the establishment of an enterprise that generates profit from reed uses and is sustainable.

Profit can mean either direct profit or indirect profit. Direct profit is defined as the difference between total sales and total costs (Samuelson, 1998). This is the total amount of money that ultimately ends up in the producer's hands. Indirect profit is not as clearly defined. Indirect profit is taken to be profit which results not from selling an item, but from using it in a money-saving manner. For example, if the reeds are used as thatching on a house, the homeowner may save money because the reeds provide a longer lasting roof than some other roofing materials. Therefore, the roof will require fewer repairs, which in turn, saves both time and money. A proposed reed use may generate direct profit or indirect profit (and in some cases both).

Now that the terms producer and profit are understood, markets can be defined. An economic market can be described as a cycle (Casson, 1997). Figure 4 depicts the cycle of goods flowing from producer to consumer, as well as money flowing from consumer to producer. A consumer is defined as a person or organization willing to purchase a commodity or service. For this

project, it is not necessary to describe the complex configuration of a general market; it is sufficient to expand the market cycle to include retailers. Webster's Encyclopedic Dictionary (1996) defines a retailer as one who sells goods to consumers. An example of a potential producer in Mariental is someone who is willing to make baskets out of the reeds. These baskets could then be sold to a group of consumers (e.g. tourists), or to retailers that then sell these goods to consumers. This demonstrates the importance of identifying the producers, consumers, and retailers associated with any proposed reed products in order to consider the full economic market cycle.

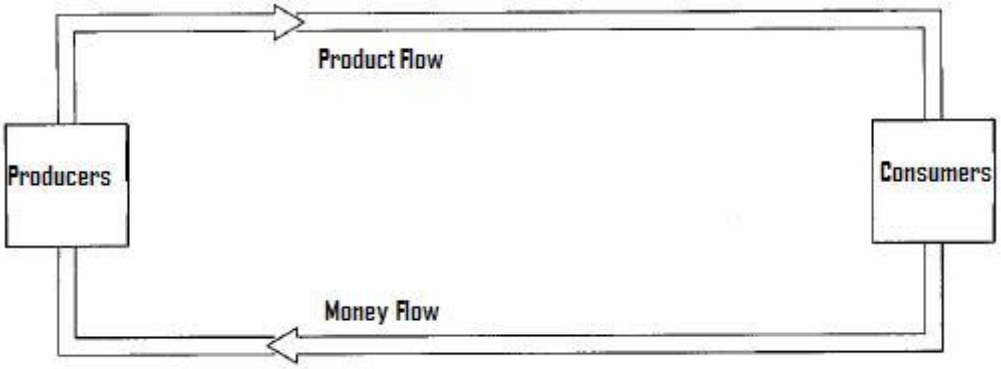

Figure 4: Market Cycle (Casson, 1997)

Utilizing the definitions previously introduced, it is possible to properly define a concept known as market potential (MP). MP can have different meanings depending on the context in which it is discussed; however, we define market potential as the potential that a particular product will have a consistent demand in any given market. With the preceding concepts clearly defined, sustainable economic development can now be properly defined.

Sustainable Economic Development

In Mariental, a variety of possible options for using the reeds exist and each one should be evaluated to determine economic sustainability. Methods of determining economic sustainability vary from case to case. To determine the economic sustainability of a particular reed use, the proposed use (as well as any economic, social, or environmental implications of the use) must be fully understood. For example, tourism is a potential market for baskets constructed from the reeds. Enough income must be generated by basket sales to support the harvesters, producers, and

retailers associated with basket production. Another example is the possible use of the reeds for animal fodder for farms. If the reeds can be harvested for animal fodder for less money than conventional fodder, then the reeds represent a potential source of indirect income for the owner of the animals. In order for this use to be considered economically sustainable, the amount of money saved by the owners must be greater than or equal to the expenses that are incurred by the reed harvesting. To ensure that direct and indirect profits are achieved with a reeds business initiative, the economy of Namibia and potential markets need to be understood.

Namibian Economy and Potential Markets for Reeds

A market potential for reed products needs to exist in order for a reeds business initiative to be sustainable. To find the markets, one must first understand the economy of Namibia, specifically the sectors of the Namibian economy that have a market potential for reed products. Based on the known uses of the reeds, two markets sectors that need to be considered are agriculture and tourism. Understanding the local economy is also critical to take advantage of local opportunity.

Agriculture

Agriculture is not a major contributor to the Namibian economy, but there is focus on trying to invest and expand in this sector (Sahlén, 2008). Agriculture accounts for about 7% of the Gross Domestic Product (GDP) and consists of commercial cereal grain production, crop production, livestock production, and subsistence farming. In recent years the prices of cereals, dairy products, and meat have been on the rise. Although this is beneficial for certain sectors of agriculture, cereal grains are one of Namibia's main imports. With higher prices, the poorer residents of Namibia have to use more of their income to pay for food (Sweet, 1998). The 1993-1994 Household Income and Expenditure Report showed that 47% of the rural households spent 60% of their income on food, and 12% spent up to 80%. Therefore, some households are attempting to expand subsistence agriculture, which is when a household grows their own food instead of purchasing it elsewhere.

Meat production is important to the Namibian economy and is considered the third most important export sector, after mining and fishing (Sahlén, 2008). Between 2005 and 2007, the price

of meat increased by 20%. Many farms depend on natural vegetation on their farms as a source for grazing their livestock (Sweet, 2008). Where the climate is dryer, such as in central and southern Namibia, the common commercial livestock raised are sheep, Karakul for pelts, and Dorper for meat. Goats are also common, such as the Boergoat and the Angora. Ostrich farming is also present, but on a much smaller scale. Livestock production on communal land is mostly found in the northern parts of Namibia, while commercial livestock production dominates the southern part of the country. In communal areas the benefits of livestock production consist of draft power, milk, dung, meat, cash income, and capital storage. Livestock production is also related to social or cultural traditions. One limitation to livestock production is the availability of grazing vegetation area, which is determined by the amount of rain that is received during the year.

Agriculture is a difficult industry to operate in Namibia because of the dry climate and scarce vegetation (Sweet, 2008). The national average of rainfall in Namibia is roughly 270 mm annually, making it the driest climate in sub-Saharan Africa. Based on the 2004 report by the Ministry of Labor and Social Welfare, agriculture has been in decline but still provides 102,636 working positions, about 26.6% of jobs in Namibia (Kamho, 2007). These positions consist of 36,000 communal or subsistence farmers, 490 commercial agriculture employers, and 5,765 self-employed workers on public farms.

There are three main types of land ownership in Namibia that determine how the land is used for agriculture, including commercial farmland, communal areas, and state owned land. Commercial farmland, which consists of 44% of the land in Namibia, is fairly well developed and utilized for livestock export. These commercial farms are mostly located in central and southern Namibia. Communal areas, which comprise 41% of land ownership, have land use distributed not by ownership but by user rights. Farmers will typically have allocated land for their household, but areas for livestock grazing are shared by all in the community. In these areas, subsistence farming tends to occur for self nourishment instead of profit. These areas are mostly located in the northern part of Namibia. The rest of the land is state-owned land, where agriculture is not allowed. An

exception to this rule is in the Namib-Naukluft Park where the Topnaars community is allowed to farm (P. Klintenberg, personal communication, March 9, 2009).

To assist local farmers, the water reeds can be turned into compost that can be spread on the farms to promote crop or vegetation growth. For livestock production, the reeds can be turned into fodder to feed the livestock. Reed mats can also be constructed to cover open sources of water, which are used to provide drinking water to livestock, in order to reduce the evaporation rate. These uses may assist with the expansion of the agriculture sector.

Tourism

Tourism is a rapidly growing industry in Namibia and could be a potential market for reed products. (World Travel & Tourism Council, 2006). According to the Namibia Tourism Board (NTB), Namibia received 777,890 tourists in 2005, 833,395 tourists in 2006, and 928, 912 tourists in 2007 (Namibia Tourism Board, 2008). The high season for tourism is in the winter months from June to August and also in December.

Since tourism is a growing industry, it is a potential market for reed products. Many tourists purchase souvenirs to bring back home and various small products made out of reeds, such as mats and baskets, may be appealing to them. This is a potential market that needs to be considered.

Mariental Economy

The economy of Mariental is important to understand in order to determine how a business working with the reeds can best be incorporated into the local economy. The Mariental Municipality is located in the Hardap Region. The region was named after the Hardap Dam because it was viewed that this dam would provide great potential for agriculture and tourism in the region (Harmelen, 2007). A railroad line and a main truck route cross the region linking Windhoek with Keetmanshoop and Lüderitz, South Africa, through the towns of Rehoboth, Kalkrand, Mariental, and Gibeon.

The town of Mariental has three major economic sectors: crop production, livestock production, and services (Harmelen, 2007). The irrigation scheme covers an area of 2,200 hectares with 23 farmers living on the plots. The main types of crops grown are wheat, white maize, grapes,

lucerne, and vegetables. The Hardap region produced 80% of the wheat for Namibia and contributed a total of 2.9% of the agriculture production in all of Namibia in 2005. There is also a pig production business that contributed to 12.5% of the total Namibia pig production in 2004. With the prominent agricultural economy in the region, the reeds could potentially be used by the farmers in Mariental for compost or livestock fodder.

Tourism in Mariental is a small industry (McIntyre, 2007). Chris McIntyre, the author of an acclaimed tourism book on Namibia, describes Mariental as a place that has "very few attractions." He continues to say that many tourists stop in Mariental in order to refuel and purchase cold drinks. To the north of Mariental, the Hardap Dam has a tourist resort. The resort offers various activities such as game drives, water sports, and hiking. Although tourists do not generally stay in Mariental, they sometimes stop in the town on their way to other destinations, which provides a potential market for reed products.

2.3.3 Social Sustainability

Social sustainability depends on the community where development is taking place. For example, there is a nickel mining project currently taking place in the Philippines, which was evaluated by Tim Downs in his article on Engineering Sustainability (2007). While the mines may be economically prosperous, the mining companies pay little or no heed to negative public comments related to the mining. This means that the community affected by the nickel mining has no influence when important decisions are made concerning the mining. This makes the project more likely to fall into public disfavor, and ultimately fail. Thus, by not addressing the social aspect of the mining project, it is not ensured to be sustainable.

Any sustainable development project that achieves the goal of actively involving the local community, and whose subsequent progress can be monitored by the community is termed socially sustainable. For this project, the three main stakeholder groups that would be affected by a reed-based business are the Hardap irrigation farmers, Mariental residents, and the government

organizations that have jurisdiction over Mariental. In order to determine how each stakeholder group will be involved in a reed business initiative, it is important to understand a general background of each stakeholder.

Unemployment in Namibia

Namibia has one of the most unequal distributions of income in the world. It also has a serious unemployment problem that affects the residents of Mariental (Kamho, 2007). The Namibian Government defines an unemployed person as a person that does not have work, is available and capable of work, and is searching for work. In the 2004 report produced by the Ministry of Labour and Social Welfare, it was determined that 36.7% of the Namibian population was unemployed.

Based on the 2004 report by the Ministry of Labour and Social Welfare, unemployment has affected people in all regions of Namibia. In the rural areas about 44.7% were unemployed compared to 29% in urban areas (Kamho, 2007). The rate of unemployment for women is 43.4% and for men is 30.3%. The age groups hardest hit by unemployment are men between the ages of 15 and 19 years, of which 65% are unemployed, and those between 20 to 24 years of age, for whom the unemployment rate is 57%. The Hardap region had 28% of its population unemployed, which consisted of 39.2% of the female population and 17.9% of the male population.

With the high unemployment rate in Namibia, it will be beneficial for the Mariental community to find a use for the reeds that will allow the residents to obtain direct or indirect economic benefits. In order for the initiative to be successful the residents must be interested in producing reed products, be satisfied with how the business is managed, and also potentially provided training in order to promote interest in the initiative. One way to determine which reed uses may provide the most benefit to the residents by using the approach of Livelihood Sustainability. Livelihood Sustainability helps understand how a household operates on a daily basis and how well they can react to externals shocks and influences. By understanding their livelihoods,

uses of the reeds that best fit with the residents' current way of life can be identified. More information on this topic can be found in Appendix B.

Government

The government of Namibia consists of the central government and regional governing bodies (Ministry of Regional and Local Government, 2009). Since 1992, the central government has been attempting to decentralize their role and bring government services closer to the people by handing down responsibilities to regional government bodies. The ideal role of the central government is defined as developing legislation and policy development, creating standards for service delivery performance, monitoring the performance, providing building and training resources, and also other typical responsibilities, such as national defense. The other responsibilities of the government that are determined to be not essential for the central government are being passed on to the Regional Councils, the Local Authorities, and Civil Societies.

Each of the thirteen regions in Namibia has a regional council. A council consists of officials elected by the people over whom the council has jurisdiction (Ministry of Regional and Local Government, 2009). The regional councils were established by the Regional Councils Act in August of 1992 and were in full operation in December 1992. The responsibilities of a regional council are to create development plans for their region, manage the formal settlements, and deliver basic services, such as rural water supply, primary healthcare, and primary education.

Local government bodies, known as the Local Authorities, were established by the Local Authority Act in August of 1992 (Ministry of Regional and Local Government, 2009). These bodies of government have jurisdiction over individual towns or villages. The *Decentralisation in Namibia* website, developed by the Ministry of Regional and Local Government, states that the amount of responsibilities and power that a local government has over a town depends on the "size, self-sustainability, and capacity in service provisions" (2009, Local Authorities). There are three official levels of town government: Municipal Council, Town Council, and Village Council. Mariental is established under the largest level which is the Municipal Council level. The responsibilities of the

council are to provide urban services, such as water supply, electricity, sewerage, garbage collection, and infrastructure maintenance and development.

Smaller organizations that are also part of the decentralized power movement are the Civil Societies (Ministry of Regional and Local Government, 2009). These organizations include community-based organizations, non-government organizations, and church organizations. The *Decentralisation in Namibia* website states that the important characteristics of these organizations are:

- *Ability to innovate*
- *Direct relationships to poor*
- *Capacity to stimulate participation and articulate local views*
- *Cost effective operations*
- *Autonomy which results in independent assessment of issues and problems*
- *Strong identification with concerns of the communities which they serve*

(Ministry of Regional and Local Government, 2009, Civil Society)

Each of these government bodies and organizations work with the community. They assist the community with various services and development projects. These organizations are important to consider as stakeholders because they may provide assistance with the reed initiative such as providing resources and funding, or information on potential problems that may be faced with this initiative.

Namibian Agriculture Union

The Namibian Agriculture Union (NAU) has been established for 63 years and most of the members consist of commercial farmers in Namibia (Namibian Agriculture Union, 2009). The membership is voluntary and is restricted to farmers and farm property owners. The mission of NAU is to expand and continue a sustainable agriculture business. The important roles of the Union are to represent the commercial farmers when talking to the government or other organizations, inform and instruct farmers on sustainable practices, and promote the agriculture sector. This organization has a local body that represents the farmers in the Hardap Irrigation Scheme, who are important stakeholders because their property borders the reeds along the Fish River.

Once we have considered all aspects of sustainable development, it is important to look at a way to combine all of these aspects into a management strategy for generating income from the reeds in the Fish River. In the next section, we will discuss such a strategy: Community-Based Development.

2.4 Community-Based Development

An initiative that uses community-based development principles considers the opinions of all the stakeholders while still sustainably generating income and using a community resource. Two methods of establishing community-based development are through community-based natural resource management, or development of small and medium enterprises.

2.4.1 Community-Based Natural Resource Management

Top-down management aimed at conserving a particular resource often ignores the needs of the local people who utilize this resource. However, allowing these resources to go unmanaged can lead to unregulated and unsustainable utilization of the resource. An approach that attempts to find a balance between allowing local participation in resource use and managing the resource in a sustainable manner is Community-Based Natural Resource Management.

The goal of Community-Based Natural Resource Management (CBNRM) is to enable local communities to make their own decisions about how a particular resource is used (NACSO, 2009). This promotes long-term thinking about how the resource will be used in the future and allows the community to derive economic and other benefits from the utilization of the natural resource. CBNRM programs have already been implemented in most regions of the world including East Asia, South Asia, Latin America, Europe, and Africa (Community-Based Natural Resource Management Network, 2006). Sixteen projects have been implemented in Africa, and an extensive CBNRM program with many communities that participate exists in Namibia. The success of the CBNRM program in Namibia has been recognized through many awards, including the United Nations Environmental Programme Global 500 Award (NACSO, 2008, p. 19).

The CBNRM approach incorporates all three aspects of sustainable development. It encourages economic development by promoting use of natural resources in a way that generates income for conservancies, such as joint ventures with tourism companies, or trophy hunting. It encourages social development by providing jobs for members of local communities, especially women. It also encourages environmental development by promoting sustainable use of all natural resources so that local communities can benefit from these resources for years to come. These principles have already been applied to manage thatching grass and river reeds as a natural resource in different conservancies, and could possibly be applied to manage the utilization of the reeds in Mariental. More information on CBNRM in Namibia can be found in Appendix C.

Another option for managing a project utilizing reeds is to establish a Community-Based Organization (CBO). A CBO is an organization that involves community members in the management of an income-generating project. An example of a CBO is provided by a case study conducted by Suich and Murphy (2002), which documents how the sale of crafts at the Mashi Craft Market in the Caprivi region of Namibia is managed and how it benefits the crafters.

Case Study: Basketry in Caprivi

Some of the people who live in Caprivi supplement their income by selling handmade crafts. The crafts that are practiced the most in this region are wood carving, almost exclusively by men, and basket weaving, clay pottery, and the construction of reed mats, done almost entirely by women. This study focuses on the production of baskets by the women of Caprivi. These women were taught to weave baskets by their mothers, in school, or through special training programs provided by the Rössing Foundation, Namibia's largest mining company and purchaser of the handmade goods of Caprivi. The baskets are woven from the Makalani palm (*Hyphaene petersiana*) and were traditionally used for storing grain. Now the production of these baskets is becoming increasingly more commercialized. Once plain and practical, the baskets are woven in intricate designs with palms that have been dyed in different colors to make the product more pleasing to consumers. The Rössing Foundation conducts quarterly trips to the region to buy the products and

transports them for sale in Windhoek though Mud Hut Trading, a company supported by the Foundation. For the harvesting of the palm, the Rössing Foundation and the Integrated Rural Development and Nature Conservation (IRDNC) have established conservancies in Muyako, Old Masokotwane and New Masokotwane and Salambala. These conservancies are meant to serve as common resources for all producers of products made from palms. They are managed by Community Resources Monitors who train those harvesting the palm how to do so in a sustainable manner. The Community Resource Monitors are often women who have been chosen by their local communities for the task. As mentioned above, the main producers of these baskets are women. Women are often among the poorest in Namibian society, and the supplementary income offered by basketry is important. Many of the women crafters interviewed in this study took up basket-weaving for financial reasons. The authors write, "…one woman began selling baskets in 1993 after she divorced and was struggling to support her three children; another started weaving and selling baskets in 2000 to earn money for school fees she was having difficulties paying" (p. 16). This income is spent on "well-being of their families" (p. 25). The women also mentioned the disadvantages of weaving. Traveling long distances to acquire palm or plants for dyes, physical strain, and low returns on their products, and dependence on the Rössing Foundation were all mentioned as problems they experienced with weaving.

Managing a business that utilizes a natural resource is a separate challenge from managing the natural resource itself. Presented in the next section is information on managing a small-to-medium enterprise.

2.4.2 Small and Medium Enterprises in Namibia

Many Small and Medium Enterprises (SMEs) exist in Namibia (Dahl, 2002). John Dahl and Grace Mohamed, in *The SME Sector in Namibia* report, say that the greatest opportunity for growth in Namibia is seen in the SMEs, which can provide employment and reduce poverty levels (2002, p.1). In mid-1990s it was estimated that 160,000 people (30% of the workforce) were in the labor

force categorized under SMEs, which shows the importance of this sector (2002, p. 3). Many of the SMEs are established by people that are unemployed and looking for alternative sources of income.

There is no universal definition of an SME. Dahl and Mohamed stated that "The definition of small businesses seems to be an international headache where it is hard to capture the small businesses with easy definitions," (2002, p. 26). The definition used by the Ministry of Trade and Industry (MTI) is shown in Table 3. In order for a business to be considered an SME they must meet those minimum requirements (Dahl, 2002). Many private businesses in Namibia are too small to produce a large enough annual turnover to be classified as a small business and therefore an accurate total number of SMEs in Namibia is unknown.

Table 3: Minimum requirements for an SME by MTI (Dahl, 2002, p.4)

Sector	Number of Employees	Annual turnover	Capital employed
Manufacturing	Less than 10	N$1,000,000	N$500,000
All other businesses	Less than 5	N$250,000	N$100,000

Although there are numerous SMEs in Namibia, many experience common problems that can lead to their failure. Wilfred Isak April describes various reasons why an SME may fail in the report *Critical Factors that Influence the Success and Failures of SMEs in Namibia in the Khomas Region* (2005). Lack of education and knowledge in managing a business can lead to business failures because this lack of knowledge limits how much the business can expand and compete against larger businesses. The management plays many roles, which include management of people, marketing, research and development, financial management, sales, purchasing, and production. Each element of management is important because these elements influence each other and if one aspect fails, then the business is at risk of failing.

Businesses owners also do not try to understand external influences that may affect their business's survival and competiveness, such as competition that is emerging from South African

businesses that are expanding into Namibia (Dahl, 2002). With lack of knowledge of external forces, poor business plans are developed, which limits the ability of a business to react to sudden changes caused by external forces, such as a change in demand for products. Many businesses also lack capital or financial support, as a lack of bookkeeping skills causes them to fail to maintain adequate financial records, which are required by banks for short-term loans. Another problem is the established location of the business, which can limit access to markets. Very little investigation is done to determine if a specific site for a business will bring enough customers to make an adequate profit. Many businesses choose to operate from private homes or find a vacant building without any other considerations.

If a reeds business initiative is established in Mariental, it could begin as a SME. By understanding the typical weaknesses of SMEs in Namibia, potential problems of starting this initiative can be identified and addressed before contributing to the failure of the reeds business initiative.

2.5 Summary

In determining the best ways to manage the reeds in Mariental, we have discussed several topics. These include the uses of the reeds and their importance to the community, sustainable development, the Namibian economy, and CBNRM and SMEs as a way to manage natural resources. Research into these topics has provided a solid foundation for understanding how using the water reeds for economic gain or other benefit may affect and improve the lives of those living in Mariental, while at the same time potentially help to reduce the risk of serious flooding.

Chapter 3. Methodology

This project's goal was to identify sustainable uses of the river reeds and factors that must be considered if a business initiative using the reeds as a raw material was to be started in the Mariental area. In order to determine which reed uses could be the most appropriate for Mariental, we investigated characteristics of the reeds, potential markets for the reeds, and interests of local residents in Mariental in different reed uses. We developed recommendations for the initiation of a reeds business initiative and the potential problems that may arise based on our findings from interviews with stakeholders in Mariental and Windhoek. This chapter describes the methods that we used to accomplish these objectives in more detail.

3.1 Understanding the Mariental Situation

To better understand the history of Mariental, previous attempts to remove the reeds, and who actually owns the reeds, we talked to various experts in Windhoek and government officials and local residents in Mariental. This information was important because it provided us with a better understanding of the situation in Mariental and what needs to be considered when investigating a potential reeds business initiative.

3.1.1 Past Attempts to Remove Reeds

We conducted interviews with and attended several presentations by experts in various topics related to our project. We attended a presentation by Dudley Biggs, a DRFN Associate, who was originally involved in water planning at the Department of Water Affairs and Forestry (DWAF) (See Appendix D for a detailed summary of this presentation). He has worked on the reeds problem in Mariental and presented information about the Hardap Dam, confirmed information from our background research on the causes of the Mariental floods, and presented what is currently being done to resolve the flooding issue. From this presentation we also learned about previous attempts to remove the reeds.

While in Mariental, we contacted Piet Jansen, who has worked for the Ministry of Agriculture Water and Forestry (MAWF) for the past 37 years, and also grew up in Mariental (See Appendix E for the interview protocol used). Mr. Jansen conducts research on the irrigations scheme and the small livestock business in the southern regions of Namibia for the MAWF. From this interview we learned more about the history of Mariental and the causes of flooding. He also informed us of past attempts to remove the reeds. We also got more information about past attempts to remove the reeds from Axab Skrywer, the Chief Administrator at the Mariental Urban Constituency Development Committee (MUCDC) (See Appendix E for interview protocol); an irrigation farmer on the Hardap Scheme; the local chairman of the Namibia Agriculture Union (NAU) (See Appendix F for interview protocol for the farmers).

3.1.2 Ownership of the Reeds

We determined who owns the reeds in the Fish River, both near Mariental and in the irrigation channels surrounding the farms of the Hardap Irrigation Scheme. Through interviews, we asked representatives of the Hardap Regional Council (HRC), MUCDC, the Mariental Municipality, the NAU chairperson, and the local farmers, who actually own the different tracts of reeds. At the HRC we spoke to Theresa Basson, Director of Planning and Development Services. At the Mariental Municipality, we spoke to the Chief Executive Officer, Paul Nghiwilepo, and Domingo Matesu, the Community Liaison Officer (See Appendix E for the interview protocol). This information was an important step in determining which stakeholders (the residents of the informal settlements, the farmers, and government officials) need to be considered when implementing any business initiative for harvesting the reeds in Mariental.

3.2 Environmental Sustainability

In order to determine environmental sustainability, we first gathered more information on what the reeds could be used for. It was also necessary to determine the properties of the reeds in Mariental because the characteristics of the reeds dictate their uses. We investigated the location of

the reeds to determine the resources that will be necessary to harvest the reeds properly. We also investigated the availability of reeds because the amount of reeds available will determine the sustainability of potential uses.

3.2.1 Characteristics of Reeds and Their Uses

Potential uses of the reeds depend on the reed characteristics. We interviewed the current and former reed harvesters in Mariental (see Appendix G for interview protocol) and asked them what characteristics they looked for when harvesting the reeds, what the reeds were used for, what is the growth rate of the reeds, and during which seasons they usually harvest.

Specifically, we contacted Phillipus Iyambo, a man who currently harvests the reeds and makes and sells reed mats (Refer to Appendix G for the interview protocol). We drove to the Fish River with Mr. Iyambo and asked him to show us which reeds are the most ideal for making mats. We determined the location of the good quality reeds, observed their characteristics, and determined the general quantity of reeds available. As we drove near the Fish River, we also took photographs and samples of the reeds for later review.

While in Mariental we determined the location of the reeds in the river through direct observation. We observed the reeds at different points in the critical stretch of the Fish River between the Hardap Dam and Mariental. We determined where the reeds were located by observing if the reeds were mostly in the middle of the channel or on the banks of the river. We also observed how accessible the reeds were for the harvesters. This information helped us identify the resources and equipment that would be necessary to harvest the reeds.

To determine other uses of reeds that we had not previously considered, we contacted Andreas Wienecke of the Habitat Research and Development Centre (HRDC), an organization that looks at using alternative building materials for sustainable houses (A detailed summary of this presentation can be found in Appendix C). Andreas explained alternative uses for reeds, the benefits of various uses, and what processes may be required to implement the various uses. When we

visited Mariental, we spoke with individuals who were currently using the reeds, to find out how they were using the reeds, and how they make their products.

3.2.2 Spraying of the Reeds

We spoke with a local farmer who was contracted to spray the reeds (See Appendix F for the interview protocol). We obtained his opinion on the reed growth, as well as information on the chemical used to spray the reeds, and the methods and techniques being utilized. He provided us with aerial photos that we observed to determine the overall impact of the spraying on the growth of the reeds. We conducted further research on the chemical by obtaining chemical specifications from the manufacturer.

3.3 Economic Sustainability

To determine the market potential for different reed products, we contacted various organizations, businesses, and specific people that were potentially willing to purchase reed products. By contacting such organizations and individuals, we were able to determine if markets for reed products exist. In order to determine the feasibility of making products out of the reeds, we identified government agencies or other organizations that could potentially assist with a reeds business initiative and specific resources they could provide.

3.3.1 Market Potential

In order to determine the market potential for the reeds we talked to government representatives and various businesses in Mariental and in Windhoek. We contacted the government representatives from the HRC, MUCDC, and the Mariental Municipality (The interview protocol used can be found in Appendix E). We inquired if they knew of any individuals or businesses that currently use the reeds in the Fish River, and where reed products were sold in the past. This information was later used to contact businesses in Mariental and Windhoek to determine their past and current involvement with the reeds, and their interest in purchasing the reed products in the future.

We also obtained information from business owners and individuals in Mariental that currently are or were previously involved with making reed products to determine how well their reed products sell and who they sell their products to (Refer to Appendix G for interview protocol). We contacted the owner and employees of Mariental Hardware, a business that sells reed products and reed bundles, and several residents of informal settlements, such as Phillipus Iyambo, an individual who currently produces reed mats (Refer to Appendix H for interview protocol). We inquired if working with reeds had been successful for them. We used this information to help determine which uses are economically sustainable.

We also visited Kalahari Anib Lodge, which is located approximately 25 km east of Mariental, to determine if they currently use reed products or would consider purchasing reeds in the future. We interviewed the manager of the lodge to determine if the lodge currently uses any reed products in their facility as construction materials or décor to attract tourists (Refer to Appendix I for the interview protocol). We also asked where they purchased the products and how they received the reed products. Then, we asked if the lodge had a gift store and if they sold any reed products. We also asked what products tourists are generally looking for (i.e. whether tourists would prefer products with a traditional tribal style or products with no association with traditional African culture).

We also investigated the tourism market outside of Mariental. We interviewed several owners and managers of accommodations in Windhoek to determine if they currently purchase or would be interested in purchasing reed products for decoration or for sale if they had a gift shop (The interview protocol used can be found in Appendix I). We also interviewed several owners of craft shops in Windhoek to investigate if they currently sold or would be willing to buy reed products from Mariental to sell in their shops (The interview protocol used can be found in Appendix J). A list of the people that we interviewed is shown in Table 4 below. We asked what products tourists typically buy, what seasons they receive the most tourists, and if they thought tourists would be interested in reed products. We also asked how the owners of craft shops obtain the products that

they sell in their stores. Based on the information we gathered, we determined the market potential of various uses and what problems are associated with marketing reed products.

Table 4: List of Interviewees in Windhoek for determining market potential

Market Potential Interviews in Windhoek			
Accommodations	***Interviewee***	**Craft Shops**	***Interviewee***
Kubata Lodge	Owner	Joe's Beerhouse	Co-owner
Kalahari Sands Hotel and Casino	Marketing Manager	Miracle Art and Craft	Owner
Leading Lodges of Africa	Marketing Manager	Nomad African Elegance	Owner
Pension Bougain Villa	Manager	Touba African Art Gallery	Owner
Roof of Africa Hotel and Travel Centre	Manager of Human Resources	Tsumkwe Craft Shop	Co-owner
Uzuri Guesthouse	Owner	Chou Chou Trading Art and Craft Shop	Owner
		Oshoto Arts and Crafts	Manager

3.3.2 Potential Sources of Assistance

Different government agencies in Mariental have provided assistance in the past to start-up businesses and community-based organizations. To determine what kind of assistance these agencies would be willing to provide to start a business initiative dealing with reeds, we interviewed representatives from the HRC, MUCDC, the Mariental Municipality and the Ministry of Gender Equality and Child Welfare (MGECW) (Refer to Appendix E for interview protocol). We asked their opinions on the potential use of reeds by the Mariental community, how involved they would like to be in starting a business initiative, and if they could provide assistance to the Mariental community in order to start a business working with reeds. This assistance could be providing capital for start-up expenses, resources such as transportation or tools, or training.

3.3 Social Sustainability

In order for any reed use to be socially sustainable, stakeholders need to be interested in participating and supporting such a business, and willing to cooperate with each other when managing the resource. The stakeholders include people who are currently involved in reed-based businesses (such as harvesters, producers, and sellers), the residents who currently have no association with the reeds but could benefit from using them, the local farmers who have reeds near their property, and the local government. From interviews with these stakeholders we also identified problems that are typically associated with community-based projects similar to this one.

3.3.1 Interest of the Government

As mentioned above, we interviewed officials of the local government organizations that have jurisdiction over Mariental (Refer to Appendix E for the interview protocol). In addition to determining the potential assistance the government organizations may be willing and able to provide, we also asked the government officials about their opinion on using the reeds as an economic opportunity and their contributions to past development projects.

3.3.2 Interest of the Residents of Mariental

We interviewed local residents and owners of businesses in Mariental to better determine their overall interest in participating in a reeds business initiative and to understand the problems that the community may face when starting such a business initiative. We interviewed workers from various Community-Based Organizations (CBOs) in Mariental, including the Tso Tso Stove Project, the Mushroom Project, and the Paperworks Project (Refer to Appendix K for the interview protocol). We also spoke with two workers at Mariental Hardware (Refer to Appendix H for interview protocol) and the owner of Oom Jeas Joinery (Refer to Appendix K for interview protocol). From all of the representatives of CBOs and businesses interviewed, we inquired about how their businesses were started, any problems they had faced, and if they would be interested in venturing into a business involving the production of reed products. Since CBOs work closely with people in the communities

they are part of, we also got the opinion of the CBO workers on how successful they thought a reeds business initiative in Mariental would be.

We also interviewed residents in the informal settlements of Mariental to determine their interest in using the reeds or harvesting the reeds for indirect or direct profit (The questionnaire used can be found in Appendix L). We interviewed people in four informal settlements: Donkerhoek, Takarania, Ombili, and Oshiwana Penduka. Based on the number of households, the largest settlement was Takarania, so eleven interviews were held there. Since the other settlements were of similar size, five to seven interviews were held in each of those settlements (Donkerhoek, Ombili, and Oshiwana Penduka). We conducted a total of thirty interviews in the informal settlements.

We began each interview by assessing what skills the interviewee had working with their hands to determine if they had any skills that they could apply to making reed products. In each interview we also determined if the person was aware of any uses for reeds and if they had any experience in using reeds. If a person had a skill that could be applied to using reeds, then we asked them more detailed questions. This information was used to determine the knowledge base of the community regarding reed products. We also determined if they would be interested in harvesting and producing reed products and where they thought the market potential was for reed products. This helped us further determine if a reeds business initiative would be successful within the community. Finally, we asked the residents if they had any suggestions or recommendations for starting a reeds business.

3.3.3 Interest of the Hardap Irrigation Scheme Farmers

Some of the Hardap Irrigation Scheme farmers were also interviewed since their properties are located along the critical stretch of the Fish River and reeds grow near or on their properties. We interviewed the local chairman of the NAU, which is an organization that represents the commercial farmers of Namibia (The interview protocol can be found in Appendix F). We also interviewed a local farmer on the irrigation scheme. From the interviews, we determined how the members of the NAU feel about the extensive reed growth in the river and what they think should

be done, and how the reeds affect the agriculture business. We also determined how involved the farmers would like to be with a reeds business initiative and if they were willing to work with the community, such as if they are willing to provide access to the reeds through their private property.

By interviewing some of the stakeholders that are or could potentially be involved with a reeds business initiative, we determined if any reed harvesting and production would be socially sustainable in Mariental. If any of the stakeholders would not be willing to cooperate with a business, then conflict could arise in the future and must be addressed properly. From these interviews, we tried to determine the possible social conflicts of implementing a reeds business initiative in Mariental. We also assessed the interest of each stakeholder group in participating in such a business.

3.3.4 Mariental Feedback Session

After our preliminary data analysis, we travelled back to Mariental to present our preliminary results to the various stakeholders that we had interviewed during our previous visit to Mariental. Overall, there were 26 attendees (mostly residents from the informal settlements of Mariental) at the feedback session, including the Honorable Councilor of the MUCDC, Barachias Namwandi. In addition, there were also representatives from the Mariental Municipality, the MUCDC, and the MGECW. Our presentation was followed by an organized discussion translated by Kenneth “Lucky” Ganeb, employee of the Desert Research Foundation of Namibia.

During the subsequent feedback session, the stakeholders were asked to provide their suggestions about management of a potential reeds business initiative, uses of reeds, and marketing of reed products. The participants were separated into three groups, and each group conducted a brainstorming session on each topic. The government officials in Mariental served as translators for each group. The participants were instructed to present their ideas to the translator, who subsequently wrote it down on appropriate yellow, orange or green card, for ideas related to management, uses of reeds, and marketing, respectively. After this session was finished, the three groups came together, and grouped the colored cards into categories based on the overall opinion

of the participants. This allowed us to both reinforce the data collected previously, and gain some new insight into these various issues (management, uses of reeds, and marketing).

3.4 Determine Sustainable Uses

We determined which uses would be feasible in Mariental by examining the environmental, economic, and social sustainability of each reed use. We determined the environmental sustainability of reed uses by evaluating what products could potentially be made out of the reeds based on their characteristics. We investigated uses for reeds that had been sprayed with herbicide and uses for unsprayed reeds. Any reed use that did not seem possible based on the physical characteristics and available quantity of reeds was considered environmentally unsustainable for a reeds business initiative.

For a reed use to be considered economically sustainable there needs to be a constant demand for that product. Based on our interviews, we determined what reed products had been previously purchased, are being purchased currently, and might be purchased in the future. Uses that were purchased only in the past demonstrate a market which may or may not exist in the future. Business owners that said they sell reed products currently and those would purchase these products in the future demonstrate a potential consistent market. These uses were considered for further analysis. Any reed use that had no market was considered to be not economically sustainable.

We determined if a reed use was socially sustainable by identifying which reed products the members of the community that we interviewed were interested in producing. We first identified which reeds uses the community was aware of or had skill in producing. This was necessary because if someone is unaware of a reed use then he or she cannot be interested in producing that product. Therefore, we first identified which reed uses the community was most aware of and then looked at how many people were interested in producing that product. If a relatively high number of people were aware of or skilled in making a reed product and were interested in producing that reed

product, then we considered that reed use to be socially sustainable. Any reed use that did not meet these requirements could not be socially sustainable. Analyzing the knowledge base of the residents also allowed us to identify the potential training required for each use.

To compile a list of potential sustainable uses of reeds in Mariental, we considered all three elements of sustainability. Based on the reasons that reed uses did not meet one or more of the defined sustainability criteria, we identified the associated problem and further investigated how this problem could be solved by conducting a Reed Business Initiative SWOT Analysis.

3.5 Reed Business Initiative SWOT Analysis

To identify the feasibility of starting a reeds business initiative in Mariental, we conducted a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis by analyzing these factors with regard to a potential reeds business initiative. The SWOT analysis is split into external and internal factors. Internal factors include those that a business manager would be able to control, such as hiring people, purchasing supplies, and providing storage for products. External factors include elements that are outside the control of the business manager, such as external funding, the demand for certain products, or the cooperation of other organizations. Internal factors are then split into two categories, strengths and weaknesses. The strengths of the business are elements that can help the business (for example, people that have experience producing reed fences). The weakness category identifies problems that could hurt the business, such as cooperation between various ethnic groups. A similar division is done for external factors, which are Opportunities and Threats. Opportunities are factors that the business could take advantage of in order to negate a weakness or increase the success of the business. Threats are problems that could potentially cause the business to fail in the long term.

Our analysis was based on the interviews conducted in Mariental and Windhoek. We created various sub-categories for each SWOT category, such as management, marketing, social, resources, and future availability of the reeds. By reviewing the data collected from the interviews,

we recorded the relevant information in the appropriate categories and sub-categories. Afterwards the weaknesses of starting a reeds business initiative were reviewed and possible internal solutions that a business manager could implement to negate the weakness were identified. If a weakness could not be resolved internally, then we identified opportunities that could help negate the weakness of the business. The potential threats that cannot be resolved need to be further investigated in order to determine if a reeds business initiative is feasible in Mariental. The next chapter presents the results and analysis of our data collection using these methods.

Chapter 4. Results and Analysis

In this chapter we discuss and analyze the results of our research, which had the objectives of understanding the situation involving the reeds in Mariental, determining the characteristics of reeds and their future availability, identifying potential markets for various reed products and external sources of assistance, and assessing the interest of all the stakeholders in a reeds business initiative.

4.1 Past, Present and Future Status of the Reeds

In order to better understand the reed problem in Mariental we received information regarding the past removal attempts and the ownership of the reeds.

4.1.1 Past Removal Attempts

According to Mr. Piet Jansen of MAWF, only a small amount of reeds were in the river in 1961, when the Hardap Dam was built. Since then, the reeds have grown rapidly and he has witnessed the riverbed rising from sedimentary deposits, which Dudley Biggs has also confirmed. Mr. Jansen remembered when one was able to ride a horse under one of the local bridges that is now only inches above the riverbed. According to Mr. Jansen, this rise in the riverbed can be attributed to reed growth (for a summary of our interview with Mr. Jansen, see Appendix N).

During our interviews it was also confirmed that the residents of Mariental want the reeds to be removed from the riverbed, and that there were attempts in the past to remove the reeds. Most of these attempts have failed to control the reeds because the programs that were established to remove the reeds did not continue for an extended period of time. In the 1990s a program was established to remove the reeds by hiring local laborers. Both Piet Jansen and the NAU Chairperson said that the project failed because the participants were only focused on earning money and did not focus on doing the job properly.

Mr. Jansen informed us of a later attempt to remove the reeds. Water was drained out of pools that had formed in the riverbed where the reeds were in an attempt to dry them out. This

failed because there were regions in the river where deep gullies existed, and those were impossible to completely drain. Also, after heavy rainfall these drainage ditches would fill up with water again.

Two additional attempts to remove the reeds in the past consisted of having cattle graze in the reeds. Both Mr. Jansen and Axab Skrywer stated that a few years ago, two people were asked if they could harvest the reeds for cattle fodder. This program was not successful in removing the reeds completely because the reeds were not removed on a continuous basis, and also transport of the reeds was an issue. This was because the people participating in this program had to travel 80 kilometers to get the reeds and during the rainy season the reeds were not needed for fodder. Piet Jansen and a local farmer on the Hardap Irrigation Scheme, informed us of a second attempt to use the reeds for cattle fodder. They mentioned that in 1995 the government built fences around areas that contained reeds and rented out these areas to livestock farmers so their cattle could graze on the reeds. The cattle did eat the reeds, but this was also not successful because farmers' cattle were lost or injured due to various hazards in the river, including sink holes and cattle theft. After each of these projects using reeds for cattle fodder ended, the reeds grew back. From these attempts, it can be concluded that cattle grazing the reeds is not a sustainable method to remove the reeds.

For a summary of the information we received from Mr. Dudley Biggs, Mr. Piet Jansen and Mr. Axab Skrywer, the NAU Chairperson and a local farmer, see Appendices E, O, and P, respectively.

4.1.2 Ownership of Reeds

Another concern for using the reeds for income-generation is the ownership of the reeds. The reeds are located both in the Fish River, on the banks of the river, and in the irrigation channels on the farms that border the Fish River. To confirm this we talked to farmers, DRFN Associates, and representatives from several government agencies.

Paul Nghiwilepo, the CEO of the Mariental Municipality, explained that portions of the Fish River are owned by different organizations. The Municipality's boundary extends two kilometers outside of the town to the middle of the river, so the reeds in this section are owned by the Municipality. The rest of the river is owned by the Ministry of Agriculture, Water and Forestry, since

in general, any open spaces are owned by the central government. Along part of the river, some of the irrigation farmers own the land up to the river. We also determined that although the irrigation channels are on the farmers' property, the channels and their contents are technically owned by the central government. This fact was confirmed by Dudley Biggs. For a summary of the information we obtained from Paul Nghiwilepo, refer to Appendix N.

The chairperson of the local Namibian Agricultural Union, stated that there are reeds growing in the irrigation channels on farmers' property, but the farmers are responsible for removing these reeds themselves. The local farmer that we interviewed stated that reeds do grow on some areas of her property. From our own observation, the reeds do grow in the drainage channels and in various locations on the property of the farms.

Overall, the ownership of the reeds is divided among three parties, the Municipality, the State, and the farmers. Therefore, the opinions of all of these stakeholders need to be taken into account when initiating a business to harvest the reeds. With a more thorough understanding of the situation in Mariental with regards to the reeds, we next investigated the environmental sustainability of a reeds business initiative.

4.2 Environmental Sustainability

Environmental sustainability is an important aspect to consider when starting a business utilizing a natural resource. We determined environmental sustainability of using the reeds in Mariental by determining the characteristics of the reeds and identifying factors that affect the future availability of reeds.

4.2.1 Characteristics of the Reeds and their Uses

By observing the reeds in the Fish River, we identified two species of reeds in Mariental. The *Phragmites australis* are shorter, thinner reeds, which have flowers on top of the shoots. The other species is taller, thicker, and stronger than *Phragmites australis*, and typically does not have flowers (see Figure 5). The *Phragmites australis* are located extensively in the river along the critical stretch

from the Hardap Dam to Mariental. During the rainy season, these reeds could be difficult to access if water is flowing. Throughout most of the year the majority of the riverbed is dry, with pools of water in various locations. There are a few bridges that cross the Fish River in the critical stretch that could help to provide access to the reeds, but most of the shoreline borders farm property. The second species is located in patches throughout the river as well as in the irrigation channels surrounding the irrigation farms. These reeds in the irrigation channels would not be accessible without going near or on the famers' properties. We were unable to identify this second species, but possible candidates for this second species can be seen in Section 2.1.

Figure 5: Two species of reeds in the Fish River, *Phragmites australis* (left), unidentified reed species that is taller and thicker (right).

To learn more about how the characteristics of the reeds affect how they can be used, we contacted Phillipus Iyambo, a resident of the informal settlements who constructs reed mats for sale, and other current and past reed harvesters in Mariental. They told us what reed characteristics they look for when harvesting as well as effects of the herbicide on the reeds that they have observed. We also learned what they make out of the reeds in the Fish River, when they harvest, and how quickly the reeds grow back.

In order to make mats and fences, Phillipus said that he harvests the majority of his reeds from the irrigation channels near the farmers' property where the second type of reeds, the stronger and

thicker reeds, are currently located (See Figure 6). Because the reeds have been sprayed with herbicide, large areas of the reeds in the Fish River are now dead above the ground (See Figure 7). Sometimes when the helicopter sprays the reeds it will miss patches in the middle of the river and good reeds will remain available to harvest. Other harvesters informed us that they harvest the reeds from the banks and the middle of the Fish River where some of the reeds remain in water. Based on our observations and the information we received from current reed harvesters, it is difficult to find strong and large reeds, such as those that are suitable for mats, along the Fish River. Most of these reeds are located in the irrigation channels. Therefore, we were unable to conduct a comprehensive survey of all harvesting locations and determine the condition of the reeds in these locations near Mariental. Further research is needed to quantify the amount of the good quality reeds in the critical stretch and in the area south of Mariental.

