

DRFN
Library

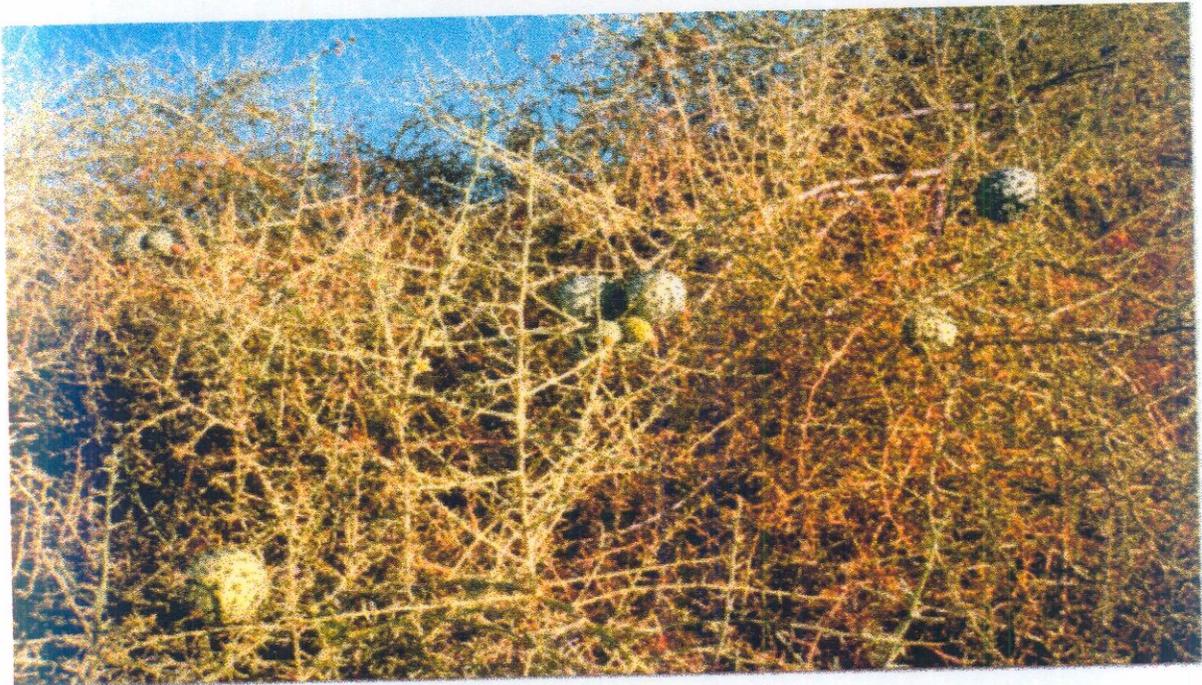
D.R.F.N. : Reports
REFERENCE: 00514
LIBRARY : DRFNW

THE !NARA AND FACTORS THAT LEAD TO ITS DECLINE IN PRODUCTIVITY.

Final In- service training in Natural Resource Management
Compiled by Mr **Andreas "Gazza" Shilomboleni**
Student number: 9511210
Date: November 1998

Supervisors: Dr. **Joh Henschel** (DERU) Desert Ecological Research Unit (Gobabeb Training and Research Centre).
Tel: 064-205089, Fax: 064- 205197
E-mail address: Gobabeb @iafrica.com.na or DERU@drfn.org.na
PO. Box 953, Walvisbay.

Dr. **W. Jankowitz** (DEAN of School of Engineering and Applied Science at Polytechnic of Namibia)
Tel: 061- 2072146, Fax : 061- 2072156, Windhoek.



Acknowledgements:

The author would like to extend his sincere thanks to the following people who made this research possible: Joh Henschel, my Supervisor is thanked for his management plans during the study and for editing my report. Chief Seth Kooitjie (Topnaar Chief) and his Councilor Dausab R. who sensitised the community aware about the objectives of this research to release the information accordingly. The same appreciative feelings are extended to the Topnaar people for being helpful during this survey.

Vilho Mtuleni "Snake" {Desert Ecological Research Unit, (DERU) staff member} - a bilingual translator drove me to the community and made the interaction possible throughout the research period. All the informants are thanked as their names appear on the reference list. Elias Shanyengana and Juliane Zeidler {Desert Research Foundation of Namibia, (DRFN) staff members} for their technical advice. My computer instructor - Connie Krug (a Ph.D. student with DERU) and the entire DERU staff members for being active. Dave Cole (DRFN member) is thanked in particular for editing my report. The zoology honours students from the University of Western Cape and B.Sc. students from the University of Namibia that helped me with my experimental activities. Also thanked are the Scientists, Profs., Drs and Researchers I have spoken to with regard to this research.

Abstract

The study on the !Nara and the factors that lead to its decline in productivity was carried out in the Namib Naukluft Park, at the Gobabeb Training and Research Centre situated along the Kuiseb River. Three aspects were considered in order to investigate the decline in !Nara productivity.

- Grazing pressure caused by the livestock in the area.
- Decline of the water table in the Kuiseb River, as a result of dams that were built in the 1960s to extract water to the coastal towns i.e. Swakopmund, Walvisbay and the mining activities in the region.
- Changing the harvesting methods used by the Topnaar Community during the harvesting of the !Nara melons.

The Topnaar are the local people found along the Kuiseb River and have depended largely on the !Nara products for their survival.

The aspect of examining the current methods used by the Topnaar was the main objective of this report. The investigation examined the current harvesting methods, uses of the !Nara products, how to mitigate human impact and makes suggestions towards their sustainable management. This project involved the collaboration with the Topnaar Community Foundation and also involved the full participation of the Topnaar people, particularly the harvesters that provided the information on harvesting procedures.

The results of this research will contribute to the Natural Resource of the #Aonin project of DRFN (!NARA Project), which was established in 1997.

Inappropriate harvesting methods used by the harvesters seem to have contributed most severely to the decline in !Nara productivity as well as the overpumping and damming. This is followed by livestock, particularly the donkey's grazing pressure that further stressed the general health of the !Nara plants along the Kuiseb River.