Figure 6: Phillipus Iyambo harvesting the unidentified taller and thicker reeds near the irrigation farms

Figure 7: Reeds Sprayed with Herbicide in the Fish River

The majority of the harvesters said they do not harvest during the rainy season to avoid high water levels. One current harvester said he cuts the reeds when the reeds are starting to turn from green to brown. One interviewee mentioned they do not harvest in winter because it is too cold, but another interviewee said that harvesting in the winter is better because the reeds are dried out and stronger. Based on these interviews it cannot be determined when the best harvesting season would be, but rather it would vary depending on the reed characteristics necessary for the intended use.

When the harvesters go out into the river to cut the reeds, they look for certain characteristics in order to make a proper reed fence or mat. Most of the harvesters mentioned they look for reeds that are straight and not bent. Other properties mentioned included size, thickness, and strength. For making reed mats, the reeds harvested should be of the same size and thickness. One harvester compresses the reed in her hand to know how strong it is, because the stronger reeds are most suitable for construction material.

Some of the harvesters informed us that after being cut, the reeds will start to grow back in about 1-2 weeks. Another harvester witnessed the reeds grow back to their full height after approximately one year (assuming this was before the spraying had begun in April of 2008). The growth rate of the reeds and the rate of regrowth after cutting are important factors in determining a sustainable harvest rate, along with how many reeds are available.

Phillipus Iyambo also informed us about the effects of the herbicide that he has observed on the characteristics of the reeds. Although the sprayed reeds are dead above ground, new shoots

have started to grow up between the dead reeds stalks (See Figure 8). We have also confirmed this through direct observation during our visit to the Fish River. However, Phillipus thinks the roots of the plant have been affected by the herbicide because the new shoots that grow up are weaker and thinner than reeds that have not been sprayed. These reeds also do not grow back to be the same height and grow back slower than normal. Sometimes the herbicide only reaches the top parts of the reeds since the reed beds are so dense. It affects only the top part, which will die, and then rot and decay. However, the bottom part of the reeds will remain strong enough for reed mats and fences. If the dead reeds are used to make a product, they decay faster than reeds that are harvested alive. The NAU Chairperson and a local farmer on the Hardap Irrigation Scheme expressed concern that most of the reeds are potentially useless because of the spraying. Besides the new reed growth among the sprayed reeds, none of these claims about the effects of the herbicide on the reeds has been confirmed through our research.

Figure 8: New reed growth among dead reeds in Fish River

A summary of the information we obtained on harvesting reeds from those with experience in this area can be found in Appendix P. Based on these interviews and observations, we know that the unsprayed reeds in the Fish River can be used for reed mats, fencing, and shading, but we cannot confirm other uses. We have not found multiple sources stating the reeds in the Fish River have

been used to produce other products. It is also uncertain how the spraying will impact the use potential of the reeds and if any good quality reeds will be available into the future.

Andreas Wienecke of the Habitat Research and Development Center (HRDC) offered a lot of ideas for how to use the reeds in Mariental, and confirmed some of our background research on uses. He suggested that the reeds be used for cattle fodder and biogas. He also mentioned that the reeds could be used for roofing material. The benefit of this is that it keeps the house cool. A drawback of using reeds for roofing material is that they can easily catch fire. Reeds are used for roofing material at the HRDC and Andreas suggested that the reeds in Mariental should be experimented with to determine the best way to use them for roofing. Reeds are also used at the HRDC for doors and cabinets. Other uses of reeds that he mentioned were crafts, furniture, bandages, firewood, bird cages, food, and paper production. More research needs to be conducted to determine if the reeds can be used to produce these products.

4.2.2 Future Availability of Reeds

The Mariental Flood Task Force decided the reeds should be sprayed with herbicide, twice a year for five years, in order to eliminate the reeds completely. The spraying of the reeds was considered a threat in our SWOT analysis, which can be seen in Appendix L. The job was contracted to a local farmer who owns a helicopter capable of spraying the herbicide (For details of our interview with the contracted sprayer, refer to Appendix O). The chemical used to spray the reeds is called Tumbleweed. The chemical name for Tumbleweed is glyphosphate-isopropylammonium. According to the local Namibian manufacturer, Enviro Weed Control Systems, Tumbleweed is a “high surfactant, non-selective soluble liquid herbicide with systemic action for the post emergence control of annual and perennial weeds in agricultural and non-cultivated areas” (Enviro Weed, 1998, p.1). Tumbleweed is non-selective and can kill most plants depending on the concentration applied. Since the chemical is systemic, it is absorbed by the leaves on the plant and is then translocated throughout the plant down to the underground roots.

Tumbleweed is a relatively low toxicity herbicide that is approved for aquatic weed control, but can be dangerous to fish if the recommended concentrations are not used. The chemical should also not be allowed to enter drainage, ground, or surface water in high concentrations. The chemical presents no long-term threat to wildlife. Tumbleweed is degraded mainly by microorganisms. The average half-life of glyphosate is 60 days in soil, and only a few days in water (U.S. Environmental Protection Agency, 2006). It is adsorbed to suspended organic and mineral matter in water. When not in water, it is adsorbed on soils, especially those with high organic content. Therefore, the chemical typically does not leach or get transported by water from the area where it was applied. According to the manufacturer, Tumbleweed is not supposed to have any negative impacts on the environment or ecosystem. For more information on Tumbleweed, refer to Appendix Q.

As we have observed and learned through interviews with current harvesters, the herbicide is effective at killing the above-ground portion of the reeds; however, due to the nutrients stored in the rhizomes, the underground roots can survive the spraying. Therefore, new shoots grow up between the dead portions of reeds. If the reeds are sprayed at the beginning of the growing season, available nutrients are not stored in the rhizomes, causing the shoots to grow back weaker and thinner. From aerial photographs of the Fish River, it can be seen that the chemical is effective at damaging the reeds (See Figure 9).

Figure 9: Aerial photos of the reeds in the Fish River, before spraying (left) and after spraying (right).

We have also been informed by the local chairperson of the NAU that the sprayed reeds are periodically burned by the farmers to remove the dead shoots from the river. However, the next

growing season following the burning, new shoots will regrow from the rhizomes since they will be unharmed from burning. Currently the dead reeds are still in the river, and it is possible that the damaged reeds can still be used for some applications; however, this has not yet been confirmed.

The Mariental Flood Task Force and the local government are investigating methods other than spraying to remove the reeds. Paul Nghiwilepo of the Mariental Municipality said that the De Beers Mining Company has been contacted as a possible organization to dredge the channel. Engineers from the company visited the Fish River in March 2009 to assess the situation and determine if the equipment that they use to mine diamonds in aquatic environments can be used to remove the reeds from the river. The company is currently drafting a proposal to the local government to dredge the channel and remove the reeds. If the government accepts the proposal and the dredging of the channel is successful, then the reeds and their roots will be completely removed from the riverbed along the critical length. However, there will still be reeds to harvest from the banks of the river along the dredged portion, and in the irrigation channels.

As we mentioned in our SWOT analysis, the amount of usable reeds that are available may directly affect how many reed products the business is able to produce. The amount of reeds that will be available for a business initiative in the future is uncertain. As we have seen from our background research, the reeds are very difficult to eradicate. Therefore some of the reeds may still remain in the riverbed after the eradication attempts. The long-term effects of spraying on the reeds and the ecosystem also have not been determined, which could cause other unknown problems for a reeds business initiative. The amount of reeds that this business initiative would require also depends on factors such as harvesting rate, and growth rate of the reeds.

To determine if a reeds business initiative could be environmentally sustainable, we investigated the characteristics of the reeds and their future availability to determine how these factors will affect how the reeds are used. Another factor that influences the success of a business is whether or not there is a strong and consistent market for the products, and enough funding to start

the business and keep it running. Therefore, the next area that we investigated was whether using the reeds for income-generation would be economically sustainable.

4.3 Economic Sustainability

Economic Sustainability is an important part of our research into the feasibility of using the reeds for income generation. A business initiative cannot be successful unless start-up costs are met and a steady market is found for reed products. We investigated these aspects in Mariental and in Windhoek.

4.3.1 Market Potential

Having a market for the reed products is very important for any business that is started in Mariental. Theresa Basson, from the Hardap Regional Council, and Paul Nghiwilepo, from Mariental Municipality, stressed the importance of determining the market in order to have a successful business (See Appendix N for a summary of our interview with Theresa Basson). It is also necessary for a business to have profit in the long-term in order for the business to maintain its capital for future investment.

Markets Within Mariental

From our interviews in Mariental with past and current producers of reed products, such as mats, we obtained information on who they sell products to, and how well the products sell. The producers stated that the main consumers of reed products were local residents of Mariental and neighboring farms, and owners of nearby lodges, including Anib Lodge. They also mentioned that sometimes people from Windhoek or Gobabis come to Mariental to purchase reed bundles or reed products. People requesting custom reed products, such as reed mats, make up the majority of their sales. The harvesters that we interviewed have been able to meet the demands for reed products. For a summary of the interviews with current and past producers see Appendix P.

The owner of Mariental Hardeware, whose business manufactures reed mats, sells approximately 10-20 reed mats per month. They sell mats that are 5 meters long and 1, 1.5, or 1.8

meters tall (See Figure 10). It costs the owner N$150 to make a 1.8 x 5 meter mat, and he sells these large mats for N$250. The owner said he would be willing to provide materials to residents of Mariental to produce reed products and he would buy the mats from them to sell in his store. He would also provide the transportation of the products from their homes to his store. Some of the harvesters that have been temporarily hired by Mariental Hardeware to harvest the reeds in the past believe that the amount of money they receive for their work was not sufficient. For a summary of our interview with the owner of Mariental Hardeware, refer to Appendix P.

Figure 10: Reed Mat for Sale at Mariental Hardeware

During our interviews with the residents in the informal settlements, we asked where they thought the markets for reed products exist. Out of the 37 interviews in the informal settlements, 24 responses were received in response to this question (See Appendix S for Raw Market Data) A significant number of respondents believe that tourists are potential markets for reed products. (See Figure 11).

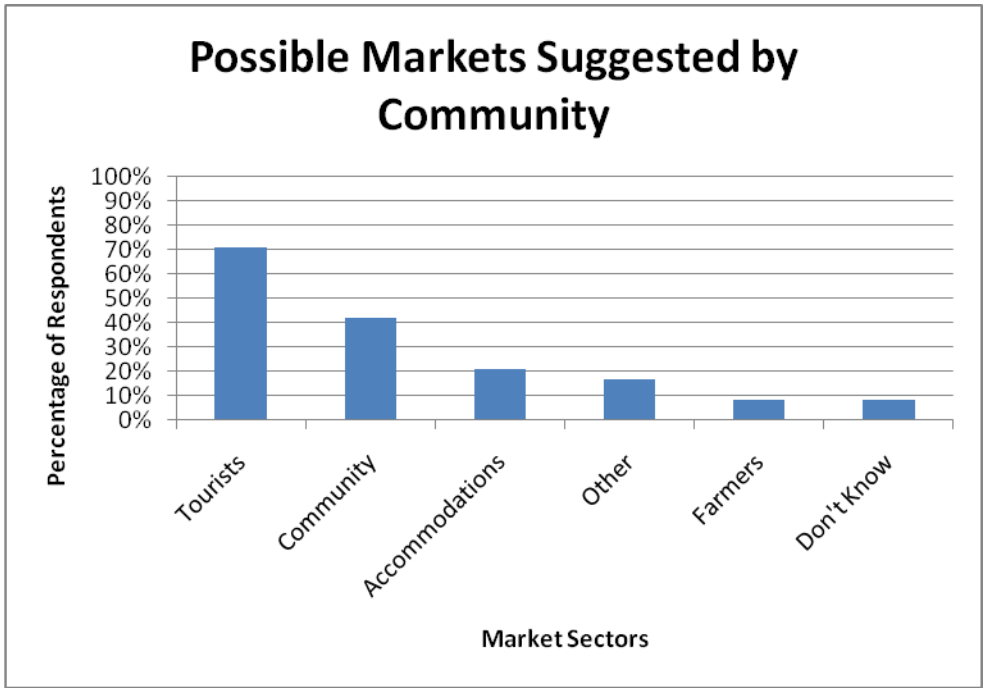

Figure 11: Possible Market Sectors

We conducted our own research into different markets for reed products. According to Axab Skrywer, representative of the Mariental Urban Constituency Development Committee, tourists typically stop in Mariental to refuel and take a break from travelling to their destination. The service station on the main B1 highway is outside of the town and therefore tourists do not typically drive through the center of town where markets could be established for reed products attractive to tourists such as handicrafts. There are plans to construct an open market on the B1 highway where the service station is located. Until this open market is constructed, the tourism market for reed products is larger outside of Mariental, such as at accommodations and craft centers in Windhoek. The tourism market outside of Mariental will most likely be larger even if an open market is constructed.

Overall the market for reed products is not very large in Mariental, which was considered a threat in our SWOT analysis. Tourists typically do not visit the town, and Mariental Hardeware is currently the only established business that sells reed products, although there are individuals in Mariental that make reed products upon request. We learned from our interviews with the owner of

Mariental Hardeware and these individuals, that the demand for reed products is not very consistent. We learned from The NAU Chairperson that compost and cattle fodder could potentially be sold to farmers, although this has not yet been tried. For a reeds business initiative to secure a sustainable market for reed products, based on our data, it may be best to market the products outside of Mariental.

Accommodations in Windhoek

We interviewed seven managers of accommodations in Windhoek; the majority stated that they would be interested in being involved in a reeds business initiative to benefit the citizens of Mariental. A majority of the lodges have never used reeds before, but a few lodges, including Leading Lodges of Africa, owner of eight major Namibian lodges, currently use reed products for decoration because they strive to create an African appearance. The manager of Leading Lodges said they always have a constant need for reed products due to periodic refurbishing. Leading Lodges typically buys from local sellers in Windhoek because they are interested in supporting the community.

Although the majority of accommodations have not used reeds before, many of the lodges had used materials similar to reeds for both structural and decorative uses, specifically thatching grass for roofing material. It is possible that the reeds could be used for roofing instead of the thatching grass if the properties are similar.

All of the lodges with an African theme were interested in using reed products for decoration. The accommodations that have gift shops also stated they would be willing to sell reed products made in Mariental. Some of the reed products that the managers of the accommodations mentioned they would be interested in using for decoration included room dividers, fencing, mats, and window shades. They also mentioned that they would be interested in selling small crafts if they had gift shops in their accommodations. Whether these accommodations use reeds currently, use

reed-like products currently, or are willing to use reed products in the future can be seen in the Figure 12.

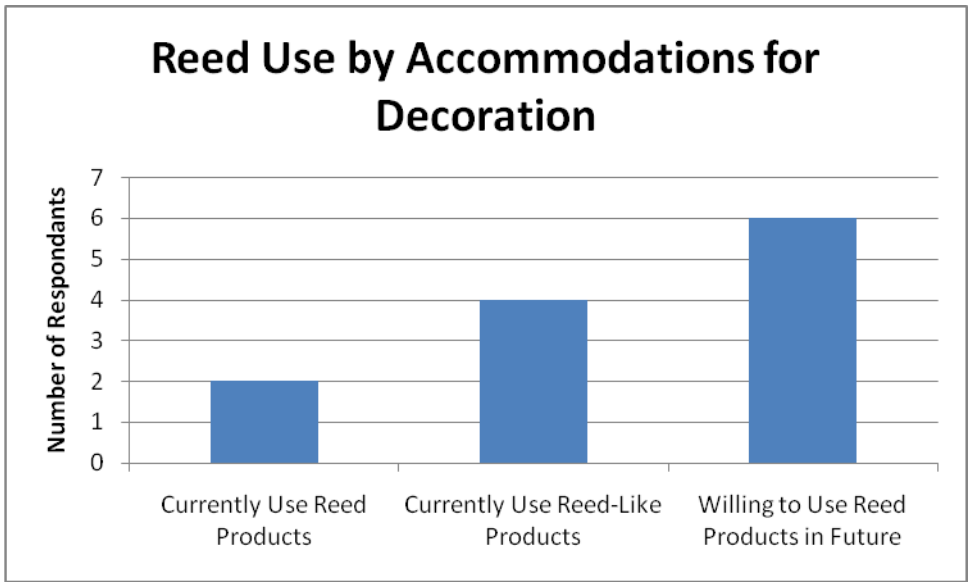

Figure 12: Current use of reeds and similar materials for decoration by accommodations, and their willingness to use reed products in the future.

A potential problem with marketing reed products to accommodations is that accommodations that prefer a more modern décor would not buy reed decorations. Another threat is that a few of the owners mentioned they were concerned with a fire hazard when using reed products for decoration as well as the rate of decay of the products. However, although our sample size is small, the results indicate a favorable response. Summaries of our interviews with owners and managers of accommodations in Windhoek can be viewed in Appendix T.

Craft Shops in Windhoek

Out of the seven craft shops that we interviewed, none had sold reed products before, but the majority had sold products made from a type of plant material, such as palm baskets. The owners of these shops stated that these products sold very well to tourists, and the overall opinion is that products made from reeds would also appeal to the tourists. Therefore, all of the shop owners were willing to try to sell reed products made in Mariental.

When marketing to craft shops there are several things that need to be considered. Many of the craft shops owners want to sell products that are unique because they appeal to the tourists, and therefore, the owners prefer to sell products that other vendors do not sell. It was also said that tourists prefer products that are made in Namibia. Another common opinion of the shop owners is that tourists prefer smaller items, such as baskets, placemats, or coasters, because they are easier to transport when they are traveling back to their country of origin. Tourists sometimes complain about the weight and volume of products. Nomad craft shop used to sell photo frames made from reeds, which sold very successfully. However, they had trouble selling reed mats. According to the manager, any product that is big and bulky will not sell to tourists. Figure 13 below summarizes the findings from interviews with owners and managers of craft shops.

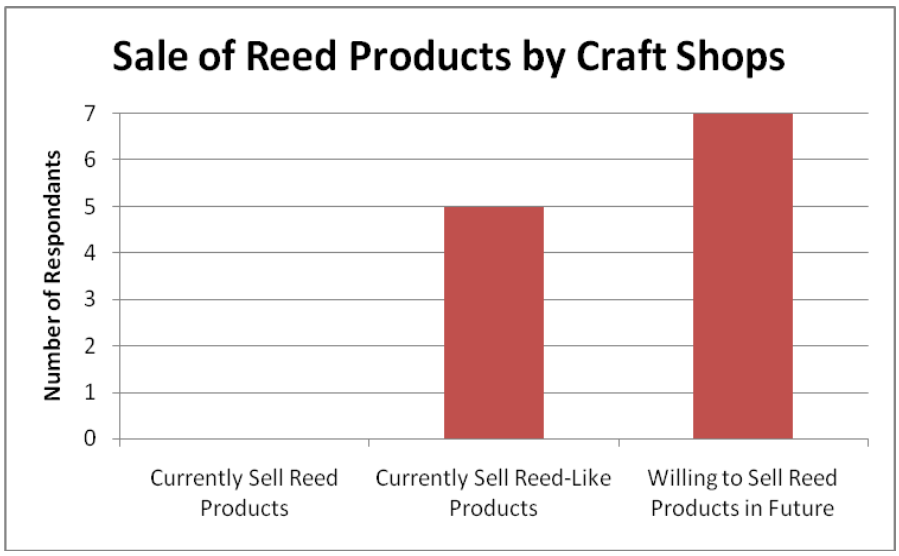

Figure 13: Summary of Craft Shops using reed products for sale.

Marketing to Accommodations and Craft Shops

From our SWOT analysis (see Appendix L), we determined that the majority of the owners of hotels and lodges that we interviewed were interested in being involved with a potential reeds business initiative, however there were a few conditions mentioned. The owners of the accommodations and craft shops stated they prefer that products are brought into their shop. This way they can see the products before they purchase them. The majority of owners we talked to

prefer this method over ordering from catalogs or brochures, because when ordering by catalog they cannot be sure that the products will be of high quality. Therefore, the majority of these shop owners purchase products from vendors that come into their store to show off their products. The owners typically do not travel to other locations to find products to sell. The owners of the craft shops also mentioned they prefer when there are a limited number of middlemen between the producer of the product and the person bringing the items into the store for sale. With an increased number of people involved with the transportation and sale, the price of the product significantly rises. If the prices become too high, then the tourists will not purchase them. Summaries of our interviews with the owners of craft shops in Windhoek can be viewed in Appendix U.

4.3.2 Capital and Other Resources

As we determined from our SWOT analysis, capital and other resources are a necessity for any project or business to be started. During our interviews, we determined what resources the residents of the informal settlements believe that they would need in order to participate in a reeds business initiative. We also identified what resources different government agencies may be able to provide. In order for the reeds business initiative to start, many residents think that pangas (machetes), fastening material, and various manufacturing supplies were necessary, as show in Figure 14 (The Raw Social data can be found in Appendix V). The manufacturing supplies mentioned included varnish, sticks for stabilizing a reed mat, pliers, glue, sandpaper, cleaning materials, and needles to thread the reeds together. For harvesting, pangas and protective clothing such as boots are required. Ideally, these items would only have to be purchased once and can be considered start-up costs. Resources for products such as small items that can be sold to tourists, such as those in the "other crafts" category, will vary, and further investigation will need to be done to determine what minimal resources will be required in order to start producing those products. Theresa Basson, Director of Planning and Development Services at the HRC, advised that a larger business may need a place to base its operations. In her previous experience, participants have had problems with being able to store products before they were sold. The residents at the feedback session also

mentioned that a reeds business initiative should have a venue where they could operate from or store materials and products.

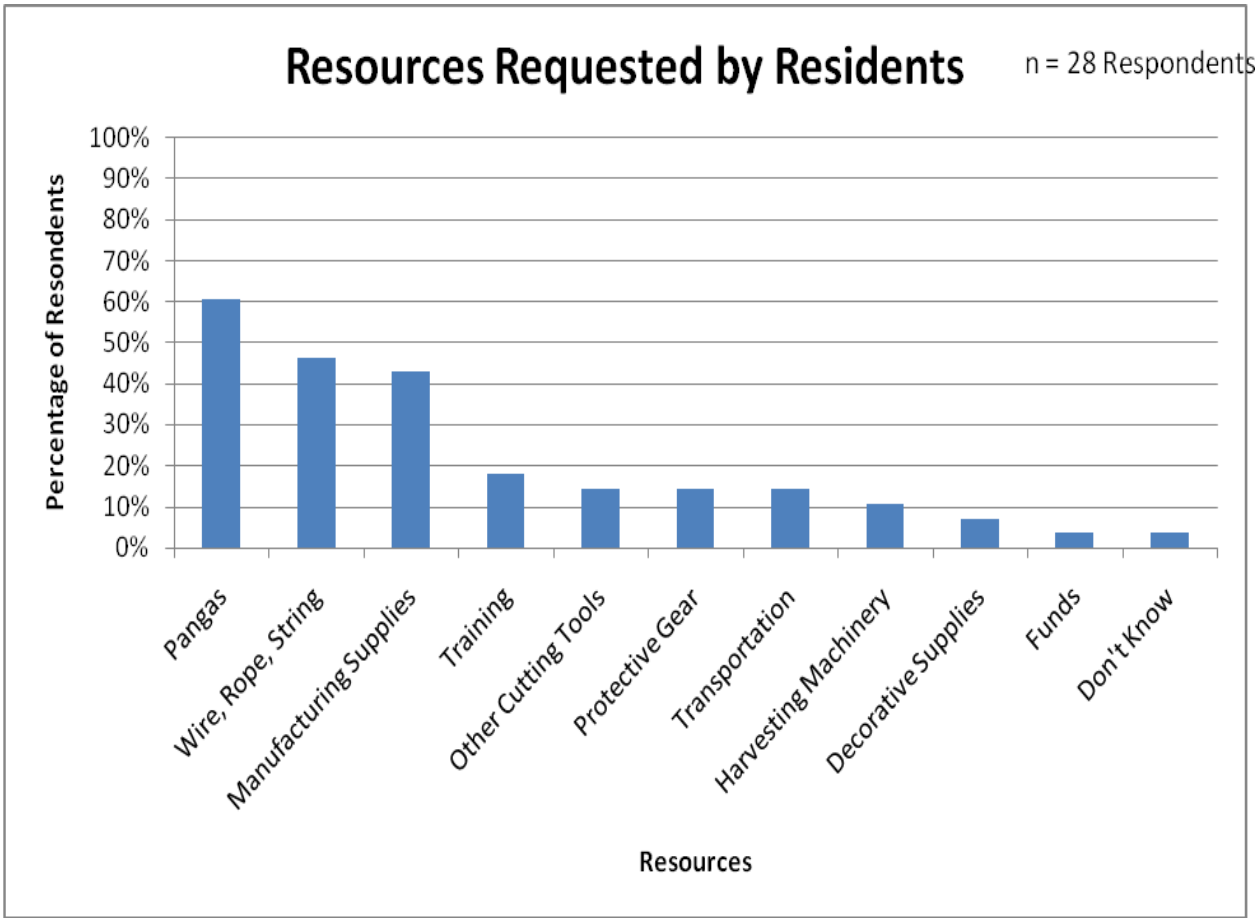

Figure 14: Resources Requested by Residents

We determined from our interviews with government officials in Mariental how they could potentially assist with this initiative. Each agency has assisted various types of initiatives in the past. The Ministry of Gender Equality and Child Welfare and the Mariental Municipality have provided funding for the Paperworks Project. The MUCDC provided funds to initiatives such as an internet café, coffin manufacturing, a hair salon, and a car wash. A summary of the resources that could be provided and could not be provided for the reeds business initiative is summarized in Table 5.

Table 5: Potential Assistance from Government Agency

Government Agency	Potentially Could Provide	Cannot Provide
Hardap Regional Council (HRC)	• Training • Technical Assistance • Various Materials	
Mariental Municipality	• Transportation • Various Materials	• Training
Urban Constituency Development Council (MUCDC)	• Funding	
Ministry of Gender Equality and Child Affairs	• Funding	• Training

We also received information from Community-Based Organizations (CBOs) in Mariental on what resources the government has provided them with in the past. Axab Skrywer made it clear that for a CBO to be established and to receive funding, the Urban Constituency Development Committee (MUCDC) requires that the products produced by a CBO be made by hand and sold directly to the customer, with no middleman. The MUCDC wants to see the CBO funded by the individuals' own money and have the initiative demonstrate potential success before funding will be provided.

From our interviews with owners and managers of accommodations we discovered that a potential external source of assistance is the Kalahari Sands Hotel and Casino. The marketing manager of the Kalahari Sands said that the hotel is involved in sponsoring a variety of community-development projects which benefit local communities. An example of this is the Plant Tunnel Project, in which the hotel sponsored plant tunnels (similar to greenhouses) for local residents of Windhoek to grow vegetables. The hotel subsequently bought vegetables from the owners of the plant tunnels. The manager specifically mentioned that the Hotel was interested in expanding these projects outside of Windhoek, so the hotel could be a source of potential assistance. This was considered an opportunity in our SWOT analysis. (See Appendix T for a summary of the interview with the manager of Kalahari Sands Hotel).

We asked some of the residents of the informal settlements how they could contribute to a reeds business initiative. Some of the residents that have used reeds in the past said that they are

willing to train others in the skills of harvesting and producing certain reed products. However others indicated that they are busy with their current job, so making time to train people may be difficult. Residents that do not have any skills in using reeds but have experience in managing or supervising a business also indicated their willingness to contribute their skills to this business. Information that we received from our interviews with residents of the informal settlements is presented in the following section regarding social sustainability.

4.4 Social Sustainability

Social Sustainability is an important aspect of any development initiative. To ensure that starting a reeds business initiative would be socially sustainable we determined what knowledge the different stakeholders had of reed uses, the interests of different stakeholders in harvesting reeds and producing or using reed products, the potential for the different stakeholders to cooperate in a business using reeds, how such an initiative should be organized and managed, and the resources that the participants in such a business would require. We achieved these objectives during our stay in Mariental by interviewing the three major groups of stakeholders in a potential reeds business initiative: irrigation farmers, representatives from government agencies, and residents in the informal settlements.

4.4.1 Interest of Residents in Mariental

The residents of the informal settlements in Mariental are a major stakeholder in a potential reeds business initiative. Since Mariental currently suffers from high unemployment, many people may be interested in participating if this business can provide income. To determine if this initiative would be socially sustainable, we determined the residents' skills with their hands, their knowledge of reed uses, interest in producing reed products, and how they would prefer a reeds business initiative be managed.

Skills Working with Hands

At the beginning of the interview, the residents were asked if they have any skills working with their hands to see how their skills could be applied to using reeds. Figure 15 shows a summary of the results. This result shows that people do have skills with working with their hands, but it was difficult to determine how their skills can be applied to different reeds uses. Based on the interviews with the current harvesters of reeds, the production of reed mats and fences is a skill that many people could pick up through practice with no previous skill necessary. Besides producing mats and fences, we have not confirmed the technical skills required for producing other products and if these skills vary significantly from product to product. Once a better understanding of what skills are required for producing each product is obtained, then this information can be used to determine if some residents in the community have the potential skills necessary for producing certain reed products.

Figure 15: Skills working with hands of the respondents in the informal settlements.

Knowledge of Reed Uses

The knowledge that different stakeholders have of reed uses varies. Some residents of Mariental living in the informal settlements have no knowledge of reed uses, while others have used reeds themselves for different products.

We first determined how much each interviewee knew about using reeds. We considered three categories of knowledge: people who know nothing about using reeds, people who are aware of using reeds but have not used reeds themselves, and people that have skills in using reeds. The percentage of people interviewed who fell into each category can be seen in Figure 16.

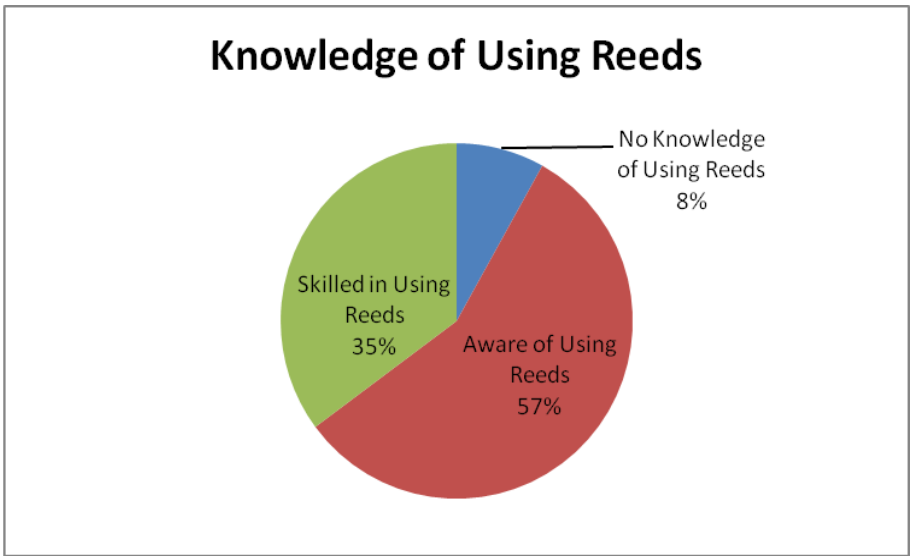

Figure 16: Residents of the Informal Settlements Knowledge of Using Reeds

We can conclude that out of the 37 people interviewed, the majority have seen or heard of someone using reeds and a significant portion of the sample have used reeds before to make products. These data give us a general idea of the knowledge base that the community has of using reeds.

We also determined which specific uses of reeds were well-known among our respondents. Many different uses of reeds were mentioned in our interviews. When analyzing the social sustainability of each reed use, we considered nine uses or categories of uses. These uses are fencing, shades, housing and other construction materials, buckets, mats, furniture, baskets, other

crafts, compost, and cattle fodder. We grouped these uses together based on popularity and similarity. The categories of the different uses of reeds that were mentioned in our interviews and the descriptions of these categories can be seen in

Table 6 below (pictures of some of these uses in Mariental can be seen in Figure 17- Figure 19).

Table 6: Categories of Uses of Reeds

Fences	• Fencing material • Shower/Toilet stalls
Shades	• Overhead shading structures
Houses	• Houses • Roofing
Buckets	• Buckets
Mats	• Mats
Furniture	• Tables • Chairs • Doors • Other joinery-related products
Baskets	• Baskets woven from reeds
Other Crafts	• Toys • Hats • Handbags • Jewelry Boxes • Photo Frames • Flutes • Pipes
Compost	• Reeds chopped up, left to decompose, spread over garden as fertilizer
Cattle Fodder	• Reeds used as food for cattle

Figure 17: Reed Fences - Fence in informal settlement (on left), Fence at Anib Lodge (on right)

Figure 18: Reed Mats made by Phillipus Iyambo, current reed harvester in Mariental

Figure 19: Shower stall made from Reeds in the informal settlements

Each time a specific use of reeds was mentioned in an interview it was recorded. If someone mentioned more than one use in one category, it was only recorded once. If a person mentioned multiple uses, it was recorded as such as long as the uses fell in different categories. We also divided the interviewees into two categories. In the first category are those who are aware of using reeds to make a specific product but have not made that product themselves. These people are considered aware of the reed use. In this category we also considered the people that are unaware of specific reed uses. In the second category are those who are aware of using reeds to make a particular product and have used reeds to make that specific product before. These people are considered skilled in that reed use. In this way we were able to determine how many people are aware of a particular use and how many people are skilled in this particular use. If we combine the percentage of respondents aware of each reed use and the percentage of respondents skilled in each reed use, then we can analyze the general knowledge of the reed use. The awareness of reed use and skill levels of the 37 people that we interviewed can be seen in Figure 20.

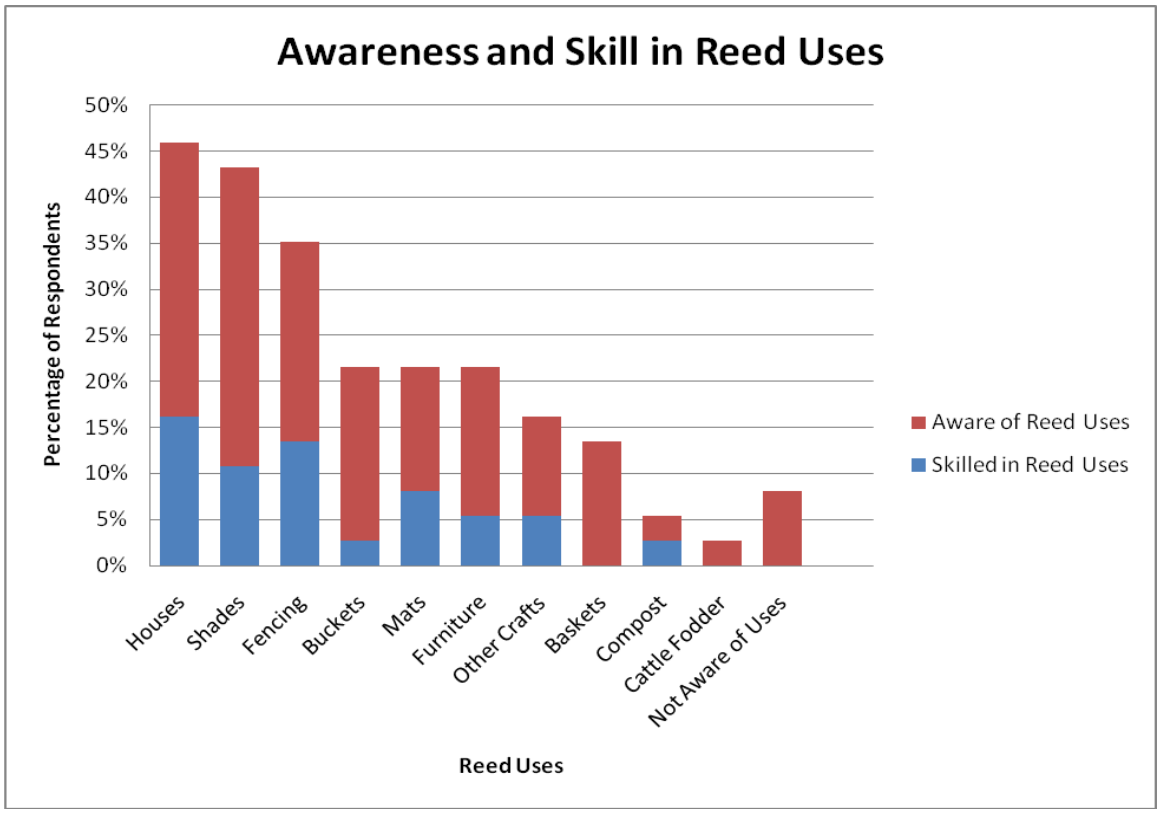

Figure 20: Percentages of respondents either aware of a reed use or skilled in a reed use.

These data show that the uses that the respondents are the most aware of and skilled in are fences, shades, and houses. Out of the respondents that are skilled in using reeds, the majority are skilled in these three uses. The higher number of people who have used reeds to make fences, shades, and houses indicates that there may be some people within our respondents willing to train others in these skills. We can also conclude that there is an overall lack of knowledge about using reeds for baskets, other crafts, compost, and cattle fodder.

During our feedback session in Mariental, the attendees discussed what reed products they would be interested in making. Table 7 summarizes some new uses that we had not previously considered.

Table 7: Summary of suggestions of community on potential uses of reeds.

• Curtains	• Cell Phone Holder
• Trays	• Pet Cages
• Plates	• Baby Cradle
• Jewelry	• Photo frames
• Lamp shades	• Hand bags
• Window and Door Frames	• Multi-purpose hangers
• Hats	• Flowerpots
• Clothes Pins	

Interests of potential producers and harvesters

Overall, we received a positive response from the people we interviewed about participating in a business harvesting and producing items using the reeds. The interests of the stakeholders in harvesting and their interest in producing reed products will be considered separately. As shown in Figure 21, a majority of the residents interviewed are interested in producing reed products.

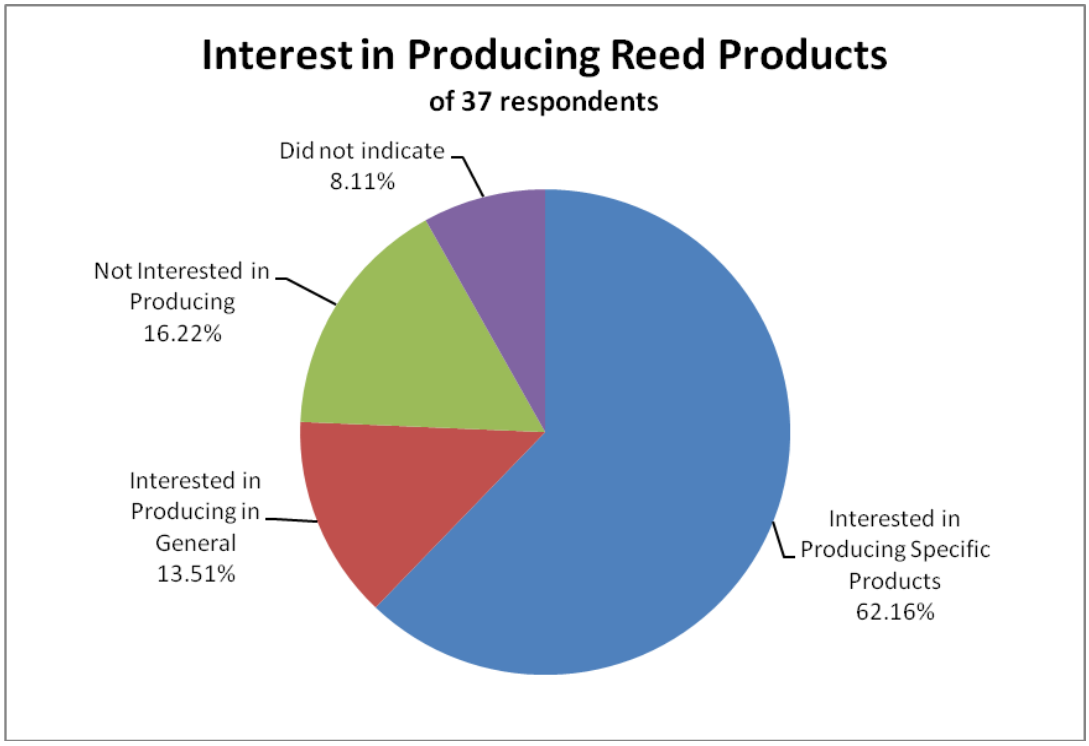

Figure 21: Interest of Respondents in Producing Reed Products

When determining which product the respondents are most interested in producing, we cannot draw any definitive conclusions by looking solely at which products they said that they were interested in producing. This is because a respondent's awareness of a reed product affects their interest in producing. If someone is unaware of the reed use, then he or she is not going to be interested in producing that product. However, when taking into account the general awareness of the products and the interest in producing together, we can draw some interesting conclusions.

We determined that if there are a relatively high number of people who are skilled in or are aware of a particular use, then the knowledge level for that use is "high." If not very many people are aware of or are skilled in the use, the knowledge is "low" for that use. We applied similar criteria for the residents' interest in producing. If the community members had a relatively high awareness of the use and there was a relatively high number of people in the community that were skilled in using reeds for a particular product (a "high" knowledge), and the community had a high interest in producing the particular product (a "high" interest), then that use would be socially sustainable. If a use had high knowledge but low interest, then it would not be socially sustainable because the

people that know about the use still do not want to produce that particular product. The social sustainability of those uses that had low knowledge and low interest could not be determined, because the fact that not very many people know about that use could contribute to the low interest in its production. Only after the people are fully informed of all the uses of reeds can a full analysis of the community's interest in producing these products be conducted. In Figure 22, the general knowledge in the community of a particular reed use can be compared with the interest of the community in producing specific reed products.

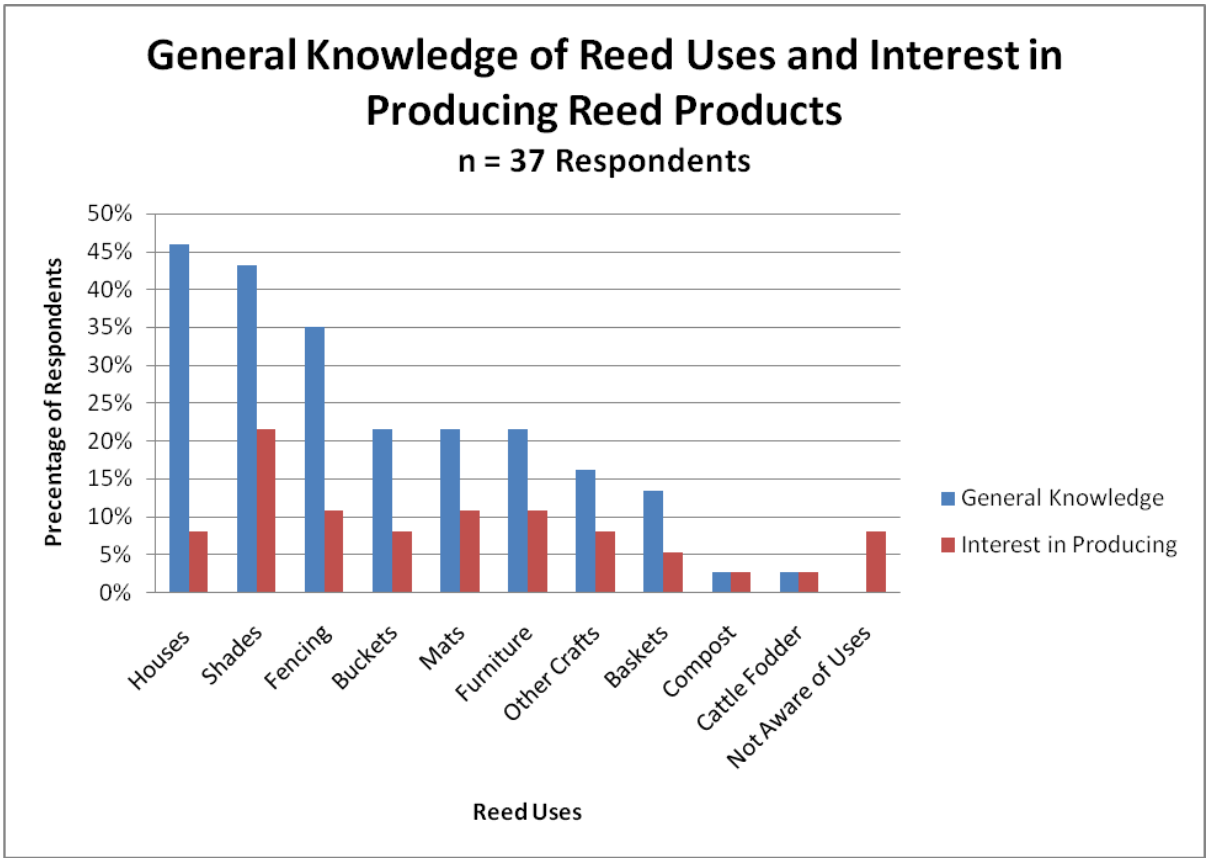

Figure 22: Comparison of Awareness and Interest in Reed Products

We can see from this graph that fencing and houses have a high awareness level but do not have a high interest level. As an example, 46% of our respondents said that they knew of reeds being used for housing material, but only 8% of these people were interested in using reeds for this purpose. We therefore considered these uses to have low social sustainability. Using reeds for shades could be a socially sustainable use, since over half of the people who are aware of using

reeds for shades are interested in producing this product. Since the community did not have a high awareness of or a high interest in producing furniture, mats, baskets, buckets, compost, cattle fodder, and miscellaneous uses, and also have a low awareness we cannot determine the social sustainability of these uses. If more people knew about these uses, it would affect how interested they are in producing these products.

Although there is a strong interest among our respondents in being involved in a reeds business initiative, there is not an overall strong interest in producing one specific reed product. There are several possible reasons for this. Four people mentioned that they specifically did not want to build houses out of the reeds; three of those four people did not want to make a house out of the reeds because it is a fire hazard. Two people did not want to make a fence out of reeds for the same reason. One person also did not see any benefit in using reeds for compost because the soil is too rocky for agriculture in general.

Additionally, someone may have had knowledge of reed uses but was simply not interested in using reeds. We received several responses, particularly from people from the Nama ethnic group, who indicated that only the people from the Kavango and the Ovambo ethnic groups used reeds. This cultural difference may explain some people's lack of interest in producing reed products.

Overall, those who are interested in participating in a reeds business initiative and producing reed products are also interested in harvesting the reeds. The hazards of harvesting were also considered in our SWOT analysis, which can be viewed in Appendix L. Of the 37 people interviewed, 34 indicated whether or not they would be interested in harvesting. Twenty-nine people would be willing to harvest the reeds, while 5 would not. When interviewing the community members, we asked what the dangers of harvesting in the Fish River were. Based on the responses, we divided these hazards into five categories: Snakes, Other Dangerous Animals, Water, Physical Hazards, and Dangerous Men. The hazard of snakes in the river was considered separately because the majority of those interviewed were aware of this danger. Other Dangerous Animals include crabs, scorpions, large lizards, crocodiles, insects and spiders, and baboons. The main hazard associated with water

was drowning. Physical hazards included sinkholes in the river, broken glass, and sharp stumps of cut reeds (see Figure 23).

Figure 23: Reed Stumps in the Fish River

Several people also mentioned the hazard of dangerous men hiding in the river. We also recorded the number of people that knew that hazards existed but were unaware of the specific hazards and the number of people that did not know that hazards existed. The percentage of respondents that mentioned each hazard can be seen in Figure 24.

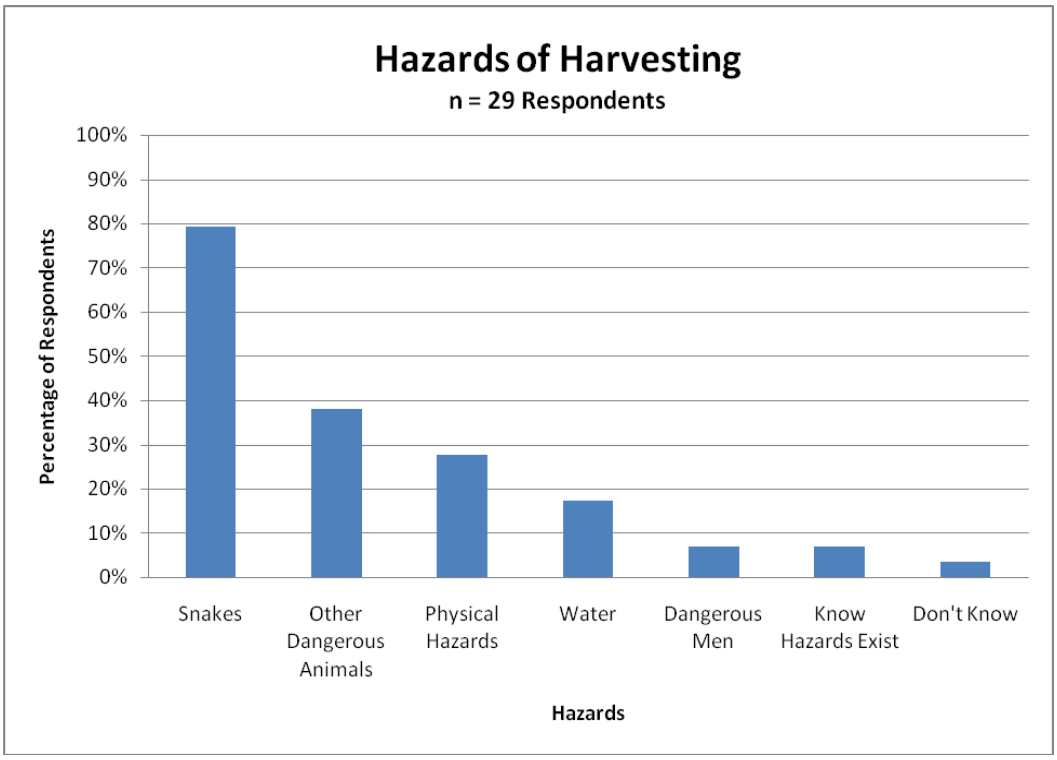

Figure 24: Hazards of Harvesting in the Fish River

From this chart we can conclude that the majority of those interviewed are aware of the hazard of snakes and other animals. This is important to consider because, as we determined from our SWOT analysis, many residents indicated they would harvest the reeds if the hazards were minimized either with protective clothing and gear or training.

Management

We also asked the residents of Mariental how they would want a potential reeds business initiative to be managed. We organized the suggestions we received about how a business should be managed through our SWOT analysis. Our full analysis can be seen in Appendix L.

Many residents indicated that they wanted a community-based management where a committee is elected to manage the business, as shown in Figure 25. The residents elaborated on this topic during our feedback session. The residents agreed they wanted to elect a committee with positions of manager, secretary, finance manager, and foreman. The committee and the participants in the business should hold regular meetings so that they can discuss issues and exchange ideas. Ten out of thirty-seven respondents from our interviews mentioned that a third party, such as the government, should oversee a reeds business initiative. Although not every resident was asked if a third party should be involved, the residents that attended our feedback session confirmed this opinion.

Another idea mentioned at our feedback session was that the management should find ways to provide training to the participants in areas such as leadership, skills, and bookkeeping. When interviewing the supervisors of three CBOs in Mariental (Mushroom Project, Tso Tso Stove Project, and Paperworks Project), they mentioned that an outside organization held a training session and then helped establish the project in the community, as can be seen in our CBO interview summaries in Appendix W. It is possible that such outside organizations could provide similar resources to a reeds business initiative. The supervisors of the CBOs also mentioned that, based on their experience establishing a CBO in Mariental, the residents would be interested in participating in a

reeds business initiative. The supervisors of Tso Tso Stoves and the Mushroom Project also said they themselves would be interested in participating in such a business.

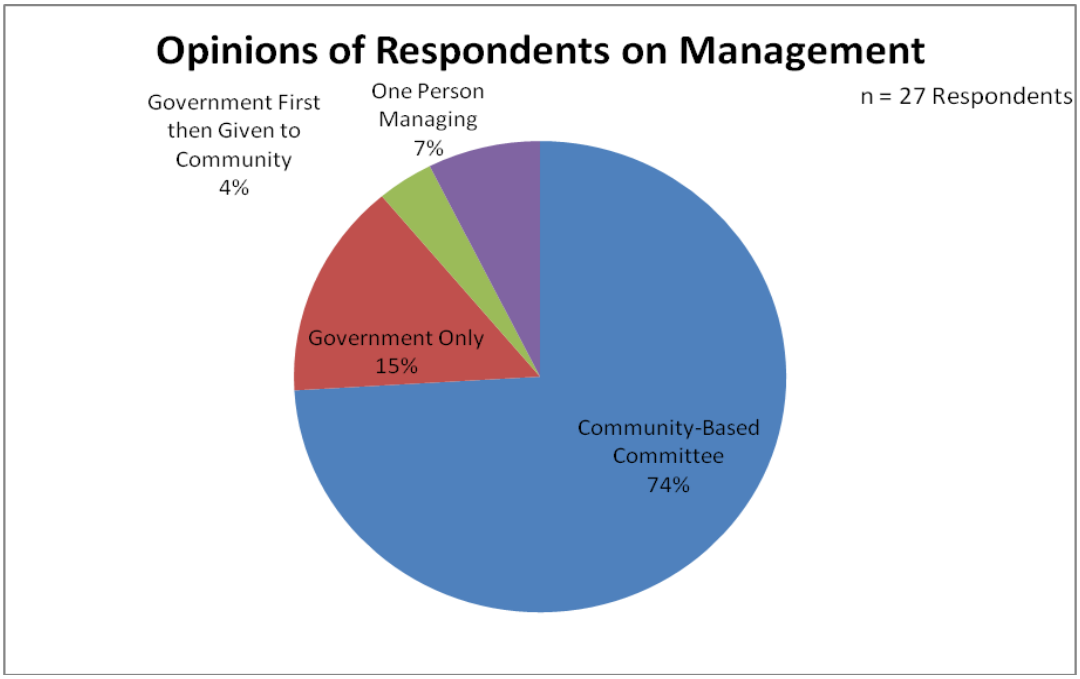

Figure 25: Desired Management for Reeds business initiative

We also asked the residents their opinions or suggestions for starting a reeds business initiative, and these responses gave us insight into potential problems that an initiative like this one may face if implemented. One issue that seems to be a problem with income-generating initiatives is the management of money. We interviewed the owner of Oom Jea's Joinery in Mariental (A summary of this interview can be found in Appendix W). He has taken various workshops on running a business, and said that many group projects have failed because of money disputes. He recommends that people should not talk about money at the beginning but focus on making the business successful. When we interviewed Phillipus Iyambo, he recommended that some sort of binding contract be made that guarantees the commitment of those involved. Therefore if a business is not profitable in the beginning people do not leave the business right away. When interviewing the Mariental Hardware workers, they also mentioned that funds need to be managed properly. The residents that attended our feedback session also discussed the management of finances. For a reeds business initiative, they would want to establish a bank account and to

maintain a debt-free account record. The committee should also write financial reports and make them available to everyone in this initiative. Some residents of the informal settlements that we interviewed mentioned that the reason people leave projects is because they do not receive a quick enough or large enough income for the work that they do (See Appendix R for the informal settlement interview summaries). Several interviewees in the informal settlements also mentioned that there should be trust among all of the participants in order for a business to be successful. It is also important for people to understand each other and the business's goal, so that people do not try to lead the business in different directions. Also, the participants should create a defined goal and set of operations. Theresa Basson of the HRC affirmed this suggestion. She said that business operations should be well defined at the beginning in order for the community to be interested in the business.

Marketing

During our feedback presentation, we led a discussion on how to market reed products. For advertising reed products the participants suggested that announcements be made in church and have printed and electronic media advertisements. Also, they suggested that selected delegates from the business should attend expos, trade shows, and exhibitions in Namibia to advertise their products. They also suggested that they could go directly to lodges and the Hardap Resort in order to market and sell their products.

During the discussion there was little concern about the potential cost or logistics associated with each marketing strategy. This is something that will need to be considered when establishing a reeds business initiative in Mariental that meets the available budget based on the secured funding.

4.4.2 Interest of Irrigation Farmers

The irrigation farmers that we interviewed were all aware of the reeds problem in the Fish River. Some of the farmers knew what reeds could potentially be used for, such as mats, fences, composting and cattle fodder. One of the local farmers has used the reeds for cattle fodder for her

non-production cows. However, if the business was guaranteed to be successful, then they would support such an initiative. The farmers mentioned that theft is a problem on their property and therefore certain guidelines would need to be followed in order for the harvester to go near their property. The NAU Chairperson suggested that the harvesters do not stay overnight near their property and that the harvesters would not trespass onto farm property. Overall, if this business could be shown to be viable, then the farmers would be willing to cooperate with such an initiative.

4.4.3 Interest of Government

While in Mariental we interviewed representatives from the Mariental Urban Constituency Development Committee (MUCDC), the Hardap Regional Council (HRC), the Mariental Municipality, and the Ministry of Gender Equality and Child Welfare. Each representative supported the idea of a reeds business initiative and thought that it would reduce the current unemployment problem in Mariental. All of the representatives also expressed interest in potentially providing some resources, as was discussed above in Section 4.3.2. Based on our interviews, the government officials are in full support of starting a business initiative.

4.5 Summary of Sustainable Uses

To determine which uses were environmentally sustainable, we looked at what products could be made out of reeds based on characteristics of both the sprayed and unsprayed reeds. We could only confirm that unsprayed reeds can be used for mats, fences, shading, and housing material. We also determined that the larger species of reed were used to make strong mats. We were unable to determine what species of reeds was used for housing materials, fences, and shading. We were also unable to determine if these reeds could be used to make any other products. We were also unable to determine what the reeds that were sprayed with herbicide could be used for. Though we have confirmed that the reeds can be used for four categories of products, we still have not been able to confirm that these uses would be environmentally sustainable because we have not determined the future availability of the reeds. The availability depends on several

factors that still need to be investigated: harvesting rate, growth rate of the reeds, and other factors such as the spraying of herbicide.

To determine which uses were economically sustainable, we looked at the demand for each product. We determined that there is a potential consistent market in the accommodations sector for decorations including room dividers, fences, window shades, ceilings, mats, and placemats. For the craft shops, there is a potential consistent market for baskets, placemats, coasters, photo frames, and other small crafts. Therefore, these uses have the potential to be economically sustainable, but further research is needed into the cost of production and transport for each use as well as the marketability of these products.

To determine which uses were socially sustainable, we looked at which uses the residents of the informal settlements were aware of, which ones they were skilled in, and which items they would be interested in producing. We determined that no uses that we considered had high knowledge and high interest in producing among our respondents, so we were unable to determine if any uses were socially sustainable. However, there was an overall interest among our respondents in producing reed products and if the community was informed of all possible reed uses, they may be more interested in producing specific reed products.

To determine a list of potential sustainable uses, we considered all three elements of sustainability. Overall, we cannot determine which uses of reeds are sustainable without further research. Recommendations for further research can be seen in the following chapter.

Chapter 5. Conclusions and Recommendations

Based on our research, we have determined that a business initiative using the reeds has potential to succeed in Mariental and further research should be conducted to determine the viability of such a business initiative. While analyzing the data we collected, we compiled a list of suggestions and concerns from the community of Mariental about starting such an initiative. These concerns are identified and possible solutions are presented through recommendations. These topics may need to be further investigated before starting a reeds business initiative in Mariental.

5.1 Conclusions

Although there is a threat of extensive removal of reeds by the Mariental Flood Task Force and little market potential in Mariental, we have concluded that there is a potential to use reeds for income-generating activities in Mariental. We confirmed that the reeds growing in the Fish River can be used to make fences, mats, and shades. Many other uses are also possible, but still need to be confirmed. Markets outside of Mariental, specifically craft shops and lodges, are interested in purchasing decorative products and small reeds products that would appeal to tourists. The three main stakeholder groups are also supportive of this initiative. Finally, from our background research and personal communication with experts, we learned that the reeds have an extensive root system in the Fish River that makes the reeds difficult to remove. Therefore, we feel confident that even if the attempt to remove the reeds continues, there will still be reeds somewhere in the Fish River that can be used for this initiative. With the support of all the stakeholders, the existence of a market, and reeds available for harvest, there seems to be a potential for a reeds business initiative. Before this initiative can be started there are several things that need to be further considered and investigated in order to determine the viability of this initiative.

5.2 Viability of a Reeds Business Initiative

We have concluded that there are gaps in our research that still need to be addressed in order to determine the viability of this initiative. The following recommendations highlight the topics that need to be addressed and how to address these topics.

5.2.1 Availability of Reeds

In order for this business initiative to be environmentally sustainable, the participants in the initiative need to consider the future availability of the natural resource that they are utilizing, which are the reeds growing in and along the Fish River from the Hardap Dam to Mariental. There are three main factors that affect the availability of the reeds: the spraying of the reeds with herbicide, the ecosystem of the Fish River, and how the reeds are used.

Spraying of Reeds

The spraying of the reeds with herbicide may affect their quality and quantity as well as have negative effects on the local ecosystem. It is important to fully research how the herbicide affects the reeds and their characteristics in order to determine if the high quality reeds will still exist in the future and what quantity will be available. If there is an insufficient quantity of good quality reeds then this business initiative will not be viable. Further investigation is also needed into the effects of the herbicide on the ecosystem of the Fish River. Even if the reeds are not directly damaged by the herbicide, it is possible that the herbicide may negatively impact their environment and thus indirectly impact the quantity and quality of reeds. To ensure the availability of reeds in the future, research also needs to be conducted into how the Mariental Flood Task Force's goal of removing portions of the reeds to reduce flood potential, and a reed business initiative's goal of using the reeds, can work together to achieve their individual goals. By working together, proper management of reeds could reduce flooding potential, and generate income for the local residents.

Ecosystem

Currently, little is known about the role of the reeds in the Fish River, and how they interact with the local ecosystem. More research needs to be conducted into how the removal of the reeds will affect the ecosystem. This information should help to determine how to sustainably harvest the reeds and how the removal of the reeds will affect the Fish River groundwater system.

It is also important to identify what factors contribute to the growth of the reeds in the Fish River. Through several interviews and presentations, we were informed that fertilizer runoff from the irrigation farms potentially promotes reed growth. If the farmers change their irrigation method to a more efficient system then the fertilizer would not enter the Fish River and could potentially reduce the growth potential of the reeds, although this still needs to be verified. With the reduction in the growth, the availability of the reeds could be reduced and limit the amount of reeds available.

5.2.2 Other Potential Uses of Reeds

Based on our research we were only able to confirm three reed uses. Investigation into using reeds for compost, cattle fodder, basketry, small crafts, and other applications needs to be conducted to confirm these uses. Also, since many of the reed shoots in the Fish River are dead above ground, further investigation should be done to see if these sprayed reeds can be used.

We have found that there is another type of reed besides *Phragmites australis* that is growing in the Fish River. Investigation needs to be done to identify the species of this second reed type because its characteristics could affect what it can be used for, and its growth rate could affect how much is available to harvest. To better understand which reeds are best to use for each product, further investigation needs to be done on the characteristics of both species, their growth rates, and how they can be used.

5.2.3 Potential Markets

If it is determined that the reeds will be available in the future and a better understanding of the possible uses of the reeds is obtained, then the next step is to further investigate the market

potential for reed products. In our research, we focused on tourism accommodations and craft shops and determined that a market exists in this sector, but we recommend that more research should be conducted into the agricultural sector. Determining if farmers would be willing to buy compost or cattle fodder made from reeds is important since there are crop and livestock farmers in Mariental. Also, research should be done to determine how to expand the tourism market in Mariental, such as by establishing an open market on the B1 highway where many tourists pass through. Research should also be conducted to determine other potential markets for reed products besides tourism and agriculture.

Our investigation into tourism-related markets outside of Mariental revealed that various retailers would sell crafts made from reeds if tourists would be willing to buy them. According to craft shop owners, tourists will buy crafts that are unique, of good quality, and small so they can transport the products back to their home country. Therefore, further investigation is needed to identify reed products that tourists will buy, and what quality standards need to be met.

Although we have determined that a tourist-based market does exist, it is important to further investigate the feasibility of providing products for these markets. It should be determined if there will be a long-term demand for reed products that will provide enough profit for the business. Since the main markets for reed products are outside of Mariental, the cost of transportation must also be investigated. This information will help to determine if a potential reeds business initiative can be profitable while transporting products outside of Mariental. The quality standards of the retailer or tourism accommodation should also be investigated to determine how the reed products should be prepared.

5.3 Considerations for Starting a Reed Business Initiative

Once the business is determined to be viable by investigating the availability of the reeds and all the potential markets for reed products, further research needs to be conducted into how funding and resources can be secured for this initiative. Initial capital funds, tools and materials,

training, and transportation are key items for starting a business initiative, especially since many residents do not have the necessary resources to start producing reed products. If a few necessary resources are provided then a reed business initiative could be started.

5.3.1 Capital Funding

Capital funds are needed in order to start the business so that resources, which cannot be provided by an outside organization, can be purchased. As presented in our results, the government agencies are willing to potentially assist with this initiative, but more investigation needs to be done to determine what requirements must be met in order to receive funding or other assistance from them. Further investigation should also be done into how potential funding from NGO's or other non-profit organizations can be secured.

5.3.2 Resources

Basic tools and materials will be needed before a potential reeds business initiative can begin. Based on our interviews with the residents that have used or are currently using reeds, we identified some of the resources that would be required for a potential reeds business initiative. No organization or government agency has indicated they will provide these resources, but if capital funding is obtained then these resources can be purchased.

5.3.3 Transportation

Since the established markets for reed products is outside of Mariental, it will be necessary to transport the products to retailers, such as those in Windhoek, who prefer to purchase products when a seller brings products directly to their business location. It is necessary to secure transportation, and determine the logistics of delivery of products to the markets before starting a reeds business initiative.

5.3.4 Management

If the necessary resources are secured for a reeds business initiative, then the following recommendations on how the business is managed should be considered. The sample of residents of

the informal settlements that we interviewed favored a community-elected committee to manage the business initiative. Some also expressed concern about harvesting near farm property, and trust in the business, especially in how the finances will be managed. To address these concerns, the residents and government officials provided the following suggestions, which we would recommend to be considered before the business initiative is started.

Create Constitution

We recommend that once a committee is selected, a constitution should be created that describes the roles and responsibilities of the committee and all the participants, and the operations of the business. The purpose of this document is to have this business transparent in all aspects, so that trust can be established within the business initiative.

The constitution should also include some other important elements to ensure the success of the business. Since the owners of the irrigation farms experience theft of their crops, a major concern is that harvesters in the Fish River may be accused of stealing crops. In order to protect the farmers and the harvesters, a protocol should be established that would be followed by the harvester and the farmer.

Third Party Oversight

Some residents expressed interest in having a third party provide advice to the committee. This third party should be an organization or person that has nothing to gain or lose from the business, so they do not take advantage of the residents. At least initially, there should be some oversight to assist in starting the business and eventually as the business establishes itself, the third party should pass all the responsibilities to the community.

The third party would monitor the function of the business, ensuring that everything is done both correctly and fairly, and it would possibly provide assistance with financial management. The third party can also be the negotiator and mediator between the residents and the irrigation farmers to resolve any issues that may arise. A third party may also be valuable to this business because

they could provide resources that the business may not have access to, such as connections with outside markets or assistance with advertising the products.

Training

When assessing the basic knowledge of reed uses of the residents in the informal residents, we determined that many residents know that reeds can be used for some purpose. Many residents have seen reeds being used by other community members, but there is a lack of knowledge of other potential uses of reeds that may interest the residents. Training will be required for the residents in how to harvest the reeds and use them to produce various products. Harvesters should be taught how to protect themselves from the hazards associated with harvesting, such as snakes, other dangerous animals, and physical water hazards. The individuals that have harvested the reeds before can potentially provide training on how to harvest the reeds properly and safely.

Residents of Mariental that have used reeds before know how to make reed mats, fences, and shades. These people could potentially train other members of their community to produce these products, and then there would be no need of getting trainers from outside of Mariental. For products that are not very well known to the community, such as small tourist products, someone from outside of Mariental will need to be brought in to provide training to the community. Expanding to other reed products is encouraged, since it will provide a larger, more diverse market for this business. Possible training on producing reed products could come from the Habitat Resource and Development Centre or people from the Kavango and Caprivi regions of Namibia that have experience in producing reed products.

Transportation

Transportation for the reeds will be required if reeds are harvested close to the irrigation farms. The main use of the transportation would be to transport the harvested reeds to the production area, but having transportation for the harvesters to and from the site will reduce the time required to walk to and from the site. This will increase overall productivity since more time

will be spent at the harvesting site instead of getting to and from the harvesting site. Also, the farmers may be more willing to cooperate with the business initiative because the harvesters would spend less time near farm property since they would not have to walk along the farmers' property to get back to Mariental after harvesting. It may be possible that some residents in the informal settlements own cars and may provide transportation if compensated appropriately. The Mariental Municipality also indicated they could potentially provide transportation to the harvesters.

5.4 Secondary Recommendations

The following are some recommendations that should be considered when investigating the viability of this business initiative, but are not currently key items that need to be addressed.

- The rate at which the reeds can be sustainably harvested based on the growth rate and availability of reeds.
- Determine if it is safe for people to harvest the reeds that have been sprayed with herbicide and what safety precautions should be taken when harvesting sprayed reeds.
- If a reeds business initiative is determined to be feasible, the Mariental Flood Task Force should consider having a trial area in the Fish River where the reeds will be allowed to grow. Thus, the community members involved with the business initiative will be allowed to harvest healthy reeds to be used to make high-quality reed products. The location and size of such an area will need to be investigated to determine the impact of such an area on the risk of flooding. Such a trial area will also be ideal for studying the rate that the reeds are harvested based on the size of the business initiative and the products that are being produced. Thus, further recommendations for a sustainable harvesting rate can be obtained.

- Determine if it is feasible for the community to derive indirect profit from the reeds, such as using them for composting. Determine if this could be an alternative way to managing the reeds by using them for indirect profit only.
- Depending on the size of the business, a secure central operating location should be established. This is where the committee can meet to discuss issues; the participants can secure their paperwork and financial records, and store supplies and products.
- Because we have learned from interviews with craft shop owners that tourists will only buy good quality products, quality control guidelines should be established for the products that are being produced to ensure that they are marketable.
- A workshop should be conducted with the local residents to encourage creativity in creating new reeds products that could be marketed to tourists.
- Look into established craft markets such as the Mashi Craft Market to get ideas on how to manage the production and sale of crafts made from natural resources. According to Candia Diggle, a representative of Integrated Rural Development and Nature Conservation, the system in place at this craft center can be used as a model for management of any craft market (For a summary of a presentation by Candia Diggle, refer to Appendix E).

After considering our background research and the results of research in Mariental and in Windhoek, we have determined that the reeds in the Fish River can be used to produce reed products, markets exist for reed products, and the community is interested in using the reeds. While there are still a number of topics that need to be further researched before establishing a business working with the reeds, there is a potential to use the reeds for income-generating activities in Mariental.

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Appendix A - The Desert Research Foundation of Namibia

The Desert Research Foundation of Namibia (DRFN) is a non-governmental organization focused on promoting sustainability. Their mission is to "empower decision-makers at all levels through its research, training and consultancy activities, thereby fostering sustainable development in Namibia" (DRFN, 2008, About Us). The DRFN is composed of three main departments, the water desk, the energy desk, and the land desk. They also have a consulting division, The Environmental Evaluation Associates of Namibia Ltd (EEAN).

The departments at the DRFN each have their own coordinator and staff, but all are overseen by an executive director (DRFN, 2008). The EEAN, led by John Pallett, aids a variety of institutions with environmental development planning. The land desk is coordinated by Erik Dirkx and is involved with agricultural resources in Namibia including management of livestock farming, resettlement farms, as well as preparing for climate changes (DRFN, 2008, Land Desk). The energy desk, which is led by Robert Shultz, is looking into alternative energy sources including renewable energy and its efficiency. They are the Secretariat for the Ministry of Mines and Energy's Biomass Energy Management Programme.

The water desk, coordinated by Viviane Kinyaga, is concerned with water resource management, including river basins, and partners with many institutions such as NamWater, government and local agencies, and consumers (DRFN, 2008). The DRFN staff involved with the water desk consists of Clarence Mazambani, Junior Project Manager, Kenneth !Ganeb, Field Facilitator, and Carole Roberts, ERB Project Manager. The DRFN is the Secretariat of the Namibia Water Partnership which is part of Global Water Partnership, an international organization concerned with managing water resources. The water desk is sponsoring the Renewable Energy and Ecological Development Solution (REEDS) project to research sustainable, income-generating uses for river reeds in order to aid in the economic development of a small Namibian town.

The water desk is currently working on several other projects in Namibia including but not limited to Ephemeral River Basins (ERB), CuveWaters, and Groundwater Monitoring (DRFN, 2008). The ERB project, funded by the Norwegian Ministry of Foreign Affairs, is investigating integrated basin management for three river basins located in southern Africa. CuveWaters is testing rainwater harvesting, desalination and sanitation technologies in the Cuvelai-Etosha Basin in an effort to create sustainable water management. An additional project led by the water desk is Groundwater Monitoring, which is trying to aid communities in Onkani and Grootberg in creating improved groundwater monitoring systems. It is funded by the United Nations Education, Scientific and Cultural Organization (UNESCO). From the nature of these projects, it is evident that the water desk plays an important role in finding ways to manage such a vital resource as water in Namibia.

The Desert Research Foundation of Namibia (2007, p.5) has established itself as a reputable institution, deeply committed to fostering sustainable development in Namibia, and as a result, has established valuable connections with various establishments in both the public and private sectors of Namibia. The DRFN has done this by completing a wide variety of projects beneficial to Namibia. For example, in the 2006-2007 DRFN Annual Report, the energy desk mentioned a promising project entitled Converting Bush Encroachment for Namibia's Development (CBEND) (p.13). This project is examining the method of gasification to turn the problem of bush encroachment into a benefit for various communities; specifically, it aims to turn an invasive plant into a source of energy. This ambitious goal is but one example of the many ways the DRFN helps to foster development in Namibia. By initiating and completing various projects such as CBEND, the DRFN has amassed a wide variety of resources, which can be utilized to solve the REEDS problem. It employs a wide variety of researchers and educators, and works closely with academic institutions such as the Polytechnic of Namibia. This makes the DRFN an extremely valuable source of information, especially considering its policy towards information sharing. In the 2006/2007 annual reports it is stated, "the DRFN shares its information with decision-makers, and the public" (p.7). Because the DRFN freely shares

information it has obtained, they will be helpful in gathering research for the REEDS project. Overall, the DRFN seems like an extremely valuable resource for anyone doing research in or about Namibia.

Along with the DRFN, there exist many other organizations, in both the private and public sector, which are devoted to Namibia's development and growth. In fact, the DRFN has had a "joint-venture agreement with the Ministry of Environment and Tourism" since 1998 (DRFN, 2007, p.5). This agreement directly benefits the Gobabeb Training and Research Centre in the Namib (GTRCN), an institution committed to training, research, and development in Namibia, and very similar to the DRFN. Despite the similarity, and connections between the two organizations, the 2006/2007 DRFN Annual Report emphasized that the organizations are legally completely separate institutions.

Appendix B - Livelihood Sustainability

Knowing that unemployment is high in Namibia, social sustainability can be used to potentially reduce poverty (Krantz, 2001). The concept of sustainable livelihood is used when there is an attempt to reduce poverty in a region or neighborhood. Lasse Krantz (2001) considers the definition developed by the Institute for Development Studies (IDS) as a goal that is realistically possible in most cases. The following is their definition:

> A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base (p.7).

The livelihood of the poor is an important element that needs to be analyzed in order to provide the proper assistance. In most applications, this concept is applied to individual households instead of large regions.

The sustainability livelihood approach to reduce poverty is a recommended method because it does not look at poverty in one aspect, such as low income (Krantz, 2001). Economic growth does not always have a direct link to assisting the poor, since the poor need to be able to take advantage of the growth. It is important to understand what the poor need, or are hindered by, that may prevent them from taking advantage of economic opportunities. These needs could be as a simple as social services, education, or basic healthcare. Two examples of organizations that assist with poverty reduction by using the sustainability livelihood approach are United Nations Development Program, and British Department for International Development.

These organizations use this approach because they realize poverty is not always driven by income (Krantz, 2001). For example, a sudden illness or injury may inflict on the household member that provides the main source of income, but in many developed countries, such as United States,

health insurance and workers rights allow the household an opportunity to recover and to not enter poverty. This type of livelihood is considered sustainable. On the other hand, when a household does not have any type of health insurance, any similar situation may devastate the household and force them into poverty. In these two cases, the livelihood resources available to each household are different and the resulting poverty of the second household was not caused by low income.

Each household has resources that they utilize in order to survive or achieve a livelihood goal, such as going to a local school in order to obtain a higher paying job (Krantz, 2001). The Institute for Development Studies defines four main resources that are available to anyone: natural capital, economic or financial capital, human capital, and social capital. Natural capital includes the natural resources and environmental processes that are utilized for one's benefit. Economic and financial capital includes the purchasing ability of a household, such as savings or access to loans or credit. Human capital focuses on the skills, knowledge, health, and the physical capabilities. Finally, the social capital includes the networks, social relations, and any social associations that may be utilized for livelihood needs or goals. By assessing these four resources of a household, one can understand the needs of a household and how to improve its livelihood.

Another important aspect of a livelihood sustainability approach is the involvement of the poor themselves in developing a plan (Krantz, 2001). The poor know best what they need because they have established their own livelihood lifestyle and goals. It is important to understand these lifestyles and goals and to provide assistance that would improve the ability of the poor to withstand potential shocks and stresses.

Livelihood sustainability is an important concept for this project, because it allows the uses of reeds to be directly connected to the livelihoods of the local people. For the success of any use of the reeds, the benefit has to fulfill some need of the household. By assessing the livelihoods of a household, those needs can be determined. Then by analyzing the benefits of various uses of reeds, a match can be made between the benefits and the needs. By establishing this connection, we can determine the most beneficial uses for the households in Mariental.

Appendix C – Participatory Research Tools

There exists a wide variety of participatory research tools that can be used to obtain information about a given community. Downs (2007) specifically mentions five main methods that are applicable to sustainable development: participatory rural appraisal (PRA), participatory action research (PAR), rapid rural appraisal (RRA), participatory action development (PAD), and the participatory geographic information system method (GIS). These tactics have been developed in an attempt to find the best method to actively involve local communities in development projects.

The assessment technique that is most relevant to our study is Rapid Rural Appraisal (RRA). Many researchers have studied RRA, two notable ones being Robert Chambers (Creighton Peet, personal communication, February 10th, 2009), and Dr. Youngyout Kachondham. According to Kachondham (1992), RRA is "any systematic activity designed to draw inferences, conclusions, hypotheses, or assessments…during a limited period of time" (section 27). RRA is performed in three basic steps. First, an interdisciplinary team gathers as much background research as possible about a problem to properly select research tools and techniques. Once this step is complete, researchers then make a series of short field visits to collect data using the methods previously decided upon. Finally, the team analyzes the data, and immediately writes up both conclusions and recommendations for future research. Kachondham (1992) emphasizes that writing happens immediately after data collection/analysis, so that no important insights are lost. This method sounds like an ideal method for an IQP group, as it follows (almost exactly) the process taken in completing an IQP project. However, Chambers (1994) criticizes RRA, stating that it relies heavily on information that is "elicited and extracted by outsiders," (p.1) rather than on actual information about the community being investigated.

All of these methods should be considered when assessing the interests of the local people in a business initiative or project, but RRA is particularly relevant to our project since we will be

conducting our assessment in a limited amount of time. Once the interests of the local people are established, sustainable management of the natural resource itself should also be considered.

Appendix D – Interview and Presentation Summaries from Pre-Field Research

Presentation Summary for Kuniberth Shamanthe

Topic: Progress by the DWAF on reducing the reeds problem in Mariental
Presented by: Kuniberth Shamanthe
Date: 19/03/09
Location: DRFN Boardroom
Time: 14:30-15:30

Kuniberth Shamanthe is working with the Department of Water Affairs and Forestry (DWAF) in the Hydrology Division. He is currently researching integrating sanitation and water systems in the Hardap region. We have obtained useful information from his presentation on flood risk reduction in Mariental.

He explained the various causes of the 2006 flood in Mariental. The main cause of the flood was the backing up of the Sandburg River, due to the intense surge of water from the Hardap Dam sluice gates (due to a release of a large amount of rainwater). It was proposed that the reeds could have led to escalated flooding by clogging the channels, and that further investigation was required.

The Hardap Dam was originally built to store water for irrigation, but is now also used to relieve floodwater. The Mariental Flood Task Force, of which Mr. Shamanthe is a member, was formed from Ministries, professional experts, community members, representatives of the farmers in the irrigation scheme, the Municipality, and the private sector. This Task Force was formed to help reduce the risk of flooding in the future. So far, the Task Force has improved the early warning system at the dam, reviewed the NamWater flood control plan, appointed a team of consultants, and recommended a plan to reduce the flooding risk in Mariental. They presented seven options to the Ministry of Agriculture, Water, and Forestry. These plans included relocating different people in Mariental and raising the banks of the Sandberg River. The option six was chosen, which includes raising the dam wall, raising the embankment along the Sandberg River, closing three of the four gates on the dam, raising the spillway to 70% of capacity, and clearing the riverbed of the reeds. This

plan was found to have the greatest economic benefit and also addressed the community's concerns surrounding the reeds. The Ministry endorsed this plan and recommended that the Task Force contact insurance agencies regarding the damage done to the town during the flood and that the Ministry of Finance be involved.

Once this plan was implemented, the reeds were burned and sprayed with chemicals. The burning of the reeds was unsuccessful since the reeds naturally retain a lot of moisture. It was also recommended that aquatic machinery be used to remove the reeds, but after representatives from the Task Force visited an aquatic machinery company in Finland, it was determined that the dry area surrounding the Fish River would not be suitable for these machines. The costs associated with operating this machinery are also high. The De Beers Mining Company proposed dredging the riverbed using conventional machinery, and will also be creating a soil composition map of the area. The Task Force has also appointed a consultant to determine how the banks of the Sandberg River should be raised. They will also publish a combined document detailing their results in local newspapers to raise awareness of the Task Force's activities.

For the future, Mr. Shamanthe recommended that we map the area according to soil composition. The reeds should be removed from the river to clear a distance 150 meters wide. The DWAF will also continue to spray the reeds every three months. The effect of the chemical on the environment is not currently known. Additionally, in Mr. Shamanthe's opinion, it would be difficult to combine any harvesting activities with the current burning and spraying of the reeds.

Presentation Summary for Dudley Biggs

Topic: Background to the reeds problem and how reeds contribute to flooding in Mariental.
Presented by: Dudley Biggs
Date: 23/03/09
Location: DRFN Boardroom
Time: 11:00 – 12:30

Dudley Biggs is an Associate of the Desert Research Foundation of Namibia. He was originally involved in water planning at the Department of Water Affairs and Forestry. He has worked on the reeds problem in Mariental and provided us with information that is useful to our project.

Mr. Biggs first gave us background information on Mariental and the reeds problem. The Hardap Dam was originally constructed to provide water for irrigation for the farmers. Currently, 96% of the water from the Hardap Dam is used for irrigation, while the rest is used for domestic water supply. The dam also has a hydropower generator but it is not operational because it is too small to provide a significant amount of power. The residents of Mariental insisted that the dam be operated at 70% of capacity to reduce the risk of flooding, but the flood of 2006 was too big for this reduction of capacity to be effective in preventing the flood.

In order to understand how the reeds contribute to the flooding, it is important to understand the relationship between irrigation, fertilization, the reeds, the crops, and the income of the farmers. The farmers in Mariental use the flood irrigation method to irrigate their crops. They dig irrigation ditches between the river and the fields to gain access to water. The water then flows into the farmers' fields. This method of irrigation is not very efficient because it over-irrigates the areas near the irrigation ditch, using a large amount of water. It also washes out some of the fertilizer spread over the fields and the fertilizer is not distributed evenly. That excess fertilizer washes back into the Fish River and causes the overgrowth of reeds. Improved irrigation methods can control the growth of the reeds by reducing the washout of fertilizer. However, this may be contradictory to our goal. If reed growth is reduced, then there may not be reeds for the people of Mariental to harvest.

Changes in irrigation systems in the region may take a long time to implement, but this is still a sustainability concern.

Efforts have been taken to control the growth of the reeds. In the 1990s, laborers were paid to cut the reeds by hand. This project failed because cutting the reeds was an unpleasant job for the laborers and they lost interest in the work. The reeds have sharp edges and there are snakes, wasps, bees, and other creatures living in the reeds. After the flood of 2006, an effort was made to control the reeds by depriving them of water. However, the reeds just began to grow in the drainage ditches. Next, the reeds were sprayed with chemicals. At first, this was ineffective because the spraying of the reeds was contained to a selective area, and did not reach the root system, so the reeds grew back. Later, a larger amount of herbicides that penetrated to the roots and attacked the reeds completely were used.

There are several other concerns to address as we proceed with our project. The reeds that are growing on the banks of the river are preventing erosion and therefore protecting the farmers' fields. It would not be a good idea to remove the reeds on the riverbanks. Mr. Biggs informed us that the reeds themselves are also not very strong in Mariental. The majority of the reeds are smaller and weaker, whereas Spanish reeds are a type that is typically larger and thicker. There is a shortage of reeds in Kavango, but it would be too expensive to ship the reeds to this region. Many people do not like to use roof thatching because insects, spiders, and mice sometimes will live in the thatch. However, the thicker reeds combined with mud could be a good insulation material.

Additionally, according to Mr. Biggs, there are no reeds growing on the farmers' property. The reeds growing in the river, around the river, and in the irrigation channels are all the property of the Municipality. Access to the reeds surrounding the farms is also a concern. According to Mr. Biggs, the farmers might not be interested in working with the Nama or other groups living in Mariental. The farmers are also concerned about theft of their crops and hire security personnel to guard the crops. These farmers hire Ovambo and other people from the northern part of Namibia who have agricultural experience, and these laborers live on the farms. There is also a prison near

Mariental that is a potential source of labor. Finally, Mr. Biggs suggested that we look at the tourist industry as a potential market.

Presentation Summary for Candia Diggle

The Role of WRM Team in IRDNC Caprivi
Presented by: Candia Diggle
Date: 24/03/09
Location: DRFN Boardroom
Time: 11:00 – 12:00

Candia Diggle works with the Integrated Rural Development and Nature Conservation in the Women in Resource Management branch. She works through Mud Hut Trading with different conservancies in the Caprivi region, specifically with the Mashi Craft Market.

Candia explained the basic principles of Community-Based Natural Resource Management. This program empowers workers by enabling them to make their own decisions about how a natural resource is managed and how any profit derived from using this natural resource is managed. Women in Resource Management focuses on deriving social, economical, cultural, and environmental benefits for craft makers, and in particular, female craft makers.

She explained the system used to document how a natural resource is used: the event book system. Using an event book, Natural Resource Monitors document how much of a natural resource is used in a particular day. An event book can also monitor craft sales: who made which item, which item was sold, and how much the item cost. Candia emphasized that rigorous bookkeeping is important to ensure that each crafter receives the correct amount of money based on her own craft sales.

The craft market is supported by the community, the conservancy where the natural resource is managed, and non-governmental organizations that fund the market. Eventually, the craft market should be able to be self-sufficient without the help of non-governmental organizations. The craft market has a managing committee that manages the craft sales. It is best to have one person in charge of the finances to reduce discrepancies. The Natural Resource Monitors, who are responsible for managing the natural resource in conservancies, are also responsible for

bringing the money back to the crafters from the craft market. Some conservancies and craft markets have contracts with tourism lodges or other organizations to provide a certain number of items to these organizations. A challenge that these contracts present is that the crafters, due to other responsibilities, may not be able to fulfill the orders in time. Additionally, all of the products need to be standardized. To determine the price and to assure the consistency between different items, a grading system has been established. AA-grade or A-grade baskets have even patterns and few noticeable flaws. B-grade or C-grade baskets may have some noticeable flaws and are sold at a lower price. Some challenges that the craft market faces are locating enough resources to produce crafts and to ensure quantity and quality of the crafts.

This information regarding how a conservancy is managed in partnership with a craft market is useful to our project in determining how the reeds should be managed. If a use were found for the reeds, they would need to be managed in a sustainable and profitable manner, and the Mashi Craft Market model is a successful way to do so.

Discussion with Andreas Wienecke of the Habitat Resource Development Center

When: March 20 and 23, 2009
Time: 10:00-11:30, 14:30-16:30
Location: Habitat Resource Development Center (HRDC)

Andreas believes that there is a huge potential for uses of the reeds located in the downstream channels of the Hardap Dam. These uses are mostly aimed at the poor and unemployed or businesses that wish to reduce operation costs. He believes that what is currently being done to eradicate the reeds (spraying and burning) is not effective because the root system extends approximately seven feet below the ground, and is therefore not affected by any of these methods. Also, burning the reeds stimulates their growth because it acts as a natural fertilizer.

Currently, the farmers are being blamed for stimulating the growth of reeds in the channel from the water irrigation run-off that carries fertilizer into the river system. In order to fully understand the effects of the fertilizer, water samples need to be taken at various points on the river system to map out the concentrations of fertilizer in the Fish River. Also, to better understand the flooding and the flow of water in the area, a hydrological map of the area should be created.

There are many potential uses for the reeds that have been proven to work but others may require tests and studies in order to determine the best method of utilizing the reeds in a specific manner. One benefit of using reeds is that it they are a free resource and readily available so if a product constructed from reeds breaks, it can easily be replaced.

One potential use of the reeds is cattle fodder. Andreas witnessed cattle in Mariental eating small soft reeds located at the local sewer plant. The local large scale farmers may find the reeds to be an appealing source of food for their cattle because it is cheap. The Nama people in southern Mariental may use it for their livestock when a drought sets in and vegetation is limited. Commercial crop farmers may be interested in starting their own livestock production for extra income and utilizing the reeds for fodder.

Another potential use of the reeds is the production of biogas for energy (electricity, heating). For large-scale production it may not be feasible, but small-scale use has potential. Currently, pig farmers have biogas generators that are not being used, and Andreas learned from interviews with these farmers that they are strong supporters of using reeds. The reeds need to be crushed into smaller pieces and mixed with other materials, such as pig manure, in order to get sufficient biomass. The correct mixture that should be used needs to be determined through experimentation. The HRDC has a biogas generator that has worked well for several years. Andreas has also witnessed the use being very successful in several different situations. The only real expense to applying this method for the pig farms would be training. Andreas suggested that a local person should be trained and then train others for an affordable fee to the local residents.

Using reeds as roofing material has been successful at the HRDC. The reeds are strapped together side by side and laid on the roof. Then, a four-inch thick layer of cardboard is placed on top and corrugated steel is placed on top of the cardboard. It is also possible to use the reeds as roof thatching, but various techniques should be experimented in order to develop the most useful design. To prevent bugs and animals from making homes in the thatched roof, Andreas recommended placing lavender plant in the roof. This method is used at the HRDC and has been successful for several years of keeping the bugs and animals away. When using large sticks for thatching, bugs can be kept away by soaking the sticks in car oil, which Andreas estimates to work 99% of the time. One advantage to using reeds for roofing material is that it acts as an insulator, keeping the indoors cool. This would be beneficial for Mariental since the temperatures are very hot. One drawback to using the reeds for roofing is that they are a fire hazard and therefore households need to be cautious about using heating elements within or nearby the structure.

Handicrafts and furniture is another potential use. The HRDC has utilized reeds for the face of walls and doors. Other possible uses that have not been considered were bird cages, suitcases, room partitions, and floor tiles. For uses that require the reeds to be bent, the reeds will need to be

kept moist in order to bend them into the desired shapes. It is unknown if the reeds in Mariental can be used in this manner, and the reeds need to be experimented with in order to find out.