Table of content	Pages
1. Background	1
2. Introduction.....	2
3. Material and Methods	3
4. Results and Discussion	5
4.1 Ecological role of the !Nara plant	5
4.2 Value of the !Nara melon	6
4.3. Economic value	6
4.4. Medicinal value	7
4.5. Result of fog experiment	7
4.6. Impact of donkeys on the !Nara plant	8
4.7 Perceptions of the Community on the factors that lead to the decline in !Nara productivity	9
4.8 Natural factors	11
5. General discussion	12
6. Recommendation	13
7. Conclusion	14
8. Topnaar references	15
9. References cited	15
10. Appendices.....	17

1. Background

The Desert Research Foundation of Namibia (DRFN), recently initiated a research project called !NARA- (Natural Resources for the #Aonin)-Project, which was founded as a joint program between DRFN and the Topnaar Community Foundation (TCF, Walvisbay) in September 1997. According to its title it refers to the main plant of the Topnaar (#Aonin), the !Nara. The !Nara plant plays a significant role in terms of the Topnaar people being able to stay in this highly marginal area. The plant is important both in terms of subsistence and commercialisation. Namibia possesses a fragile environment, therefore it depends more on a healthy ecological ecosystem. !Nara occur in an arid environment, which is variable and is highly sensitive to disturbance.

Because of the declining yield of !Nara fruits in recent years the TCF requested the DRFN in March 1997 for support in establishing a long-term management system for !Nara fruit production. A workshop in November 1997, organised by TCF and DRFN in the Lauberville delta of the lower reaches of the Kuiseb ephemeral river, tried to point out the important questions and problems of the Topnaar community towards the harvesting and utilisation of the !Nara fruit. All participants at the Workshop agreed to initiate a joint project, which would attempt to answer the following fundamental questions.

- What are the reasons for the decline in !Nara fruit production?
- Is there a possibility to cultivate the !Nara?
- How can the !Nara fruit be used, manufactured and marketed more effectively?

The unique idea of this project is not only the very interdisciplinary approach to the problem, touching different areas such as biology, geology, climatology, economics and sociology. Above this complex examination stands the new idea of creating an integrated approach, integrating the involved residents and scientists. This participatory approach is aimed at developing a strategy, which is accepted, - in a long-term and - could be adopted by the local people to manage the !Nara more efficiently. The main objectives of the !Nara-project include:

- Research in ecological issues.
- Implementation of the results to an appropriate harvesting management system.
- Information exchange and training of the local people carrying out the developed strategy in an independent and self-reliant way.

Experts from different disciplines will contribute with their results to the whole project i.e. !NARA Project.

A Ph.D. program has already begun and examines the composition of animal communities in the !Nara plants by Rainer Kruger - Germany student with the DERU and two MSc. students - Germany students with the DERU (Markus and Liner) are examining pollination and seed dispersal.

2. Introduction

The !Nara plays a very important role in the ecological and in the socio-economic system of the Topnaar Community. Due to the ecological aspect Klopatek (1991) mentioned that most life in and around the dunes depends on the !Nara's presence. The !Nara provides shelter for many creatures, and fodder for wild and domestic animals. Its socio-economic significance is expressed by Moritz (1992) who calls the !Nara plant, the bread of the Namib desert. For the Topnaar the !Nara fruit delivers food as cakes and soups, the seeds are highly nutritious because they contain essential oils. The roots are famous for their medical values (Pfeifer, 1979). !Nara products, particularly the seeds, are traded to South Africa via the local business in Walvisbay (Dausab 1998).

The !Nara and the factors that lead to its decline in productivity are discussed in the context of the study.

Study aims:

- Ecological and economic role of the !Nara plant.
- Uses of the !Nara products by the Topnaar Community.
- To find out what views and perceptions the Topnaar Community has in terms of sustainable resource management.

The ultimate aim is to carry out the overall project practically by looking at these three aspects.

Study objectives:

- Examine the harvesting methods used by the T.C. in terms of sustainable management.
- Monitor and evaluate changes in the productivity of the !Nara in all three aspects.
- To raise awareness about the sustainable use of the !Nara plant.

The overall long-term objective is to enhance a sustainable use of natural resources to the benefit of the Topnaar Community by strengthening their economic position and claim to the resources, and increasing their control over them.

2.1. Description of the !Nara plant

The !Nara plant, *Acanthosicyos horridus* is endemic to the Namib desert and is one of areas most characteristic plants. It belongs to the Cucumber family. The majority of the !Nara plants are found abundant on banks of the dry riverbeds, on slip the face of dunes as well as on the interdune valleys along the whole western part of the Namib Desert (Moritz, 1992). !Nara plants are like coral reefs in the sand (pers. obs.). !Nara can survive indefinite number of years without rain, but it does need continual water. It has a long root system which is about 50m long enabling it to tap ground water sources (Klopatek, 1991). Photosynthesis takes place via the stem and thorns, as the whole plant is green and it has no leaves. This is one of its adaptations in the desert as it limits the loss of transpiration. !Nara plants are dioecious (sexes are separate). The female and male flowers are similar but the female flowers are easily distinguishable from / by their swollen fruit bodies below the petals. Female !Nara produce between 20 and 500 fruits in

a year (Klopatek, 1991).

A single plant can bear an average of 321 fully developed fruits, the plant can grow up to 1.5 m high, forming tangled thickets above a large hummock and an old plant can cover an area of 1, 000 sq. meters (Berry, 1991). Ten to fifteen mature melons make up a one-kilogram of nuts/ pips. One melon produces approximately 200 seeds (Zeidler, unpublished.).