Other potential uses for the reeds are firewood, soap, bandages, food, and paper production. The reeds can be used as firewood but because of their low density they will burn very rapidly and therefore many reeds would be required in order to maintain a fire for a long period of time. Using reeds to develop soap was an unknown concept to Andreas and has been added to our list of things to investigate. He is not surprised that reeds can be used for bandages, such as the outside layer, because it was a method of bandage in the past. As far as food products, Andreas had only heard of the reeds being used for cattle fodder. Paper production is difficult because the process of converting the reeds into pulp is not easy. Many processes can be used to convert it into pulp but the more high-tech methods are expensive. It may be able to be done in Mariental, but only in a small-scale production.

The ease of harvesting the reeds will vary throughout the river basin. It will be easiest to harvest the reeds on the banks of the river. Some areas can be muddy. The profile of the river basin is constantly changing over time and therefore harvesting techniques may not always be consistent. The ecosystem of the reeds may contain various types of birds, mice, snakes, and scorpions. In order to better understand the local wildlife, Andreas recommended we talk to the local farmers. While spending time in Mariental, Andreas does not remember seeing any birds' nests in the reeds, but he had limited mobility to explore the reeds because of their high density.

In order for a use of reeds to be successful, it would be beneficial to find people that have a basic understand of a certain use, such as basketry, because then it will be easier to teach them more complicated techniques. Also, Andreas recommended educating residents on how the reeds are free and a good material, if not better, than the modern materials used, such as for construction and furniture. Also, many sources of funding may be available to start small enterprises.

Appendix E – Interview Protocols for Government

Interview protocol for Hardap Regional Council

Background Information

- What does the Hardap Regional Council do?
    - What is the Council's role in the community?
- What is your role in the Hardap Regional Council?
    - What does your position entail?
    - How long have you had this position?

Involvement in the Mariental Flood Task Force

- Is the council involved with the MFTF? Are you involved with the MFTF?
    - What is the council's role in the Task Force? What is your role in the Task Force?
    - We understand that option six was chosen to deal with the reeds problem. What was the council's role in determining what should be done about the reeds?
    - What is the council's role in implementing option six?
        - Is the council involved with the removal of the reeds?
            - What is the council's plan for removing the reeds?
    - What will the council's role be in the future?

Questions on current projects

- Do you know of any businesses or individuals that are currently harvesting or using the reeds?
    - Who is using the reeds? (Contact information?)
    - How was the project started? When was it started?
    - Is the council involved?
    - What were the challenges with starting the project and keeping it running?
    - What is the current status of the project?

Other Income-Generating Opportunities

- Do you have any ideas on how the reeds could be used for income-generation?
- Do you know any individuals or businesses that could establish these uses?
- If the residents of Mariental were interested in using the reeds, would the council want to be involved?
    - What resources would the council be willing to provide? (Transportation for workers, tools, etc?)

Is there anything else we should consider in our project?

Interview Protocol for Mariental Urban Constituency Development Committee

Background Information

- What does the Committee do?
    - What is the Committee's role in the community?
- What is your role in the Urban Constituency Development Committee?
- What does your position entail?
- How long have you had this position?

Involvement in the Mariental Flood Task Force

- Is the committee involved with the MFTF? Are you involved with the MFTF?
    - What is the committee's role in the Task Force? What is your role in the Task Force?
    - We understand that option six was chosen to deal with the reeds problem. What was the committee's role in determining what should be done about the reeds?
    - What is the committee's role in implementing option six?
        - Is the committee involved with the removal of the reeds?
            - What is the committee's plan for removing the reeds?
    - What will the committee's role be in the future?

Questions on current projects

- Do you know of any businesses or individuals that are currently harvesting or using the reeds?
    - Who is using the reeds? (Contact information?)
    - How was the project started? When was it started?
    - Is the council involved?
    - What were the challenges with starting the project and keeping it running?
    - What is the current status of the project?
- Do you know of any businesses or individuals that are selling products made out of a similar material?

Other Income-Generating Opportunities

- Do you have any ideas on how the reeds could be used for income-generation?
- Do you know of any individuals or businesses that could establish these uses?
- Is there a current venue or marketplace where reed products could be sold?
- Do you think tourists in Mariental would be interested in buying reed products?
- If the residents of Mariental were interested in using the reeds, would the council want to be involved?
    - What resources would the council be willing to provide? (transportation for workers, tools, etc?)
- Is there anything else we should consider in our project?

Interview Protocol for Mariental Municipality

Background Information

- What does the Municipality do?
- What is the Municipality's role in the community?
- What is your role in the Municipality?
    - What does your position entail?
    - How long have you had this position?
- What is your opinion regarding the reeds growing in the Fish River? Is it a problem?
    - If yes: What are your suggestions in dealing with the reeds problem?
- Has the Municipality tried any activities in the past to deal with reeds?

Involvement in the Mariental Flood Task Force

- Is the Municipality involved with the MFTF? Are you involved with the MFTF?
    - What is the municipality's role in the Task Force? What is your role in the Task Force?
    - We understand that option six was chosen to deal with the reeds problem. What was the Municipality's role in determining what should be done about the reeds?
    - What is the Municipality's role in implementing option six?
        - Is the Municipality involved with the removal of the reeds?
        - What is the Municipality's plan for removing the reeds?
    - What will the Municipality's role be in the future?
- Do you see any negative impacts (e.g. to do with the environment) resulting from the harvesting of reeds?

Questions on current projects

- Do you know of any businesses or individuals that are currently harvesting or using the reeds?
    - Who is using the reeds? (Contact information?)
    - How was the project started? When was it started?
- Have you tried anything along these lines (e.g. reeds harvesting) in the past? If s/he says nothing, then we should prompt more, just for us to get information on that project where they started with 60 people and then it reduced up to 15 and then 5/6. Also ask the questions below:
    - Could you tell us more about the reed harvesting: community involvement, harvesting methods, training, marketing and monitoring?
    - How was the project started and what methodology was used?
    - Whose initiative was the project?
    - What were the challenges with starting the project and keeping it running?
    - What is the current status of the project?
    - Request for project documents
- Do you see any potential of using the reeds for income generating activities?
    - If, yes, what activities do you suggest?
    - Do you know any individuals or business that could establish these uses?
- Based on previous community project experiences, do you think the residents of Mariental will be interested in an initiative like this one (work with reeds)?

    - If the residents of Mariental were interested in using the reeds, would you want to be involved and how?
- Are you aware of a venue/market place where reed products could be sold within and outside Mariental?
- Does Mariental receive tourist on a regular basis?
    - Do you think tourists in Mariental would be interested in buying reed products?
- What projects have you worked with in the past?
    - What were the challenges with starting the project and keeping it running?
    - What is the current status of the project?

Ownership of the Reeds

- Do you know who owns the reeds? (Background: We heard that…)
- Do you know if any of the reeds are on irrigation farm property?
- Do you have a map of the irrigation farms?
- Are there any conflicts between the residents and the farmers? Do the residents have to go through the farms to harvest the reeds?

Informal Settlements

- How many informal settlement areas are there?
- How many households are there in each settlement?
- How many people are living in the informal settlements?
- Where are they located? Do you have a map?
- Are there different ethnic groups living in the settlements?
    - Will the relationships between the different ethnic groups affect how they work together in using the reeds?
- Do you have information on unemployment rates in Mariental? What contributions or impact do you think using the reeds would have for Mariental's low-income residents?

Appendix F – Interview Protocols for Farmers, NAU Chairperson, and Contracted Sprayer

Interview protocol for Farmers' Union Chairperson

- What does the Farmers' Union do?
    - What are they involved in?
    - How many members are in the union?
- What is your role in the Farmer's Council?
- How long have you held this position?
- Are you aware of the Mariental Flood Task Force and its responsibilities?
- Is the union involved in the Mariental Flood Task Force?
- What is the union's position on the reeds?
    - What is the union's opinion on the removal of reeds? What does the union think should be done with the reeds?
    - Do the reeds have any negative impacts on the irrigation farms?
    - Do the reeds provide any benefit to the irrigation farms?
    - Does the spraying affect any of the farmers' crops?
- Are you or the farmers currently doing anything with the reeds?
    - Do you or the other farmers use compost?
    - Do you have any livestock? How much?
    - Are the farmers doing anything to remove the reeds besides the spraying in the river?
- Do you have any concerns about the wildlife living in the reeds?
- Do farmers own any portions of the reeds?
- If the community is interested in using the reeds, how would the farmers feel if local residents of Mariental harvested reeds near farm property?
    - What are the farmer's feelings towards the harvesters?
    - How would you feel if more people were to harvest near your property?
- Has the reed growth changed from the past? Has it escalated?
    - What do you think are the major contributors to the reed growth?
    - Are there any plans in place to change the irrigation systems of the farms?
- Do you think the reeds should be managed?
    - What type institutional arrangement do you think should be put into place?
    - Who do you think should manage the reeds? The government? A community-based management?
        - How would the union like to be involved in the management of the reeds?
    - Would the council be willing to provide any resources to people willing to harvest the reeds and remove them from the river? (What would they expect in return?)
- Are you interested I being involved with this project in the future?
- Do you have any recommendations for starting this type of project?

Interview Protocol for Farmers

- What do you do for a living?
- What types of farming do you do? Crop or livestock?
    - How many livestock do you have?
    - Do you compost?
- How long have you been running this farm?
- Does your property extend to the Fish River?
    - What can you tell us about the reeds growth in the river in the past decade?
- Are the reeds on your property?
    - Do you feel it is a problem?
    - Are you doing anything to control the growth of the reeds?
    - Do these reeds provide any benefit to you?
    - Do these reeds negatively impact you? (Besides the flooding?)
- Are you aware of the Mariental Flood Task Force and its responsibilities?
    - Are you involved with the Mariental Flood Task Force?
        - If so, what is your role?
- What do you think should be done with reeds?
- Are you currently using the reeds?
- Do you see any potential for using the reeds?
- Do you know anyone else that is currently using the reeds?
- Does anyone harvest reeds near your property?
    - If Yes: What arrangements/procedures are in place?
        - How would you feel if more people came to harvest?
    - If No: How would you feel about local residents of Mariental harvesting reeds near your property?
- If the community is interested in using the reeds and implementing a program to manage the use, who do you think should manage the reeds? The government? A community-based management?
- How would you like to be involved in the management of the reeds?
- What suggestions do you have for starting a reeds project?
- Would you be willing to provide any resources to people willing to harvest the reeds and remove them from the river? (What would you expect in return?)
- Were there reeds in the river in the past?
    - How has the reed growth changed from the past? Has it escalated?
    - What do you think are the major contributing factors to the reeds problem?
    - Are there any plans to change the irrigations systems of the farms?

Interview Protocol for Contractor who is Spraying Reeds

- What do you do for a living?
- Does your property extend to the Fish River?
- Are the reeds on your property?
    - Do you feel it is a problem?
    - Do these reeds provide any benefit to you?
        - Do you currently use the reeds?
    - Do these reeds negatively impact you?
- Do you know any businesses or individuals using the reeds?
- Are you aware of the Mariental Flood Task Force and its responsibilities and plans?
    - Are you involved with the Mariental Flood Task Force?
    - What is your role?
- How did you get involved with spraying the reeds?
- Have you done any similar work in the past?
- What have you been contracted to do specifically?
- What chemicals do you use? How environmentally friendly are they?
- How often do you spray?
    - How do you determine when to spray?
- Where are you spraying?
    - How do you determine where to spray?
- How much area have you been spraying?
- What are the characteristics of the reeds before and after spraying?
- What effect has the chemicals had on the reeds?
    - How do the reeds grow back?
    - Does it affect the characteristics of the reeds after they grow back?
- What are the challenges associated with spraying?
- Do you have any suggestions for other methods to remove the reeds?
    - What effect would harvesting the reeds have?
    - Could this be able to be combine with spraying?

Appendix G – Interview Protocol for Community Members using Reeds

Interview Protocol for Individual Community Members using Reeds

- What do you do for a living? (Harvesting or making reed products)?
- Is this a seasonal job or are you do you work year-round?

Harvesting the reeds

- Do you harvest the reeds?
    - When did you start harvesting the reeds?
- What skills are involved?
    - Were you trained?
    - By who?
    - How long was training?
    - What were the components of the training?
    - Is it difficult to learn how to properly harvest the reeds?
- How do you harvest the reeds (what techniques, where the reeds are cut, etc)?
- Is it a physically demanding job?
    - How much (per day, per week, per product, etc) and how often (every day, a few times a week, etc) do you harvest the reeds?
- Where do you harvest the reeds?
    - Do you harvest the reeds on the banks of the river or in the middle of the river?
- Do you harvest near the farms?
    - If yes: What is your relationship with the farmers? Have you made any arrangements with them to harvest the reeds?
- How do you get to the harvesting site and back?
- How do you transport the reeds?
- Is harvesting seasonal?
    - How do the reeds vary from season to season?
- What tools do you use?
- Do you need a team of workers to harvest the reeds?
- What are the hazards associated with harvesting the reeds?
    - How do you protect yourself from the hazards associated with harvesting (snakes, etc)?
- (Possible?) How much do you earn?
- How quickly do the reeds grow back after you harvest them?
- What are the challenges with harvesting the reeds?
- Are you aware of the MFTF and its activities/responsibilities?
    - Do you know of the MFTF's plan to harvest the reeds?
- How will it affect your work?
- Do you see any negative impacts (e.g. do to with the environment) resulting from the harvesting of reeds?
- Who owns the reeds?
- Do you need any permission to harvest the reeds?

Making reed products

- What products do you make?
- How do the characteristics of the reeds affect which products you make?
- How long have you been making these products?
- How do you make them?
- What tools do you use?
- For the product that you make, what are the ideal properties of the reeds? (Small vs. large, stiff vs. flexible, etc)
- What parts of the reeds do you use?
- What is the market for your product? Who is buying it?
- Do you think the reeds should be managed? (give background)
- Who do you think should manage the reeds? The government? The community?
- Would you like to be involved in the management of the reeds?
- Are you aware of any businesses, community individuals, CBOs or anyone harvesting reeds in Mariental (besides Mariental Hardware)?
    - In your opinion and knowing the residents of Mariental, do you think they will be interested in an initiative like this one (harvest reeds to generate income)?
    - What would be your suggestions and recommendations in starting a project/initiative like this one (reeds harvesting for income generating activities)?
        -How could we go about establishing a new business dealing with the reeds?
    - Are you interested in being involved with this project in the future? If yes, in what capacity would you want to be involved?
    - Is there anyone else associated with the reeds that we should contact?
    - Is there anything else we should consider with our project?

Appendix H – Interview Protocol for Mariental Hardware Owner, and workers

Interview Protocol for Mariental Hardware Owner

Background

- What is your position within the business?
- What are your responsibilities in this position?
- How long have you had this position?
- How many workers do you employ?
- When and how was your business started?

Reed Products

- We observed that you are selling reeds and reeds products, when did you start selling the reeds?
- What other reed products do you sell and are not in stock right now?
- Does your business make all of these products? Do you acquire these products from other sources?
- How long have you been selling reed products?
    - Who purchases these products?
    - How is the demand for reeds and reeds products?
        - Do you always meet the demand?
        - Which products have been the most successful?
- Have you tried making any other products?
    - Would you be willing to sell other products such as…?
- What tools and methods do you use to make your products?
    - What are the difficulties associated with making these products?
- Have you had any difficulties selling the products? If so, how could they be improved?
- What are the expenses associated with producing reed products?

Harvesting

- Does your business harvest the reeds?
- Who harvests the reeds?
    - How many people do you employ to harvest the reeds?
- Where are the reeds harvested?
- How often are the reeds harvested?
    - How much do you harvest on one trip to the harvesting site?
- How do you transport the reeds from the harvesting site to your business?
    - How much does this cost?
- What are the challenges in harvesting the reeds?
- Do you have to ask for permission/apply for permits in order to harvest reeds?
    - If yes, who do you ask for permission and what are the procedures?
- Are you aware of the Mariental Flood Task Force and its activities/responsibilities?
    - If yes, in what capacity and are you involved and how are you involved?

- What do you know about the Mariental Flood Task Force's plan to remove the reeds?
    - How will this affect your business?
- Do you see any negative impacts (e.g. do to with the environment) resulting from the harvesting of reeds?

Opinions on harvesting of reeds for income generating:

- What is your opinion regarding the reeds growing in the Fish River? Are they a problem?
    - If yes: What are your suggestions in dealing with the reeds problem?
- Are you aware of any community individuals, CBOs, or anyone harvesting reeds in Mariental?
    - Are there any similar projects in the region that you are aware of?
    - Do you know of any businesses or organizations currently using the reeds or that may be willing to use the reeds?
- In your opinion and knowing the residents of Mariental, do you think they will be interested in an initiative like this one (harvest reeds to generate income)?
    - If the community is interested in using the reeds, would you be interested in expanding your business?
    - What would be your suggestions and recommendations in starting a project/initiative like this one (reeds harvesting for income generating activities)?
- Is there anyone else associated with the reeds that we should contact?

Future Possibilities

- Are you interested in being involved with this project in the future?
    - If yes, in what capacity would you want to be involved?
    - Have you considered working with community members?
- Do you think the reeds should be managed? (Give background on necessity for management. Sustainability, etc)
    - Who do you think should manage the reeds? The government? The community?
    - Would you like to be involved in the management of the reeds?
- Is there anything else you think we should consider with our project?

Interview Protocol for Mariental Hardware Workers

- What is your job (harvesting vs. making reed products)?
- Are you employed by Mariental Hardware, or are you an independent worker?
    - If employee, how long have you been working for Mariental Hardware?
    - If independent, for whom do you work for?
- Is this a seasonal job or are you employed year-round?

Harvesting the reeds

- What skills are involved? Were you trained? By who? How long was training? What were the components of the training?
    - Is it difficult to learn how to properly harvest the reeds?
- How do you harvest the reeds (what techniques, where the reeds are cut, etc)?
- Is it a physically demanding job?
    - How much (per day, per week, per product, etc) and how often (every day, a few times a week, etc) do you harvest the reeds?
- Where do you harvest the reeds?
    - Do you harvest the reeds on the banks of the river or in the middle of the river?
- Do you harvest near the farms?
    - If yes: What is your relationship with the farmers? Have you made any arrangements with them to harvest the reeds?
- How do you get to the harvesting site and back?
- How do you transport the reeds?
- Is harvesting seasonal?
    - How do the reeds vary from season to season?
- What tools do you use?
- Do you need a team of workers to harvest the reeds?
- What are the hazards associated with harvesting the reeds?
    - How do you protect yourself from the hazards associated with harvesting (snakes, etc)?
- (Possible?) How much are you paid?
- How quickly do the reeds grow back after you harvest them?
- What are the challenges with harvesting the reeds?
- Are you aware of the MFTF and its activities/responsibilities?
    - Do you know of the MFTF's plan to harvest the reeds?
    - How will it affect your business?
    - Do you see any negative impacts (e.g. do to with the environment) resulting from the harvesting of reeds?

Making reed products

- What products do you make?
    - How do the characteristics of the reeds affect which products you make?
- How long have you been making these products?
- How do you make them?
    - What tools do you use?
- For the product that you make, what are the ideal properties of the reeds? (Small vs. large, stiff vs. flexible, etc)

- What parts of the reeds do you use?
- What is the market for your product? Who is buying it?
- Do you think the reeds should be managed? (give background)
- Who do you think should manage the reeds? The government? The community?
    - Would you like to be involved in the management of the reeds?
- Are you aware of any community individuals or CBOs or anyone harvesting reeds in Mariental?
- Are there are any similar projects in the region that you are aware of?
    Do you know of any businesses or organizations currently using the reeds or that may be willing to use the reeds?
- In your opinion and knowing the residents of Mariental, do you think they will be interested in an initiate like this one (harvest reeds to generate income)?
- What would be your suggestions and recommendations in starting a project/initiative like this one (reeds harvesting for income generating activities)?
    - How could we go about establishing a new business dealing with the reeds?
- Are you interested in being involved with this project in the future? If yes, in what capacity would you want to be involved?
- Is there anyone else associated with the reeds that we should contact?
- Is there anything else we should consider with our project?

Appendix I – Interview Protocols for Accommodations

Anib Lodge

- What is your position at the lodge?
- How long have you worked here?
- What are your role and responsibilities?
- Is this a seasonal lodge? When it is most active?
- How many tourists do you receive yearly?
- When do you receive the most tourists?
- Where do most of the tourists come from?
- Has the business been expanding? And what is your outlook for the business in the future?
- Are you involved with the reeds? How?
    - If NO: Would you consider using reeds (roof thatching, insulation, window blinds, wall dividers, furniture).
- If YES: What do you use the reeds for?
        - Where do you purchase the reed products?
        - How often do you purchase the products?
        - How are they delivered?
        - Do you see lodge buying more reeds in the future?
        - What metrics of quality do you want? What quality of products do you receive?
- Do you have a gift shop?
    - What products do tourists tend to buy (Traditional or unique)?
    - How do you determine which products to sell?
    - Do you sell any reed products?
        - If NO: Would you consider selling reed products in your gift shop such as baskets, mats, etc?
            - If reeds products sold well, would you continue to purchase them for retail sale?
            - Do you think there is a market potential for the reed products/uses?
        - If YES: Which reed products are the most successful in terms of sales?
            - Where do you get these reed products?
                - Can you give us contact information?
                - Do you purchase from any CBO's or from Mariental Hardware?
                    - What do you purchase from them?
                - How often do you purchase these products?
                - How are the products delivered to you?
    - Would you be willing to sell products on behalf of the residents of Mariental?
- Do you know of any other lodges that might use reed products?
- Do you have any connections/associations with other lodges?
- Do you have any suggestions on how to market products?
- Are you interested in being involved with this project in the future?

General Lodge/Hotel/Craft Center

- What is your position at the lodge?
- How long have you worked here?
- What are your role and responsibilities?
- When it is most active?
- How many tourists do you receive yearly?
- When do you receive the most tourists?
- Where do most of the tourists come from?
- Has the business been expanding? And what is your outlook for the business in the future?
- Do you use reeds for anything? How?
    - If NO: Would you consider using reeds for decoration (roof thatching, insulation, window blinds, wall dividers, furniture).
    - If YES: What do you use the reeds for?
        - Where do you purchase the reed products?
        - How often do you purchase the products?
        - How are they delivered?
        - Do you see lodge buying more reeds in the future?
        - What metrics of quality do you want? What quality of products do you receive?

- Do you have a gift shop?
    - What products do tourists tend to buy (Traditional or unique)?
    - How do you determine which products to sell?
    - Do you sell any reed products?
        - If NO: Would you consider selling reed products in your gift shop such as baskets, mats, etc?
            - Do you think there is a market potential for the reed products/uses?
        - If YES: Which reed products are the most successful in terms of sales?
            - Where do you get these reed products?
                - Can you give us contact information?
                - How often do you purchase these products?
                - How are the products delivered to you?
    - Would you be willing to sell products on behalf of the residents of Mariental?
- Do you know of any other lodges that might use reed products?
- Do you have any connections/associations with other lodges?
- Do you have any suggestions on how to market products?
- Are you interested in being involved with this project in the future?

Appendix J- Interview Protocol for Craft Shops

- What is your position at this business?
- How long have you worked here?
- What are your role and responsibilities?
- When do you receive the most customers (time of year)?
- Where do most of the tourists come from?
- Has the business been expanding? And what is your outlook for the business in the future?

- What products do tourists tend to buy (Traditional or unique)?
- How do you determine which products to sell?
- Do you sell any reed products?
    - If NO: Would you consider selling reed products in your gift shop such as baskets, mats, etc?
        - Do you think there is a market potential for the reed products/uses?
    - If YES: Which reed products are the most successful in terms of sales?
        - Where do you get these reed products?
            - How often do you purchase these products?
            - How are the products delivered to you?
        - What metrics of quality do you want? What quality of products do you receive?
        - Do you see lodge buying more reeds in the future?
    - Would you be willing to sell products on behalf of the residents of Mariental?

- Do you know of any specific craft markets that sell reed products?
- Do you have any connections/associations with other craft markets?
- Do you have any suggestions on how to market products?

Appendix K – Interview Protocols for CBO's and Local Businesses

Interview Protocol for Community-Based Organizations and Local Businesses

- What do you do for a living?
    - What does your organization do?
- What is your position?
    - What are your responsibilities in this position?
    - How long have you had this position?
- How was your organization started?
    - How long has your organization been established?
- How do you find a market for your products?
- If you don't mind us asking, how much do you earn?
- Have you worked with reeds before?
- Would you be interested in using the reeds?
    - Where do you think there is a market potential for the reeds?
    - Since you are currently busy with this project, will you be able to work on both projects?
- Do you think the poor and unemployed would be interested in using the reeds for income-generation?
- Do you have any recommendation or suggestions for an initiative like this one?
- If the residents of Mariental were interested in using the reeds, would you want to be involved?
    - To what capacity would you like to be involved?
- Are there any other organizations we should contact?

Appendix L – Questionnaire for Informal Settlements

Informal Settlement REEDS questionnaire

Sex: Male Female

Settlement Location: _____

Age: _____

Family Origin: _____

Length of Time in Mariental:_____

Household Size: _____

Current livelihood: _____

1. What skills do you have in working with your hands?
   (Go through detailed questionnaire for relevant skills)
2. Have you used reeds for anything?
   - **a. NO:**
     - i. Have you seen anyone using reeds? How?
     - ii. **NO**: What income-generating activities do you think the reeds could be used for?
       1. If no ideas, brief them on the uses
       2. Which one of these uses would you be interested in trying?
   - **b. YES:**
     - i. What were the reeds used for?
     - ii. To whom you sell them to?
     - iii. How much did you make?
   - c. What do you think you need in order to start producing these products?
   - d. Do you think there is a market for these products? Where?

3. NO ASSOCIATION WITH REEDS

- a. Would you also harvest the reeds?
  - **i. YES:**
    1. Do you have a way of getting to the reeds?
    2. Do you have a way to transport the reeds?
    3. When will you be available to harvest the reeds during the year?
    4. How far are you willing to walk in order to harvest the reeds?
    5. Do you know of any hazards associated with harvesting reeds?
       - a. **If NO, PRESENT HAZARDS**
       - b. Would you still harvest the reeds knowing the following hazards?
  - ii. **NO:**

1. Why not?

4. **CURRENTLY OR USED REEDS IN PAST**
    a. When did you harvest the reeds?
    b. Where did you harvest the reeds?
    c. How did you get to the reeds and transport them back?
    d. What are the hazards?

FOR ALL

5. Do you think all the ethnic groups in the informal settlements can work together on this initiative?
6. What do you think about this initiative of income-generating activities by using the reeds?
    a. What would be your suggestions and recommendations in starting a project/initiative like this one?
        i. Who do you think should manage the reeds?

Construction

- *Roof Thatching & Insulation*

Does anyone in your household know how to thatch roofs or install insulation?

YES_____

How long have you/he/she been doing this?	
What method and techniques do you use to do it?	
What materials do you use?	
How much thatching do you do annually?	
	How much thatching or insulation do you do annually?
	How much material do you use per house?
Would you consider using reeds as a material for roof thatching or insulation?	
If you don't wish to use reeds, then why not?	

NO____

If no, what do you know about roof thatching or insulation?
Using reeds for roof thatching or insulation can make your house cooler and it is inexpensive. However, insects and small animals can get into the roofing. There is also a possibility that the reeds can be used for tourism lodges (to be determined). Would you be interested in using reeds for roof thatching if training was provided?

Compost	
Do you have a garden or fruit trees?	
YES ___	What method do you use to compost?
	What do you include in the compost?
	How much compost do you use annually?
	Would you consider using reeds for your compost?
NO ___	What do you know about composting?
	Pros: Provides nutrient rich soil for gardening. Cheap or possibly free. **Cons:** It takes time to produce soil. Would you consider using reeds for composting now?

Domestic Items

Do you or anyone in your household have any experience in handicrafts, such as making baskets or mats?

YES ____

What do you specifically make?

How long have you done this?

How do you make the specific products?

How do you make the specific products?

Do you sell these products? To who?

How many of these products do you make annually?

How much material do you use per item?

Would you consider using reeds as a material?

NO ___ If not, why?

Would you consider making one of the following items: (*Explain self-benefit and market potential for each.)*

	YES	**NO**
Mats		
Baskets		

NO ____ Are you interested in being trained in the skill of handicraft?

Do you or anyone in your household have any experience in building furniture or household items? Such as the following: Boxes, window shades, door panels.

YES ___

What do you specifically make?

How long have you done this?

How do you make the specific products?

Do you sell these products? To who?

How many of these products do you make annually?

How much material do you use per item?

Would you consider using reeds as a material?

NO — If not, why?

Would you consider making one of the following items:

	YES	NO
Window Shades		
Furniture		
Door Panels		

NO ____

Are you interested in being trained the skill of building furniture or household items?

<table>
<tr><th colspan="3">Cattle Fodder</th></tr>
<tr><td colspan="3">Does your household own any livestock locally?</td></tr>
<tr><td rowspan="4">YES ____</td><td colspan="2">What type of livestock do you own?</td></tr>
<tr><td colspan="2">What do you feed them?</td></tr>
<tr><td colspan="2">Would you consider using reeds as fodder? (Self-benefit)</td></tr>
<tr><td>NO ____</td><td>If not, why not?</td></tr>
<tr><td rowspan="2">NO ____</td><td colspan="2">Would you consider getting livestock if you could get cheap fodder?</td></tr>
<tr><td>NO ____</td><td>If not, why?</td></tr>
<tr><td>YES ____</td><td>If yes, would you consider using reeds as fodder?</td></tr>
</table>

Appendix M –SWOT Analysis

***Things that contribute to problems are in bold, and potential solutions are in italics**

Internal

Strengths

- Management
  - Community members that run CBO's could help manage the project
  - The community members know what they want for management as a majority
- Social
  - The residents are interested in the project
  - Some people are experienced in making these products
  - Residents have some knowledge about reeds uses
  - Residents know what basic resources they need
  - Residents are aware of hazards of harvesting the reeds
  - People agree that ethnic groups can work together
- Markets
  - The community members think there is a market for reeds/reed products
- Potential Assistance
  - The Supervisor of the Paperworks project is willing to contribute her managing skills to this project.
  - People that have past experience with reeds are willing to train others.

Internal

Weaknesses

- Management
    - Financial Problems
        - People want a quick and large return.
            - **Market determines how much profit is generated.**
                - **Need a solid market.**
            - **Money could be provided up front by managing party or requested from customer.**
                - **May not work on large scale, plus capital funds are needed.**
            - **Cost of materials may lead to not enough profit margins.**
                - **Need a large and consistent market.**
        - Capital needed to start the project.
            - **Could come from external source.**
            - **Community could pool money to invest in project.**
        - Trust of managing money is a problem among community members.
            - **Transparency and accountability.**
            - **Rigorous in book keeping.**
            - **One book keeping system.**
            - ***Elect a committee and the committee develops management guidelines, using the conservancies of the north as a model.***
            - ***Have one person oversee management of finances (government official, etc – trusted authority figure – someone who is not personally invested in the project – nothing to gain or lose)***
    - Manager of project needs control over the people working especially harvesters near farmer's property.
        - ***Having a third party/government participation in management.***
        - ***Have guidelines for participants that everyone must abide by, make sure people are accountable for breaking those guidelines***
            - ***Make sure farmers participate in developing guidelines related to harvesting near their property.***
- Social
    - Keeping the interest of the people to continue the project.
        - **If the residents are making enough money to satisfy them, then the interest in the project should still be there.**
        - **This factor depends on the success of marketing the products.**
    - Cooperation
        - How to get participation and representation of all ethnic groups?
            - ***No ethnic groups should be excluded – no discrimination.***

        - How to have all groups work together?
            - ***Committee or manager needs to be part of conflict resolution.***
    - People would like to have confidence that the project succeed before participating.
        - **Depends on how strong is the market.**
    - Knowledge
        - Some projects may not fit in with certain people's cultures because it may be different from their normal way of life.
        - People do not have a good foundation of how to use the reeds.
            - Residents do not know what specifically they want to make.
        - Diverse level of education among the population.
        - Lack of knowledge of benefits of reed uses.
        - ***Have a workshop for reed uses so everyone is equally informed.***
        - ***Workshop should be accessible for people of all education levels.***
    - Other Issues
        - The harvesters may need to travel a long distance in order to harvest the reeds.
            - ***Provide transportation – resources from community***
        - Alcohol Abuse in settlements.
        - The availability of residents that do have skills in reed product production to train others.

- Markets
    - Quality of product is important in order for it to sell.
    - Marketing the products outside of Mariental may pose a challenge.
    - Transporting the goods to markets outside of Mariental may pose a challenge.
    - Small products for tourist must be made for easy transport.
        - ***Have quality control guidelines.***
        - ***People who have used reeds in the past can develop guideline.***
        - ***Third-party organization with experience in this area can develop guidelines.***
- Resources
    - Residents requested resources.
        - **Capital funds can be used to purchase.**
        - **External donations from government or NGOs.**
    - Facility to run operations from.
        - **Based on interest of people and size of project – Further study needed**
        - **Good to have a place for central management decisions and discussion.**
        - **Need a secure place for record-keeping, storage of supplies, products.**

External

Opportunities

- Management
    - Government Support
        - CBOs – Require product to be made by hand and sold directly to customers.
        - MUCDC funds group projects.
        - MUCDC does not require things to be made by hand while the CBOs have that requirement.
- Social
    - People that have skills of using the reeds from north could come to Mariental to train the local residents.
    - Other organizations could help with the project by providing training and initial management (HRDC, Rossing Foundation– could give suggestions or participate, run workshops).
- Markets
    - Products
        - Tourists like products made in Namibia
        - Tourists like small products, such as coasters, placemats
        - In some craft shops mats and photo frames sold very well in the past
        - Craft shops sell products made from palm (similar material) such as baskets
            - Tourists like to buy these products, they sell well
        - Owners like to have a variety of products, and unique items
    - Advertising
        - Owners will buy products from anyone who comes into their shop
            - can work on commission if there is trust established
            - could create brochure of products
            - majority would prefer actual reed samples to be brought in
        - Potential open market will be constructed on main road of the B1 Highway in Mariental.
    - Tourism business has been expanding
    - Several lodges trying to attract more tourists
        - interested in wall dividers, decorations
        - have thatched roofs from grass
    - There is a high season for tourism every year
    - Leading lodges uses reeds and buys from local sellers
        - They have a constant need for reeds for refurbishing
        - They like to support the local community
    - Kalahari Sands Hotel is interested in helping community development projects
        - They would like to expand outside Windhoek
- Potential Assistance
    - Regional Council
        - Provided pangas for previous reed projects.
        - Willing to provide training.
        - Can assist with negotiation with farmers.
        - Would only oversee project and let the community run the project.

        - Would help with technical aspects at the beginning of the project.
        - Would eventually have MUCDC step in and run the project.
        - Previously had helped with finance for Paperworks project.
    - Mariental Municipality
        - Provided training and raw materials for Tso Tso stoves project.
        - Can potentially provide transportation.
        - Can help find people to work.
    - MUCDC
        - Has provided funding for various initiatives, such as internet café, coffin manufacturing, hair salon, and car wash.
        - Can potentially provide funds to purchase protective clothing, such as shoes, against snakes.
    - Ministry of Gender Equality and Child
        - Provided funds for Paperworks project.
        - Would provide funding for this initiative if money is available.
    - Local technical school may provide reed use training
- Future availability of reeds
    - Extensive root system in the Fish River which means they are hard to remove.

External

Threats

- Quality of reeds/future availability of reeds
    - 1980's Ministry of Environment raised concerns about bird nests in the reeds, which is part of the ecosystem harvesting could disrupt.
    - Fertilizer is contributing to the growth of the reeds, if irrigation scheme is improved, there could be a reduction in reed growth.
    - Complete removal of reeds by MAWF.
    - Quality of reeds
        - Sprayed reeds are not of good quality because they are brittle, weaker, and would rot if gotten wet.
        - 90% of reeds are dead.
        - Stronger and larger reeds on irrigation channels are near farmers' property.
        - Good reeds are scarce.
- Management
    - Government Support
        - To get funding from MUCDC, the project participants must invest their own money first, to demonstrate the success of the project.
        - One businesses owner said that his proposal was lost by Regional Council Office.
        - Mariental Municipality cannot provide training.
        - Ministry of Gender Equality and Child Environmental do not have resources to provide training.
- Market
    - Residents feel profit is too little for the work done
    - A market needs to be found outside of Mariental
    - Tourism
        - Products
            - The owners do not want to sell products that street vendors or lots of shops sell
            - Owners won't buy products with bad craftsmanship
            - Tourists complain about the weight and volume of products
            - Some lodge owners are hesitant about using reed products
                - Some think reeds decompose and rot quickly
                - Some think reeds are fire hazard
        - Some lodges like modern look, not authentic
            - Lodges cater to business people and tourists
        - In future, craft shop business might not be a success because there are too many people entering the market
        - Some owners harvest reeds from river in Windhoek themselves
        - Owners don't like catalogs or emails

        - Owners do not travel places to buy products
        - Shop owners don't like too many middlemen, because it raises prices
- Social
    - Farmers experience theft of their crops and this could pose a challenge to the project if harvesters are not allowed to harvest near farmers' property.
    - Cooperation
        - Chairman of NAU is hesitant to participate in project.
        - There are tensions between people collecting wood and Farmers.

Advice from Interviewees

- Starting Project
    - Need to define how project operates from beginning to have the project run properly and gain people's interest.
    - Do not talk about money initially, but wait a while for project to succeed.
    - There should be a binding contract among a group, even if project is not successful at first.
    - Rules and regulations must be put into place in terms of execution and discipline.
    - Products should be sold individually instead of a group, to avoid financial conflicts.
- Market
    - Government should build market for reed products.
    - Government should establish connection to markets.
- Harvesting Hazards
    - Avoid the snakes.
    - Harvests when water level is low.
    - Where hard sole shoes to avoid injury from reed stumps.
- Social Problems
    - Theft solutions
        - Consult with farmers before harvesting.
        - One harvester got permits from Hardap Regional Council in order to harvest near farmers' property.
        - Harvester cannot have overnight stays near farm property. - The NAU Chairperson
        - Harvesters should not be allowed to enter farm property. – The NAU Chairperson
- Transportation suggestions
    - Bicycle.
    - Pay for car transport.
    - Transport reeds on head.

Appendix N – Interview Summaries for Government

Interview with Mariental Urban Constituency Development Committee

Interviewee: Axab Skrywer - Mariental Urban Constituency Development Committee Administrator
Location: MUCDC Office, Mariental, Namibia
Date: 31 March 2009
Time: 15:30-16:30

The Hardap region consists of six Constituency Development Committees (CDC), one of which is located in Mariental. The local office is headed by the Regional Councilor who is also a member of Parliament. Axab is the Mariental Urban CDC Administrator (MUCDC) for the local office, who essentially manages the local activities and affairs of the office. Axab also represents the Regional Councilor when he is away, assists him with decision making, and provides advice. The MUCDC provides development opportunities for the community by allowing them to submit a proposal for a review. If the proposal is approved, then financial assistance is provided for the project. These projects consist of infrastructure upgrade, building construction, roads construction, and many other community related projects. All of the funds come from the central government.

The MUCDC provides funds to locals also to assist them in expanding their projects or businesses. Axab said that many businesses just need some investment in order to expand, and without this assistance, they are not able to expand and help develop the local community. Community-Based Organizations assist locals with expanding their businesses, but require that they make products by hand and sell it directly to the consumers. The MUCDC does not require them to make something by hand, but requires that those involved with the initiative invest their own money in their endeavor and show that it is successful. Some of the projects that were funded by the MUCDC include an internet café, coffin manufacturing, a hair salon, and a car wash.

Axab says that the reed problem is a difficult one. Currently, no solution has been found that actually removes the reeds successfully. A previous attempt to remove the reeds occurred in

1993-1994, when local farmers hired workers to go to the river and cut the reeds. The reeds were used for animal fodder. Axab was not part of the project because he was only a student at the time.

The Regional Councilor is part of the Mariental Flood Task Force (MFTF) and Axab is a member of the Regional Emergency Management Unit (REMU). The REMU assists the community during crises, such as when flooding occurs. After a major flood, the government will give assistance to REMU to distribute to the affected communities. The MFTF is the organization that is specifically looking into what caused the flooding in 2006 and how future floods can be prevented. The meetings for the MFTF are held in Windhoek, because the Ministry of Agriculture, Water and Forestry and other officials that are part of the committee are based in Windhoek.

Axab has witnessed or heard of people using the reeds from the Fish River. Some young men from Mariental Hardware produce mats out of the reeds and sell them. In Rehoboth, there is a business that is manufacturing furniture, and at times use reeds in their products to make tables and chairs. Axab knew very little information about this businesses and how they used the reeds. This business did apply for assistance from the Regional Council, through the MUCDC, to expand their business.

Axab believes that having the residents of Mariental use the reeds would be a good solution to the reeds problem. The government could provide money to cut the reeds, especially before each rainy season. The reeds could possibly be ground up and used as food for animals. Even providing employment for a three month period annually would be good for the community. He believes that the residents would fully support this project and have a good understanding of how the reeds can be used. In the past, a food-for-work proposal was submitted by the residents to remove the reeds, but the MUCDC could not help because the MFTF did not give permission for the reeds to be harvested. The Fish River is owned by the government and there are no laws preventing people from harvesting reeds there. Currently, the MUCDC would just need funding to start a program using the reeds. The funding would also be used to make sure the people taking part in the imitative are fully protected, by providing shoes if necessary to protect against snakes.

The market potential for reeds would be Mariental Hardware and the local farmers. The farmers typically come into town at the end of each month to get supplies, and may be interested in purchasing reed products. They might be interested in using it for livestock fodder since it would be cheaper. The market for tourists is small because tourists do not drive through downtown Mariental; however, currently there are plans to construct an open market on the main road, sponsored by the Municipality, to capture the tourist market. Axab expects that the construction will begin in April, once the budget is approved.

Interview with Hardap Regional Council

Interviewee: Theresa Basson
Position: Director of Planning
Location: HRC Boardroom
Date: 7th April 2009
Time: 11:00 – 12:00

Theresa Basson is the Director of Planning for the Hardap Regional Council. She coordinates development and funding. She has been the director for 3-4 years. In her opinion, the reeds are blocking the flow of the river and need to be removed from time to time, because it worsens the flooding, which affects the whole town.

In the beginning of last year, there was a group of residents in the informal settlements of Mariental that wanted to work with the reeds and asked the Council for assistance. There were approximately ten people involved, who were cutting the reeds from the Fish River, and selling raw bundles as well as reed mats. However, the quality of the final reed mats was not satisfactory. They had a connection with people selling the reeds and products to lodges in the North. The Regional Council tried to assist, and helped those involved get pangas. However, there was not enough support and funding. She did not know how the connection was made between the customers and the workers. The Desert Research Foundation of Namibia has also looked into using the reeds for biogas; however she feels the community will not benefit very much from this. Other than these projects, she does not know any individuals or projects that use the reeds.

Ms. Basson does not know very much about the Mariental Flood Task Force, except that they are working to find ways to improve the flow of the water in the river. The Municipality is more involved in the task force than the Regional Council. After being briefed about option six, she does not think there are any environmental concerns.

The Council could assist with training if a project involving the reeds was started in Mariental. They also could look into funding for a project. Ms. Basson thinks the community would be interested in using the reeds, since they have started using them on their own before. Reed mats

and using reeds for ceilings would be good products to sell. There is no current open-market to sell products made out of reeds. However, the lodges will be very excited to purchase reeds or reed products. The farmers might be interested in using the reeds as well.

The Council could assist with negotiating with the farmers, especially if people were to harvest near their property. The Council would be involved with the project, but the community would have ownership. They would only oversee the project, such as making sure they have a financial account. They would also help with some technical aspects in the beginning, but then the Urban Constituency Development Committee would step in to help.

Ms. Basson provided some recommendations for a project using the reeds. The project should consider the empowerment of existing groups using reeds, since they have had problems in the past with transport and storage of products. Projects on a larger-scale will be more challenging than smaller-scale projects. The project might need a place that the workers could operate from. It is also important to get people working together and making a plan from the start on how to do things properly.

She does not think there would be a problem with different ethnic groups working together. Some projects may not fit in with certain people's cultures because it may be different from their normal way of life. Other cultures may be more experienced with using reeds already. For the project to be successful, the people must be informed. If they are aware of how to use the reeds and how the project will be run, they will be interested in being involved. People need to get together to determine what is needed. They also need to determine if there is a market for any reed products. She also suggested that we might want to talk to the local technical school and see if they would be interested in starting a reeds training program.

Interview with Pete Jansen of the Ministry of Agriculture, Water, and Forestry

Interviewee: Pete Jansen
Position: Researcher MAWF
Location: Ministry of Agriculture, Water, and Forestry
Date: April 3, 2009
Time: 12:00 – 13:00

Pete Jansen has worked for the government for the past 37 years. Prior to Namibian Independence he was a field technician. Currently he works for the research department in the Ministry of Agriculture, Water, and Forestry (MAWF). This task includes maintaining budgets, appointing people for positions, developing research stations, and communicating with the head offices and people in the field. He also mentioned that since a lot of positions in his office remain open, he has had to take on other responsibilities. The research conducted by the ministry is mostly with the irrigation scheme and the small livestock business in the south. Pete grew up in Mariental and has been living here since the 1970's. He also mentioned that his house is in the flood plain of the Fish River.

Mariental was and is a railroad town and was developed around the railroad in 1901. In 1927, the west side of the railroad was developed with businesses. There were some floods that occurred in 1974, even before the Hardap Dam was built. In 1961, Jansen observed only a small amount of reeds. Since then, the reeds have grown large-scale and he has witnessed the riverbed rising from sedimentary deposits. He remembered when a horse was able to ride under one of the local bridges that now only stands a short distance above the riverbed.