2.2. The Topnaar and their culture

The Topnaars, also named in Nama as #Aonin, belong to the Nama people. According to oral tradition, the Topnaar came from the north of Namibia to settle down along the Kuiseb river (Van den Eynden, Vernemmen and Van Damme, 1992). They are currently under the rule of Chief Seth Kooitjie and his Councilor Rudolph Dausab. Chief Seth Kooitjie was elected in 1981 after his father Chief Esau Kooitjie retired. !Nara harvesting was common to almost every family until the beginning of this century. The harvesting seasons normally start from November - April. Their whole daily life completely revolved around this plant. The Topnaars are also well known by their common name “!Naranin”, which simply means that they depend more on wild food, such as !Nara products. In the past the !Nara fields were divided into patches among the different families and were passed on to successive generations through an unwritten law of inheritance. However, due to certain factors, the !Nara fields are largely commercialised today. Currently only ten families of the 500 member strong Topnaar community remain as regular farmers and rely more on their livestock, particularly donkeys for transport, goats and on selling !Nara pips to the local business to generate a source of income. The majority of the young Topnaars live in the Narraville and Kuisebmond suburbs of Walvisbay (Visser, 1998).

3. Material and methods

The following methods and materials have been used:

Literature, monitoring, vehicles, camera and binoculars, as well as the developed questionnaire on harvesting procedures and on utilization of the !Nara products.

3.1. Literature review/ survey

The literature review was conducted to collect information about the !Nara plant specifically. Furthermore, to get more insight into the socio-economic life of the Topnaar with regard to the !Nara plant.

To get past information on the uses of !Nara products and on harvesting methods to compare that with the current situation. In some occasions literature was used to find appropriate information about the behavioural ecology of animals feeding.

3.2. Monitoring

This aim/ objective was used to determine the impact that the animals have on the !Nara plant and also to give an indication of the ecological role of the !Nara plant. Methods that

were involved are as follows:

1. Pit traps were placed around the !Nara hummocks to capture the crawling insects that visit the !Nara hummocks. The following procedure was used to place traps: one trap was placed in the center of the hummock and two on the slope, one at the edge and at 10 m interval radiating outward until 50m away from the hummock, this was done in ten plants for a period day. The recording took place at early morning and later in the evening. This helped to verify the species diversity close and further away from the !Nara plant and in turn assisting with determining the ecological role of the !Nara plant in its ecosystem.
2. Two female !Nara plants were selected to determine the impact of donkeys on the productivity of the !Nara. Procedure that was followed: six samples were identified per plant, ten shoots were marked per each sample and the experiment was carried out for the duration of two and a half months.
3. The observation of the donkeys was done between 08:00-12:30 and 16: 00-17:30, depending on the day temperature. The main idea was to find out what part of the !Nara plant the donkeys prefer and to determine their impact on the !Nara plants.
4. Sweep around the two selected !Nara plants every Monday, Wednesday and Friday late in the evening. The identification of the spoors takes place in the swept areas early the morning on the following day, aimed to find out the frequency of the organisms that visits the !Nara plant.
5. Visual sampling (focal sampling) to identify the insects (animals) within and around the !Nara plants took place during the morning, midday and later afternoon.

3.3. Questionnaire on former and current harvesting methods.

The interviews were conducted in six Topnaars villagers along the Kuiseb River i.e. Soutrivier, Klipneus, Swartbank, Armstraat, Dabe draai and !Aodanab. The target groups were both the old harvesters and the young harvesters. The questionnaire comprised of 26 different questions (appendix 3.). These questions focused mainly on the !Nara plant in relation to the Topnaar community. The questionnaire was designed to get the information on the former and current harvesting procedures. It was also used to test the awareness, level of management, conservation and perspectives of the Topnaar Community towards the !Nara plant. During the interviews, questions were changed aiming to get the same information if the informants experienced problems with the question.

3.4. Fog water experiment

Four !Nara plants were selected to do an experiment with fog water. Both were in the same location at the interdune valley near Gobabeb. Half of the population were treated and compared with the non-treated one. A sample on the shoots was selected to compare

the growth rate of both plants. Fog water was taken to plants in the evening and plants were watered directly on their roots after every fog event at Gobabeb. The purpose of the experiment was to see whether the !Nara plant will react to fog water and whether there is a possibility to cultivate the !Nara plants. It may also be possible to determine the effect that the decline of subterranean water has on the general health of the !Nara plants along the Kuiseb River by looking at the new growing shoots and flowers on the plants under the experiment.

4. Results and discussion

4.1. Ecological role of the !Nara plant

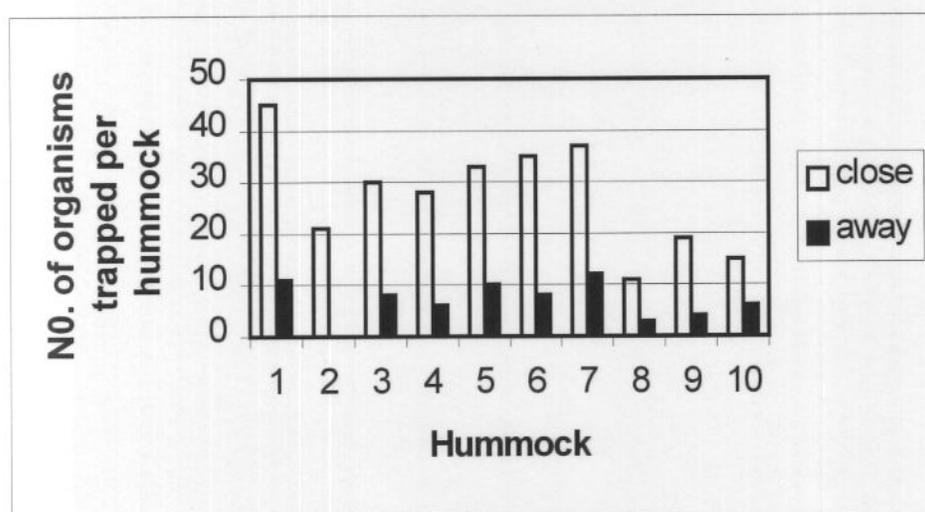


Figure 1: Number of crawling organisms trapped in various pit traps on ten hummocks

Traps 1-4 were placed on the hummock and they are referred to as close, while traps 5-9 were placed away from the hummock at 10m interval until 50m radiating outwards. More insects were trapped within/ around the hummock than further away from the hummock, indicating that the !Nara was important for these insects. The pit trap results indicate the beetle activity pattern, for e.g. the *Onymacris rungatipennis* were trapped during the day time. Others like *Stips stalis* were caught at night and Scholtz and Holm (1996) describe them as crepuscular or nocturnal. The monitoring reflected that the !Nara plant houses many species e.g. crawling organisms such as Tenebrionid beetle species, lizards and birds species and many others. This reflects the !Nara's significant role for the food web. Tenebrionid beetle species that were found common in the !Nara plant during the field observation are as follows: *Onymacris rungatipennis*, *Onymacris plana*, *Stips stali*, *Zophosis hereroensis*, *Zophosis orbicularis* and *Physadesmia globosa*. Some of these beetles are detritus feeders. The *Onymacris plana* was seen feeding on the petals of the flower. Zigzag beetles (*Meloides sp.*)- a flying beetle is common on !Nara plants and is possibly one of the pollinators. It was observed feeding on the nectar for about one and half-hours. Sunbirds and Whitebacked mousebirds were also observed feeding on the nectar. Mice and lizard spoor were common in and around the !Nara plant. The !Nara

takes a key position both in the desert-ecosystem and in the socio-economic system of the Topnaars. The !Nara plants also serve as a wind erosion controller by trapping the sand dunes during the windstorm. When the melons ripen, they are food for jackals, gerbils, crickets and beetles (Seely, 1992).

4.2. Impact of donkeys on the !Nara plants

Table 1. Impact of donkeys in two female !Nara plants

Plant No.	No. of sample	Shoots in the beginning	Shoots at the end	Amount of shoots grazed	Loss in %
1.	1.1	10	3	7	62%
	1.2	10	5	5	
	1.3	10	6	4	
	1.4	10	3	7	
	1.5	10	4	6	
	1.6	10	2	8	
2.	2.1	10	4	6	55%
	2.2	10	3	7	
	2.3	10	5	5	
	2.4	10	5	5	
	2.5	10	4	6	
	2.6	10	6	4	

Calculations: *Shoots in the beginning* – *Shoots at the end* = *Amount of shoots grazed*.

$$\frac{\text{Shoots in the beginning}}{\text{Amount of shoots grazed}} \times 100\% = \text{loss \%}$$

The sampling technique, which was used to determine the impact of the donkeys, shows that the donkey grazed 55% and 62% of the shoots in two female plants for the duration of two and a half months. These shoots possessed small fruits. However, the available data is not sufficient to conclude on whether the donkeys have a negative effect in !Nara productivity or not. But the argument follows that, if this is the case on a large scale (!Nara field), the donkeys might be considered to have negative effect in !Nara productivity.

Some authors are of the opinion that it is not known whether the donkeys have a negative or positive impact on the !Nara plant as it release its dung on/ around the hummocks which acts as compost for the plant. However, the damage caused by the donkeys to the !Nara plant is more than the benefits of the compost it release on the hummock. Also possible trampling impacts (usually negative). To construe this, see the pictures taken in the study site. Donkeys feed on the new growing !Nara plant, thus, limiting the abundance or the diversity of the !Nara in the first place.

They also feed on the shoots of the big !Nara plant including the fruits. This might stress the general health of the plant and lead to poor yields. The visual sampling revealed that the !Nara plants that are found closer to the River site are highly utilized compared to the

interdune site. This may simply be because the donkeys tend to concentrate more on the River site than at the interdune site (see picture 1.). Furthermore, the impact of donkeys was observed by comparing the !Nara plants in the enclosure (see picture 4.) with those outside and as a result, the outside !Nara plants were less healthy because of the grazing pressure (see picture 2.).

It was observed that donkeys spend a considerable amount of time feeding on the !Nara plant, although not more than four hours were spent to observe exactly how long does the donkey spend on feeding.

Donkeys also feed at night, this was determined by seeing them at night in the study area and by the identification of spoors early the morning on the following day. The donkeys feed at every part of the !Nara plant that is accessible (see picture 1 and 3.). Thus, they use their lips to pull the twigs/ shoots into their mouths with the aid of the long tongue to manipulate the thorns. Most !Nara plants at the study site were therefore pulled into different shapes, particularly the female plants, due to the grazing pressure (see picture 1). To conclude, the impact of donkeys on the !Nara plants appears to be bigger compared to other organisms that feed on the !Nara plants.

4.3. Result of fog experiment

The !Nara plants were watered after at every fog event received at Gobabeb. The quantity of 3.5 liters of fog water was poured per plant. The quantity of 3.5 liters is a crop factor number that suits the Cucumber family for the plantation purpose. The !Nara plants were watered three times only, which gives 10.5 liters per plant.

There was no change on the plants under the experiment, because of the low fog moisture content received at Gobabeb during the experiment.

4.4. Value of the !Nara melon

The !Nara fruit is edible. It measures up to 15cm in diameter when it ripens (Seely, 1992). The !Nara melon can be eaten raw and its inner pulp has a rich, creamy taste. The !Nara fruit has a very high sugar content and its juice can be used as an aid for brewing sugar beer (Pfeifer, 1979). The Topnaar have developed methods for preparing and preserving the melon. Traditionally, the pulp is cooked for 3-4 hrs to remove pips from the pulp. The cooked pulp is prepared as soup or preserved as a dried flat cake, locally known as "goa-garibeb". This fruit roll provides the Topnaar with a secure source of food during off-season periods. Once the pips are separated from the pulp, they are left to dry on the sand. When dried, they can be eaten as nuts or compressed to extract oil to be used in foods. Seeds are highly nutritious, they contain up to 57% oil which has a high percentage of poly-unsaturated fatty acids and 31% protein, the taste is similar to that of almonds (Visser, 1998). Once the pulp is extracted from the melons, the peels are given to livestock.