The residents of Mariental want all the reeds to be removed, and there were attempts to remove the reeds in the past, but most of these attempts have failed because they were not continuous. In the past, a program to remove the reeds would be started to successfully maintain the reeds, but internal problems would cause the project stop, and the reeds would grow back. In 1990, the spraying and burning was done by hand using prison labor but this was not successful because it was not continuous. Later there was an attempt to drain the water to dry out the reeds, but there are regions in the river where deep gullies existed, where it would be impossible to drain

certain areas. Also, after a lot of rain these drainage ditches would fill up. A few years ago two people were asked if they could harvest the reeds for cattle fodder. This was not sustainable because the people had to travel 80 kilometers to get the reeds and during the rainy season the reeds were not needed for fodder. In 1995, the government put up fences and rented out spaces for livestock farmers. The cattle ate the reeds. This was not successful because the reeds just grew back and a lot of cattle were lost in the river bed. Employing local people to remove the reeds has been done, but this method is not successful because the people are only doing it for the money and do not do a proper job.

In 2007, the government paid N$475,000 to spray and burn the reeds. The reeds were not burned. It will take 3 to 4 years to remove the reeds if it is done continuously every six months. The chemical used is eco-friendly, although the MAWF has shown concern for the effects on the fish and birds. The spraying was completed up to the Maltahöhe Bridge, but the reeds are growing back. There are also more reeds further down the river that were not sprayed.

The fertilizer is also a contributor to the reeds problem because it stimulates the growth of the reeds. The farmers realize this problem. Jansen says that other efficient irrigation methods must be implemented. Flood irrigation is used because the water is cheap. It would benefit the farmers if they used more efficient methods because if the dam is 50% full, then they can still continue irrigating without worrying. Raising the dam wall might also be ineffective because the dam might then be operated at a higher capacity.

The chemical used to spray the reeds can also affect the crop farmlands. The farmers have not yet made claims to the government that the spraying is affecting their harvest. This could be because after Namibia gained independence, the farmers had extended their property towards the Fish River. This also means that reeds could unofficially be on farmers' property.

Another problem is the sedimentary build-up in the river. The sand needs to be removed in order to restore the previous river capacity. In the past the river was able to handle 2500 cubic meters per second of water, but currently the river can only handle 600 cubic meters per second.

But removing the sand will not get rid of the reeds because seeds from the reeds upstream near the dam could still travel down the river and restart the growth. Currently DeBeers Mining was selected to dredge the channel by using the same equipment used to harvest diamonds in the south. The cost would be N$10 million. But where the dredged soil is going to be placed is a problem. It will contain reeds, so it needs to be transported far away, but the soil will be heavy with water, and therefore will be impossible to transport.

Another solution proposed was to relocate the town. This solution is not possible because everyone in the town wants to be compensated for the property they currently own. He also mentioned that if the town were relocated, the residents of Mariental would forget about the reed problem and nothing would be done to solve it.

For any solution to be successful it needs to be ongoing and money needs to be available for a longer period of time. This is currently not a priority for the government. Pete Jansen suggests that the government should establish a small team of engineers, scientists, and other specialists based in Mariental. This team would monitor reed growth in the river and maintain the Fish River's capacity, dredge the river channel, and encourage the farmers to use a more efficient use of irrigation. Mr. Jansen predicted that within 5 to 6 years, the reeds and channel would be restored to its capacity and continuously maintained.

The river and the irrigation channels are owned by the government. The farmers have no other problems with the reeds besides the flooding. The reeds grow in their irrigation channels causing sedimentary built up, which causes occasional overflows.

Reeds can be used for cattle fodder. The reeds are best for this use when they are still wet and can be ground up and mixed in with sugar to be more palatable. The livestock can eat the young reeds without difficulties, but reeds that are older will need to be bent over, so the cattle can reach the edible parts on the top. The reeds could also be covered with a plastic bag and buried in the ground to ferment, then given to the cattle.

If the people can use reeds for something, Jansen poses two questions: What will the residents make? And where will the market be?

Appendix O – Interview Summaries for Farmers, NAU Chairperson, and Contracted Sprayer

Interview with Scheme Farmer

Location: Wimpys
Date: April 4, 2009
Time: 9:00 – 10:00

We interviewed a local farmer who is also a former worker for the Ministry of Agriculture, Water, and Forestry and worked on the National Development Plan as the Extinction Officer. She is currently a science teacher at a local private school and also a farmer near the river basin. Her family's farming consists of some crops, but it is mostly a dairy farm. The farm is 93 acres and has roughly 400 cattle, some sheep, and a few horses. The farm has been around for 18 to 19 years. She has also been involved in previous projects at the Desert Research Foundation of Namibia, such as the Ephemeral River Basins Project.

She observed that the reeds were not growing when the Hardap Dam was built. Her farm contains reeds, especially at the center point of the irrigation system. The center point is a circular irrigation system that is able to control how much water is sent into the fields for efficiently than flood irrigation. Her cattle do eat the reeds, but the reeds need to be pushed down in order for the cattle to be able to reach the edible portions. It is typically the non-production cows that are sent to eat the reeds.

They have also used herbicide to kill the reeds, but this method does not work because of the extensive root system. The reeds grow in the channel, causing sedimentary deposits, which cause the water to overflow the banks. The reeds growing on the farm is also a problem because one of the crops, lucerne, is sensitive to other grasses.

She also confirmed that the fertilizer from the flood irrigation contributes to the reed problem. The water is very cheap in Mariental and therefore it is difficult to motivate the farmers to

upgrade their irrigation system. Flood irrigation is also inefficient because in steep places, the water runs off very quickly and washes the fertilizer away. Upgrading the irrigation system is also an expensive investment. The water meters are broken, so there is no way to know how much water is used. To improve the current irrigation system, she suggested that the runoff water be recycled.

The current method being used by the government to kill the reeds with herbicide is not very effective. The reeds are being sprayed during the rainy season, which just washes the chemical away. Reeds are also very dense, so the chemical cannot get down to the roots. She suggested spraying the bottom part of the reeds. The reeds need to be completely removed on the surface so when they grow back, it will be less densely populated and the herbicide can kill the reeds effectively. In order to remove the reeds completely, the root system needs to be removed. Sometimes the farmers dredge out the reeds on their property. Reeds also provide a hiding spot for thieves. She also mentioned that people harvesting near her property would not be a problem, as people already harvest prosopis pods near her property. If people were to harvest near farm property, they should consult the farmers before doing so.

The Ministry of Agriculture, Water, and Forestry had established a program where livestock farmers were allowed to let their livestock graze in the riverbed. The cattle would get lost in the reeds and get injured in holes. This contributed to the failure of the project. Sometimes the cattle would be rushed in and out in of the reeds in order to push the reeds down, so the cattle would not be lost in the reeds.

Her husband had proposed a solution of digging a path for the water to constantly flow. With constantly fast flowing water, no reeds will be able to grow, and also if constructed properly, it will drain the river. The reeds can be easily washed away. The only problem is that the river basin is too wet to be dredged. As for cleaning the reeds in the irrigation channel, she suggested that each farmer should have an area of the channel that they are responsible for cleaning.

There are various potential uses of reeds. Dry reeds can be used for mats or fences and this is becoming a fashion for households and therefore everyone will buy. She mentioned that she has

seen reed fences near Stampriet. The reeds can also be used for composting. As fodder, it is good for cattle and donkeys. Any use should be sustainable because many reeds are available. If a program was established, a private firm should manage the program. She is a busy person, but the option of participating in this project is possible. She does not see herself actually using the reeds.

Interview with the NAU Chairperson

Interviewee: NAU Chairperson
Date: 4/4/09
Time: 10:00– 11:00

We interviewed the NAU Chairperson in the Hardap Irrigation Scheme. He works with the day-to-day issues with the farmers, makes sure the farmers have enough water for irrigation, harvesting methods, and marketing the harvested crops. He is also responsible for making sure the crops are distributed throughout the country. He ensures that the farmers' interests are represented in different committees as well as linking with the government. He has held this position for 3- 4 years. There are about 25 farmers in the union and all of the farmers in the Hardap irrigation scheme are members of the union. Typically the union meets monthly to discuss issues, but during the rainy season the union meets every week to solve problems with organizations such as NamPower and NamWater. The NAU Chairperson is also a farmer. He has been farming for 18 years and grows maize, wheat, and lucerne. His property does not extend to the Fish River.

He has also represented the farmers in the Mariental Flood Task Force. He suggests that all the reeds should be taken out of the river so it can flow at its full capacity and that the river should be deepened. He believes that the spraying and burning of the reeds up to the Maltahöhe Bridge is working. The reeds were sprayed in April and November of 2008. Three to four months after the spraying, the farmers were asked to burn the dead reeds. The farmers worked collectively to burn the reeds. Some of the reeds were burned using petrol and diesel fuel. Then the reeds grew back and they were sprayed again. This will be a continuous process. The November spraying focused on the small rivers feeding into the Fish River, such as the Dabib River. He said that before the spraying, only 300 – 400 cubic meters per second of water could be released from the Hardap Dam. But after the spraying, 700 - 800 cubic meters per second of water could be released.

The spraying itself does not have a negative impact on the crops because the reeds are sprayed in the morning on non-windy days. He sees the potential for problems with the spraying

affecting the crops near the Fish River, but so far he has not experienced any problems. Spraying is done early in the morning during windless days to avoid accidently spraying the crops along the river. The spraying of the reeds is also environmentally friendly. There are no reeds in the Sandberg River so no spraying took place in that river. He also believes that once the reeds are removed, the river will deepen over time. In his opinion, the reeds do not provide any benefit to the farmers, but they do not have a negative impact.

In terms of reed growth, the reeds were in the Fish River in the past but they have grown more in recent years. There have been allegations made against the farmers for causing the reed growth through excess fertilizer in runoff from the irrigation plots. He said that he cannot deny the fertilizer problem, but it is not the only factor contributing to reed growth. He said to consider that there are reeds growing near the abattoir but the abattoir does not use fertilizer.

There are currently discussions with the government on a possible tariff increase for the water. The government wants to give the irrigation scheme to the farmers, but if the farmers take that responsibility, then the government needs to take care of the reeds in the river.

He also made reference to the biogas project by the Desert Research Foundation of Namibia and remembered that Dudley Biggs took water samples from the irrigation channels to determine the amount of fertilizer in the runoff from the irrigation plots. He expressed his desire to know for certain whether the fertilizer from the farms is causing the excess reed growth and to what extent it is causing this growth. The farmers are not currently doing anything to stop reed growth because the government is already spraying the reeds. If the reeds are growing in the irrigation channels on the farmers' property, the farmers are responsible for getting rid of those reeds and paying for it.

He also remembered a project related to reeds in the past, in which some residents of Mariental were cutting the reeds and using them for cattle fodder. The manager of the project had only 20 or 30 people working for him and he could not control his workers. Therefore, they did not produce enough cattle fodder and the project failed. An idea has also been mentioned to fence off

plots of land with young reeds growing for cattle grazing, but this idea was not implemented. He also mentioned that he could use the reeds for composting.

If a project were to start with people harvesting the reeds, he believes that there would not be enough reeds to harvest because 90% of them are dying and the previously studied biogas production from the reeds would also fail.

The reeds that are in the riverbed are the property of the government because the riverbed is government land. He suggests that the person managing this project should have control over his workers to reduce theft near the farms. He also believes that it would be better for the reeds to be totally removed instead of sustainably harvested. Some of his suggestions for managing the project are that those harvesting the reeds should not stay overnight near the farms and that they should not enter the farmers' property. Currently, the government manages the reeds, but the community could be involved. As of now, the Farmers' Union would not want to be involved with the project because he sees no direct benefit to the farmers. If this project is sustainable, produces a product, and provides work to the community, then he believes the union would participate.

Interview with Contracted Reed Sprayer

Position: Contractor to spray the reeds
Location: Bastion Bed and Breakfast
Date: April 2, 2009
Time: 15:45 – 16:30

The contractor has been a farmer for 48 years. He was contacted by the central government to spray the reeds because he is the only one that has the equipment that is capable of spraying the reeds (a helicopter). The reason he owns a helicopter is to spray crops to control pests, such as certain worms that target maize, or for rounding up game. He has a team that consists of local people to assist him with flying operations, such as checking the weather and measuring wind speeds.

He said that the reeds are causing problems because there is an abundance of them and they are blocking the river and in the irrigation channels. He said that in the past the reeds were growing, but the government did not want to do anything about it until now. The reeds' roots also appear to contribute to a build-up of sediment in the river bed. He mentioned that one of the bridges that cross the Fish River is one meter above the surface of the water bed. When he was younger, he remembers that the river bed was much lower and a car could fit under the bridge. Everyone in Mariental has shown strong support for removing the reeds, including the farmers.

When spraying the reeds, he uses a systemic chemical, which is manufactured by Enviro Weed. The chemical targets the roots of the plant and kills it from the ground up. The manufacturer has claimed that this herbicide is eco-friendly and that large dosages are required in order to harm the fish in the river. The long-term effects are not known. The manufacturer also stated that it will take up to 5 to 6 years for the reeds to be completely eliminated from the river system, because the root system of the reeds can be as deep as 5-6 meters. Until then, repeated sprayings must be conducted. The chemical affects nearby crops, and therefore must be sprayed carefully and not on days when there are high winds. He has a weather station at his farm and works with a team to

determine when it is safe to spray the reeds without harming the crops. He mentioned that during this time of year, the maize has already developed and the herbicide cannot harm the maize.

Before any spraying begins, he contacts all the farmers along the river to inform them about the spraying. He mixes 50 liters of water with 2 liters of chemicals, making a diluted solution. Then he loads the chemical into hoppers on the helicopter, and uses the spray booms to distribute the herbicide. He will only spray areas that have a majority of reeds containing green leaves, and will not spray areas with open water where there are no reeds growing. The seasons selected for spraying are April through May and November through December. During April through May the reeds are flowering and preparing to hibernate for the winter and therefore take up and store the herbicide, which eventually kills them. During the November and December season, the reeds are regrowing and it is right before the rainy season, making it a priority to remove the reeds. Also, during the summer the machinery used to spray the reeds are harder to maintain due to the heat, making it difficult for spraying to be done properly. The decision of when the reeds are to be sprayed is determined by the government.

The reed sprayer has received two contracts for spraying the reeds. The first one was for April 2008, which was considered to be a heavy spray. The second contract was for December of 2008 and April of 2009. The December spraying was lighter and less successful because many of the reeds did not have green leaves that would take up the herbicide. The sprayings for April of 2008 were delayed because it was determined that they were not enough live reeds to initiate the spraying. He sprayed the reeds from the Hardap Dam to the Maltahöhe Bridge and one kilometer past the bridge. It can be seen clearly where he stopped spraying the reeds. One difference from previous sprayings compared to the spraying planned for May is that the one in May will cover a wider area in the river channels. He was also contracted to remove the reeds by burning, but this method had failed because a fire cannot be sustained in the reeds and fire accelerants cannot be used because of potential environmental hazards. The original purpose of burning was to have the reeds grow back in a less densely vegetated area, allowing the herbicide to enter the plant easily.

When he sprays the reeds, he uses a GPS to track where he has sprayed and how much. This is required by the government in order for him to get paid for his work. Further contracts will be granted once the government inspects the work done by him and sees this method as a solution that is working.

He believes that the spraying is successful, because it can be seen that many of the reeds have been killed. Also, from the last rainy season, the sluice gates in the Dam were opened for three weeks and large masses of dead reeds washed away, increasing the flow in the channels. The problem of reeds is huge and he said he has a big job ahead of him. He also believes that no methods or solutions will completely remove the reeds. They will always exist in the river channels and in the irrigation channels and he cannot remove the reeds that grow under trees through spraying. He has also received a lot of positive support from the community members for his work in spraying the reeds.

As far as using the reeds for other uses by the community, he thinks that the reeds he had sprayed are useless, because they are brittle. If they are used for a roof shade, and it rains, then they will start to rot and will need to be replaced. He thinks the reeds that have not been sprayed are of good quality to be used by the local residents. He has seen the reeds used for hunting shelters.

Another method of removing the reeds that was discussed was using heavy machinery to excavate the reeds, but this method has yet to be implemented.

The growth of the reeds is fairly rapid. Last winter he had set fire to reeds, in a length of 500 meters. By summer, they started to grow back at a height of one meter. After a full year, they were one to two meters high. One of the contributing factors to the growth of reeds is the fertilizer that enters the river system from the irrigation farms.

Appendix P – Interview Summaries for Community Members and Businesses Currently using Reeds

Interview with Phillipus Iyambo (currently making reed mats)

Interviewee: Phillipus Iyambo
Date: 1/4/09
Time: 11:00 – 12:30
Location: Phillipus' Cuca Shop, Informal Settlement – Oshiwana Penduka
One Translation

Phillipus Iyambo is an individual living in Mariental in Oshiwana Penduka who works with the reeds growing in the Fish River. He makes reed mats in different dimensions to sell, or people will buy the reeds in bundles. As an example, a 5 meter long reed mat can be sold for N$175. He started his reeds business initiative in 2005. Mr. Grellman, a gentleman in Gobabis, originally got him interested in making reed products. Phillipus had prior knowledge of how to work with the reeds, but Mr. Grellman taught him how to refine his techniques.

His main customers are Anib Lodge, a tourism lodge 24km outside of Mariental, local people in Mariental, people in Gobabis, and two businesses: Mariental Hardware and Swaret. He generally makes reed products only when these customers place an order. The requests for reed products do not come in on a regular basis. In Gobabis, however, customers will buy the reeds that he has in stock, but he is then forced to sell them at a lower price.

His venture into the reeds business initiative originally started with 17 people, but many of these people went back to the northern part of the country when there was no work. Currently, he only employs people when he receives requests for reed products and whenever he receives a new request, he hires a new team of people to fill the order.

He originally started harvesting the reeds near Mariental. However, the reeds there have become unsuitable, and now he must travel farther up the river, towards the Hardap Dam, to find the good quality reeds for his mats. He now harvests 10 – 12 km from the Hardap Dam. A high

quality reed product is made of reeds that are the right thickness and straightness for whatever product you are trying to produce. To find a good harvesting site, he walks along the Fish River until he finds the right reeds. Some of these harvesting sites might be close to the irrigation farmers' property.

He initially had problems with the farmers accusing him and his workers of stealing their crops. Through the original community project started with reeds, there was a system in place where Phillipus contacts the Hardap Regional Council when he found a site where he wants to harvest. He provides the Council with a list of names and identification numbers of the people that will be harvesting with him. The Council then contacts the farmers to let them know who will be harvesting near their land. Then the Council prints a permit for him to harvest the reeds. The process only takes a few minutes. Phillipus also contacts the farmers when he goes to harvest the reeds near their property to let them know he will be there. He also lets them know if he plans to leave the reeds and come back later to collect them. Now most of the farmers know him and are comfortable with him harvesting near their property. Whenever he moves to a new harvesting site, he must obtain a new permit. He also mentioned that he cannot harvest the reeds south of Mariental because the farmers there are concerned about cattle theft.

Phillipus and his workers use pangas to harvest the reeds. He cuts the reeds at the base. If the reeds are growing in water the panga may become slippery in water, which is dangerous to those using it, so one must be skilled in using a panga. One also needs shoes with thick soles because once the reeds are cut the parts of the reeds left in the ground are sharp and can cause injury if they are stepped on.

Another danger when harvesting the reeds are the snakes living in the reeds. Phillipus said that the snakes will run away if you make noise. Also, the snakes are rarely seen in the riverbed, but live in the trees near the river. Phillipus harvests the reeds between August and May. He cannot harvest in June or July because it is too cold. The reeds do not vary between seasons. The best time to harvest the reeds is when the water levels are low. Once harvested, the reeds start to grow back

within ten days. When he goes to harvest the reeds, he prefers a team of six people to go with him. With six people, he can produce about 10 bundles of reeds per day with 250 – 300 reeds per bundle. Once the reeds are harvested, he leaves the reeds at the harvesting site and walks back to town to find transport for the reeds. He used to pay N$20 for transport, but now because of the rising cost of fuel, he sometimes pays up to N$100 for transport.

All of workers that know how to harvest the reeds also know how to make the reed mats. Once harvested, the reeds are cleaned by using a panga or smaller knives to strip them of leaves. The scraps are then thrown away, but can be used to clean small pots. Then the reeds are cut according to length and laid in the sun to dry out. The cutting and cleaning is done on the first day the reeds are harvested and the reeds are dried on the second day. When making a mat, he looks into what kinds of reeds he has as well as what reeds are left over from the previous harvest. He also organizes the reeds into groups according the size and strength. In addition to the reeds, he needs rope to tie the reeds together to make a mat. When asked if making a mat was difficult to learn, he said that if you were to watch him make a mat, it would seem easy, but it is difficult. At first, he said that it would take him a day to tie together a 5 meter long mat, but after working with the reeds for a few years, it only takes him an hour.

Once the reeds are bound together to make a mat, he sells them to various clients. As an example, Mr. Grellman from Gobabis asked him to make 20 mats. He would pay N$100 per mat for a total of N$2000. But after paying for rope, transport, and other costs of production, the profit was divided between 17 people. In Phillipus' opinion it was too little money for the amount of work involved. Ideally, he will hire only six people to fill an order for reed mats. To avoid arguments about money, he pays his workers up front with money from the Cuca Shop that he also manages. He has had some problems in the past with clients not paying him for his work. One customer ordered four 2 meter long mats and one 5 meter long mat. Once Phillipus completed his work, the customer was unable to pay. Phillipus asked another person to help him obtain the customer's money, but this person ended up buying the mats instead of the original customer.

Phillipus believes that the community will be interested in a project harvesting reeds and producing reed products. When he is making his reed mats, everyone in the area comes over to see what he is doing, and they are interested in his work. He also thinks this project is a good idea because it would help the community. He suggests that in starting a project, there should be a binding document so that all people involved in the project will continue to work even if it is not successful. Also, the marketing of the products should be done properly, and they could make other products with the reeds. People involved in a project like this will also need training and Phillipus is willing to train people how to make reed mats.

Interview with Reed Harvester working with Phillipus

Position: Reed harvester working with Phillipus
Date: 1st April, 2009
Location: Phillipus' Cuca Shop – Informal Settlement – Oshiwana Penduka
Double Translation

This harvester was interviewed because she is one of the people currently harvesting reeds and constructing reed mats with Phillipus. Her household is comprised of four people, and she sells cabana and beer to support herself (along with working with the reeds). Phillipus asked her to join his reed project in January 2008, and he trained her to work with the reeds.

She provided us with a lot of information on harvesting the reeds in the Fish River. Specifically, her group usually harvests reeds behind the local truck port in the middle of the river. She mentioned that there were many hazards associated with harvesting reeds. The three main hazards mentioned were sinkholes, snakes, and drowning. She said however that if you want to make money, then you have to work for it, and be brave. She also mentioned that the danger due to snakes is minimal because the snakes get scared away by loud vibrations. She said that harvesting can happen anytime of the year, however, to minimize drowning risk, it is advisable to cut when the water levels are low (i.e. not during the rainy season). To cut the reeds, she uses a panga. To select which reeds are best for harvesting, she and her group look at two main reed qualities. The first quality is how hard the reed feels when compressed in her hand. The stronger reeds are of better quality, so if a reed is soft, then it is left in the river. The second quality that is looked for is how straight the reeds are (straighter reeds are better). Reeds that are bent will not look good in mats, and are left in the river.

After harvesting, she and her group pay for transport of the reeds back to Mariental (anywhere from N$100-$250, depending on who owns transport). Once the reeds are delivered to Philipus' Cuca shop, the group will start cleaning the reeds. This involves shaving the leaves off with a panga, until it is a straight stem. The reeds are then left outside to dry. Once the cleaning is

complete, the reed mat construction is started. To construct the mats, she utilizes both wire and rope along with the reeds. She said that it is not hard to learn how to make the mats, but the time it takes to learn varies with intelligence. Along with the mats, she thinks that reeds can be used for curtains, shower stalls, and fencing. She specifically mentioned the benefit of using reeds for shading from the hot sun.

She emphasized that income is not fixed, and any money earned is divided among workers. She also thought that if a reed harvesting industry did grow, that the resource would not be depleted. She also thought that people would be very interested in harvesting reeds. In her opinion, new reed harvesters should only harvest what they need, and they should get in contact with Phillipus.

Interview with Individual Community Member Using Reeds in Informal Settlements (Kavango Man)

Interviewee: Kavango Man using Reeds

Location: House in Informal Settlements

Date: 3rd April, 2009

A resident that uses reeds in the informal Settlements is originally from Kavango and moved to Mariental in 2003. His household is comprised of three members, and he works as a prison officer. He has experiences with reeds and has seen people making baskets and mats from the reeds in Kavango. He doesn't know how people bend the reeds in order to make baskets. He doesn't make baskets or mats himself, and he feels it is a very hard skill to learn, but is easier if you are shown how to do it. Instead of baskets, he made reed fences in Kavango, and put reeds all along his house that he built. In his opinion, it is cooler inside his house when he uses the reeds around it. The reeds and products in Kavango were sold to tourists and other people in the community. They were either sold on the sides of the roads, or people who wanted reed products came to the homes of people they knew constructed products.

He is using reeds in Mariental to build a fence around his property and is thinking about putting the reeds up around his house here. He gets the reeds from the Fish River, close to Mariental. He harvests the reeds from the banks of the river.

There are dangers associated with harvesting, including snakes, but he recommended that you should just try to avoid them. He uses a bicycle to carry the reeds from the river, and a panga to cut them down. He says it is better to harvest in winter when the reeds are stronger. The reeds in Kavango are stronger compared to the reeds in Mariental that are softer. He harvests the reeds when they are just a little green and starting to become brown. After cutting down the reeds, Ben has observed that they are fully grown back after one year. The reeds that he harvests are prepared by putting them out in the sun so that they become hard. It takes about one day to dry out the

reeds. In order to make a reed fence, he looks at the reeds to see which are beautiful and nice. The reeds should be straight, not bent. He harvests whenever he has time after coming home from work.

He has not considered making or selling reed products in Mariental. The only other people he is aware of that currently use the reeds is Mariental Hardware. He thinks people in the community do not know how to use them properly. He is not sure if the community would be interested in using the reeds. They would have to walk a long distance, and a lot of the members of the settlements abuse alcohol.

In order to start a project, the people would need pangas and training. He would be interested in being involved with this initiative, and would be willing to teach people the skills he has. He has no experience training people in the past. Since he is employed it may be difficult to find time to train others in these skills. It would take different people varying amounts of time to learn depending on their intellectual capacity. Harvesting is much easier to learn than learning how to make products from the reeds.

He does not know if there are places to sell the finished products. In Kavango, they sold reed products at craft centers. In Mariental, the tourists may be a good market for products, but people in Mariental wouldn't buy the products because they would not know what to do with them, except for possibly using the reeds as roofing material.

Interview with Individual Community Member Using Reeds in Informal Settlements (Reed House)

Interviewee: Member of Oshiwana Penduka

Date: 3rd April, 2009

We interviewed a women living in an informal settlement in Mariental who has part of her house made out of reeds. She has been living in Mariental since 2006 when she moved here from Gibeon. There are eight people in her household. She is currently unemployed at the moment. She does not actually use the reeds herself, but reeds were used to build her house. She obtained the house from a lady who passed away, and she doesn't know where the reeds originally came from. She has seen other people using the reeds as well. She knows Phillipus, another member of the informal settlements, who goes to the river and harvests the reeds to sell them. He cleans the reeds and makes them look nice, and then sells products to people who use them to build roofs.

She does not have experience in roof thatching, but she has heard about it. She would be interested in trying roof thatching for her home. She doesn't have any experience in gardening, but would be willing to try. Her mother does some needlework, but nobody else in her household has handicraft experience. She would need training and some funds in order to start up a business. Nobody in her household has experience with building furniture. They did own livestock in the past, but own none currently. Her brother is very interested in farming, and would be interested in using the reeds as free fodder for the animals.

She would be willing to harvest the reeds herself. She would need a panga, and has no transportation for herself or the reeds to and from the river. Since she is unemployed she would be available to harvest whenever. She would even be willing to harvest knowing it is a labor-intensive job, a hot working environment, and that there are dangerous snakes in the reeds.

She thinks a reed project in the community would be a good initiative because many people are unemployed. Also, the Kavango people living in the settlements already have knowledge about using reeds. In terms of the management of the reeds, she feels a committee should be in charge.

She thinks a project would work, as long as training was provided. People would be eager to make use of an opportunity for income or other benefit. She and another woman would be most interested in making baskets from the reeds, as basketry is an interest of theirs. Currently, nobody in Mariental are selling reed baskets, but if they make the products and try to sell them, people might be interested, especially tourists that they receive on a regular basis.

Interview with Mariental Hardware (Business Using the Reeds)

Interviewees: Mariental Hardware Workers

Company: Mariental Hardware

Translated by: Lucky Ganeb

Date: 4th April, 2009

The workers have been employed full-time by Mariental Hardware for 8-9 years. They live in Donga, within Oshiwana Penduka. They play several roles within the company as general workers, including sales, cleaning, packing, and loading. They make big bundles of reeds, the longest of which was 8 meters, by 1.8 meters. If a customer comes into the store, they can specify a shape and size of the final reed product. The store gets a lot of custom-orders.

In the past, they collected the reeds from the Fish River themselves, however, now the owner outsources the work to other people. The harvesting of the reeds was an added duty to the worker's jobs, but there was no increase in their salary. They had to do the harvesting on a Saturday, but didn't want to do the extra work for no benefits. The owner outsourced to a Nama man, named Moses, who collected the reeds on behalf of the shop. However, he is not currently supplying reeds. At first he was bringing some reeds into the shop every day, but then he wanted 25 cents per reeds and the owner only wanted to buy them for 15 cents a reed. Another member of the community, Phillipus, brought in finished products to the store to sell. Mariental Hardware no longer resells his products because he was asking for too much money.

When the workers used to harvest the reeds for Mariental Hardware, they would walk 3-4 Km to the site on the river. They collected the reeds from the middle of the river bed, where some water collected. The more reeds they needed, the closer they had to go towards the Hardap Dam. They did not go near the irrigation farms though. When harvesting the reeds they did not obtain

permission or permits from anyone, but it could be possible that the owner of Mariental Hardware had already worked out arrangements.

The workers weren't trained, but rather just tried things out and learned as they went. They do not just go out and start chopping the reeds; instead they have to be very careful. They do not just harvest any reed, but the reeds that are the same size and also straight. If the reeds are bent, then they create spaces in the mat. Also, they do not take young, green reeds. The workers cannot chop more than one reed at a time, because then the reeds will not be at the same height. They use pangas and some sort of clippers to cut the reeds. They do not need a large team of workers to harvest the reeds, but the transport of the reeds can be difficult with only a few people. The two workers carry the reeds by laying two sticks down on the ground, and placing the reeds across the sticks. Then they each take an end of the sticks and carry them from the river back to the shop. In one day, the two workers can get approximately 2000 reeds. In one bundle of reeds, there are approximately 350-370 reeds.

There is not a specific time or season necessary to harvest the reeds. In the summer, the reeds grow the fastest. Between 1-2 weeks, they observed the reeds growing back at the same spot they had already harvested reeds.

The most important danger is the snakes in the riverbed. Anyone harvesting reeds needs to be on constant alert for snakes. There are large snakes that are in the water, and they sense the snake coming when the water is being splashed along the sides. The snakes can hide and stay underwater for a long time. The best method for protection is just avoiding the snakes. If you see a snake first, then you can run away, but if it sees you first, then you are in trouble.

After harvesting the reeds, or obtaining them from other sources, Mariental Hardware mostly produces fencing. Other times, people come in and request certain products to be custom-made. Most of the work is requests from within Mariental but they have customers from neighboring farms and lodges. So far, they have been able to meet all the demands for reed

products that they receive. They have orders currently, but are waiting for the water level in the river to go down so that they can harvest more reeds.

Mariental Hardware just started using reeds last year, but the two workers have been using reeds to make products from their homes for over three years. They can make up to N$150 a month on the side. The workers weren't trained how to make the products. Instead, they taught themselves how to make the fencing. They use wire and thread to sew the reeds nicely together with no spaces in between. Working with reeds can be a lot of work. First, you have to cut them to the desired length, and then clean the reeds, and then bind them together.

The workers would be willing to take part in a community project involving the reeds. In order for a project to be successful, the workers feel that people must understand each other. If people go different directions, the project will fail as has happened in the past. The project funds need to be properly managed as well. The community should be responsible and run the project; however, non-government organizations should also supervise. Many members of the community would be willing to take part and join the project.

Interview with Owner of Mariental Hardware

Interviewee: Owner of Mariental Hardware

Company: Mariental Hardware

Date: 29 April, 2009

We interviewed the owner of Mariental Hardware to obtain more information on the business of selling reed products. Mariental Hardware sells reed mats in rolls of 1.8m x 5m mats for N$250, 1.5m x 2m mats for N$230, and 1m x 5m mats for N$160. It takes approximately 360 reeds to make a 5m mat. He sells 10 to 20 reed mats per month.

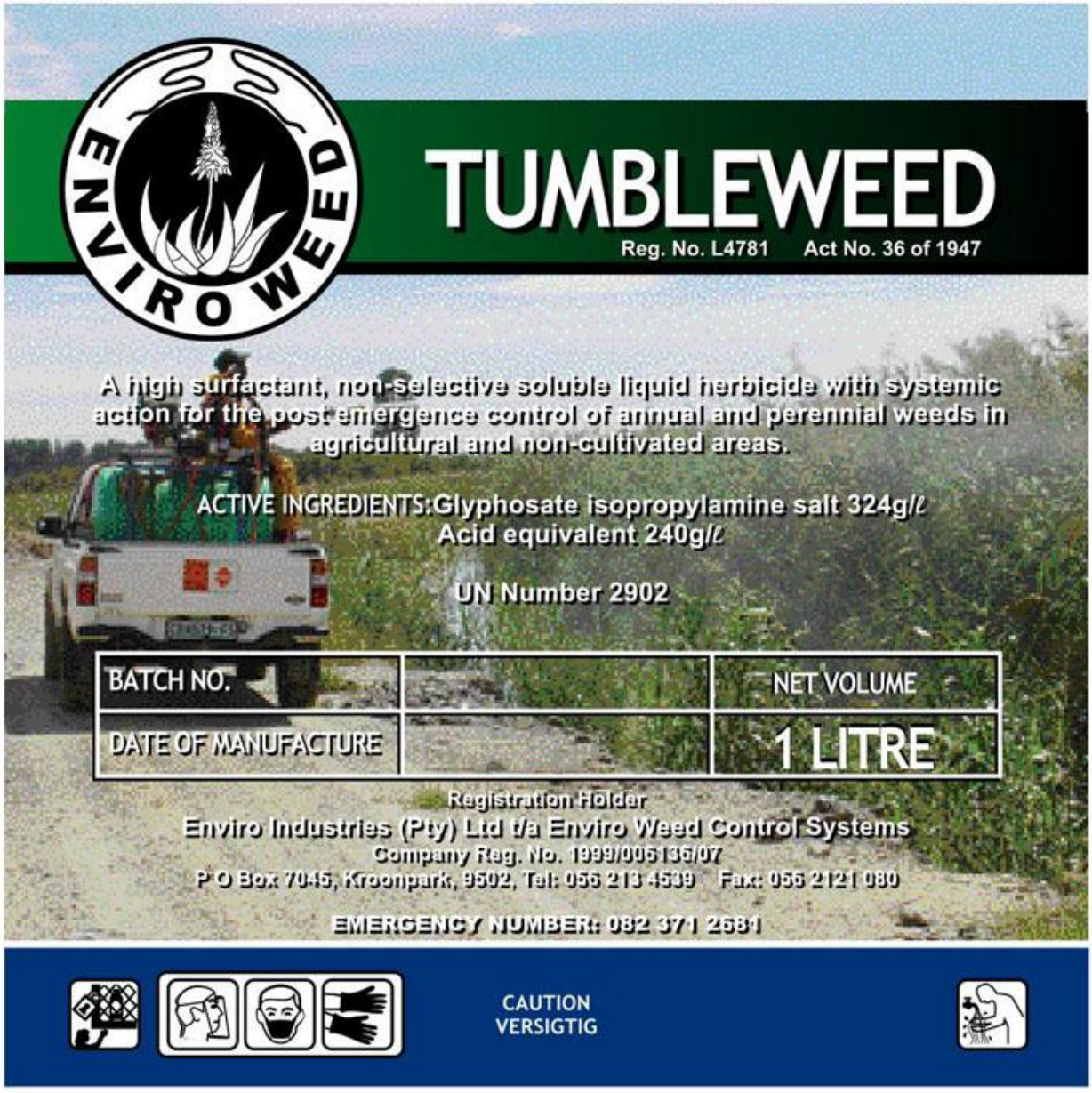
To harvest the reeds he will hire three or four people. He pays them 15 cents per harvested reed. If the reeds come to him cut and cleaned, he pays them 30 cents per reed. If the reeds come to him without being cleaned, he pays his daytime workers to clean the reeds during their working hours.

In terms of production costs, he gave us an example of how much it costs to make a 1.8m x 5m mat. It costs N$52.50 for the cutting of the reeds, N$52.50 for the cleaning of the reeds, N$20 for rope, N$15 for transport, and N$10 for wire. The total cost of this reed mat is N$150, and he sells it for N$250 including VAT. He provides all of the materials necessary for harvesting the reeds. He also mentioned that it is hard to find big reeds in the river to make nice mats. To prepare the mats, he has them varnished so that they look nice and last longer. He said that if anyone in Mariental were to make reed mats that he would buy them and sell them. He would also be willing to provide resources for harvesting the reeds and making reed mats.

Appendix Q – Information on Tumbleweed Chemical

Tumbleweed Chemical

Information



WARNINGS

- Poisonous if swallowed.
- Irritating to eyes and skin.
- Keep out of reach of children and uninformed persons.
- Store away from food, feed, seed, fertilizers and other agricultural chemicals.
- The product should be mixed, stored and applied only in stainless steel, aluminium, fibreglass, plastic or plastic lined containers.
- Do not mix, store or apply the product or solutions in galvanised steel or unlined steel (except stainless steel) containers or spray tanks. The product can react with such containers and tanks or produce hydrogen gas which may form a highly combustible gas mixture that can flash or explode if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

Aerial application:

Notify all inhabitants in the immediate vicinity of the area to be sprayed and issue the necessary warnings. Do not spray over or allow drift to contaminate water or adjacent areas.

Although this remedy has been extensively tested under a large variety of conditions the registration holder does not warrant that it will be efficacious under all conditions because the action and effect thereof may be affected by factors such as climatic and storage conditions, quality of dilution water, compatibility with other substances not indicated on the label and the occurrence of resistance of the weed against the remedy concerned as well as by the method, time and accuracy of application. The registration holder furthermore does not accept responsibility for damage to crops, vegetation, the environment or harm to man or animal or for lack of performance of the remedy concerned due to failure of the user to follow the label instructions or to the occurrence of conditions which could not have been foreseen in terms of the registration. Consult the supplier in the event of any uncertainty.

PRECAUTIONS

For your own safety take the following precautions:

- Do not eat, drink or smoke while handling this product.
- Prevent contamination of food, feeds, drinking water and eating utensils.
- After using the product wash hands and face before eating.

When mixing:

- Wear eye protection and impermeable gloves.
- In the case of contact with skin, wash immediately with plenty of water.
- In the case of eye contamination, flush out at once for five minutes and get medical attention if necessary.

When spraying:

- Do not inhale fumes or spray mist.
- Avoid contact with the spray solution as much as possible.
- Wear suitable protective clothing.

After spraying:

- Clean applicator thoroughly after use and dispose of rinsing where it will not contaminate crops, grazing, rivers or dams.
- Rinse empty container three times with a volume of water equal to at least one tenth of that of the container, add the rinsings to the spray tank before perforating and flattening the container. Do not use for any other purpose.
- Change and wash your work clothes.
- Wash your exposed skin area with soap and water.

Use precautions:

- Ensure that the person assigned to apply the product is properly trained in its use.
- Prevent spray drift onto susceptible or edible crops, grazing, green or immature bark and fruit of non-target plants, which can result in serious localised or translocated damage.

USAGE

Tumbleweed may be used:

- As a broadcast spray to control weeds pre-planting in arable agriculture, forestry and sugar-cane to reduce tillage.
- As a directed spray to control annual and perennial weeds in forests, fruit and ornamental plantings in sugarcane culture.
- For the control of unwanted trees and semi-woody plants on farmland, parkland, road reserves, forest plantations and similar areas.
- For the non-selective control of weeds in non-cultivated areas such as roadsides, railway lines and electrical yards and the like.
- For the creation of fire breaks.

DIRECTIONS FOR USE: Use only as directed

General

- **Tumbleweed** is a non-volatile, water soluble liquid product with non-selective herbicidal activity against a wide range of annual and broadleaf weeds and grasses in crop and non-crop situations.
- It is absorbed by plant foliage, green stems and immature bark and is inactivated immediately in the soil and does not provide residual weed control.
- Visible effects on annual weeds may take up to 7 days, while on perennial weeds effects may take 2-3 weeks or longer to become evident. Results are quicker under warm conditions.
- Weeds are best treated when growing vigorously, and prior to seed formation. Do not treat plants which are dormant or which have been frosted, or growing poorly due to drought, water-logging or are covered with dust or silt. Diminished results may occur when spraying is done when weeds are covered with dew.
- Perennial weeds are best treated when peak growth is achieved in midsummer. Weeds having underground rootstocks may require a second application to control growth from buds which survived the initial application. Top growth of perennial bunch grasses may be removed by mowing prior to application and the herbicide applied after a few days. Plant residues should be raked away from the area to be treated so as to expose the green foliage to the spray.
- **Tumbleweed** is rainfast within 3 hours of application. Rainfall within this period may cause diminished results on hard to kill weeds. For best results, use a minimum of 2.5ℓ **Tumbleweed** in 100-200 total spray solution per ha. Always adhere to the recommended dosage mℓ/ha for the weeds in question. Where higher volumes of spray are required to treat dense weeds, do not use less than a 1% concentration by Volume!

APPLICATION

- **Tumbleweed** must be diluted with water and applied as a fine spray to the vegetation. Volumes of between 12 and 600ℓ/ha may be used, provided the recommended quantity of product is applied on a hectare basis, and that a minimum concentration of 1% product by volume is maintained. Best results are obtained if a maximum volume of 200ℓ/ha is used. Spray apparatus must always be calibrated under field conditions, to determine the quantity of product to be added to the spray tank.
- Avoid spray drift. Extreme care must be taken when applying the product to prevent injury to desirable plants and crops.
- Do not spray under conditions when spray drift to desirable vegetation may occur.
- Do not drench weeds or spray beyond the point of run-off. Apply to the product the minimum quantity of water to achieve an even coverage of the leaf surface.

Boom equipment using standard nozzles

- The optimum volume using standard nozzles is 100-200ℓ/ha.
- A nozzle giving "fine" to "medium" droplets is preferred to "coarse" droplets to ensure adequate coverage of the leaf surface.
- Boom height must be set to ensure correct overlap of nozzle pattern at the top of the weed canopy.
- Standard flat fan nozzles may be used at pressures at 200-300kPa. Alternatively low drift nozzles may be used at 100-200kPa.
- The nozzle size to be used will depend on the speed of travel and pressure. Higher pressures than those specified will result in the production of finer droplets increasing the risk of drift.

Knapsack equipment

Standard or low-drift flat fan nozzles, or Anvil (TK series) or hollow or solid cone nozzles may be used.
For a spray swath of 500mm a standard flat fan such as 8002 at 200-300kPa, walking at 1.0m/second (3.6km/hr) will apply approximately 200ℓ/ha. A 20ℓ sprayer will then treat 2.0km or 0.10ha. Maintain the band with width, walking speed and pressure used in the initial calibration. The use of the "Weedmaster" spray management valve will ensure a constant output from the nozzle.

- For a 1,0m swath width an anvil or TK 2.5 tip at 150kPa will deliver approximately 200ℓ/ha. 20ℓ will then treat 1,0km.
- For spot spraying or treating shrubs up to 2.0m high, a hollow or solid cone nozzle is recommended. A D3 or D4 disc with a No. 25 core will produce a hollow cone pattern with fine droplets. For a solid cone pattern with coarser droplets, a TG 0.5 or 1.0 tip may be used. Pressures or 200-300kPa are satisfactory. Spray operators should be trained to achieve the correct dosage.

Pressure sprayers – hand gun Eequipment

- This equipment is used to treat tall growth of dense stands of weeds.
- Adjust equipment to achieve a fine spray pattern to give complete foliar coverage but do not spray to the point of run-off. Use the minimum spray volume needed to achieve uniform wetting of all foliage.

LOW VOLUME CONTROLLED DROPLET APPLICATION EQUIPMENT (CDA) (SPINNING DISC)

Spinning disc equipment is ideal for the application of **Tumbleweed** in various situations. The spray droplets produced are sized to produce optimum coverage at volumes of 15-30ℓ.ha while at the same time the quantity of driftable particles is significantly reduced. Care must however be taken to ensure that the spray swath is not displaced by wind to reach non-target plants.

The type of equipment available is as follows:

1. Hand held battery operated units applying a 1.2, wide swath, or adjustable from 300 to 750mm.
2. ATV, tractor or utility mounted equipment for swaths from 1.8m to 7.2m wide

HAND HELD APPLICATORS

The tables below are a guide to application rates and dilutions when Micron Herbi (1.2m swath) or Herbaflex (adjustable swath) applicators are used. Always check the flow rate before adding Tumbleweed to the tank.
Walking speed 1.0 metre/second (3.6km/hr)

Model	Swath width	Tumbleweed dosage ℓ/ha	Qty Tumbleweed in 5ℓ spray mix
Micron Herbi Yellow nozzle at 160mℓ/minute 22ℓ/ha 5ℓ covers 2.0km	1.2m	3.0 4.5 6.0 7.5	700mℓ 1.0ℓ 1.36ℓ 1.70ℓ
Herbaflex Narrow Cone A90 White nozzle at 50mℓ/min 18ℓ/ha 5ℓ covers 6.0km	450mm	3.0 4.5 6.0 7.5	830mℓ 1.25ℓ 1.67ℓ 2.0ℓ
Herbaflex Wide cone B 120 Brown nozzle at 68mℓ/min 15ℓ/ha 5ℓ covers 4.5km	750mm	3.0 4.5 6.0 7.5	1.0ℓ 1.5ℓ 2.0ℓ 2.5ℓ

Consult your supplier for additional information on hand held and mounted units.