4.5. Economic value

Dried pips are an important source of cash income for the Topnaar. The Topnaar sell these pips to the Flamingo Furnishers in Walvisbay. The one kilogram of pip ranges

between N\$4 -5. The Flamingo Furnishers trade the pips further in Cape Town where they are eaten as nut or used in confectionery (sweets, cakes) and are called "botter pitte" or butter pips in Cape Town (Owen, pers. comm., 1998).

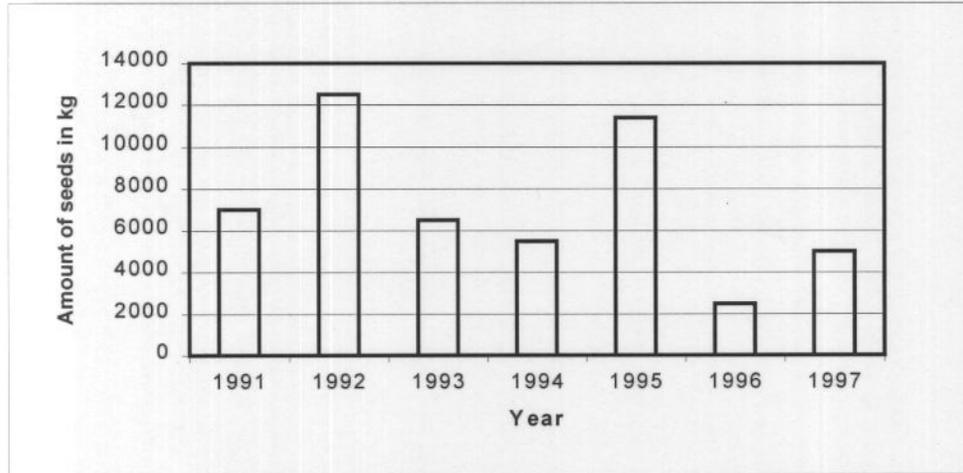


Figure 2: Amount of pips sold by the Topnaar harvesters to Flamingo Furnishers.

The graph shows the estimated figure of the amount of pips sold by the Topnaar harvesters in a given year. The interpretation of this graph includes the human aspects (overpumping water from the Kuiseb River, damming and inappropriate harvesting procedures), flood- may cause a destructive on the roots of the !Nara plant, and also some effects of environmental changes. The yield varies considerably as expressed by the amount of pips in kg. In 1992 the yield was quite high and the Kuiseb River was recorded as having flowed for 3 days at Gobabeb. In 1993 the flood was recorded flowing for 18 days. Flood damage might be the reason why the production was low in 1993-4. Despite this, the harvesters have harvested more in 1992 than the potential production of the plant. From 1993-4 the amount of pips declined to less than 7000 kg, nearly half of 1992 yield and this revealed the damage applied by the harvesters in 1992 in the !Nara fields when the yield was preferable (Dausab, pers. comm., 1989). In 1995 it again yielded much compared to the previous two years, although the flood was recorded as having flowed for 17 days. The reason might be that only few people harvested in 1994, after they noticed a low yield in the same year. Since the plants yielded better in 1995 a lot of harvesters moved into the field again to harvest as much as they could. These are perceptions from the Topnaar people interviewed. Their consequences lead to the poor yield in the following year during which the river flowed for 3 days only. In 1997 the yield was low. This might indicate pressure from the harvesters as their number increased, while the recorded flood was 33 days, which might also be the reason for the poor yield.

It can be speculated that, overpumping and damming also take their toll in !Nara productivity changes as the water table decline in the Kuiseb River. Other environmental changes may also play a role with regard to the decline in !Nara productivity. For example, the El Nino can affect the growth rate of the plants due to the high temperature of the earths surface. As a result of high temperatures, fog precipitation may decrease as

one moves away from the coast and the !Nara plants that are found away from the coast will suffer the consequences. To conclude, the human aspects influenced the productivity of the !Nara more in comparison with the flood. For e.g. the flood recorded as having flowed for 17 days in 1995 but the yield was nevertheless good. However, the speed at which the flood flowed was not recorded to construe this statement.

4.6. Medicinal value

Traditionally, the Topnaars use the !Nara oil for moisturizing and protecting their skin from sunburn, it is also used as an ointment. Claims have been made that a decoction of the !Nara root is good for controlling high blood pressure, diabetes, stomach ulcers and indigestion (Owen, pers. comm., 1998). Old people and Topnaar experts are of the opinion that it relieves or cures chest pains, gonorrhoea, nausea and internal diseases. The crushed root mixed with fat can be rubbed on wounds to hasten healing. The older Topnaars are firmly convinced that the root of the !Nara cures all the diseases.

4.7. The perceptions of the community on the factors that lead to the decline in !Nara productivity.

Much of the statistics data included in this section were gathered during the interviews. Unfortunately, this data set includes only those twelve people interviewed by means of the questionnaire and others via informal interviews.

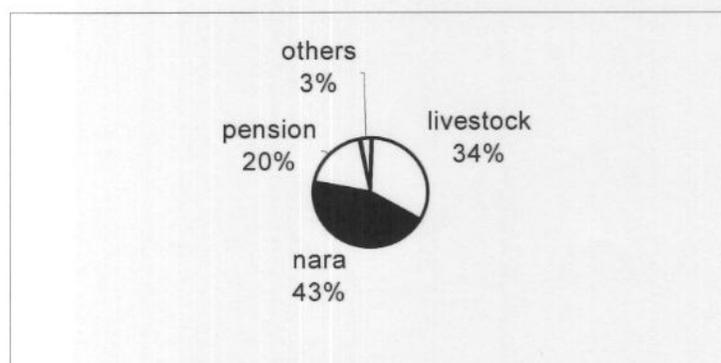


Figure 3: Sources of income of the Topnaar harvesters interviewed

Briefly, this illustrates the sources of income of the Topnaar, which is based mainly on the livestock, !Nara and on pensions. The data was derived by scoring the importance by rank for each harvester. The !Nara was given a higher score, reflecting its role in the socio-economics of the Topnaar community. The given percentage thus expresses its value. In fact, the livestock plays a major role on the socio-economics of the Topnaars, although it is not perceived as much as the !Nara by the community. For e.g. donkeys are used for transporting people, goods and also for food. The other 3% represent casual jobs.

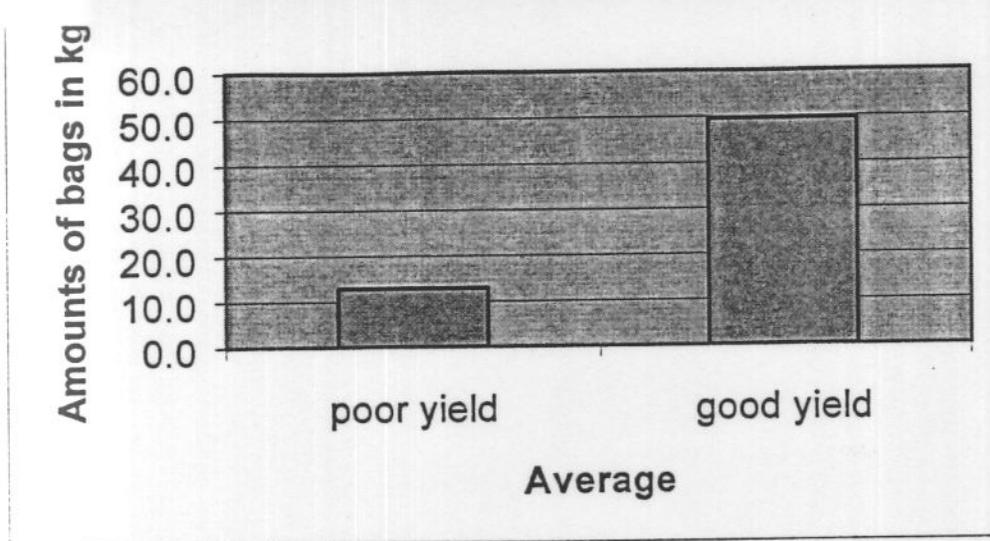


Figure 4: *Poor and good yield average of bags the harvesters can collect during the harvesting season.*

The above graph shows the poor and good yield average number of bags (each approx. 50 kg) that can be collected by the Topnaar harvesters during the harvesting time. When the yield is poor one harvester can collect 12.9 bags per season and sometimes hardly to get any fruit from specific plants. While the good yield average of 49.4 bags can be collected during a good yield. Therefore, the yield is very much unpredictable and it varies from season to season, (see figure 1.). Factors such as the declining of ground water table, livestock pressure, incorrect harvesting procedures were claimed by the harvesters to be responsible for these changes. Assuming that there were no limiting factors the harvesters might earn more than the good yield average they can earn now.

Table 2: *Variations between the former harvesting system and modern harvesting system*

Former harvesting system	Modern harvesting system
Patches of !Nara plant belong to the family/group (common access)	The existing !Nara patches leads to open access- (tragedy of the commons)
Harvesters were skilled old people	Harvesters are both old skilled and non skilled young ones
Harvesters were patient and appreciated the value of the plant	The patience rate is low, particularly in young harvesters
Wide tolerance towards the !Nara plant with potential yield rate	Narrow tolerance towards the !Nara plant with low or fluctuation yield rate
!Nara plants were healthy and died naturally	!Nara plants are unhealthy and the decline is enhanced by the anthropogenic factors such as extraction of ground water from the Kuiseb River and the incorrecting harvesting procedures by the harvesters
No trespassers were allowed to harvest in someone's field	Trespass is high and competition is common
Only ripen melons were harvested	Incompletely ripe melons are harvested sometimes and buried under the sand to enhance the ripening process
Color of the melon was used to determine the ripeness of the melon	The ripeness is judged by beating the melon off from the plant with either wooden sticks or iron rods

Wooden sticks were used as tools to remove melons from the !Nara plant	Both wooden sticks and iron rods are used as tools to remove melon from the !Nara plant
Application of burning system was practiced on the old !Nara bushes to ensure a healthy !Nara field and enhance the rate of fruitation	The Cons. laws cut down the burning system.

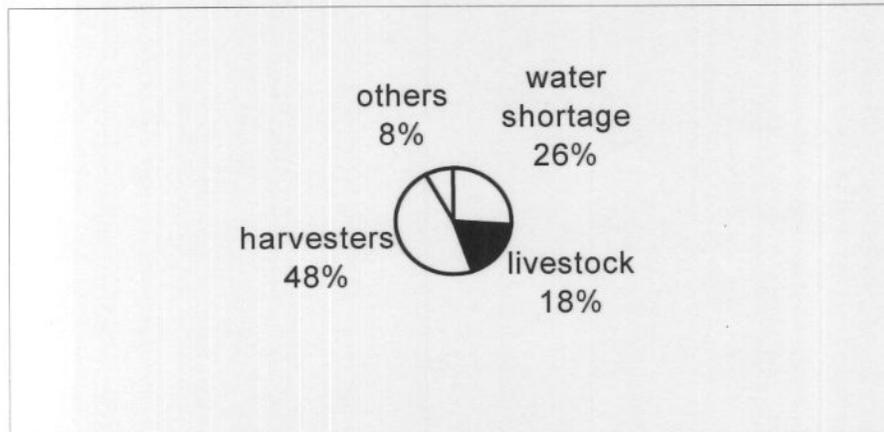


Figure 5: Factors and their percentage contribution to the decline of the !Nara productivity.

The above factors as perceived by the community were discussed.

The outcome on the ranking by the interviewees stratified a simple demonstration on the factors that contributed to the decline in !Nara productivity.

The harvesters perceived themselves to have contributed more to the decline in !Nara productivity. This is due to careless harvesters, particularly those using iron rods as tools to extract melons off from the plants. Some harvesters were of the opinions that iron rods harm new growing shoots and may inhibit the general health of the plant, thus in turn slow down the rate of the productivity. It will take time for the plant to recover and continue bearing more valuable melons. All the interviewees supported the system of plant ownership as it encouraged people to take care of their plants and the yield was evidently more reliable.