AERIAL APPLICATION

- Use only correctly calibrated aircraft suitable for the required application.
- A spray volume of between 20-50ℓ/ha is suitable provided the following constraints are observed.
- Tumbleweed is a non-selective translocated herbicide. Direct spray contact, or even slight drift may cause severe injury or complete destruction of any growing crop, or other desirable plants including trees.
- Droplets with an average size (VDM) of 300-400 micron diameter are recommended. The Micronair AU7000 is suitable when mounted on an approved microlight aircraft.
- Do not spray when winds exceed 8km/h or when wind direction is towards nearby desirable vegetation.
- Do not spray on a windless day with hot rising air conditions as fine droplets may move with the air current and cause damage elsewhere.
- Do not spray under inverted temperature conditions.
- Do not spray in the heat of the day.
- Do not spray when temperatures exceed 35 degrees C or when relative humidity is below 40% or when the difference between wet and dry readings as determined by a whirling hygrometer exceeds 8 degrees C.
- Obtain an assurance from the aerial spray operator that the above specifications will be met before using the product.

MIXING INSTRUCTIONS

- Ensure that the spray tank is free of any residue from previous spray materials.
- Fill the spray tank with half the required amount of clean water, add the proper amount of Tumbleweed and ensure thorough mixing before adding the remaining water.
- Position the filling hose below the surface of the spray solution to prevent excessive foaming. Position the outlet of any return hoses at the bottom of the tank to reduce foaming. After mixing agitation is not required with this product.
- Reduced results may occur if water containing soil is used, e.g. from dams or rivers, or if hard water containing calcium is used.

WATER QUALITY – SPRAY WATER MODIFIERS.

- For optimum results a minimum of 1.0% Tumbleweed solution in the total spray volume is recommended.
- The addition of ammonium sulphate at 1-2kg per 100ℓ water, or Bladbuff 5 (Reg. L3351) may improve the action when hard waters are used. The addition of herbicidal spray oils is not recommended with the combination mixtures.

HERBICIDE INJECTION INTO SPRAY LINES

In order to avoid the necessity of bulk tank mixes, a calibrated chemical doser such as the Dosatron may be used to

introduce Tumbleweed and additional herbicides listed into a spray line at the appropriate concentration. Consult a representative from the Enviro Weed Control Systems for information in this respect.

CROP USE RESTRICTIONS

Situation	Critical comments
Vineyards	Do not use in vineyards younger than 2 years or near interplants less than 2 years old. Apply only as a directed spray to vines from bud to dormancy. Use only in the dormant pre-bud-burst stage for cover crop destruction in late winter in the Western Cape. In low growing bush or trellised vines or under 60cm high use only pre-bud burst. Do not permit spray or drift to contact buds, foliage or green stems, suckers or fresh wounds otherwise severe injury or destruction may result. Allow 10 days to elapse between pruning and application to prevent uptake from wounds
Pome fruit Apples, pears Stone fruits Peaches, plums, nectarines Subtropical fruit Citrus, nutcrops, avocado, paw-paw, mango, guava, litchi, bananas Tea plantations	Use only as a directed spray in orchards older than 3 years or near interplants less than 3 years provided the green bark and foliage is protected from the spray or drift. Do not permit spray or drift to contact leaves, green bark or fruit as severe damage or destruction may result. Allow 10 days to elapse between pruning and application to prevent uptake from wounds.

TANK MIX COMBINATIONS

Tumbleweed may be tank mixed as follows:

1. With Simazine for extended weed control in apples, pears and vines Do not use Simazine in stone fruit or other plantings where Simazine is not recommended. The correct quantity of simazine for the soil type and frequency of application must be adhered to.
2. With MCPA for improved control of Plantain (Plantago lanceolata); Heron's Bill (Erodium moschatum), Burrclover (Medicago polymorpha), Prostrate Knotweed (Polygonum aviculare) and Sheep Sorrel (Rumex angiocarpus)

The directions for use and dosage rates for the additional herbicide must be followed in all cases. Should simazine be used, ammonium sulphate as a 2% solution is recommended to assist in compatibility.

USE IN SUGAR-CANE CULTURE

Situation	ℓ/Ha Boom sprayer	Knapsack mℓ/20ℓ at 200ℓ/ha	Critical comments Sugar-cane is susceptible to damage particularly in young growth stage.
Annual weed control	1.5 - 3	150-300	Apply pre-plant broad cast, or as a directed spray to avoid injury in plant or ratoon cane. Avoid drift.

Situation	ℓ/Ha Boom sprayer	Knapsack mℓ/20ℓ at 200ℓ/ha	Critical comments Sugar-cane is susceptible to damage particularly in young growth stage.
Perennial Weed Control Cyperus rotundus (Nutsedge)	4.5-6.0	450-600	Apply as a directed spray to plant or ratoon cane when nutsedge is in early head stage. Apply a second treatment after maximum re-emergence in nutsedge control programme.

CONTROL OF WEEDS IN INDUSTRIAL AREAS

Tumbleweed may be used as a post-emergence application to vegetation on roadsides, electrical sub-stations, railway lines, storage areas or wherever unwanted vegetation exists. Consult the weed list for specific weeds where required. No residual action is obtained and repeat applications will be required to control new germination.

Species controlled	Boom sprayer ℓ/Ha	Handgun ℓ/100ℓ	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments
Annual weeds	2.25-4.5	1.125-2.25	250-450	Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Perennial weeds	4.5-7.5	2.25-3.75	450-750	

COMBINATIONS WITH OTHER HERBICIDES.

Where residual weed control is required **Tumbleweed** may be used as a tank mix with Outpace Flowable (Reg. L4760), Outpace Super (Reg. L4769), Arsenal (Reg. L3013), Hyvar X 80W (Reg. L1885), Velpar L (Reg L3996), Velpar DF (Reg L5432), R-P Diuron Flo (Reg. L4558). **Tumbleweed** will assist the action of the co-herbicide by providing additional foliar knockdown, and widening the range of weed species controlled. In all cases follow the directions for use on the product label of the additional herbicide. A compatibility test with the proposed combination should be made using the spray water intended for use to determine if flocculation (rapid settling-out of chemicals) occurs, in which case special precautions should be taken to ensure adequate agitation in the spray tank.

UNWANTED TREES AND WOODY PLANTS – ALIEN INVADERS AND DECLARED INVADING SPECIES

Based on 200ℓ volume per hectare

Species controlled	ℓ/Ha	Handgun ℓ/100ℓ water	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Bugweed *(Solarium mauritianum)* a) Seedlings b) Large trees	 0.75 1.5-2.0	 375ml 0.75-1.0	 75 150-200	Summer-autumn application. Spray up to 1.0m high saplings. Apply to 1,0m high coppice growth after cutting stems to ± 100mm.
Black wattle *(Acacia mearnsii)*	2.25-3.0	1.125-1.5	225-300	Summer-autumn application. Spray up to 2.0m high plants.
Lantana *(Lantana camara)*	4.5-6.0	2.25-3.0	450-600	Summer-autumn application. Use penetrating spray to wet plants.

Species controlled	ℓ/Ha	Handgun ℓ/100ℓ water	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments
				Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Bramble (Rubus species)	4.5-6.0	2.25-3.0	450-600	Apply in summer/autumn. The volumes of 200ℓ/ha with conventional equipment. Alternatively CDA application at 20-30ℓ/ha where feasible.
Port Jackson Willow (Acacia saligna) Seedlings Coppice regrowth after slashing or single stemmed trees up to 2.0m	4.5	2.25	450	Treat coppice growth at a height of 0.5 -1.0 high; single stemmed trees up to 2.0m high. Low volume CDA application suitable for low growing coppice or seedlings.

AQUATIC WEEDS

Species controlled	ℓ/Ha	Handgun ℓ/100ℓ using 600ℓ /ha	Mist blower ℓ/100ℓ using 600ℓ/ha	Critical comments
Water hyacinth (Eichornia crassipes)	7.5	1.25	1.25	Apply when new leaves are fully developed and follow up with repeat treatments regularly. Avoid run-off into water.
Common Reed (Phragmites australis)	7.5	1.25	1.25	Treat in late summer when 20-30% flowering. Slash dead material and treat regrowth in same or following season. Visible effects may take several months to become evident.
Bulrush (Typha capensis) or mixed communities with common reed.	7.5 plus 2-3ℓ Arsenal	1.25 plus 335-500mℓ Arsenal	1.25 plus 335-500mℓ Arsenal	Use a combination treatment with Arsenal (Reg. L3013) at 2-3ℓ/ha together with **Tumbleweed** at the recommended rate. Apply from early summer when in active growth, and re-treat when necessary in same or following season.

Note: Aerial application

These herbicides may be applied by aerial application to the infestations where conditions permit, using from 20-50ℓ total solution per ha. Follow the directions given under "Aerial application".

Species controlled	ℓ/Ha	Handgun ℓ/100ℓ water	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments
				Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Bramble (Rubus species)	4.5-6.0	2.25-3.0	450-600	Apply in summer/autumn. The volumes of 200ℓ/ha with conventional equipment. Alternatively CDA application at 20-30ℓ/ha where feasible.
Port Jackson Willow (Acacia saligna) Seedlings Coppice regrowth after slashing or single stemmed trees up to 2.0m	4.5	2.25	450	Treat coppice growth at a height of 0.5 -1.0 high; single stemmed trees up to 2.0m high. Low volume CDA application suitable for low growing coppice or seedlings.

AQUATIC WEEDS

Species controlled	ℓ/Ha	Handgun ℓ/100ℓ using 600ℓ /ha	Mist blower ℓ/100ℓ using 600ℓ/ha	Critical comments
Water hyacinth (Eichornia crassipes)	7.5	1.25	1.25	Apply when new leaves are fully developed and follow up with repeat treatments regularly. Avoid run-off into water.
Common Reed (Phragmites australis)	7.5	1.25	1.25	Treat in late summer when 20-30% flowering. Slash dead material and treat regrowth in same or following season. Visible effects may take several months to become evident.
Bulrush (Typha capensis) or mixed communities with common reed.	7.5 plus 2-3ℓ Arsenal	1.25 plus 335-500mℓ Arsenal	1.25 plus 335-500mℓ Arsenal	Use a combination treatment with Arsenal (Reg. L3013) at 2-3ℓ/ha together with **Tumbleweed** at the recommended rate. Apply from early summer when in active growth, and re-treat when necessary in same or following season.

Note: Aerial application

These herbicides may be applied by aerial application to the infestations where conditions permit, using from 20-50ℓ total solution per ha. Follow the directions given under "Aerial application".

PERENNIAL GRASSES AND BROADLEAVED WEEDS
200ℓ Volume per hectare

Species controlled	Boom sprayer ℓ/Ha	Handgun ℓ/100ℓ	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Buffalo or Ubabe grass (Panicum maximum)	3.0-4.5	1.5 -2.25	300-450	Use the higher rate on old stools and repeat at 3.0ℓ/ha or 1.5ℓ/100ℓ as required.
Bush buffalo grass (Setaria megaphylla)	4.5-6.0	2.25 – 3.0	450-600	Ensure thorough coverage.
Common grass (Cynodon dactylon) a) Initial treatment b) Follow up	 6.0-7.5 6.0	 3.0-4.0 3.0	 600-750 600	Apply in summer and follow up in autumn; or apply in autumn and follow up in summer.
Common paspalum (Paspalum dilatatum)	4.5-6.0	2.25-3.0	450-600	Apply at flowering stage and spot treat re-growth in autumn using 4ℓ/ha.
Couch paspalum (Paspalum pasalodes)	8.0	4.0	800	Apply in summer but before onset of dormancy.
Johnson grass (Sorghum halepense)	3.0-4.0	1.5-2.0	300-400	Apply at flowering stage and treat regrowth at 3ℓ/ha or 1.5ℓ/100ℓ
Wild grain sorghum (Sorghum bicolour)	2.25-3.0	1.125-1.5	225-300	Apply when in vigorous growth. Treat any regrowth to prevent re-infestation from dormant buds.
Kikuyu grass (Pennisetum clandestinum) a) Initial application b) Follow up application	 2.25-3.0 2.25	 1.125-1.5 1.125	 225-300 225	Apply when in vigorous growth. Treat any regrowth to prevent re-infestation from dormant buds.
Natal red top (Rhynchelytrum repens) a) Seedlings b) Tufts	2.0 2.0-3.0	1.0 1.0 -1.5	200 200-300	In mature stage mow to remove seed stalks: 4-6 weeks may be required for full effect.
Common thatch grass (Hyparrhenia hirta)	4.5-6.0	2.25-3.0	450-600	In mature stage mow to remove seed stalks: 4-6 weeks may be required for full effect.
Bushveld herringbone grass (Urochloa mosambiscensis)	2.25-3.0	1.125-1.5	225-300	
Tall paspalum (Paspalum urvillei)	3-4	1.5-2.0	300-400	

Species controlled	Boom sprayer ℓ/Ha	Handgun ℓ/100ℓ	Knapsack mℓ/20ℓ calibrated at 200ℓ/ha	Critical comments Use the lower rate on younger actively growing plants under optimum conditions. Increase the rate as plants mature or when environmental conditions are less favourable.
Red grass (Thermeda triandra)	4.5-6.0	2.25-3.0	450-600	
European verbena (Verbena officinalis)	3.5-4.0	1.5-2.25	350-400	
Lovegrass (Eragrostis curvula) (E. chloromelas) (E. gummiflua)	2.25-3.0	1.125-1.5	225-300	Apply to full growth but before onset of dormancy.
Fan lovegrass (Eragrostis plana)	3-4	1.5-2.0	300-400	In mature stage mow to remove seed stalks: 4-6 weeks may be required for full effect.
Purple nutsedge (Cyperus rotundus) Yellow nutsedge (Cyperus rotundus)	4.5-6.0	2.25-3.0	450-600	Apply at flowering and follow up with a repeat treatment to regrowth in a programme to reduce infestation.
Field bindweed (Convolvulus arvensis)	4.5-6.0	2.25-3.0	450-600	Apply at early flowering and follow up with 1.5ℓ/100ℓ
Plaintain (Plantago lanceolata) a) Pre-flowering b) Flowering	 2.25-3.0 4.5-6.0	 1.125-1.5 2.25-3.0	 225-300 450-600	Apply before flowering. Resistant after flowering.
Small mallow (Malva parviflora) a) Pre-flowering b) Flowering	 3.0-4.5 4.5-6.0	 1.5-2.25 2.25-3.0	 300-450 450-600	Apply before flowering and treat any regrowth to prevent re-establishment.
Smuts finger grass (Digitaria eriantha)	3-4.5	1.5-2.25	300-450	
Tassel three-awn (Aristida congesta)	3-4.5	1.5-2.25	300-450	

WEEDS IN ARABLE AGRICULTURE PRE-PLANTING (REDUCED TILLAGE) AND IN FORESTRY, FRUIT AND PLANTATION CROPS, SUGARCANE AND NON-CROP AREAS.

Critical comments

- Refer to general instructions for use for the crop concerned.
- Use the lower rate on younger actively growing plants under optimum conditions.
- Increase the rate as plants mature or when environmental conditions are less favourable.
- Rates apply from seedling to flowering stage of growth.

ACKNOWLEDGEMENT OF TRADEMARKS

Arsenal: American Cyanamid Company Wayne, New Jersey, USA; Hyvar X 80W: E I Du Pont de Nemours & Co, Wilmington, Delaware 19898, USA; Bladbuff 5: Plaaskem (Pty) Ltd, P O Box 87005, Houghton 2041, Tvl; Velpar: E I Du Pont de Nemours & Co, Wilmington, Delaware 19898, USA; R-P Diuron Flo: Rhone-Poulenc Agrichem, PO Box 12447, Onderstepoort, 0110

Botanical Name	**Common Name English**	**Boom sprayer ℓ/ha**	**Knapsackmℓ/20ℓ at 200ℓ/ha**
Susceptible Weeds		1.5-2.5	150-225
Alternanthera pungens	Khaki bur weed		
Amaranthus hybridus	Cape pigweed		
Amaranthus spinosus	Thorny pigweed		
Amaranthus thunbergii	Red pigweed		
Argemone subfusiformis	Mexican poppy		
Bidens pilosa	Common blackjack		
Chenopodium album	White goosefoot		
Chenopodium carinatum	Green goosefoot		
Chenopodium murale	Nettle-leaved goosefoot		
Cirsium arvense	Canada thistle		
Cotula tenella	Wild cucumber		
Cucumis spp.			
Datura ferox	Large thorn apple		
Datura stramonium	Common thorn apple		
Galinsoga parviflora	Gallant soldier		
Gisekia pharnaceoides	Gisekia		
Gnaphalium subfalcaturn	Cudweed		
Pentzia grandiflora	Karoo bush		
Pseudognaphalium luteo-album	Jersey cudweed		
Pseudognaphalium undulatum	Undulate Cudweed		
Spergula arvensis	Corn spurry		
Avena spp.	Wild oats		
Avena fatua	Common wild oats		
Briza maxima	Quaking grass		
Bromus diandrus	Ripgut brome		
Chloris pycnothrix	Spiderweb Chloris		
Ehrharta longifolia	Oat seed grass		
Hordeum murinum	Wild barley		
Lolium multiflorum	Italian rye grass		
Lolium temulentum	Darnel		
Poa annua	Winter grass		
Secale cereale	Rye		
Tragus racemosus	Large carrotseed grass		
Moderately Susceptible weeds		2.25 - 3.0	225-300
Arctotheca calendula	Cape marigold		
Chloris virgata	Feathertop chloris		
Conyza Canadensis	Fleabane		

Botanical Name	Common Name English	Boom sprayer ℓ/ha	Knapsack mℓ/20ℓ at 200ℓ/ha
Conyza floribunda	Tall fleabane	2.25-3.0	225-300
Emex australis	Spiny emex		
Fumaria muralis	Fumitory		
Hibiscus cannabinus	Kenaf		
Oxalis pes-caprae	Yellow sorrel		
Phalaris canariensis	Canary grass		
Portulaca oleracea	Common purslane		
Schkuhria pinnata	Dwarf marigold		
Senecio consanguineus	Starvation Senecio		
Sesamum triphyllum	Wild sesame		
Sonchus oleraceus	Sowthistle		
Tagetes munuta	Khaki weed		
Tribulus terrestris	Common dubbeltjie		
Veronica spp.	Speedwell		
Phalaris minor	Little seeded canary grass		
Setaria pallide-fusca	Red bristle grass		
Setaria verticillata	Sticky bristle grass		
Conyza bonariensis	Flax-leaf fleabane		
Eragrostis ciliaris	Woolly love grass		
Chamaesyce hirta	Red milkweed		
Chamaesyce inaequilatera	Smooth creeping milkweed		
Flaveria bidentis	Smelters bush		
Lepidium bibaruebse	Pepper cress		
Raphanus raphanistrum	Wild radish		
Setaria sphacelata	Common bristle grass		
Solanum nigrum	Deadly nightshade		
Tragus berteronianus	Small carrot-seed grass		
Urochloa panicoides	Herringbone grass		
Anchusa azurea	Oxtongue		
Senecio pterophorus	Perdegifbos		
Digitaria sanuinalis	Crab finger-grass		
Eleusine indica	African goose grass		
Panicum schinzii	Sweet buffalo grass		
Taraxacum offincinale	Dandelion		
Medicago polymorpha	Burclover		
Moderately resistant weeds		3.0-4.5	300-450
Latuca serriola	Wild lettuce		
Erodium moschatum	Musk heron's bill		
Rumex angiocarpus	Sheep sorrel		
Malva parviflora	Small mallow		
Commelina benghalensis	Wandering Jew		
Flaveria bidentis	Smelters bush		
Hypochoeris redicata	Hairy wild lettuce		
Echium lycopis	Purple echium		

Cefic Tremcard - Instructions in Writing

EC:ENVIROWEED:007

Class	6.1
PG	II
HI No	60
UN	2902

LOAD
Pesticide, liquid, toxic

Name of substance(s): TUMBLEWEED
- Coloured liquid.
- Perceptible odour.
- Miscible with water.

NATURE OF DANGER
- Toxic: by absorption through skin, by inhalation, by ingestion.
- May cause severe damage: to eyes.
- May have irritant effect: on skin, on air passages.
- Decomposes in a fire giving off toxic fumes. Symptoms may develop after several hours.
- May be combustible.
- Heating will cause pressure rise with risk of bursting.

PERSONAL PROTECTION
- Goggles or face shield.
- Light protective clothing.
- Protective gloves.
- Protective footwear.
- Eyewash bottle with clean water.

INTERVENTION EQUIPMENT
- Shovel.
- Broom.
- Sand or other absorbent.
- Alternatively, appropriate spill kit.

GENERAL ACTIONS BY THE DRIVER
- Stop the engine.
- No naked lights. No smoking.
- Mark roads with self-standing warning signs and warn other road users or passers-by.
- Keep public away from danger area. Keep upwind.
- Notify police and fire brigade as soon as possible.

ADDITIONAL AND/OR SPECIAL ACTIONS BY THE DRIVER
- Any action only if without personal risk.
- Stop leaks if without risk.
- Contain or absorb leaking liquid with sand or earth or other suitable material.
- Avoid direct contact with substance.
- Prevent liquids entering water courses, sewers, basements and workpits.
- If substance has entered a water course or sewer or been spilt on soil or vegetation, inform police.
- Warn everybody: Toxic hazard.

FIRE (information for the driver in case of fire)
- Do not attempt to deal with any fire involving the load.

FIRST AID
- Remove contaminated clothing immediately and wash affected skin with soap and water.
- A person suspected to have swallowed the substance who is conscious should be given water to drink. Take to a doctor immediately together with this card.
- Apply artificial respiration only if patient is not breathing or under medical supervision.
- If substance has got into the eyes, immediately wash out with plenty of water. Continue treatment until medical assistance is provided.
- Seek medical treatment when anyone has symptoms apparently due to inhalation, swallowing or contact with skin or eyes.
- Persons who have inhaled the gas or fumes produced in a fire or who have come into contact with the substance may not show immediate symptoms. They should be taken to a doctor with this card. Patient must be kept under medical supervision for at least 24 hours.

SUPPLEMENTARY INFORMATION FOR EMERGENCY SERVICES
- Do not flush road with water.
- Keep container(s) cool by spraying with water if exposed to fire.
- Extinguish with waterspray, foam or dry chemical.
- Do not attempt to smother the fire.
- If possible prevent water running into sewers.

Additional information

EMERGENCY TELEPHONE: 082 371 2681

ENVIRO INDUSTRIES T/A ENVIRO WEED CONTROL

Tumbleweed MSDS Sheets

MATERIAL SAFETY DATA SHEET **TUMBLEWEED**	
Reg no: L 4781 (Act no.36 of 1947)	**Date Issued:** 1998/08/28

COMPANY DETAILS	
Name: Enviro Weed Control Systems	**Emergency tel no:** Poison Centres (Unitas Hospital): (012) 664 1100 or Toll-free: 0800 111 229 Tygerberg: (021) 931 6129 Red Cross (021) 689 5227
Physical Address: 32 Eighth Avenue Industria KROONSTAD; 9500	**Postal Address:** P.O. Box 7045 Kroonpark KROONSTAD; 9501
Tel: (056) 213 4539	**Fax:** (056) 212 1080
E-mail: Derek@enviroweed.co.za	**Emergency Cell no:** 082 371 2681

1. PRODUCT AND COMPANY IDENTIFICATION	
Trade name: Tumbleweed	**Chemical abstract no:** 38641-94-0
Chemical family: Not classified	**NIOSH no:** Not available
Chemical name: Glyphosate-isopropylammonium: N-(phosphonomethyl) glycine (IUPAC)	**Hazchem code:** Not available **Reg. L** 4781 (Act no. 36 of 1947)
Synonyms: Glycine (Glyphosate)	**UN no:** Was 3018; now 2902

2. COMPOSITION
Hazardous components: Glyphosate Isopropylammonium salt 360 g/ℓ (acid equivalent 240 g/ℓ) Surfactant: Polyethylene alkylamine

EEC Classification: Harmful.
R Phrases: R 20/22 Harmful by inhalation or if swallowed. R 36 Irritating to eyes. (Risk of serious damage to eyes).

3. HAZARDS INDENTIFICATION

Main hazard: A relatively low toxicity herbicide. Poisonous if swallowed. Irritating to respiratory system.
Flammability: Water based product, non-flammable.
Chemical hazard: Irritating to eyes. (Risk of serious damage to eyes).
Biological hazard: Dangerous to fish. Approved for aquatic weed control if the instructions for use are followed (see product label).
Reproductive hazard: Glyphosate: Most of the field and laboratory evidence shows that glyphosate produces no reproductive changes in test animals. It is unlikely that the compound would produce any reproductive effects in humans. It did not cause any teratogenic effects (birth defects).
Eye effects: eyes: Glyphosate: Irritating to eyes. (Risk of serious damage to eyes).
Health effects: skin: Glyphosate: Non-irritating to skin (rabbits); Glyphosate – Dermal LD_{50} (rat) > 5000 mg/kg.
Health effects: ingestion: Glyphosate: Oral LD_{50} (rat) > 5000 mg/kg.
Health effects: inhalation: Glyphosate: LC_{50} (4h) for rats > 12.2 mg/ℓ air.
Carcinogenicity: Rats and dogs and mice fed glyphosate over a wide range of doses showed no cancer related effects directly due to the compound. EPA has stated that there is sufficient evidence to conclude that glyphosate is not carcinogenic in humans.
Mutagenicity: Glyphosate does not cause mutations in microbes. The tests on eight different kinds of bacterial strains and on yeast cells were all negative. The compound poses little mutagenic risk to humans.
Neurotoxicity: Glyphosate: Hens fed massive amounts over three days and

again 21 days later showed no nerve related effects.

4. FIRST AID MEASURES

If poisoning is suspected, do not wait for symptoms to develop. Contact a physician, the nearest hospital, or the nearest Poison Control Centre.

Symptoms: Symptoms of Glyphosate poisoning include: headache, dizziness, weakness, in-coordination, muscle twitching, tremor, nausea, abdominal cramps, diarrhea, and sweating. Blurred or dark vision, confusion, tightness in the chest, wheezing, productive cough, and pulmonary oedema may occur. Incontinence, unconsciousness and convulsions may indicate severe poisoning. Slow heartbeat and salivation may occur. Slowing of the heartbeat rarely progresses to complete sinus arrest. Respiratory depression may be fatal.

Advice to physician: There is no specific antidote. Treat symptomatically and supportively as and when required. Remove by gastric lavage and catharsis, but not if victim is unconscious. Give oxygen if respiration is depressed.

Product in eye: Hold eyelids open and flush immediately with clear clean running water for at least 15 minutes. If eye symptoms (redness, irritation or pain) persist refer patient to ophthalmologist for examination of eye.

Product on skin: Remove contaminated clothing and wash before reuse; wash affected skin areas with fresh running water and soap. Treat symptomatically.

Product ingested: Seek medical advice immediately. Rinse mouth thoroughly. Dilute immediately by swallowing water. Treat symptomatically.

Ingestions of small amounts (less than 10mg glyphosate / kg body weight) occurring less than an hour before treatment, are probably best treated by: Syrup of Ipecac (e.g. Lennon Ipekakuanha), followed by 1-2 glasses of water. Dose for adults and children over 12 years: 30 ml. Dose for children under 12 years: 15 ml.

Notes to physician: Glyphosate: There is no specific antidote. Treat symptomatically and supportively as and when required. Remove by gastric lavage and catharsis, but not if victim is unconscious. Give oxygen if respiration is depressed.

INGESTION of LARGE amounts (more than 10 mg glyphosate / kg) occurring less than an hour before treatment, should probably be treated by gastric lavage:

A. INTUBATE stomach and ASPIRATE contents.
B. LAVAGE stomach with slurry of ACTIVATED CHARCOAL in 0.9% saline.

Leave 30-50 gm activated charcoal in the stomach before withdrawing tube.
C. SODIUM SULFATE, 0.25 gm/kg in tap water, as a cathartic.
CAUTION: Hydrocarbons (kerosene, petroleum distillates) may be included in the formulation.

Ingestion of very LARGE AMOUNTS may cause CNS depression. In this case, IPECAC IS CONTRAINDICATED. Also, gastric intubation incurs a risk of HYDROCARBON PNEUMONITIS. For this reason observe the following precautions:

(1) If the victim is unconscious or obtunded and facilities are at hand, insert an ENDOTRACHEAL TUBE (cuffed, if available) prior to gastric intubation.
(2) Keep victim's HEAD BELOW LEVEL OF STOMACH during intubation and lavage (Trendelenburg, or left lateral decubitus, with head of table tipped downward). Keep victim's head turned to the left.
(3) ASPIRATE PHARYNX as regularly as possible to remove gagged or vomited stomach contents.

INGESTIONS occurring MORE THAN an HOUR before treatment are probably best treated only by ACTIVATED CHARCOAL, 30-50 gm, and SODIUM or MAGNESIUM SULFATE, 0.25 gm/kg, as described above. There are no specific antidotes for these chemicals. Because manifestations of toxicity do occasionally occur in peculiarly predisposed individuals, MAINTAIN CONTACT with victim for at least 72 hours so that unexpected adverse effects can be treated promptly.

Product inhaled: Move victim from contaminated area to fresh air. Apply artificial respiration if necessary. Irritating to respiratory system. Avoid inhalation of vapour or spray mist. Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing media: Extinguish small fires with carbon dioxide, dry powder, or alcohol-resistant foam. Water can be used for larger fires or cooling of unaffected stock, but avoid the accumulation of polluted run-off from the site. Contain fire control water for later disposal.

Special hazards: Slight fire or explosion hazard when exposed to heat and flame. Keep upwind. Avoid inhalation of hazardous vapours. Keep material out of sewers and water sources.

Protective clothing: Fire may produce irritating or poisonous vapours, mists or other products of combustion. Fire-fighters and others that may be exposed should wear full protective clothing and self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Wear protective clothing. Avoid breathing vapours or spray drift. If necessary, wear a self-contained breathing apparatus.

Environmental precautions: Glyphosate: Dangerous to fish. Maximum permitted concentration in treated water 0.2 ppm. Livestock need not be excluded from treated water. Approved for aquatic weed control. Do not contaminate ponds, waterways or ditches with chemical or used container. Do not allow to enter drainage systems, surface or ground water. If the product enters watercourses or sewers or contaminate soil or plants, inform competent authority.

Small spills: Soak up with sand or other suitable non combustible absorbent material, such as sawdust, and place into containers for subsequent disposal.

Large spills: Contain spillage and contaminated water for subsequent disposal. Do not flush spilled material into drains. Keep spectators away.

7. HANDLING AND STORAGE

Suitable material: Do not mix, store or apply in galvanized or unlined mild steel containers or spray tanks. The product can react with such containers and tanks or produce hydrogen gas, which may form a highly combustible mixture that can flash or explode, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source. Mix store, and apply glyphosate solutions in stainless steel, aluminium, fiberglass, plastic, or plastic-lined steel containers.

Handling/ Storage precautions: Store at temperature not exceeding 40°C. Poisonous if swallowed. Avoid contact with skin, eyes and clothing. Store in sealed original containers, in a well-aired, fresh and dry storehouses or in shaded and possibly well-aired places. Keep away from direct sunlight, food, seed, animals, children and uninformed persons. Use with adequate ventilation. Wash hands before eating, drinking, chewing gum, smoking, or using the toilet. Remove clothing immediately if the herbicide gets inside, then wash skin thoroughly using a non-abrasive soap and put on clean clothing. Do not apply directly to areas where surface water is present, or to intertidal areas below the mean high water mark. Water used to clean equipment must be disposed of correctly to avoid contamination.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits:
Glyphosate: ADI (acceptable daily intake) for man 0.3 mg/kg body weight (World Health Organization).

Engineering control measures: Use outdoors in a well ventilated area. Comply with occupational safety, environmental, fire, and other applicable regulations. Wear suitable personal protective equipment. Following application clean sprayer parts by flushing with water.

Personal protection – respiratory: Avoid inhaling fumes or spray drift. Respiratory protection is not required for normal use and handling. During periods of abnormal exposure to heavy spray or mist, use a NIOSH approved dust/ mist respirator. Limitations of respirator use specified by the approving agency and the manufacturer must be observed.

Personal protection – hand: Protective waterproof (impermeable) rubber or plastic gloves are recommended.

Personal protection – eye: Wear eye protection. During mixing or pouring operations or other activities in which eye contact with undiluted Tumbleweed is likely to occur, splash goggles should be worn.

Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance; the employer should provide an eye wash fountain or appropriate alternative within the immediate work area for emergence use.

Personal protection – skin: Long-sleeved shirt, long pants, shoes plus socks, protective waterproof (impermeable) gloves. Employee must wear appropriate protective clothing and equipment to prevent prolonged skin contact with this product. Clothing soaked with Tumbleweed solution should be promptly removed and laundered before re-use.

Other protection: Do not eat, drink or smoke while handling this product. Prevent contamination of food, feeds, drinking water and eating utensils. After using this product wash hands and face before eating. Take extreme care to avoid drift. Wash accurately (preferably a shower) after work shift. Wash hands during breaks and at the end of the work with soap and water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Light-amber to light brown liquid.

Odour:	
pH: 4.5 – 5.5	
Boiling point:	**Auto flammability:** Not Applicable
Melting point: Glyphosate: 200°C	**Explosive properties:** No explosion hazard.
Flash point: > 100°C. Water-based, non flammable.	**Oxidizing properties:** Corrosive to iron, steel and aluminium.
Flammability: Not Applicable	
Vapour pressure: No data available	
Density: 1.13 – 1.17 g/mℓ @ 20°C.	
Solubility – water: Glyphosate: 12 g/ℓ (25°C); Very soluble in water.	
Solubility – solvent: Glyphosate: Insoluble in common organic solvents, e.g. acetone, ethanol and xylene.	
Solubility – coefficient:	
Neurotoxicity: Glyphosate: Hens fed massive amounts over three days and again 21 days later showed no nerve related effects.	

10. STABILITY AND REACTIVITY

Conditions to avoid: Glyphosate is stable up to 60°C.

Incompatible materials: Spray solutions containing this product should be mixed, stored or applied using stainless steel, aluminium, fibreglass or plastic lined containers. Do not mix, store or apply in galvanized or unlined mild steel containers or spray tanks. The product can react with such containers and tanks or produce hydrogen gas, which may form a highly combustible mixture that can flash or explode, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source. The product is relatively stable in neutral, weakly acidic and weakly alkaline media, but reacts strongly (and possibly violently) with strong alkalis. Mixing with other products may reduce the activity of Glyphosate. Do not mix with other herbicides or pesticides except for products mentioned on the product label. Do not physically mix concentrate directly with other herbicides or

pesticides concentrates; always dilute first.

Hazardous decomposition products: Not any known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity: Glyphosate: Acute oral LD_{50} for rats 5600 mg/kg; Acute percutaneous LD_{50} for rabbits > 5000 mg/kg; Acute inhalation (4h) for rats > 1.3 mg/ℓ air. Glyphosate is a moderately toxic herbicide. Even though the LD_{50} values show the compound to be relatively non-toxic it can cause significant eye irritation.

Skin and eye contact: Glyphosate: Mild eye irritant; it can cause significant eye irritation; non-irritating to skin (rabbits); LD_{50} for rabbits > 5000 mg/kg. Contact and non-contact re-entry: When fully dry. In a number of human volunteers, patch tests produced no visible skin changes or sensitization.

Chronic toxicity: Glyphosate: NOEL (no observable effect level) – In 2 year feeding trials, no ill-effects were observed in rats and dogs receiving 300 mg/kg diet (highest dose treated); ADI (acceptable daily intake) for man 0.3 mg/kg body weight. Sub-chronic and chronic tests with glyphosate have been conducted with rats, dogs, mice, and rabbits in studies lasting from 21 days to two years. With few exceptions there were no treatment-related gross (easily observable) or cellular changes. In a chronic feeding study with rats, no toxic effects were observed in rats given doses as high as 31 mg/kg/day, the highest dose tested. No toxic effects were observed in a chronic feeding study with dogs fed up to 500 mg/kg/day, the highest dose tested. Mice fed glyphosate for 90 days exhibited reduced body weight gains. The lifetime administration of very high amounts of glyphosate produced only a slight reduction of body weight and some microscopic liver and kidney changes. Blood chemistry, cellular components, and organ function were not affected even at the highest doses.

Carcinogenicity: Glyphosate: Animal studies did not detect any carcinogenic effects. The US EPA has stated that there is sufficient evidence to conclude that glyphosate is not carcinogenic in humans.

Mutagenicity: Glyphosate: The product was not clastogenic when tested with Chinese Hamster ovary cells, and is not mutagenic in mouse lymphoma cells.

Reproductive hazards: Glyphosate: Most of the field and laboratory evidence shows that glyphosate produces no reproductive changes in test animals. It is unlikely that the compound would produce any reproductive effects in humans. It did not cause any teratogenic effects (birth defects).

12. ECOLOGICAL INFORMATION

Aquatic toxicity – fish: Glyphosate: LC_{50} (96h) for trout 86 mg/ℓ; Bluegill sunfish 120 mg/ℓ.

Aquatic toxicity – daphnia: LC_{50} (48h) > 780 mg/ℓ. There is a very low potential for the compound to build up in the tissues of aquatic invertebrates or other aquatic organisms.

Aquatic toxicity – algae: Toxic to algae.

Biodegradability: Glyphosate: Microbial degradation is the major cause of loss from soil, with liberation of carbon dioxide. The principle metabolite is aminomethylphosphonic acid. DT_{50}, 3 days for salt, 60 days for the acid. Photodecomposition plays only a minor role in environmental breakdown. In water, glyphosate is strongly adsorbed to suspended organic and mineral matter and is broken down primarily by microorganisms. Its half-life in pond water ranges from 12 days to 10 weeks.

Bio-accumulation: Glyphosate: The product shows little or no tendency to bio-accumulate and poses no long term threat to wildlife. Glyphosate has no significant potential to accumulate in animal tissue.

Mobility: Glyphosate: Glyphosate is highly adsorbed on most soils especially those with high organic content. The compound is so strongly attracted to the soil that little is expected to leach form the applied area. Because glyphosate is so tightly bound to the soil, little is transferred by rain or irrigation water. One estimate showed less than two percent of the applied chemical lost to runoff. The herbicide could move when attached to soil particles in erosion run-off.

German wgk: Not available.

13. DISPOSAL CONSIDERATIONS

Disposal methods: Do not contaminate crops, grazing, rivers or dams with chemical or used container. Waste resulting from the use of this product that cannot be re-used or reprocessed should be disposed of in a landfill approved for pesticide disposal in accordance with applicable local procedures. Hydrolysis under alkaline conditions (10% NaOH) is a suitable method to dispose of small quantities of the product. After hydrolysis, dilute and dispose of in pits or landfill. Comply with any local legislation applying to waste disposal.

Disposal of packaging: Emptied containers retain vapour and product residues. Observe all labeled safeguards until container is cleaned,

reconditioned, or destroyed. Rinse empty container three times with a volume of water equal to at least one tenth of that of the container. Add the rinsings to the spray tank before perforating and flattening the container. Dispose of in approved landfill or preferably in a pesticide incinerator. Containers that are in good condition may be returned to a drum reconditioner for re-use with the same type of pesticide product.

14. TRANSPORT INFORMATION
Non-Hazardous for transportation. **UN no:** Was 3018; now 2902. (For RSA consumer use only)
Substance identity no: CAS NO 38641-94-0 (Glyphosate-isopropylammonium)
ADR/RID class: 6.1
ADR/RID item no: Not Available
ADR/RID hazard identity no: HI NO: 60
IMDG – shipping name: Pesticide, Liquid, Toxic, N.O.S.
IMDG – class: 6.1
IMDG – packaging group: II
IMDG – marine pollutant: Although glyphosate is practically non-toxic to fish, the formulated product is considered a marine pollutant. (Approved for aquatic weed control if the instructions for use are followed. Dangerous to fish. Maximum permitted concentration in treated water is 0.2 ppm).
IMDG – EMS no: 6.1-02
IMDG – MFAG table no: 505
IATA – shipping name: Pesticide, Liquid, Toxic, N.O.S.
IATA – class: 6.1
IATA – subsidiary risk(s): Toxic
ADNR – class: 6.1

UK – description: Pesticide, Liquid, Toxic, N.O.S.

UK – Emergency action class: 6.1

UK – classification: Data not available.

Tremcard no: Cefic TEC(R) – 61GT6-II

15. REGULATORY INFORMATION

EEC hazard classification: Data not available.

Risk phases:
R 20/22 Harmful by inhalation or if swallowed.
R 36 Irritating to eyes. (Risk of serious damage to eyes).

Safety phases:
S2 Keep out of reach of children.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice Immediately (show label where possible).
S 61 Avoid release to the environment.

National legislation: Act no 85 of 1993 (Republic of South Africa)

16. OTHER INFORMATION

NB. Read and understand all the information on the product label before using the product.

Glyphosate is a broad-spectrum, non-selective systemic herbicide. It is useful on essentially all annual and perennial plants including grasses, sedges, broad-leafed weeds and woody plants.

EMERGENCY AND FIRST AID PROCEDURES:
The chemical information provided has been condensed from original source documents, primarily form: **"Morgan, D.P. 1982** Recognition and management of pesticides poisonings, 3rd ed. U.S. Environmental Protection Agency, Washington, DC. 120 pp". This information has been provided in this form for your convenience and general guidance only. In specific cases, further consultation and reference may be required and is recommended. This

information is not intended as a substitute for a more exhaustive review of the literature nor for the judgement of a physician or other trained professional.

All information and instructions provided in the Material Safety Data Sheet (MSDS) are based on the current state of scientific and technical knowledge at the date indicated on the present MSDS and are presented in good faith and believed to be correct. It is the responsibility of persons in receipt of this MSDS to ensure that the information herein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product.

Appendix R – Interview Data for the Informal Settlements

REEDS Settlement Questionnaire – Donkerhoek #1 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translators: Lucky Ganeb and other
Number of People Interviewed: 1
Sex: Female
Ages: 36 years old
Settlement Location: Donkerhoek
Family Origin: Okasorday
Length of Time Living in Mariental: 4 years
Household Sizes: 21 people
Current livelihood: Out of the 21 people, 3 are working on the plots

1. **Skills working with hands**
   They can make bowls and plates.

2. **Experience using reeds**
   a. **YES:**
      i. Her family has used reeds for making verandas, mats, and building materials around toilets.
      ii. They have not sold any products, but her uncle who lives elsewhere makes and sells products from the reeds.

   Her family would be interested in making more products if they are trained.

3. **Potential markets for the products**
   She does not know if there would be a market because she has not tried selling products before.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   They have gotten the reeds from the Fish River. They walk to the river and just look for good reeds. Her family knows it is a long distance but they still go there. They do not go too far up the river though since they do not have transport. As far as the hazards associated with harvesting, she is aware of a reptile in the river that looks like a crocodile but is not. It can whip its tail around and cut a person so that their flesh is visible. There are also snakes present near the river. The stumps from the reeds can hurt your hands and feet. If somebody cuts the reeds near the existing stumps, their hand can slip and hit the reed stumps. Even though there are hazards, if there is a need to make reed products they will brave the hazards and go harvest. They harvest when there is no water, so not during the rainy season.

6. **Necessary resources**
   They use sticks for steadiness of the products, and use wire and rope to tie the reeds together.
7. **Opinion on starting an initiative using reeds**
   She thinks the project is a brilliant idea, and would be great for income-generation.

8. **Ethnic groups working together**
   If the project is going to be successful, then the different ethnic groups must mix together and all must be represented.

9. **Management and Organization of Project**
   The project should be managed by the community. Everyone with a stake in the project should come together and hold a meeting. They should vote on who should be in charge of specific positions such as finances. However, there should be somebody higher up that oversees the entire process.

REEDS Settlement Questionnaire – Donkerhoek #2 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 1
Sex: Female
Ages: 30 years old
Settlement Location: Donkerhoek
Family Origin: Oshikango
Length of Time Living in Mariental: 6 years
Household Sizes: 8 people
Current livelihood: Owns a cuca shop

1. **Skills working with hands**
   Needlework

2. **Experience using reeds**
   a. **NO:** She has not tried using reeds herself.
      i. She has seen Phillipus using the reeds to make mats, and does not think it looks too difficult. She has also witnessed people harvesting the reeds. She knows the reeds can be used for baskets.
      ii. She is most interested in using the reeds to make baskets.

3. **Potential markets for the products**
   She thinks there is market for reed products, such as baskets, worldwide and that anyone would buy them.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** She is willing to harvest the reeds. She would walk to the river to find the reeds, and carry them on top of her head to transport the reeds back. She is willing to walk 10 kilometers to harvest the reeds. She will harvest the reeds anytime as long as the water in the river does not come above her ankles.
   b. What hazards do you know of that are associated with harvesting?
      She is aware that there are snakes in the reeds that are dangerous. There are also thugs that will hide out in the reeds and then mug you. It would be necessary to wear boots to go harvest, but she would still be willing to.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   Since she is interested in making baskets, she would need only reeds, and thread and needle to tie them together. She would start in the middle and work her way outwards. It is necessary to sew the reeds tightly together.

7. **Opinion on starting an initiative using reeds**
   She thinks that as long as there is market for the products, then the initiative will be good. It is important that the products are not sold only locally but elsewhere as well.

8. **Ethnic groups working together**
   She thinks that since the Nama do not have respect towards each other, they will not have respect for other groups, so they should be left out of the initiative. The Kavangos and Ovambos
   Would work very well together, and both should be included in the project.

9. **Management and Organization of Project**
   She says that one person should coordinate the project, but that person should not walk around with money. It must be put right in the bank. Financial management is very important is any project. The community should manage the reeds themselves.

REEDS Settlement Questionnaire – Donkerhoek #3 - Team Blue

Date: 7th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 2
Sex: Females
Ages: 23/24 years old
Settlement Location: Donkerhoek
Family Origin: Mariental
Length of Time Living in Mariental: whole life
Household Sizes: 10/12 people
Current livelihood: Only the father and brother in the household are working. One works for the Ministry of education and the brother is a handyman.

1. **Skills working with hands**
   Needlework, weeding, and making things from wire
   She has not used compost for her garden because she has not thought of it. It grows fine without any composting.