The community expressed their concern with the extraction of water from the Kuiseb River to supply towns such as, Walvisbay, Swakopmund, Arandis, HentisBay and Rossing Mine as a second major factor responsible for the decline of the !Nara in productivity.

“The existing !Nara fields have probably decreased by more than a third over the last 10 to 20 years. Many factors are responsible for this, the Topnaar must also reassume responsibility for incorrect harvesting methods” Dausab (1998).

Most of the !Nara seedlings are grazed by livestock, before they reach the maturity stage.

4.8. Natural factors

Other factors viewed by the interviewees as responsible to the decline in !Nara productivity are as follows:

Flood, this is a natural process, therefore, there is no remedy for this. A heavy flood can easily wash the new !Nara plant away. With big plants it can break the roots plant that are above the ground. This might be the reason why the yield was low in 1997(see figure 1).

Wind, wind has an effect on the productivity of the !Nara plant during the flowering time, although the author does not have enough information on the pollination agents of the !Nara. A strong wind may result on the flowers falling off before the pollination can take place. The falling off of small fruits from the plant. Most !Nara plants out in the field are found buried under the sand after the wind blows. This too may lead to the decline of the !Nara fields.

5. General discussion

The following factors hamper the productivity of the !Nara directly and indirectly:

In 1960's a flood barrier was constructed in the Kuisieb delta to halt floods from reaching nearby Walvisbay which was built on granite rock and therefore also blocks the river's subterranean flow (Budack, 1983). Commercial farmers have gradually cut off the supply of water to the lower Kuisieb River Valley by damming the rivers in the upper part of the Kuisieb Catchment. In the meantime, the pumping of water from the Kuisieb River at an unsustainable rate to supply water to towns such as WalvisBay, Swakopmund, Arandis and the mining activities in the region. Rossing uses more than a quarter of the water consumed in the Kuisieb Catchment Area (Dausab, et. al. 1993). The result has been a steady deterioration over the last three decades on the Topnaars northern !Nara fields (Van den Endyen, et. al. 1992). Today the Topnaar can no longer harvest in the northwesterly arm of the delta. Decades of damming and pumping of the Kuisieb River may have a detrimental effect on the !Nara fields in the southwesterly field arm of the delta where the Topnaar are currently harvesting. Both the harvesters and the pip buyers have pointed out on the low productivity of the !Nara bushes. There are few melons per bush and the size of the fruit and pips has changed drastically.

Generally speaking the potential lack of subterranean water may be the one of the factors that cut down the Topnaar's inherited plot system. In addition, the Topnaar can no longer harvest in the northwesterly arm of the delta due to the barrier that was constructed in the Kuisieb River in 1960's. All these factors encouraged the "tragedy of the commons" within the previous system of private ownership, which had helped to regulate conflict and ensured management and maintenance of healthy !Nara fields. Since then the competition over the !Nara has increased and disputes over access arose, because of the increased number of harvesters.

Furthermore, the more the urban population increases in towns that are supplied by the water from the Kuisieb River, the more the subterranean water will drop and this impacts the roots of the !Nara plant. In the long run the !Nara fields may decline if these schemes are still repelling the sustainable way of use. Water is a limited resource, therefore, there is a need to instill skills among the users particularly the towns.

In addition, the decline of !Nara productivity is expressed by the Topnaar as a hot issue. Referring to the Nature Conservation Ordinance Act that was set in place 1975, many of

the park regulations are in direct conflict with the Topnaar traditional land practices. Many of their natural resources have been set aside, as a result. The Topnaar can no longer meet their basic day to day needs as in the past. For example, they can no longer harvest the marine resources as in the past. Nowadays the Topnaars are facing new challenges due to their changing environment and developing social economy. In this way, the !Nara resource is getting pressure from various sides.

Harvesters are also blamed because of their incorrect harvesting procedures. The method some harvesters apply is not sustainable. Great damage is done to the plants during the process of harvesting. Due to this damage, plants can no longer yield to their maximum capacity as plants aren't given enough time to recover.

Moreover, the economy of the country has a secondary impact [indirect impact] to the decline !Nara in productivity. This simply means that, if the !Nara pips are in demand, it encourages the Topnaar harvesters to collect more melons to obtain as much as possible and therefore tend to ignore the value of the plant in trying to earn more money by selling the !Nara pips. According to the people interviewed the population structure increased compared to the past years. However, demands are now higher than the supply.

Box 1. Some implications on the Topnaar life

- *In the past before the colonial era, the Topnaar people had access to wildlife and other natural resources.*
- *Conservationists have sought to separate local people from wildlife by creating game parks and reserves. Since then wildlife was seen as the property of the government.*
- *Furthermore, the nature conservation laws cut down the burning system which the Topnaar people used to burn the old !Nara plants so that they can regenerate.*

6. Recommendation

There is a need for rural awareness programs among the harvesters, particularly the young people, this will help them to gain more realistic and honest perspective on sustainable management utilization. The awareness on its own can not reduce the problem, therefore, the community should respect the value of the plant as in the past in order to achieve better production. It is recommend that the Topnaar Community Foundation get the input to set up a local market of the !Nara seeds so that seeds are sold directly from the market instead of selling via the Cape Town. This will improve the lifestyle for both the present and future generations of the Topnaar. The benefit derived from the market might encourage the Topnaar to control and respect the plants and strengthened their management position. The scientific research about the decline of this plant should be increased.

The Ministry of Environment and Tourism (MET) needs to redraft its policy to take the Topnaar community into consideration. The community should benefit on the tourism activities that are taking place in the area. This enhances sustainable natural resource management and use while improving the quality of life of the Topnaars. The Topnaars must be included in taking part in planning sessions or decisions concerning their traditional living area. The MET should spell out the rules and conditions that apply to

the community living and working in the game park.

With regard to water extracted from the Kuiseb River, all the schemes are asked to utilise water sustainably. The alternative could be to increase the desalination systems to supply water to the above mentioned schemes rather than depending largely on water from the Kuiseb River.