2. **Experience using reeds**
   a. **NO:** Neither of the women has used reeds before.
      i. They have seen their neighbors using reeds to make fencing for Mariental Hardware. The other uses of reeds that they are aware of include chairs and baskets.
      ii. Both women would be most interested in baskets for small jewelry. However, other people in their families would also be interested in using the reeds for various products.

3. **Potential markets for the products**
   They believe there is a market for the products. The Germans may be especially interested in the products. The products could be sold at the truck port or at Spar because the tourists visit those places. However, the people selling products would have to ask permission from the owners before they try to sell on their property.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** If pangas were provided, the women and people in their family would be interested in harvesting the reeds. They would have to walk to the reeds, and would be willing to go 3-4 kilometers. Since it would require a lot of energy, they would need food. To transport the reeds back, they can either be carried, or people with transportation could be paid to transport the reeds. They would harvest only after the rainy season, and never when there is water.

   b. What hazards do you know of that are associated with harvesting?

The women said there are snakes, scorpions, and baboons that you have to look out for when harvesting the reeds. One of the women said she would be too afraid to harvest, but the other was willing to harvest even knowing the associated dangers.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   In order to make baskets they would need electrical wire that you can knit through the reeds.

7. **Opinion on starting an initiative using reeds**
   The project is nice because there is a high rate of unemployment and large household sizes, so any income is good. Also, the spraying and burning of the reeds has caused ashes and fumes to travel to the settlements from the river.

8. **Ethnic groups working together**
   Everyone must come together and work together in projects.

9. **Management and Organization of Project**
   There must be a very good person in charge of finances because that can be a huge issue. Every person should come together to work, and different people should be in charge of different aspects of the project. To be successful, there would have to be trust and respect between the people involved in the project. The government should not be involved because they are already employed. The people in the project should run it themselves. Some other projects have the councilor's office in charge, but the office does not do anything for the project that the people cannot do themselves.

REEDS Settlement Questionnaire – Donkerhoek #4 – Team Blue

Date: 7th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 6 people
Sex: Female
Ages: 40 years old
Settlement Location: Donkerhoek
Family Origin: Mariental
Length of Time Living in Mariental: whole life
Household Sizes: 6 people
Current livelihood: She currently sews, people in the community ask her to make clothing and dresses for them. Her machine broke two days prior to the interview, so she still has orders she needs to complete.

1. **Skills working with hands**
   Her boyfriend is a handyman and can fix anything. He fixes televisions and other electronic devices for people.
2. **Experience using reeds**
   a. **NO:** She has not worked with reeds before.
      i. She has seen people making reed mats, and thinks that it looks easy to do. She was discussing with her boyfriend the other day that she would like to start working with reeds.
      ii. They were interested in making shades from the reeds, but would be willing to do anything with the reeds.

3. **Potential markets for the products**
   She thinks people would be interested in buying reed products, especially tourists. However, it would depend on how the product looks. If the reeds are uneven or bad, then people will not buy it. If a person makes the products look nice, then people will buy the products including farms and lodges.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** She would be willing to harvest. She grew up in Mariental and the distance to the river is not very far for her, so she and her boyfriend would be willing to walk to the river to harvest the reeds. Transportation of the reeds could be a problem, but she could put them on her head to carry. She is available to harvest anytime of the year. If there is water, she just would not go near the deeper parts of the river.
   b. What hazards do you know of that are associated with harvesting?
      She is aware of some of the hazards associated with harvesting such as snakes, but up until now she has not heard of any incidents. She will still go harvest because she has no life here and needs to do something.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**

N/A

6. **Necessary resources**
   She would need thread and wire to make reed products, as well as a panga, pliers, and thick poles for the corners of shades for strength.

7. **Opinion on starting an initiative using reeds**
   She thinks the project is a nice initiative that she would like to be involved with. Because of the unemployment rate, it would be good for people to work with their hands.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   If projects are started, everyone needs to be on the same wavelength to achieve the objectives. Some people want to share immediate profit but do not think of buying more materials. Managerial skills are necessary in whoever is leading the project. The government should probably run such a project using the reeds. The local people know each other too well, so there would be no respect. If the unemployed were to manage the project, then it will not work. The person would try to become rich and there would be no money left in the project. There may also be issues with jealousy and the leader would fire the workers who are not as good as others.

REEDS Settlement Questionnaire- Donkerhoek #5 – Team Blue

Date: 7th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 2
Sex: Female**s**
Ages: 29/35 years old
Settlement Location: Donkerhoek
Family Origin: Mariental
Length of Time Living in Mariental: whole life
Household Sizes: 5/10 people
Current livelihood: One of the women works at Mariental Hotel and the other at a farmer's meat market.

1. **Skills working with hands**
   They do not have any skills working with their hands.

2. **Experience using reeds**
   a. **NO:** Neither woman has used reeds before**.**
      i. They have seen people using reeds to make laundry baskets, huts, handbags, hats, and photo frames.
      ii. They would be most interested in making photo frames.

3. **Potential markets for the products**
   They think there is market for reed products including photo frames. Tourists would most likely be interested including places like Mariental Hotel.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** Both women would be willing to harvest the reeds. They would harvest all year through, just not when there is water. They would either walk down to the river to find the reeds and carry them on their head to transport. Another method would be to pay someone with a car to transport the reeds. They are willing to walk until they reach the reeds.
   b. What hazards do you know of that are associated with harvesting?
      They are aware that in the water there are sink holes you can fall in. There are also reptiles and snakes. They are still willing to harvest knowing there are hazards. If they were bitten by a snake they would just go to the hospital.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   They would need glass, glue, and paper, in order to make reed photo frames.

7. **Opinion on starting an initiative using reeds**

In starting a project, the people participating must be divided into jobs based on their levels of education. The people without education should just harvest the reeds. There should be no corruption in the projects. People should not help out others just because they are neighbors, so there is no uneven distribution of money.

8. **Ethnic groups working together**

   There should be a mixture of ethnic groups working on the project since some will have experience and some will not. The experienced people should teach others, and there should be an exchange of ideas.

9. **Management and Organization of Project**

The government should oversee the project, but since it is a community project, there should be a committee established. The positions within the project should be divided amongst the members. The government should be involved for two years and teach the leaders of the project how to do things. Then they should pull out and let the commit

REEDS Settlement Questionnaire Donkerhoek #6 – Team Blue

Date: 3rd April 2009
Interviewers: Laurie, Billy, Michelle, Dennis
Translator: N/A
Number of People Interviewed: 1
Sex: Male
Ages: middle-aged
Settlement Location: Donkerhoek
Family Origin: Kavango
Length of Time Living in Mariental: 6 years
Household Sizes: 3
Current livelihood: prison officer

1. **Skills working with hands**
   He has built his house and made fences.

2. **Experience using reeds**
   a. **YES:**
      i. He puts reeds on his house to keep it cool, and also builds reed fences to put up around his property. He has seen people in Kavango making baskets and mats but has not done it himself. It is a very hard skill to learn, but is easier if someone shows a person how to do it.
      ii. He has not considered selling reed products because he thinks people in Mariental will not know how to use the products properly.

3. **Potential markets for the products**
   In Kavango, people sold reed products to lodges, community members, and tourists. People set up their products on the sides of roads, or residents came to the houses of people they knew made products.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   He used to transport the reeds with a canoe in Kavango. He would put them out in the sun to dry so they become hard. Then they would be cut to the desired length. In Mariental, he harvests his reeds from the Fish River. He uses a bicycle to get to the river, and cuts the reeds with a panga. He cuts the reeds that are on the banks of the river. He harvests if he has time after getting home from work. In the winter the reeds are better because they are harder and stronger.
   a. What hazards do you know of that are associated with harvesting?
      There are snakes in the river that he has to try to avoid when harvesting the reeds.

6. **Necessary resources**
   Pangas are necessary to harvest the reeds.

7. **Opinion on starting an initiative using reeds**

He is not sure if the community would be interested in a reeds project. There is a lot of working involved in obtaining the reeds, and there are lots of problems with alcohol abuse by the residents. He would be interested in the initiative himself, and would be willing to teach people the skills that he has. However, since he has a job it might be difficult to find time to train.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   N/A

REEDS Settlement Questionnaire – Ombili #1 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 1
Sex: Female
Ages: Middle-aged
Settlement Location: Ombili
Family Origin: Ongha
Length of Time Living in Mariental: 12 years
Household Sizes: 4 people
Current livelihood: She is currently unemployed but her husband is working.

1. **Skills working with hands**
   The only skills working with hands in her household is herself. She used reeds to make small boats and houses as toys for children in her family.
2. **Experience using reeds**
   a. **YES:**
      i. Used reeds for small boats and houses a long time ago. She saw other people doing stuff with the reeds so she decided to try something herself. She used to be part of the project with Phillipus, but people did not work fairly with the money so she dropped out of the project.
      ii. She has not sold the products because she does not think anyone will buy them. She sent them to the north to her relatives children.

   She knows reeds can be used to build houses. She would be interested in using the reeds for other things. She would be willing to train others in the uses that she knows how to make.

3. **Potential markets for the products**
   There would be a market for many products, such as mats. However, in the south she does not think that anyone would be interested in her reed toys.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   a. She harvested the reeds a very long time ago. She can go down to the river to collect more reeds. She used to go early in the morning and come back in the afternoon. She will not go all the way close to the Hardap Dam because it is too far to walk. She has to transport the reeds on her head. The best time to harvest is not during the rainy season. If the water level is very low then the reeds can still be harvested.
   b. What hazards do you know of that are associated with harvesting?
      One of the hazards is the water itself, so nobody should harvest during the rainy season. There are insects in the water that can bite people harvesting. Even though she knows the hazards she still will go harvest because she is unemployed so it does not matter.

6. **Necessary resources**
   In order to make the small boats and houses she needs boxes and glue. She uses the boxes as the basic structure and glues the reeds on. She uses approximately four reeds per boat.

7. **Opinion on starting an initiative using reeds**
   She thinks the project will be a very good thing to provide income to the unemployed. She thinks every member should sell their own products separately. If it is done collectively, it will be a problem because of money issues and people lying about money.

8. **Ethnic groups working together**
   She prefers that the ethnic groups be mixed in the project in order for it to work better.

9. **Management and Organization of Project**

The project should not be managed by the government. The government should have no involvement. The person who came up with the idea of the project should be in charge of the money and administration. That person will know what is best for the project. The other people that become involved with the project should only harvest and make the pro

REEDS Settlement Questionnaire – Takarania #1 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 1
Sex: Female
Age(s): 29 years old
Settlement Location: Takarania
Family Origin: Gochas
Length of Time Living in Mariental: 9 years
Household Sizes: 5 people
Current livelihood: working as a chef/bartender at a nearby lodge

1. **Skills working with hands**
   She has skills in knitting, cooking, and sewing.
   Her husband is a mechanic.
2. **Experience using reeds**
   a. **NO:**
      i. She has seen Ovambo speaking people making fences, houses, toilet surroundings
      ii. She is interested in using stuff for decorations in the home, especially products such as window shades, mats, and picture frames.

3. **Potential markets for the products**
   She thinks there is a market for the products, specifically at the lodges. She used to work at Mariental Hardware, and when reed products were brought in, the lodges would buy them out.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. YES: She would harvest the reeds if the water is not too deep. She would be willing to walk to the reeds, and make use of a cart to transport the reeds. She does not know the best time to harvest the reeds, but would be willing to harvest whenever she needed. She would walk even up to the Hardap Dam if that is where the best reeds are.
   b. What hazards do you know of that are associated with harvesting?
   She knows that reed stumps are in the water. They are firm and sharp and people harvesting can get hurt on the stumps. She is not worried about snakes though.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   In order to make these products, she thinks she needs sandpaper, finish, glue, and string.

7. **Opinion on starting an initiative using reeds**

She thinks starting a reeds project would be a nice initiative because currently there are lots of people looking for work. If the unemployed could make things out of the reeds, it would be better than doing nothing, and they could even get a little income. She thinks to start a project, everyone must be in cooperation. There must be rules and regulations in place in terms of execution and discipline.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   She thinks someone from the government with experience should oversee the project.

REEDS Settlement Questionnaire – Takarania #2 – Team Blue

Date: 6th April 2009
Interviewers: Billy Sanguinet and Laurie Soderbom
Translator: Lucky Ganeb
Number of People Interviewed: 3
Sex: 1 Male, 2 Females
Ages: Female 1 – 27 Years
Settlement Location: Takarania
Family Origin: Karisberg
Length of Time Living in Mariental: 3 Years
Household Sizes: 6 People
Current livelihood: Domestic Work in Town – Currently on Pregnancy Leave

1. **Skills working with hands**
   Women in Household
   - Ironing
   - Washing
   - Cleaning

   Men in Household
   - Butcher
   - Construction
   - Plumbing
   - Welding

2. **Experience using reeds**
   a. **NO:** The woman we interviewed said that she has never used reeds before. However, she also mentioned that her husband has used reeds.
      i. **(List reed uses that the people witnessed)**
      She has seen men in town making shades, and then selling them. Some ideas she had were to make fencing, ceiling shades, and furniture (such as chairs, benches, benches, dressers, and cupboard doors).
      ii. **(List reed products they wish to produce)**
      She said that she would be interested in producing reed shades.
   b. **YES:** The interviewed woman said that in 1999 her husband had used the reeds to produce roof shading.
      i. **(List the uses)**
      We were told that her husband successfully made a shade mat for their house. She said that she didn't know exactly how her husband made the mat, because she only saw the finished product.
      ii. **(List of markets sold to)**
      The woman said that the shading wasn't sold; it was simply used in their house.

3. **Potential markets for the products**

The interviewed woman thinks that there are many potential markets for reed products. Specifically, she thinks that people in town would be interested (specifically white farmers) in shading. She also thought that tourism could be a good sector for marketing.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
    a. Would you also harvest the reeds?
        i. **YES:** The interviewed woman said that she would be interested in harvesting the reeds, if such a project was put into place. She said that she would gladly walk the entire river for reeds, provided that she was getting either food or income. After harvesting the reeds, she said that she would leave the reeds at the river, and find a transport to pick them up. Lastly, she advised that harvesting should happen after the rainy season, when the river is almost dried (so that the risk of drowning is minimal).
    b. What hazards do you know of that are associated with harvesting?
    When asked about the hazards, she specifically said that baboons could charge at you. There are also snakes in the river that can be dangerous, as well as reed stumps sticking out of the ground. However, she said that it is possible to try to avoid these hazards. As long as she was making an income, she would still harvest despite the hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
    N/A

6. **Necessary resources**
    - Pangas
    - Clippers
        - To cut reeds same length
    - Cleaning Materials
    - Sharp object to thread reeds together
    - Thread or Wire to tie reeds together

7. **Opinion on starting an initiative using reeds**
    She thinks the project using reeds would be a nice initiative. Anything that can generate income or provide food to the residents would be appreciated due to the high unemployment.

8. **Ethnic groups working together**
    She does not think that ethnic groups working together should cause any problems. Some different groups already work together.

9. **Management and Organization of Project**
    A committee should be selected to monitor the day-to-day activities of the project. The government should have a link to the project in case of problems, to help out the committee. There must be a good relationship between those involved in the project. Many people will join and know their coworkers, but there needs to be respect between everyone.

REEDS Settlement Questionnaire – Takarania #3

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 1
Sex: Male
Ages: 32
Settlement Location: Takarania
Family Origin: Mariental
Length of Time Living in Mariental: whole life
Household Sizes: 4 people
Current livelihood: His girlfriend and he are both unemployed currently, but they do temporary work occasionally.

1. **Skills working with hands**
   He knows carpentry and how to make tables and chairs. He also can do electrical work. He has been selling his carpentry products for two years in town. He sells alongside the road to tourists as well as locals.

2. **Experience using reeds**
   a. **NO:** He has not used reeds before but always has time to learn new things.
      i. He has seen Ovambo people using the reeds for shading, fencing, and toilet surroundings. He thinks people can products lots of products from reeds if they are innovative. He has also seen people making pipes for smoking from the reeds, and flutes as well.
      ii. He is interested in making photo frames from the reeds, as well as miniature toys such as horse carts, and decorations for his house. He is willing to try and produce any reed products that would sell well.

3. **Potential markets for the products**
   He thinks there is a potential market for the reeds. People could make their own store and people would come buy the products. At the truck port or at Spar would be good locations to sell the products. Tourists who come through town usually stop at the truck port on B1, and locals go to Spar, so people should probably try to sell in both locations.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** He would be willing to harvest the reeds. He would walk to the reeds as long as they are within 5 km. He would collect before and after the rainy season when the river is dry.
   b. What hazards do you know of that are associated with harvesting?
      There are lots of hazards when harvesting reeds, but whoever is harvesting just needs to keep their eyes open and be aware.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   In order to make reed products, he would need sharp objects such as knives. He would also need saws, glue, string, paint, and varnish.

7. **Opinion on starting an initiative using reeds**
   Since there is an abundance of reeds, and an abundance of unemployed people, the initiative should work.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   In starting a project, community consultation is necessary. The unemployed population needs to get involved, so they all need to be informed correctly. The Municipality should manage the reeds and be in charge of the initiative.

REEDS Settlement Questionnaire – Takarania #4 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People Interviewed: 2
Sex: 1 Male/1 Female
Ages: 40/45
Settlement Location: Takarania
Family Origin: Kajas
Length of Time Living in Mariental: 20 years
Household Sizes: 12 people
Current livelihood: The grandfather in the household is a pensioner, the rest are unemployed.

1. **Skills working with hands**
   Some of the people in the household are carpenters, the rest do not have skills with their hands. The grandfather of the household knows how to make some things with his hands, but has never seen anyone use reeds for construction. They own a garden but do not use compost. They have to get water from the standpipes, but they do not get that much water and cannot extend their garden. They would be interested in using composting if water was not an issue.

2. **Experience using reeds**
   a. **NO:** None of the members of the household have used reeds before.
      i. The female has seen people making shades with the reeds but it has been a long time since she has witnessed anyone harvesting the reeds. She knows the reeds can be used for a lot of different products but have not seen any other than shades.
      ii. She would be most interested in making shades from the reeds because she has been informed that it keeps places very cool.

3. **Potential markets for the products**
   She thinks there would be a market, including tourists and the locals. People would buy products if they saw something they wanted, but a lot of people do not know what people are making.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **NO:** She would not harvest the reeds, because she has to look after a lot of children and also the grandfather. The other people in her household could get a job at any time, so they would not have much time to harvest the reeds.
   b. What hazards do you know of that are associated with harvesting?
      N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   N/A

7. **Opinion on starting an initiative using reeds**
   She thinks the project would be a nice initiative because of the unemployment rate some people could at least get some income. She thinks everyone would be happy as long as the river gets cleared of the reeds, and the reeds generate income.

8. **Ethnic groups working together**
   She cannot comment on how the groups will work together because she does not really know.

9. **Management and Organization of Project**
   She is not sure who should manage the reeds because there are issues within the community. They all want money but there are many problems with the behavior of the people. She thinks there should be someone from the outside to come in to be in a management position. The locals all know each other, so they should not be in charge since there would be a lack of respect towards each other in the community.

REEDS Settlement Questionnaire – Takarania #5 – Team Blue

Date: 6th April 2009
Interviewers: Laurie and Billy
Translator: Lucky Ganeb
Number of People interviewed: 7 adults
Sex: 4 male/3 female
Ages: 3 elderly
Settlement Location: Takarania
Family Origin: A farm in Koue
Length of Time Living in Mariental: 9 years
Household Sizes: 15 people
Current livelihood: 1 member is an employed electrician, 2 pensioners

1. **Skills working with hands**
   The elder man in the household makes straps for donkeys and horses. Several members of the household are electricians.

2. **Experience using reeds**
   a. **YES:** They used reeds in the past before they moved to Mariental. But they had to dismantle the products when they moved.
      i. Used for shades, roofing, and fencing
      ii. They used the products for themselves and did not sell any products or reeds.
      Comments: If there is training they are interested in using the reeds again, and learning new uses. They know the reeds can be used for chairs, tables, laundry baskets, shading and carports.

   They are most interested in using the reeds for shading because it gets very hot in Mariental.

3. **Potential markets for the products**
   They agree there is a market for the products. Tourists would be willing to buy and even maybe locals.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** They would be willing to harvest the reeds as long as they were given permission by the Municipality. They wanted some white stones for their yard but they are on Municipality property and were not allowed to take them.
      They would use a donkey cart to transport the reeds. They are available to harvest whenever, but the best time is in the winter season.
   b. What hazards do you know of that are associated with harvesting?
      In the summer, there are dangerous spiders and snakes in and around the river, but they usually are hiding in the winter. The stumps from the reeds are also a danger since they are sharp, but they are still willing to harvest despite these hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   In the past they harvested the reeds in the Fish River with pangas.

6. **Necessary resources**
   In order to work with the reeds, they would need pangas, thread, a strong frame made from metal or wood, and saws.

7. **Opinion on starting an initiative using reeds**
   They think the project would be a nice initiative.

8. **Ethnic groups working together**
   There should not be only Nama working on the project. There needs to be a variety of ethnic groups so they can exchange knowledge. If there is only Nama it will be a problem because diversity is necessary.

9. **Management and Organization of Project**
   Somebody outside of the community should be in charge, such as the government. The government takes cares of the elderly with pensions, but the project would be great for the young and unemployed.

REEDS Settlement Questionnaire – Ombili #1 – Team Red

Date: April 6, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 1
Sex: 1 Female
Ages: Mid-Age
Settlement Location: Ombili, interview 1
Family Origin: Karas region, in the Betlame area.
Length of Time Living in Mariental: 3 years.
Household Sizes: 3, her boyfriend, herself, and her child.
Current livelihood: Domestic work

1. **Skills working with hands**
   For hand skills, she has done traditional Nama needle work and sells it within the community.

2. **Experience using reeds**
   a. **NO:**
      i. **Uses witnessed:** Houses, shades
      ii. **Uses interested in:** Fence, buckets

      Note: She has never used reeds before, but has seen the Oshivambo people construct houses and make shades. Other than that, they do not know of any other uses of reeds. She would like to have a fence around her house. She would also consider potentially making a bucket out of reeds and then try to sell it.

3. **Potential markets for the products**
   N/A

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?

      YES: If she started using reeds, she does not know how often she would harvest them. She said she is willing to walk to the river in order to harvest them but may need transportation if it is very far away.

   b. What hazards do you know of that are associated with harvesting?
      She did not know at first of the hazards in harvesting the reeds but after being informed of the hazards (snakes, dangerous animals, hard labor), she said she would still considered it if protection is provided for those hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Training, wire, transportation

b. In order to do this she needs training in harvesting the reeds and some wire to bind the reeds together. In order to harvest the reeds she will need training and resources that are required to harvest the reeds.

7. **Opinion on starting an initiative using reeds**
   She thought this project would be good because the Oshivambo people are the only ones doing it, and it will be good to have this reed use expand to other people.

8. **Ethnic groups working together**
   They also think that the different ethnic groups will be able to work together.

9. **Management and Organization of Project**
   She thought the government should manage the project because whenever community run projected are started, cooperation is always a problem. If a project like this was started, she would be interested in participating.

10. **Other:**
    She does not compost, but would consider making compost out of reeds if she was taught how to do it.

REEDS Settlement Questionnaire – Ombili #2 – Team Red

Date: April 6, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 2
Sex: 2 Females
Ages: 1 elderly, 1 mid-age
Settlement Location: Ombili, interview 2
Family Origin: Mariental
Length of Time Living in Mariental: 20 years
Household Sizes: 25, including children
Current livelihood: In the household some people are working. The husband works for a welding company and some of their kids do domestic work on a part-time basis.

1. **Skills working with hands**
   The only skill that they have working with their hands is needle work.

2. **Experience using reeds**
   a. **NO:** They have never used reeds before and know very little about them. If provided training then they would know some of the uses and they would be able to use the reeds.

3. **Potential markets for the products**
   If they produced these products there could be a place established in town to sell these products.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** They would also consider harvesting the reeds if provided protection against the dangers of the water, but they would rather have the men harvest the reeds. Since the river is not that far away, they are willing to walk there. They are willing to harvest along the irrigation farm if permission was granted to them by the farmers.
   b. What hazards do you know of that are associated with harvesting?
      They said that since there is water there is potential danger, although they did not specifically say what dangers existed.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Transportation, cutting tools, wiring

7. **Opinion on starting an initiative using reeds**
   Starting a reed project in their community would be good because a lot of people are suffering in the community.

8. **Ethnic groups working together**

They think that the different ethnic groups would be able to work together in this project.

9. **Management and Organization of Project**
   A committee should be elected by the community to manage the project. Some of the positions in the community would include secretary and treasurer. This committee would work closely with community and communicate with other parties, such as government and other organizations.

10. **Other:**

    They would also use reeds as compost for their garden if they knew how to do it. Currently they get their soil from the river for their garden. They would also consider using reeds for a ceiling if it is shown to be feasible.

    Tension between the farmers and the residents does exist. This tension arises from people going into the river bed to collect firewood. If no arrangements were made, the farmers think that these people are there to steal their crops and so the farmers would take the wood and then chase them away.

REEDS Settlement Questionnaire – Ombili #3 – Team Red

Date: April 6, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 1
Sex: Male
Ages: Mid-age
Settlement Location: Ombili, interview 3
Family Origin: Oldangwa
Length of Time Living in Mariental: 15 years
Household Sizes: 3
Current livelihood: Currently Unemployed because his contract had expired.

1. **Skills working with hands**
   He has skills in using his hands for traditional activities, such as milking.

2. **Experience using reeds**
   a. **YES:**
      i. **Produced:** buckets, doors
      ii. **Markets:** These items were made for himself instead of for sale. He made these reed products in 2002 and 2003.

3. **Potential markets for the products**
   He says people from the north would buy these products. He has personal contacts that he could establish to make these connections.
   He would consider producing the reed products and selling them if someone asked him for these products. He would consider producing anything, whether it is chairs or tables.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   He did harvest the reeds himself. In order to harvest the reeds he used a panga. He harvested the reeds anywhere along the river that contained good reeds, mostly near the local truck port. He would walk to the site and the carry the reed bundles back himself. When harvesting, he did not get any permission from the government or any other organization. He is also aware of the snakes in the river, but he is still willing to go and harvest the reeds.

6. **Necessary resources**
   Currently he does have a panga in order to start the project.

7. **Opinion on starting an initiative using reeds**
   He thinks this is a good project and would attract people, because when he established his sugar cane garden on his property, people came up to him and asked him how he did it. This might have the same affect when people see someone making items out of reeds. Although he cannot give any further advice on how to start the project until it is in its later stages.

8. **Ethnic groups working together**
   He believes that the different ethnic groups can work together in this project.

9. **Management and Organization of Project**
   The people that know how to use the reeds should lead the project, but community as a whole should manage the project.

10. **Other:**
    Currently he has a sugar cane garden and uses fertilizer to encourage growth. He does not know anything about composting with reeds but would consider it if he was trained.

REEDS Settlement Questionnaire – Ombili #4 – Team Red

Date: April 6, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 1
Sex: Female
Ages: Mid-aged
Settlement Location: Ombili, interview 4
Family Origin: Mariental
Length of Time Living in Mariental: 10 years
Household Sizes: 10
Current livelihood: Selling meat and also grants from the government.

1. **Skills working with hands**
   She does tradition Nama needle work.

2. **Experience using reeds**
   a. **NO:**
      i. **Witnessed reed products:** fencing, roof thatching, houses.
      ii. She does not desire to make a fence for her house because it could burn down. And she is not interested in doing any of the other reed activities.

3. **Potential markets for the products**
   She does not know of any markets because she has never produced any of these products.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **NO:** There are snakes in the water and men walking in the river which could chase the women and rape them.

   b. What hazards do you know of that are associated with harvesting?
      Snakes and dangerous men.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Training in how to use and harvest the reeds.
   b. Tools to harvest the reeds

7. **Opinion on starting an initiative using reeds**
   The community would be interested in using the reeds if training was provided.

8. **Ethnic groups working together**
   Yes, she believes the different ethnic groups could work together.

9. **Management and Organization of Project**

In order to start a project, training should be first provided. Based on people that can actually use the reeds should run the project. They should be elected by the community into positions such as manager, secretaries, and treasurer. As for managing the reeds, the Municipality can give out licenses to harvest the reeds.

10. **Other:**
    She does not own a garden.

REEDS Settlement Questionnaire – Ombili #5 – Team Red

Date: April 7, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 1
Sex: Male
Ages: Middle-aged
Settlement Location: Ombili, interview 5 (this gentleman approached us and really wanted to be interviewed.)
Family Origin: N/A
Length of Time Living in Mariental: N/A
Household Sizes: 4, including small children
Current livelihood: Produces picture frames, making about $14,000 per month.

1. **Skills working with hands**
   Produces picture frames out of wood.

2. **Experience using reeds**
   a. **NO:**
      i. Seen women make baskets and sell them to the community.
      ii. But if he received training he would start working with reeds.

3. **Potential markets for the products**
   The products could be sold to the community, tourist, and other towns.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:**
   b. What hazards do you know of that are associated with harvesting?
      He said if there are any hazards he would be able to manage to avoid the hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Training in how to use and harvest the reeds.
   b. Machinery to harvest the reeds.
   c. He can also contribute wood glue to this project.

7. **Opinion on starting an initiative using reeds**
   Community members would have no problem with participating in this project.

8. **Ethnic groups working together**
   Yes, anyone in the community can work together.

9. **Management and Organization of Project**

The community should manage the project so the community can benefit from the project.

10. **Other:**
    He does not own a garden.

REEDS Settlement Questionnaire – Ombili #6 – Team Red

Date: April 7, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 3
Sex: 1 male, 2 female
Ages: 1 mid-aged woman, 1 mid-aged male, 1 daughter
Settlement Location: Ombili, interview 5
Family Origin: Oshanango
Length of Time Living in Mariental: 6 years
Household Sizes: 5
Current livelihood: The husband is working in construction.

1. **Skills working with hands**
   The daughter has skills in needle work. The mother did make clay pots and sold it to the community back in Ovamboland. She said she would do it again when she goes back home. She was trained by her family members and would be willing to teach others this skill if she needed to.

2. **Experience using reeds**
   a. **NO:**
      i. **Witnessed uses:** buckets (produced by the Kavango people)
      ii. They would produce anything from reeds if they were trained. The mother said she would consider using reeds for buckets if she was trained in this skill.
3. **Potential markets for the products**
   The government should establish a market place to sell the products and establish connection with customers.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** If they saw the benefit. But they are not willing to travel too far in order to harvest the reeds.
   b. What hazards do you know of that are associated with harvesting?
   Too much water. They would still harvest the reeds but avoiding the dangerous spots.
   c. **Note:** They would prefer that the men would harvest the reeds and the women actually produce the reed product.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Panga and other required resources needed for harvesting.
   b. As the project progresses they can determine what resources are needed.
   c. Currently they have nothing to contribute to the project.

7. **Opinion on starting an initiative using reeds**
   People, first need to get together to share their ideas and then before starting the project.

8. **Ethnic groups working together**
   They don't see any problems with the tribes working together.

9. **Management and Organization of Project**
   The government should take the initiative in starting the project and then giving the management of the project to the community. The government should also establish a market place to sell the products and establish connection with customers. They would prefer that the men would harvest the reeds and the women actually produce the reed product.

10. **Other:** They do not have a garden

REEDS Settlement Questionnaire – Ombili #7 – Team Red

Date: April 7, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 3
Sex: 3 Males
Ages:
Settlement Location: Ombili
Family Origin: Aramus
Length of Time Living in Mariental: 2 years
Household Sizes: 5
Current livelihood: Government Pension, (livelihoods of other people interviewed?)

1. **Skills working with hands**
   One man makes furniture. He has sold this furniture to a guesthouse (which one?). He was not trained in this skill, but would be willing to teach others how to do this. He makes around N$1,200 per month.

2. **Experience using reeds**
   a. **NO:**
      i. **Uses witnessed:** Shades, building houses
      ii. **Uses interested in:** The man who works with furniture could make tables and chairs out of the reeds. They would be interested in using reeds for their houses if they were provided the right material.
   b. **YES:**
      i. **Uses:** One man used the reeds two years ago to construct a fence before his accident which made him bound to a wheelchair.

         Another person has harvested reeds for other people. He hasn't used the reeds himself, but harvested them while others bought the reeds from him. He does this currently whenever someone asks him to do so.
      ii. **Markets:** He did not sell a fence, but only built it for himself.
         The second man sells harvested reeds to people who ask him for them. He sells to people in Mariental as well as outside of Mariental. His clients find him by word of mouth. Sometimes people see him harvesting in the river and ask him to harvest the reeds.

3. **Potential markets for the products**
   Tourism lodges, guesthouses

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   N/A

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**

One man has harvested the reeds in the past in the Caprivi region, but has not harvested the reeds from the Fish River. To transport the reeds, he carried the bundles to a place where a car could pick them up. Other people assisted him in Caprivi. He did not receive training to harvest the reeds in Caprivi, but would be willing train others. To make his fence properly, he used a lot of reeds.

The second man who harvests the reeds harvests them whenever he gets a request to do so. He does not harvest when there is water in the river. He does not harvest near the irrigation farms. If he were to go near one of the farms, he would ask for permission to harvest the reeds. He knows of some people who go to the river to fish and harvest, but some do steal from the farmers. He recommends that one should always go and ask for permission.
Hazards: Snakes and Baboons.

6. **Necessary resources**
   Pangas, wires, varnish to protect the reeds against sun damages.

   The second man who harvested the reeds, the resources are provided by the people that hire him. If training were provided, he would be interested in producing reed products.

7. **Opinion on starting an initiative using reeds**
   People would be interested in this project if they can make a living out of it because a lot of people are unemployed in Mariental.

8. **Ethnic groups working together**
   The ethnic groups can work together if the management of the project is honest.

9. **Management and Organization of Project**
   They can go to the Hardap Regional Council to get permission for the project. A third party should provide materials and sponsor the project. Every project needs a reliable manager to make sure that the benefits are distributed evenly. A committee to manage the project can be elected from the members of the project, but the government should be part of the management. If only community members manage the project, then other community members might have a negative influence on the project. They might have problems with theft and community members selling the products on their own without distributing the benefits.

   Another man suggested that if a project like this were to be started, there could be two groups of people: one group that harvests the reeds and one group that makes the reed products. They should rotate jobs so that all of the people on the product know how to perform each task.

REEDS Settlement Questionnaire – Oshiwana Penduka #1 – Team Red

Date: 7th April 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 2 (sisters)
Sex: 2 females
Ages: Mid-age
Settlement Location: Oshiwana Penduka
Family Origin: N/A
Length of Time Living in Mariental: In Mariental since birth.
Household Sizes: 11
Current livelihood: Currently their boyfriends, father, and government are supporting them.

1. **Skills working with hands**
   They have no skills with their hands.

2. **Experience using reeds**
   a. **NO:**
      i. **Witnessed uses:** shades, mats (Oshivambo people)
      ii. **Desired products to make:** They possibly could make fencing and shading, but would not build a house because electricity could cause a fire and burn the house down.

3. **Potential markets for the products**
   If the Oshivambo people sell their products then they could do it also. They could also sell it to local guesthouses.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **NO:** Maybe they would have the men to harvest the reeds and they would be on the banks of the river assisting.

   b. What hazards do you know of that are associated with harvesting?
   Crocodiles, water snakes, broken glass, but if protective clothing was provided they would still harvest the reeds.

   c. **Note:** They are willing to walk down to the river, but if they need to go far, maybe they can get a car to drive them there.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. They would need training and wheelbarrow to transport the reeds. A car for long distance travel to harvest the reeds.

7. **Opinion on starting an initiative using reeds**

They think this project can happen, but a good investigation of people must be conducted because many people will say yes without thinking about it. It also needs to be determined if the project will actually work. There is a high unemployment in Mariental which leads to rise in crime because people have nothing to do. By providing work, it will keep busy and potentially reduce crime rate.

8. **Ethnic groups working together**
   Many groups would work together but the Oshivambo people could potentially cause problems because they work for themselves and not for others.

9. **Management and Organization of Project**
   The community needs to get together and elect leaders into a committee, such as supervisors and someone to work with money. Then training should be provided. The men should harvest and transport the reeds while the women produce the reed products.

REEDS Settlement Questionnaire – Oshiwana Penduka #2 – Team Red

Date: 7/4/09
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 1
Sex: 1 Female
Ages:
Settlement Location: Oshiwana Penduka
Family Origin: Oshivamboland
Length of Time Living in Mariental: 26 years
Household Sizes: 6
Current livelihood: Sells meat and bread

NOTE: In this interview, there was a lot of discussion amongst the family for each question, and we believe that the person being interviewed may have been pressured to say that she was interested in our project.

1. **Skills working with hands**
   None

2. **Experience using reeds**
   a. **YES:**
      i. **Uses:** She has built a house with reeds before by tying the reeds together. She said that she had no other option but to use reeds to build her house because she didn't have enough money to buy other materials. She said that building a house out of reeds was difficult and the skill is difficult to learn. Another negative aspect of building a house out of reeds is that the house can easily catch fire. She would be interested in other uses of reeds if she were trained, but did not mentioned any specific uses. She has seen other people building houses with reeds.
      ii. **Markets:** N/A

3. **Potential markets for the products**
   N/A

4. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   She harvested the reeds a long time ago to build a house out of the reeds. She used a panga to harvest the reeds and carried them from the harvesting site. She would not be interested in harvesting the reeds currently because she does not want to leave her business or her children. She also cannot swim and would not want to work in the river.
5. **Necessary resources**
   Panga, wire for the reeds

6. **Opinion on starting an initiative using reeds**
   She is unable to say because she hasn't thought about it and the project hasn't started, but she thinks that it is a good idea.

7. **Ethnic groups working together**
   The Kavangos would be interested in this project because they already work with reeds.

8. **Management and Organization of Project**
   N/A

REEDS Settlement Questionnaire – Oshiwana Penduka #3 – Team Red

Date: 3rd April 2009
Interviewers: Laurie, Billy, Michelle, and Dennis
Translator:
Number of People Interviewed: 1
Sex: Female
Ages: middle-aged
Settlement Location: Oshiwana Penduka
Family Origin: Gibeon
Length of Time Living in Mariental: 8 years
Household Sizes: 8 people
Current livelihood: unemployed

1. **Skills working with hands**
   Her mother does needlework.
2. **Experience using reeds**
   a. **NO:** Her house was made out of reeds, but she inherited the house from the women who previous lived there. She does not know how they got the reeds or built the house.
      i. She knows the reeds can be used to build houses, roofs, and shading.
      ii. She would be most interested in making baskets out of the reeds. Her brother is very interested in farming and would be interested in using the reeds for fodder for livestock.

3. **Potential markets for the products**
   She believes that tourists would be interested in buying reed products including baskets. The Zimbabweans would be interested in buying the products and reselling them. Nobody in Mariental is currently making reed baskets, so if people made some they probably would sell. Mariental receives tourists on a regular basis, and the Zimbabweans come back and forth to the town.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. YES: She is willing to harvest the reeds. She would not have transportation to the river, but would be willing to walk. Since everyone in her household is unemployed, they have are available to harvest anytime.

   b. What hazards do you know of that are associated with harvesting?
      Even knowing harvesting is intense labor, and there are snakes and other dangerous animals, she is still willing to harvest.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**

Her household would need pangas in order to start harvesting and making products from the reeds.

7. **Opinion on starting an initiative using reeds**
   She thinks the reed project is a good thing, because many people in Mariental are unemployed. Also, there are Kavangos living in the area that already have knowledge about reed uses. She thinks many people will be willing to work and take advantage of the opportunity as long as they are provided with training.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   There should be a committee.

REEDS Settlement Questionnaire – Oshiwana Penduka #4 – Team Red

Date: 1/4/09
Interviewers: Dennis Milechin, Michelle Terry, Billy Sanguinet, Laurie Soderbom, Clarence Mazambani
Translator: Lucky !Ganeb
Number of People Interviewed: 1
Sex: 1 Male
Ages:
Settlement Location: Oshiwana Penduka
Family Origin:
Length of Time Living in Mariental:
Household Sizes:
Current livelihood: Selling Reed Products, Cuca Shop

1. **Skills working with hands**
   Makes reed mats

2. **Experience using reeds**
   a. **YES:**
      Uses: Makes reed mats.

      He makes reed mats in different dimensions to sell, or people will buy the reeds in bundles. As an example, a 5 meter long reed mat can be sold for N$175. He started his reeds business initiative in 2005. Mr. Grellman, a gentleman in Gobabis, originally got him interested in making reed products. Phillipus had prior knowledge of how to work with the reeds, but Mr. Grellman taught him how to refine his techniques. His main customers are Anib Lodge, a tourism lodge 24km outside of Mariental, local people in Mariental, people in Gobabis, and two businesses: Mariental Hardware and Swaret. He generally makes reed makes only when these customers place an order. The requests for reed products do not come in on a regular basis. In Gobabis, however, customers will buy the reeds that he has when he has them, but he is then forced to sell his products at a low price. His venture into the reeds business initiative originally started with 17 people, but many of these people went back to the northern part of the country when there was no work. Currently, he only employs people when he receives requests for reed products and whenever he receives a new request, he hires a new team of people to fill the order.

      Once harvested, the reeds are cleaned by using a panga or smaller knives to strip them of leaves. The scraps are then thrown away, but can be used to clean small pots. Then the reeds are cut according to length and laid in the sun to dry out. The cutting and cleaning is done on the first day the reeds are harvested and the reeds are dried on the second day. When making a mat, he looks into what kinds of reeds he has as well as what reeds are left over from the previous harvest. He also organizes the reeds into groups according the size and strength. In addition to the reeds, he needs

rope to tie the reeds together to make a mat. When asked if making a mat was difficult to learn, he said that if you were to watch him make a mat, it would seem easy, but it is difficult. At first, he said that it would take him a day to tie together a 5 meter long mat, but after working with the reeds for a few years, it only takes him an hour.

Markets: Mariental Hardware, Swaret, Anib Lodge, Individual clients. Once the reeds are bound together to make a mat, he sells them to various clients. As an example, Mr. Grellman from Gobabis asked him to make 20 mats. He would pay N$100 per mat for a total of N$2000. But after paying for rope, transport, and other costs of production, the profit was divided between 17 people. In Phillipus' opinion it was too little money for the amount of work involved. Ideally, he will hire only six people to fill an order for reed mats. To avoid arguments about money, he pays his workers up front with money from the Cuca Shop that he also manages. He has had some problems in the past with clients not paying him for his work. One customer ordered four 2 meter long mats and one 5 meter long mat. Once Phillipus completed his work, the customer was unable to pay. Phillipus asked another person to help him obtain the customer's money, but this person ended up buying the mats instead of the original customer.

3. **Potential markets for the products**
   Tourism Lodges, Individual requests from clients, Mariental Hardware

4. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   He originally started harvesting the reeds near Mariental. However, the reeds there have become unsuitable, and now he must travel farther up the river, towards the Hardap Dam, to find the good quality reeds for his mats. He now harvests 10 – 12 km from the Hardap Dam. Phillipus and his workers use pangas to harvest the reeds. He cuts the reeds at the base. If the reeds are growing in water the panga may become slippery in water, which is dangerous to those using it, so one must be skilled in using a panga. One also needs shoes with thick soles because once the reeds are cut the parts of the reeds left in the ground are sharp and can cause injury if they are stepped on. Another danger when harvesting the reeds are the snakes living in the reeds. Phillipus said that the snakes will run away if you make noise. Also, the snakes are rarely seen in the riverbed, but live in the trees near the river. Phillipus harvests the reeds between August and May. He cannot harvest in June or July because it is too cold. The reeds do not vary between seasons. The best time to harvest the reeds is when the water levels are low. Once harvested, the reeds start to grow back within ten days. When he goes to harvest the reeds, he prefers a team of six people to go with him. With six people, he can produce about 10 bundles of reeds per day with 250 – 300 reeds per bundle. Once the reeds are harvested, he leaves the reeds at the harvesting site and walks back to town to find transport for the reeds. He used to pay $20 for transport, but now because of the rising cost of fuel, he sometimes pays up to N$100 for transport.

   Hazards: Snakes, Panga becomes slippery in water, sharp stems of reeds can cut through shoes

5. **Necessary resources**
   Pangas, wire, thick-soled shoes

6. **Opinion on starting an initiative using reeds**
   Phillipus believes that the community will be interested in a project harvesting reeds and producing reed products. When he is making his reed mats, everyone in the area comes over to see what he is doing, and they are interested in his work. He also thinks this project is a good idea because it would help the community.

7. **Ethnic groups working together**
   N/A

8. **Management and Organization of Project**

He suggests that in starting a project, there should be a binding document so that all people involved in the project will continue to work even if it is not successful. Also, the marketing of the products should be done properly, and they could make other products with the reeds. People involved in a project like this will also need training and Phillipus is willing to train people how to

REEDS Settlement Questionnaire – Takarania #1 – Team Red

Date: 6th April 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 5
Sex: 5 Females
Ages: 4 Young Females and 1 Elderly Female
Settlement Location: Takarania
Family Origin: All grew up in Mariental
Length of Time Living in Mariental:
Household Sizes: Their households consist of 15 people, 5 people, and 8 people.
Current livelihood: One young female said she depends on her mother, another older female said she cleans offices, and a young female stated that she still attends school but is currently looking for work.

1. **Skills working with hands**
   The only hand on skills that they have is needle working.

2. **Experience using reeds**
   NO:
   i. **Observed uses:** houses, buckets, fences
   ii. **Desired products to produce:** Buckets, boxes, joinery related projects.
   iii. **Note:** They have seen the Oshivambo people use the reeds to build houses, buckets, and fences. They sell these products on the streets. They said if training was also provided they might consider it. Over all they showed little interest in using the reeds.

3. **Potential markets for the products**
   If they did produce these products they could sell their products by walking around the community and possibly selling them to tourist.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      They did not specifically say yes or no, since they demonstrated a lack of interest in reeds.
   b. What hazards do you know of that are associated with harvesting?
      Snakes, crocodiles, crabs, and other dangerous animals live in the river bed.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   They might consider producing these items from reeds if it was a project introduced to the community, but they see that working with reeds is very difficult. Since they have little knowledge of how to use the reeds, they did not know what resources they needed in order

to start such a project. They would prefer that the men would do the harvesting or if they had tractors to harvest the reeds.

7. **Opinion on starting an initiative using reeds**
   N/A

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   N/A

REEDS Settlement Questionnaire – Takarania #2 – Team Red

Date: April 6, 2009

Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani

Translator: Domingo Matesu

Number of People interviewed: 23 people attended the interview, although three mid-aged women answered most of the questions.

Sex: 3 Elderly women, 6 mid-age women, 1 elderly man, 5 young men

Ages:

Settlement Location: Takarania

Family Origin: All grew up in Mariental

Length of Time Living in Mariental: N/A

Household Sizes: The household size is very diverse among the group, because some live with extended families while others do not.

Current livelihood: N/A

1. **Skills working with hands**
   One woman does needlework, another is part of the Paperworks Project, one does bakery, one collects firewood, and another woman uses plastics to make flowers.

2. **Experience using reeds**
   a. **NO:**
      i. **Witnessed Uses of Reeds:** houses, tables, and chairs.
      ii. They have considered producing these items such buckets, houses (because brick houses are too expensive), and shades.
      iii. **Note:** None of them have used the reeds before and they do not know how to harvest the reeds. They have seen the Oshivambo people use the reeds but not for profit, but for themselves. They have never considered using the reeds because it was considered to be the Oshivambo work.

3. **Potential markets for the products**
   In order to sell these products they thought they could sell them on the streets or directly to tourist that visit Mariental.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** They are willing to harvest the reeds.

   b. What hazards do you know of that are associated with harvesting?
      They know of hazards such as snakes, crocodiles, and other dangerous animals.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   a. Panga, protective clothing, and tractors (for deep water harvesting).

b. Currently they have no resources that could contribute to the project.

7. **Opinion on starting an initiative using reeds**
   They think that a project like this would be good for the community because it may improve their living conditions and the extra income could be used to pay for school fees and uniforms.

8. **Ethnic groups working together**
   N/A

9. **Management and Organization of Project**
   They thought the community should manage the reeds by electing people into a committee.

REEDS Settlement Questionnaire – Takarania #3 – Team Red

Settlement REEDS questionnaire

Date: April 6, 2009

Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani

Translator: Domingo Matesu

Number of People Interviewed: 1

Sex: Male

Settlement Location: Takarania (#3)

Ages: Middle-Aged

Family Origin: Kavango

Length of Time Living in Mariental: 5 years

Household Sizes: 10+

Current livelihood: Farming

Has worked on farms in Mariental as well as in Kavango.

1. **What skills do you have in working with your hands?**

2. **Have you used reeds for anything?**
   a. **YES:**
      He has worked with the reeds in the Fish River before. He was hired by white people to cut and sell the reeds. Otherwise, he has used the reeds himself.
      i. **Uses:** Shading, building houses, and fencing.
      ii. **Markets:** Tourists.
      As an example, he said that in Kavango he would make products in his village and sell them to foreigners.

3. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:**
      Resources Required: If he were to go and harvest the reeds, he would need protective clothing, boots, a panga, and safety glasses. He would also need training.
   b. **Hazards:** Snakes, injury, drowning.

4. **Ethnic groups working together.**

5. **Management and Organization of Project**
   In managing the project, he suggests that management should be discussed among everyone interested in the project and a committee should also be elected through group discussion. The different responsibilities of men and women within the project should also be discussed. A problem that he sees is people leaving the project once it has started. When asked his opinion of a project like this one, he said that he cannot see into the future and therefore cannot comment on it, but if it provides benefit to the people, then it will be a good project. He is interested in being involved if a project like this was started.

REEDS Settlement Questionnaire – Takarania #4 – Team Red

Date: April 6, 2009
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 3
Sex: 2 Females, 1 Male
Ages:
Settlement Location: Takarania
Family Origin: Oshikati
Length of Time Living in Mariental: 5 years
Household Sizes: 2, 3, 1
Current livelihood: Cuca Shop, Construction, baking bread and selling beans.

1. **Skills working with hands**
   One man works in construction.

2. **Experience using reeds**
   a. **NO:**
      i. **Reeds uses people witnessed:** Man working in construction has seen reeds used for shade nets. They have also seen the Kavangos using reeds. One person has never heard of anyone using reeds, but would be interested.
      ii. **Products they wish to produce:** Could use reeds for shade nets. One person has a garden where he could use reeds for composting.

3. **Potential markets for the products**
   One person is aware that the reeds are bought by tourism lodges. They also think that reed products, such as shade nets, could be sold to community members.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** The man is willing to harvest the reeds.

   b. What hazards do you know of that are associated with harvesting?
      He is aware that there are snakes and other hazards associated with harvesting, but would be willing to harvest despite these hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   Pangas, appropriate shoes for harvesting

7. **Opinion on starting an initiative using reeds**
   Good idea. Would be interested in this project.
8. **Ethnic groups working together**
   N/A
9. **Management and Organization of Project**
   Community should manage project and select their own committee

REEDS Settlement Questionnaire – Takarania #5 – Team Red

Date: 6/4/09
Interviewers: Team Red
Translator: Domingo Matesu
Number of People Interviewed: 7
Sex: 7 Males
Ages:
Settlement Location: Takarania
Family Origin: N/A
Length of Time Living in Mariental: N/A
Household Sizes: N/A
Current livelihood: N/A

NOTE: This interview ended early because the men left to go back to work.

1. **Skills working with hands**
   They do not have any skills working with their hands.

2. **Experience using reeds**
   a. **NO:**
      i. **Reed uses people witnessed:** Have not seen reeds used before
      ii. **Reed uses they could produce:** Do not know any uses of reeds.

3. **Potential markets for the products**
   N/A

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** They would be interested

   b. What hazards do you know of that are associated with harvesting?
      They do not know the hazards.

5. **CURRENTLY OR USED REEDS IN PAST – Harvesting**
   N/A

6. **Necessary resources**
   N/A

7. **Opinion on starting an initiative using reeds**
   Would be interested in the project, but not in any particular use.

8. **Ethnic groups working together**
   N/A
9. **Management and Organization of Project**
   N/A

REEDS Settlement Questionnaire – Takarania #6 – Team Red

Date: 6/4/09
Interviewers: Dennis Milechin, Michelle Terry, Clarence Mazambani
Translator: Domingo Matesu
Number of People Interviewed: 4 (+ 5)*
Sex: 3 Females (+ 3)* 1 Male (+2)*
Ages:
Settlement Location: Takarania
Family Origin: Rural Areas
Length of Time Living in Mariental: 5 years
Household Sizes: 5 - 8
Current livelihood: Domestic work, Crop production, Supported by government pension and children

*The number of people that showed up in the middle of the interview.

1. **Skills working with hands**
   None

2. **Experience using reeds**
   a. **NO:**
      i. **Reed uses people have witnessed:** Have seen Ovambos using reeds for buckets and shacks and have seen that they sell these products to tourists and people walking around in Mariental.
      ii. **Reed products they wish to produce:** None specifically. One woman mentioned that she would not use the reeds for her house because if she got into a conflict with another member of the community, her house could be easily burnt down. Another woman mentioned that it would be difficult to use the reeds for housing because of the fire danger and that the snakes in the river would make it dangerous to harvest the reeds.

   YES:
      iii. **Uses:** The man who works in crop production said that he has used reeds for composting before and that the Germans taught him how. He digs a hole, cuts up the reeds and puts them in the hole, and then waters it. He is not using reed compost currently, however, because the soil is too rocky and dry.
      iv. **Markets:** N/A

3. **Potential markets for the products**
   They could try selling reeds to people walking around in Mariental, including tourists.

4. **NO ASSOCIATION WITH REEDS - Harvesting**
   a. Would you also harvest the reeds?
      i. **YES:** Yes, but it would be difficult. They also said that they would be willing to walk to the river to harvest and would be able to harvest whenever needed. They would also be willing to travel to Windhoek

b. What hazards do you know of that are associated with harvesting?
Snakes

5. CURRENTLY OR USED REEDS IN PAST – Harvesting
N/A

6. Necessary resources
They said that they would need machines such as tractors to harvest. The man who works in crop production said that he knows how to operate such machinery, so he would be able to if he received such equipment.

7. Opinion on starting an initiative using reeds
Good idea, would be interested

8. Ethnic groups working together
N/A

9. **Management and Organization of Project**
They suggested that for harvesting, one group of people could harvest the reeds while another group transports the reeds back to a place where the products are made. For managing a project like this one, they said that the community must come together and manage the project, but it should be overseen by one person, possibly a white person, to prevent problems like theft.

Appendix S - Market Potential Data

Months	Accommodations	Craft Shops	Total
January	0	0	0
February	0	0	0
March	0	0	0
April	1	3	4
May	2	3	5
June	3	6	9
July	4	5	9
August	4	5	9
September	2	2	4
October	2	1	3
November	2	0	2
December	1	1	2
Same Year Round	1	0	1
Did Not Specify	0	0	0

Purchased Reed Products for Resale in the Past			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	0	0
Placemats	0	1	1
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	0	0	0
Small Crafts	0	0	0
Yes	1	0	1

Purchased Reed-Like Products for Resale in the Past			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	1	1
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	1	0	1
Thatching	0	0	0
Small Crafts	1	0	1
Yes	1	1	2

Currently Sell Reed Products			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	0	0
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	0	0	0
Small Crafts	0	0	0
Yes	0	0	0

Currently Sell Reed-Like Products			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	1	1
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	2	5	7
Thatching	0	0	0
Small Crafts	1	3	4
Yes	1	5	6

Willing to Purchase Reed Products for Resale in the future			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	2	2
Placemats	1	2	3
Photo Frames	0	1	1
Baskets	1	3	4
Thatching	0	0	0
Small Crafts	0	0	0
Yes	2	7	9

Appendix T – Interview Summaries for Accommodations

Interview with Leading Lodges of Africa

Interviewees: Marketing Office Manager

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the Marketing Office Manager at Leading Lodges of Africa in Windhoek, Namibia. Leading Lodges own 8 lodges in Namibia including Epacha Game Lodge & Spa, Camelthorn Kalahari Lodge, Zebra Kalahari Lodge, Suricate Kalahari Tented Lodge, Eagle Tented Lodge and Spa, Villa Verdi Guesthouse, and Divava Okavango Lodge & Spa. The manager is in charge of public relations, marketing, brochures, corporate identity, rates, and agreements. The main tourism season for the lodges goes from May to June, and also at the end of December. The lodges are all full for the next few weeks because there are four large groups coming in to different lodges. The majority of tourists are European, German, and Belgian. There are not a lot of American tourists that visit the lodges. The company wishes to expand their business to Asian customers.

Most of the lodges use reed products, products made from similar material, or grasses. There are many roofs thatched with grass for an authentic appearance. The reed products that the lodges use come from local sellers. There is a constant need for the reed products because they need to be redone periodically.

In some of the lodges there are gift shops. If the reed products are small enough, then the tourists will purchase them. The lodges do not sell reed baskets, but do have small wooden artifacts and jewelry. Some of the locations use placemats used from sticks that appear very similar to reed mats. They use tire to tie the sticks together. These placemats were made by a local man in Windhoek. The manager believes that tourists would be interested in buying placemats, as well as

photo frames. Another product she has seen is a reed boat with candles inside that was very unique and nice.

Leading Lodges of Africa, in the manager's opinion, would be interested in being involved in a reed initiative by buying products from the residents of Mariental. The company likes to support the local community since they are a Namibian company. They had to look in many places in order to get products that they wish to sell. Selling unique products is very important for marketing, and people will pay more money for these products.

Interview with Kalahari Sands Resort and Casino

Interviewees: Marketing Manager

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the Marketing Manager of Kalahari Sands Resort and Casino in Windhoek, Namibia. She is part of the executive operations committee, and ensures that the hotel is run properly and that the financial matters are set. She has been working at the hotel for 5 years now. The resort is busy the entire year, and caters more towards corporate customers than tourists, although they do cater to both. The resort receives approximately 1 million foreign tourists per year. The peak season is from July to August. They mostly come from Germany, America, and Asia. There are 173 rooms in the hotel and 5 conference rooms. The resort is planning to refurbish in July, and redo a lot of the rooms in the hotel with a new design.

The Kalahari Sands Resort has not used reeds in the past. They would be interested in wall dividers for the restaurant, and possibly reed products for the presidential suite that is their largest room. The other rooms available are more minimalistic, and have very natural colors. The manager recommended a brochure showing the reed products available. The resort does not have a gift shop, but recommended interviewing Leading Lodges of Africa. The lodges have a much more authentic look than the Kalahari Sands Resort.

She recommends having the reed products for people to see in order to market the products, so buyers can see the quality of the products. If the reeds are of great quality and the products look nice, she would be interested in being involved with the reed initiative.

The resort is involved with corporate social investment projects. They look at what the community does that may be sustainable to generate income, and the resort helps to provide assistance for these programs. They sponsored 4-5 vegetable tunnels for a local community to produce vegetables that the resort subsequently purchases from them. They would like to expand

and extend these projects outside of Windhoek. The manager was interested in our project and would like us to send her our final presentation so she can better understand the project and see if her company would be interested in being involved.

Interview with Pension Bougain Villa

Interviewees: Manager

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed the manager of Pension Bougain Villa in Windhoek, Namibia. She runs the entire operation, and is responsible for booking, finance, and marketing. She has been in charge for two years, but the lodge has been established for many years. Most of the customers at the lodge are business clients, so there are fewer customers on weekends and holidays. The customer number fluctuates every year, and was not good last year. However, this year more customers have stayed at the lodge. Most of the customers are from South Africa, but there are some from all over the world. The lodge is expanding currently. They only have 5 rooms, but are building 11 more. The owner wants to attract more tourists. The lodge is successful in maintaining its customers, and wants to keep the customers, but at the same time wishes to expand to tourists.

Pension Bougain Villa does not use reeds and would not be interested because they are more of an African decoration. The new building is going to have a modern look, and the existing place has vintage decorations. There is no gift shop at the lodge.

The manager is planning on opening up a restaurant at a zoo in Kleine Kuppe, and wishes to have a gift shop. The zoo has an African appearance, and therefore, she would be looking for African decorations for the restaurant, such as reed placemats or shades. She thinks there would be a market for selling reed products to tourists, but does not know who the customers at the zoo will be. If she opens a gift shop and restaurant, she would like residents to bring in products for her to see and decide if she would like to buy them. She would be interested in being involved with a reed project and buying products.

Interview with Uzuri Guesthouse

Interviewees: Owner

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the owner of Uzuri Guesthouse. She has been running the bed and breakfast for 4 years. She is in charge of everything from booking to cooking breakfast for the guests. The guesthouse does not have any associations with other lodges or hotels. Originally the guesthouse received the most tourists from June to August, but now it is steady throughout the year. She receives a lot of guests from South Africa and Angola. The guesthouse is usually 70-80% occupied. The customers at the guesthouse are both tourists and business clients. The tourists come from Europe, Italy, and Portugal, and very few from America. The business has been expanding every year as does the tourism industry in Namibia. The guesthouse is expanding due to the increased tourism.

The Uzuri Guesthouse does not currently use river reeds, but they do use grass for thatching their roofs. There are a few companies in Namibia that do thatching, and she is not sure of the exact company that did her roofing. She said the guesthouse may be able to use reeds for decoration, especially at the new campsites they are adding. The reeds could be used for shading or dividers. She believes all the lodges in Namibia would be interested in using reeds because they provide a more natural look, which tourists prefer. There is no gift shop at the guesthouse at which to sell products. She provided us with two brochures of accommodations in Namibia for reference.

Interview with Kubata Lodge

Interviewees: Manager of Administration and Finance

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the Manager of Administration and Finance at Kubata Lodge in Windhoek, Namibia. Kubata Lodge is family run, and was established 7 years ago. They are not associated with any other lodges. There is no specific season that the lodge receives the most guests. It is sometimes full and sometimes not. The majority of the people who stay at the lodge are Angolan and come to the area for doctor's appointments and shopping, but they are not really tourists. The lodge has been expanding and added on more rooms, for a total of 20, in order to accommodate more customers. They have also added a conference room as well.

In the past, Kubata Lodge used the reeds for fencing. The manager did not know where the reed fence came from, but it did not last long, and his family replaced the fence with a brick wall. The reed fence required maintenance and also was a fire hazard. The reeds used in the fence were not treated.

The manager said the lodge would consider using reeds, but not for the guest rooms. They would possibly use it for the conference room for decoration. Kubata Lodge does not have a gift shop, but He recommended interviewing a representative from Roof of Africa Lodge in Windhoek. Also, he recommended going towards the outside of the city where the lodges tend to be more authentic in their design.

In terms of marketing, the manager recommended that the sellers set up a stand in the central part of the town in order to expose themselves and advertise. Word of mouth is also important when businesses are trying to decide what products to buy. He would be interested in the reed products depending on what specific products were being marketed and the quality of the products.

Interview with Roof of Africa Hotel and Travel Centre

Interviewees: Head of Human Resources

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed the head of Human Resources, at Roof of Africa Hotel and Travel Centre in Windhoek, Namibia. She has been working for Roof of Africa for four years. The high season for the hotel is between July and November. There are 25 rooms at the hotel, and on average the hotel is 60% full. The hotel accommodates both tourists and business clients. The majority of customers come from Germany. The business has been expanding, and the hotel is adding a conference and travel center.

The hotel has thatched roofs, but no other reed products for decoration. The hotel probably would buy reed products because they are renovating soon. There is no gift shop at the hotel. The hotel wanted to build a gift shop, but there is limited space available. All African lodges would be interested in using reed products for decoration, including Klein Windhoek Guesthouse, and Hotel Thule.

Community members that wish to sell products should come into hotels and show the products, or pictures of the products. Roof of Africa would be interested in being involved and purchasing reed products, as long as someone came in and tried to sell the products

Interview with Anib Lodge
Name: Manager
Position: Lodge Manager
Date: April 3, 2009

Anib Lodge is a tourism lodge located 24km outside of Mariental. The lodge started out as a guest farm and has been in operation for about three and a half years. They receive approximately 23,000 guests per year, 85% of which are German. Other tourists come from Italy, France, and other parts of Europe. They receive the most guests between April and November. The Anib Lodge is also part of the Gondwana Collection Group. (Info about person)

Anib Lodge uses reed products as decoration. In the guest rooms, reed mats line the ceiling for decoration. Since there are spaces between the reeds covering the ceiling, a brown fabric is used as a backdrop for the reed mats. Reeds are also used in the dining area as wall decoration or fencing. The reeds are also used as window shades in the conference room and the gift shop. These reed products are considered a one-time purchase because they do not wear out very quickly. The lodge may consider purchasing these products again when they renovate the lodge after ten years. The lodge also has a garden that is surrounded by a reed fence. These fences may need to be replaced after a few years because of bleaching in the sun, but she does not consider it a big-scale purchase. She is not sure where the lodge obtained all of the reed products, but she remembers purchasing some products from Mariental Hardware. She is pleased with the quality of the reed products. In her opinion the reeds that were tied together with wire were of higher quality than those tied together with string. The mats that were tied with wire came from Mariental Hardware. When purchasing these products, they go to Mariental themselves and transport the reed products back to the lodge. She remembers last purchasing reed products in the middle of 2008.

Anib Lodge also has a small gift shop. They sell products handmade in Namibia. When considering what to sell in her shop, she looks for something interesting. She also looks for products to sell that are small because tourists cannot fit large items in their baggage when they leave

Namibia. In determining how well something will sell, she relies on her own opinion. Many people in Namibia drive around with crafts to sell to different people. If she sees something that she think will sell, she will buy it from them. If it does sell, she purchases more of these crafts. If they do not sell, the people who originally sold her the crafts are usually willing to purchase them back. Products that sell well are those that are finely woven, such as baskets from Zambia. She would consider selling reed products that are small and finely made instead of products made from large reeds. She would also consider selling reed products on the behalf of Mariental residents if the products are of good quality and space is available within the gift shop.

Appendix U – Interview Summaries for Craft Shops

Interview with Chou Chou Trading CC Art and Craft Shop

Interviewees: Owner

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed the owner of Chou Chou Trading CC Art and Craft Shop in Windhoek, Namibia. The shop opened last year, approximately 6 months ago. Between January and February there is not a lot of business, but is hoping the business will be better soon. The tourists have been visiting the shop. The shop buys whatever products they want to sell, mostly those that are Namibian made. They purchase the products from people who bring them into the shop.

The tourists are buying many different products including Namibian art. The Chou Chou shop does sell baskets made from palm, but no specific reed products. There is a big market for baskets. Four out of ten customers purchase a basket. The baskets sell fast because they come from Namibia and are cheaper than some other products. Chou Chou had some mats in the past that sold very fast. She likes to have a variety of products in her store, so that if one product does not sell today it may tomorrow. If a shop only sells one item, they will not do well.

The Chou Chou shop would be willing to sell products made by the residents in Mariental. If the residents brought their products into her shop, chowchow would be willing to help out. People typically come into the shop trying to sell products, and they agree on a price with the owner, and she pays them in cash. Sometimes, if there is trust, the seller will leave their products in the shop for her to sell, and then she will pay them after it has been sold.

Interview with Oshoto Arts and Craft

Interviewees: Manager

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed Jeff, the manager of Oshoto Arts and Craft in Windhoek, Namibia. His mother is the owner of the shop. The shop was established one year ago, and Jeff has been working at the store for 3 months. He is in charge of the business when his mother is away, and she is teaching him to take over the shop because he is the eldest son. Oshoto receives the most customers from April to November. The majority of customers is tourists, and come from Germany. The business has been expanding because they first started as a smaller market. The store has more products than before because the more tourists came in and liked the products the store sold. Jeff feels that in the future the business will not be successful. More and more craft shops are being established. It may only be successful if the products were shipped overseas.

The tourists that come into the Oshoto shop prefer animal crafts such as giraffes, elephants, and lions. The owner decides what products to sell by going to other stores and observing what they sell. Then Jeff and his mother will try to find products to sell that are unique and the other stores do not have. Oshoto sells products made out of materials similar to reeds including baskets and necklaces. The necklaces sell very well. These products come from Caprivi and Zambia. The locals in these places know how to make products well because it is in their tradition.

Oshoto Arts and Craft would consider selling reed products such as baskets, mats, and photo frames, or other small crafts. The residents that wish to sell products should bring the products into the store for the owners to see. If someone brings in a product that the store wants to sell and the owner does not have money to give them at the time, then the seller can get credit. The owners do not have time to go other places to buy products and rely on people coming in to sell goods.

Interview with Joe's Beerhouse

Interviewees: Managing Director

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the co-owner of Joe's Beerhouse in Windhoek, Namibia. She has been working with the company for 13 years, and her husband, Joe, is the one who started the business. She is involved in the operations, management, and marketing. The restaurant has a curio shop which was her idea. They just revamped the curio shop. They sell products that the locals produce, including products from the Bushmen, ostrich necklaces from Tsumkwe, beaded handbags from Katutura, and earrings from South Africa. The owners do not want to sell products that street vendors do, but would rather have unique products.

Depending on the time of year, the amount of tourists the restaurant receives varies. Approximately 80% of the customers are tourists. There is a regular flow of tourists visiting Joe's Beerhouse. The majority of overseas tourists visit from July to September, and come from Europe, Russia, Australia, and America, as well as other countries. The business has been expanding. The restaurant was started 20 years ago, and could seat about 150 people, but currently the restaurant has room for 450 customers. The owners have plans to open more shops in other locations such as Swakopmund and South Africa.

Joe's Beerhouse uses reeds or similar plants for decorations. They have fish baskets made by the Ovambos. They do not use reed placemats because the owner thinks it is too fragile for the number of people that visit the restaurant, which is about 100,000 people a year. The reeds they use for decoration were harvested by the employees in the local rivers. The co-owner thinks her husband would be very interested in using more reeds for decoration.

In the gift shop, the tourists buy a wide variety of products. The shop has unique items that local people make. The tourists prefer smaller items, such as coasters. The gift shop does not sell

baskets, because the co-owner said too many craft markets sell them, so the baskets are not a unique item. No reed products are currently being sold in the gift shop, but they would consider selling such products. She thinks reed products such as coasters or mats would be bought by tourists. Joe's Beerhouse is one of the only restaurants in the area with a gift shop, so it is a unique concept. The restaurant would definitely be interested in being involved with the reed initiative and purchasing reed products from Mariental.

Interview with Miracle Art & Craft

Interviewee: Owner

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed the owner of Miracle Art & Craft, in Windhoek, Namibia. She is in charge of marketing and buying of the products in her shop. The shop was established in 2007, and is an independent business. The most customers come to the store in the winter months, and come from Germany and France. The business has been expanding a little bit. She is hoping to expand her business to Swakopmund and Walvis Bay. She thinks the business will do better in the future. When the shop is not busy, it is hard to make enough money to pay for rent.

The tourists that visit the shop like to buy stone, wooden, or wire animals. People come into her shop and try to sell her their products. If she likes the products she will give them money right away to buy them. Most of these people are locals, but some are from outside the country such as Kenya. The owner does not usually go out to places to buy products to resell. However, she is going to Ovamboland soon, and will buy more baskets while she is there.

Miracle Art & Craft does not sell any reed products, but does sell baskets. The baskets sell very well. The baskets were made in Ovamboland, Zambia, and Zimbabwe. The owner prefers to sell products from Namibia. She would like to sell reed products, because tourists like reed-type products. She thinks reed products definitely would sell, and the market for them is good. She is very interested in being involved with buying reed products from Mariental.

Interview with Nomad African Elegance

Interviewees: Manager

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the Manager of Nomad African Elegance in Windhoek, Namibia. The shop was established in 2003, and she has been the manager for six years. She is in charge of the buying of products for the shop, and keeping track of stock. The busiest time for the shop is in August. The customers that visit the shop come mostly from Italy and France, but the store does see some American tourists. Most of the German tourists go to Bushmen Art because the owners speak German.

The Nomad shop took over the current location two years ago. They wanted to have the window space for advertising, and also for expanding their offered products. The stock increased by 40% at this new location. The shop would not have been successful without the new location, because position is very important in the tourism business. Because the new shop is so large, Nomad had to add more items to their stock in order to cover the larger overhead costs. It is also important to optimize floor space in the shop.

The Nomad shop has some products made out of materials similar to reeds. They have fish catches and mats, but these products do not sell well. The lodges mostly buy the fish catches to use at lampshades. Tourists need products that are small and that they can easily pack. Baskets are very popular with tourists and would be a huge market.

At her home, the owner built a reed fence for around her yard and play area for her children. Her gardener harvested them from the nearby river. The reeds started to decompose over time, and did not last very long.

The owner of Nomad stressed the importance of eliminating the intermediate people in the process of selling products. The intermediates make the price of the products very expensive, and

are much cheaper if the craftmakers come directly to her shop to sell her the products. She bought some leather necklaces the other day from a group in the North, but they were very expensive so she did not buy many. Then the following day, someone came into her shop offering the same necklaces for significantly less money. People selling products need to do it more directly in order to be successful. If there are too many intermediates, by the time the products reach the shop, they are too expensive to buy in order to be able to sell it at a price to make a profit.

Several of the products in the Nomad store come from suppliers in South Africa. Other products are brought in by local people who make the products. There is a company called Oshikutu Baskets in Ovamboland that keeps its prices low and therefore has been successful.

The owner has had experiences with the Rossing Foundation that led her to believe the organization can be unfair. The Foundation trained people in the community, but due to budget problems, they decreased the money they provided causing the people to be on their own. Mud-Hut training stepped in and dominated. They told people in the community who they could supply to.

Interview with Touba African Art Gallery

Interviewees: Owner of Touba African Art Gallery

Interviewed by: Billy and Laurie

Date: 22nd April, 2009

We interviewed the owner of Touba African Art Gallery. The shop has been established for six months. The owner is in charge of everything, including marketing and advertising. The business has been successful so far. The high season is from the end of April-June. Most of the customers come from Germany, but also France. The business has expanded to sell more products.

The tourists that enter the shop like to buy products made in Namibia. If people want to sell products to the Touba shop, they just enter the store with their products. If the owner likes the products that are brought in, he will buy them. Most of the products in his shop were purchased from people walking into the store with their items.

The store does not have any reed products, but has baskets from Okahandja. The owner would consider selling reed products, but he is not sure if they will sell. The craft markets might sell reed products already.

Interview with Tsumkwe Craft Shop

Interviewees: Owner and Co-Owner of shop

Interviewed by: Billy and Laurie

Date: 21st April, 2009

We interviewed the co-owner and owner of the Tsumkwe Craft Shop in Windhoek, Namibia. The shop was established two years ago. The owner is in charge of buying the products and displaying them. The co-owner is in charge of marketing the products. In the wintertime they receive a lot of customers, as well as at the end of December. Most of the people who purchase products are tourists, approximately 90%. Most of the tourists are Germans, approximately 60-70%. The store initially got bigger, but the expansion in still in process. In the future, they would like to open branches in other locations.

The shop currently sells fish baskets made out of material similar to reeds, and uses reeds to line the ceiling of the shop. The shop gets the products from the Caprivi region, as well as curio services. The most popular items in the shop are smaller ones, such as jewelry. Customers usually say that weight and volume of products can be an issue. If the owners could purchase reed products at a good price, they would be willing to sell the products in their shop. If the products sold well, they would then continue to buy more reed products. The owners felt that tourists would buy reed products such as photo frames or small mats. However, the products must be very unique. The shop likes to have 70% of the products in their shop be from Namibia and from varying regions. They recommended we visit the Nomad shop in Windhoek as another possible venue that could retail sell reed products. In terms of retail, the owners recommended that a website is created or brochures that could advertise the products, and have a number that could be called in case of problems with the products.

Appendix V- Data from Informal Settlement Interviews

Knowledge of Reed Uses of Informal Settlement Community (37 Respondents)

Knowledge of Reed Uses	Number of Respondents	Percentage of Respondents
No Knowledge of Using Reeds	3	8.11%
Aware of Using Reeds	21	56.76%
Skilled in Using Reeds	13	35.14%

General Knowledge of Specific Reed Uses of Informal Settlement Community (37 Respondents)

Reed Use	Number of Respondents	Percentage of Respondents
Fencing	13	35.14%
Shades	16	43.24%
Houses	17	45.95%
Buckets	8	21.62%
Mats	8	21.62%
Furniture	8	21.62%
Baskets	5	13.51%
Other Crafts	6	16.22%
Compost	1	2.70%
Cattle Fodder	1	2.70%
Unaware of Uses	3	8.11%

Awareness of Specific Reed Uses in Informal Settlement Community (37 Respondents)

Reed Use	Number of Respondents	Percentage of Respondents
Fencing	8	21.62%
Shades	12	32.43%
Houses	11	29.73%
Buckets	7	18.92%
Mats	5	13.51%
Furniture	6	16.22%
Baskets	5	13.51%
Other Crafts	4	10.81%
Compost	1	2.70%
Cattle Fodder	1	2.70%
Unaware of Uses	3	8.11%

Skill in Specific Reed Uses in Informal Settlement Community (37 Respondents)

Reed Use	Number of Respondents	Percentage of Respondents
Fencing	5	13.51%
Shades	4	10.81%
Houses	6	16.22%
Buckets	1	2.70%
Mats	3	8.11%
Furniture	2	5.41%
Baskets	0	0.00%
Misc	2	5.41%
Compost	1	2.70%
Cattle Fodder	0	0.00%

Interest in Producing Reed Products in Informal Settlement Community (37 Respondents)

Interest in Producing	Number of Respondents	Percentage of Respondents
Interested in Producing Specific Products	23	62.16%
Interested in Producing in General	5	13.51%
Not Interested in Producing	6	16.22%
Did not indicate	3	8.11%

Interest in Producing Specific Reed Products in Informal Settlement Community (37 Respondents)

Reed Use	Number of Respondents	Percentage of Respondents
Fencing	4	10.81%
Shades	8	21.62%
Houses	3	8.11%
Buckets	3	8.11%
Mats	4	10.81%
Furniture	4	10.81%
Baskets	2	5.41%
Other Crafts	3	8.11%
Compost	1	2.70%
Cattle Fodder	1	2.70%
Not Interested in Producing	6	16.22%
Did not indicate	3	8.11%

Market Sectors Suggested by Community

Market Sector	Number of Respondents	Percentage of Respondents
Tourists	17	71%
Accommodations	5	21%
Farmers	2	8%
Community	10	42%
Other	4	17%
Don't Know	2	8%

Hazards of Harvesting Mentioned by 29 Respondents

Hazards	Number of Respondents	Percentage of Respondents
Snakes	23	79.31%
Other Dangerous Animals	11	37.93%
Water	5	17.24%
Physical Hazards	8	27.59%
Dangerous Men	2	6.90%
Don't Know	1	3.45%
Know Hazards Exist	2	6.90%

Resources Requested by Informal Settlement Community (28 Respondents)

Resources	Number of Respondents	Percentage of Respondents
Pangas	17	60.71%
Other Cutting Tools	4	14.29%
Harvesting Machinery	3	10.71%
Protective Gear	4	14.29%
Wire, Rope, String	13	46.43%
Manufacturing Supplies	12	42.86%
Decorative Supplies	2	7.14%
Transportation	4	14.29%
Funds	1	3.57%
Training	5	17.86%
Don't Know	1	3.57%

Purchased Reed Products for Decoration in the Past			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	2	0	2
Mats	0	0	0
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	0	0	0
Small Crafts	0	0	0
Yes	1	1	2

Purchased Reed-Like Products for Decoration in the Past			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	0	0
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	2	1	3
Small Crafts	0	1	1
Yes	0	0	0

Currently Use Reeds for Decoration			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	1	0	1
Mats	1	1	2
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	0	0	0
Small Crafts	0	0	0
Yes	2	2	4

Currently Use Reed-Like Products for Decoration			
	Lodges	Craft Shops	TOTAL
Dividers	0	0	0
Fencing	0	0	0
Mats	0	0	0
Placemats	0	0	0
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	5	1	6
Small Crafts	0	1	1
Yes	4	0	4

Willing to Purchase Reed Products for Decoration			
	Lodges	Craft Shops	TOTAL
Dividers	3	0	3
Fencing	1	0	1
Mats	1	1	2
Placemats	1	2	3
Photo Frames	0	0	0
Baskets	0	0	0
Thatching	0	0	0
Small Crafts	1	0	1
Yes	6	2	8

Appendix W – Interview Summaries for CBOs & Local Businesses

Interview with Mushroom Project CBO

Date: 2nd April, 2009

Location: Informal Settlement Municipality Office

Interviewee: Manager

The first community based organization (CBO) that was interviewed was the Mushroom Project, which is run by three people. The purpose of the Mushroom project is to generate income by cultivating mushrooms in plastic bags, and subsequently selling the mushrooms to various buyers (Including various restaurants and shops in Mariental, Tsumes, and Valldam). Two members were present at the interview, including the supervisor (she oversees the project, makes sure there is enough material, etc). She informed us that the project was initiated by University of Namibia (UNam) Research, and Funded by AGRI Bank. She said that the community was not consulted about the project, rather, UNam research just showed up in Mariental, and trained whoever expressed interest in the project. Originally, 25 people were trained for the mushroom project, but many of them left because they expected immediate payment. The supervisor mentioned that it takes up to 6 months for mushrooms to grow; so much patience is required when growing them. Currently, only the three people mentioned above are left in the project. One reason for the drop in involvement is that people from other constituencies were trained, and as such, they went back to their individual constituencies when training was finished. The training takes two weeks to complete, and the supervisor's group has been actively cultivating mushrooms for two years now. Whenever the group needs anything, they go to the Regional Council for assistance. So far, the regional council has bought them a scale, materials, and is working on getting a fan for the mushrooms. The supervisor is interested in training people, and is currently searching for people to train, and possible trainers. When the mushrooms are ready for harvest, they can harvest up to 500g per day, which will provide N$50 to the team. They then evaluate how much new material that is needed, bank the money, and

split any extra as profit. The market for the Mushrooms is solid, and the group constantly receives large orders, which they cannot always meet.

When asked about the reeds, the supervisor was enthusiastic about possibly being trained in various reed uses. She explained that the mushrooms take one full day to plant, and only require being watered every day (which only takes about an hour). This means that if she was trained in using the reeds, that she would have time to actively be involved in any project. When asked about what she thought the reeds could be used for, she mentioned baskets and huts. She mentioned that baskets could be successfully marketed to tourists and locals, and that some people come from Windhoek to sell baskets in Mariental. She thinks that the community would definitely be interested in a reeds project (especially oshivambo), as the unemployment rate in Mariental is very high. She specifically said that any proposed reed project should focus on the unemployed. When asked if she could use reed compost, she explained that the mushrooms didn't require soil, as they were grown in plastic bags, and as such, compost made from reeds would not be useful to her.

Interview with Tso Tso Stove CBO

Interviewee: Worker

Location: Informal Settlement Municipality Office

Date: 2nd April, 2009

Single Translation

The second community based organization (CBO) that we interviewed was the stove project (a.k.a. Tso Tso Stoves). The stove project was started by the Mariental Municipality (they provided training, and raw materials), and focuses on teaching people how to make sun stoves (stoves which get heat from the sun) from raw materials, and subsequently sell the stoves to farm workers or anyone who is interested. Training lasts about a week, and once finished, you will have two stoves (one to use at your house, and one to sell). The Tso Tso Stove project was started in 2007, and started out with six people (two women, and four men). Currently, the same six people are still working in the project. We interviewed a worker of the stove project who is currently trying to make a living selling Tso Tso Stoves. He said that so far, the stoves have not sold well at all, and it is hard to make a living. Willem asserted that he is only a worker (part of the manufacturing and selling of stoves), and that his supervisor was not available for interview. He regularly spends time at the Mariental Municipality (as well as other locations around Mariental), trying to sell the Tso Tso stoves. Because of the heavy stove weight, Willem does not carry the stoves around, but rather, he carries posters (which describe the stoves) around with him. He also set up posters in Mariental Hardware, so that people could read, and possibly purchase one. Willem mentioned his desire to travel to sell stoves, and thinks that that might increase the market potential of the stoves.. Overall, he said that the stoves are very hard to market, and he has sold only one stove (each one of which goes for about N$300). He mentioned that the project is currently in the process of opening a bank account to store funds. Once a stove is sold, the project will use the money to buy more raw materials, and will subsequently distribute any extra funds as profit.

When asked about using the reeds, Willem enthusiastically said that he would be willing to try anything (although he has no prior knowledge of reed use), and that he is eager to learn new things. He mentioned that he has seen people working in the reeds, but he didn't want to enter the reeds because he is scared of snakes. He explained that he is trying to support a family of five (him, wife, and three children), and if anything were to happen to him, then his family would be left unsupported. He said that if the reeds were harvested by someone else that he would definitely work with them. When asked what would be needed for a reeds business initiative, he replied with a few basic suggestions such as training, pangas, and varnish. He specified that he might need more, once he had more specific information. He suggested using reeds for decoration, toy boats, and possibly baskets. He also said that he had seen people making shading with the reeds. Willem said that he had a lot of unemployed friends, and that many unemployed people want to work with their hands, so working with the reeds would be very beneficial. Willem also mentioned that he would like to try managing both the stoves and the reeds.

Interview with Community-Based Organization: Paperworks

Interviewees: Director of Income-generation for Ministry of Gender Equality and Child Affairs,
Supervisor for Paperworks Project

Location: Ministry of Gender Equality and Child Affairs

Translated by: Lucky Ganeb

Date: 2nd April, 2009

We interviewed the Supervisor of the Paperworks project in Mariental. She oversees what needs to be done, and makes sure things are done correctly, like a quality control role. Other people in the project are in charge of administrative roles such as finances. The Paperworks Project makes products out of recycled paper. In order to make a product from the recycled paper, they use four major ingredients: bread, flour, hot water, and paper. They mix the ingredients together to get a glue-like substance. Then they tear the pieces of paper and layer them over an object and put them in the sun. After it dries, they can remove the object and they will have a base which they can keep adding layers of paper to, in order to make the product stronger.

The project was started in 2007, initiated by the Ministry of Gender Equality and Child Affairs. A woman attended a workshop in Swakopmund on making paper-based products and decided to start a project in Mariental. The Ministry and the Regional Council helped initially with finances to get the project started. Thirty-five women were trained on the project, and now there are twenty-seven still working in Mariental. The other women did not withdraw, but came from other places and are doing the work there instead. They have trained women in other Constituencies, and others are also demanding that they wish to be trained.

The women do not have a place to operate from and are doing it out of their homes on their own to generate income. The women involved with the project come together occasionally to do work collectively. They make products to sell to the Ministry of Development, as well as the community. The Ministry donates the products to kindergartens, especially tables and chairs. All the tables and chairs sold to the Ministry were N$2500 in total, and the money went to a group fund.

Other popular Paperworks products include dust bins and fruit baskets. There are no specific people they sell products to, just anyone who is interested. They sell outside of the Mariental Community as well, such as to a college.

They put finished products on display in town for marketing, so the public passing by can see the products. They do not have an open-market that they can use for display, so they just use the open road to show by passers. They have set listing prices for the products that they make, but they can vary depending on the size of the product. It is hard to estimate exactly how much people earn because they all make products on their own to sell from their houses, and those sales are private. Some of the group money is spent to buy food for the group while they are all working together. They also get approximately N$50 at the end of each month, but the rest is kept to purchase more materials.

The supervisor has not work with reeds before, but she has seen other people doing it, including making baskets. She is aware that reeds are being used for ceilings, shades, and the construction of houses. She would be interested in learning and getting involved with the use of reeds. She would be willing to try making tables and chairs from the reeds. In her opinion, the whole community would be interested in using reeds for income. She would be willing to transfer her knowledge of supervising to others as well. When she used to be employed at the BP station, she saw people selling small cars made of wire for children. It was a good place for marketing because many tourists were passing through and purchasing the items. She says any place to sell products must be seen by the tourist and the locals in order to sell the best. She also recommended that people be trained in bookkeeping not just funds.

The Ministry of Gender Equality and Child Affairs would be interested in getting involved with starting a project using the reeds. The Ministry could support the community with funds, but there is a lack of training available, and training must be given before assistance. As with any community initiative, if funds are available then the Ministry will try to assist. They support community work through their office and offer motivation. Other income-generating activities that

the Ministry has started other than paper include sewing/knitting in Mariental, as well as gardening and soap-making outside of Mariental. People in the community usually come up with their own ideas for projects, mostly things that they can do with their own hands. There has not been anyone trying to start a reeds project, probably because the people are not aware of the ways to use reeds.

Interview with Individual Community Member with Income-generating Business

Interviewee: Owner

Company: Oom Jea's Joinery

Translated by: Lucky Ganeb

Date: 2nd April, 2009

We interviewed the owner of Oom Jea's Joinery, an income-generating business in Mariental. The owner is a carpenter who typically builds cabinets for homes. He sometimes builds coffins, but right now the necessary machine is out of order. He does not employ full-time workers, because the work is too scarce. If the business gets a large work load, then he has about five people that he hires to come in and work for him. He has trained 15 people in joinery, and most now own their own business and work from home.

He first got started in 1971 in Windhoek working for a German man who provided him with training. He moved to Mariental in 1986, and continued doing joinery on his own. He started the business at his house and the community approved of his work and supported him. His yard got full, so he applied for a place in the business area so people could come to his shop instead of his home. In February 2004, he moved his business to the current location in Mariental. In the past when business was thriving, he used to put money in the bank and kept books and records. Now he does everything by himself because business is slow.

The market for his products is only people coming into his shop on their own. He does not produce and sell, but rather makes to order. He takes deposits upfront, and then the people come and buy back the product when he is finished. He wants to produce new items and sell them, but money and the market is an issue. He has talked to Woodpeckers, a business that sells and buys second-hand furniture. He asked if they would be willing to sell furniture if he gave it to them and they agreed. There is also a place in Windhoek, called the Pine Shop, which he sells furniture to them for re-sale.

In 2005, he received the highest profit ever, N$10,000 in one month, but since then profits have declined. The only profit he made last year was N$300 in September. From last September until the present he has not made any profit. He pays approximately N$3900 for rent a year. He is not sure why profit has declined. One reason for business declining is that people bring in broken furniture for him to fix, but they never come back to buy it. He tells customers that their furniture is finished, and they say they are coming to pick it up, but they never do. The furniture sits in his shop, and in one instance a piece of furniture left for repair has been there for three years. He has told people that leave furniture in his shop that he will move it outside, and they will have to pay him rent in order to keep their belongings inside. The first 14 days of storage after he finishes fixing the furniture is free, but then when it is not collected he charges 5% of the original amount every day it remains in the shop without being picked up. After keeping an item for three months, he will try to sell it to other people.

He used to own livestock, but needed to get cash to fix furniture so he sold his livestock. He planned to use the money he received from customers to replace the money and buy more livestock. However, this did not work and now he has no livestock. No institutions or individuals have helped him with money or machinery. He wrote a proposal to the Regional Council, but it got lost in their office, and he never received feedback. He wrote another proposal recently after people explained to him how to write one properly. The second proposal went through the Urban Constituency Development Committee's office, but they said he did not meet the requirements that were necessary because the funding was for group projects, and the owner wanted to work on his own. He prefers working alone so he can manage money himself and put some in the bank, and use some for materials. In groups, projects often fail because of the money issue.

He started doing cabinetry when he was still in school, and it has always been his desire. It would be very hard for him to divert to other ventures, so he has not considered other work. He has worked with reeds in the past when he was operating from his house, but stopped when he acquired his current business location. He used to harvest the reeds from the Fish River and make shades or

verandas. He made some for his house and sold a few but he does not currently have any requests for such products. In 2002, he used reeds for door panels on a few cabinets by gluing the reeds to the top of a panel. He stated that you cannot just use reeds for the door alone, but that they must be glued on top of the wood panel. When he used the reeds twice for door panels, they were bought by Germans, and he does not know if the locals would also be interested.

He cannot say for sure if the community would be interested in using reeds. He has seen people in the informal settlements making shades out of the reeds, and has seen Mariental Hardware using the reeds. He would like to work with people so they can give each other advice on how to make reed products. He would buy reeds if he had money from whoever collected the reeds, and would also look into harvesting the reeds himself. He would participate in a reed project on a part-time basis, if he had about 5-7 people working with him so he could work with reeds as well as cabinetry. He recommends that when working with a group, do not talk about salaries in the beginning of the project, but rather wait for a while first. In his experience, money can divide people. He attended workshops when he was younger in business courses including finance and marketing.