The author is not in the position to recommend a comment on the population of the donkey to reduce the impact on the !Nara plants, but rather to urge that research be done or recommending further research to provide the results to the people involved in making the decisions.

7. Conclusion

The !Nara plays a key role both in the desert-ecosystem and in the socio-economic system of the Topnaars. !Nara pips play a major role in the Topnaar life, therefore, the Topnaar community regards it as a traditional staple food. Currently, the selling of !Nara pips serves as a source of self-employment among the community to derive small incomes to live with. The decline is experienced by the harvesters in both the !Nara bushes as well as in its productivity. The increase of the population impinges on the resources negatively and the competition increases among the harvesters. Demands are now higher than the supply.

The statistics from the interviews show that the harvesters are responsible for more percentage to the decline in !Nara productivity. The changing of plant ownership and changing of harvesting methods used by the Topnaar Community during the harvesting of !Nara melons, pose a threat to the !Nara fields. This is due to the careless harvesters, particularly the young people who ignore the cultural value of the !Nara plants. The majority of the Topnaar interviewed were aware of their damage to the !Nara plants. They only need to change their attitudes to appreciate the value of the plants as in the past. In addition, there is a lack of self-reliance in the community and therefore, the harvesters could be assisted with plans to manage resources sustainably.

The Topnaar's unique system of land tenure, however, has virtually died out due to the developments in the area at their expense, for e.g. the tourism activities. The !Nara fields are changing, due to the hydrological variations of the river Catchment (Botelle and Kowalski, 1995). Despite these inherent natural changes, overpumping, damming and overstocking have impacted on the general health of the !Nara plants and this has led to the decline of !Nara productivity. The increasing pressure in the central Namib Water Supply Scheme has a negative influence on the roots of the !Nara plants. The subterranean water level in the Kuiseb River is dropping at a rate of half a meter per year (Henschel, pers. comm., 1998). This has a negative influence on the roots of the !Nara plants. In the long run this might lead to the decline in !Nara fields. Environmental factors/ changes such as a reduction in rainfall claimed to be responsible for the decline of !Nara productivity (Henschel, pers. comm., 1998).

The simultaneous occurrence of these many factors makes the question of !Nara productivity quite complex.

The study period was not enough to reach the objectives of this study and also to get more information on the harvesting procedures from different people for the true representative of the whole community. For e.g. a rather small group of women were interviewed.

8. Topnaar references:

Formal and Informal Interviews with their Residents.

Jesay Animab- 32 age (Swartbank)

Paulus Ndume- 71 age (!aodanab)

Ouma-Lydia -78 age (Armstraat)

Helmut !Abeb-32 age (Dab draai)

Aloise !Areb - 45 age (Klipneus)

Piet Bees - 63 age (Nadab 2.)

Ruben - 72 age (Klipneus)

Arbert #hoakob - 27 (Klipneus)

Daniel Cloete – (Klipneus)

Johanna Fischer (Klipneus)

Moses Animab (Klipneus)

Sebetius Swartbooi - 60 age (Klipneus)

9. References cited

Berry, C., (1991). !Nara: Unique melon of the desert. *Veld & Flora* 77, p. 22-23.

Botelle, A., Kowalski, K., (1995). Changing resource use in Namibia's Lower Kuiseb River Valley: Perceptions from the Topnaar Community. Institute of Southern African Studies, University of Lesotho, Roma, Box 180.

Budack, K., (1983). A harvesting people on the South Atlantic coast. *South African Journal of Ethnology* 6.

Dausab, F., G. Francis., G. Johr., Kambatuku, J.R., Shanyengana, S.E., and S. Swartz., (1993). *Kuiseb Cacthment area. DRFN Occasional paper No.1., 118 pp. DRFN, Windhoek.*

Dausab, R., (1998). The Namibian Newspaper. Thursday, March 5 1998. p. 11.

Henschel, J. and Dausab, R., (1998). Pre-Proposal on the Fruit Production by the !Nara.

DERU, TCF, Walvisbay, February 1998.

Klopatek, J.M. and Stock, W. D., (1998). Partitioning of nutrients in *Acanthosicyos horridus*, a key stone endemic species in the Namib Desert. *Journal of Arid Environments* 26, p. 233-240.

Pfeifer, E.H., (1979). !Nara & Topnaar Hottentots. *S.W.A. Annual book*, p. 158-159.

Scholtz, C. H., and Holm, E., (1996). *Insects of Southern Africa*. University of Pretoria, Pretoria.

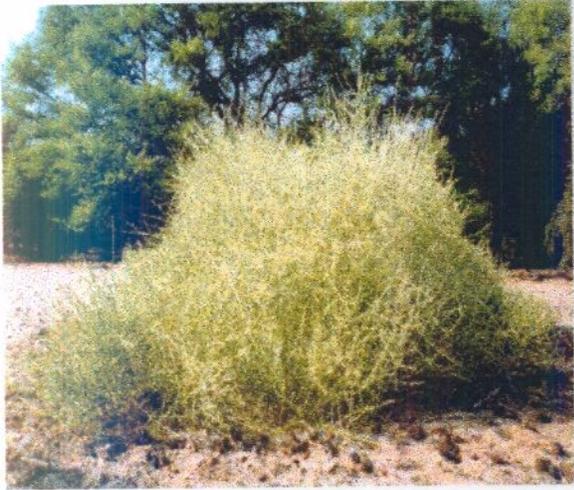
- Seely, M.K., (1992). The Namib - Natural history of an ancient desert. A Shell Guide (2nd ed.). Shell Namibia Ltd., Windhoek.
- Storad, C. J., (1991). Fruit of the Dunes. *ASU Research Publications*, p. 3-6.
- Van den Eynden, V., Vernemmen, P. and Van Damme, P., (1992). The Ethnobotany of the Topnaar. The Commission of the European Community.
- Visser, *Africa*, May 1998, p. 66-75.

Appendices

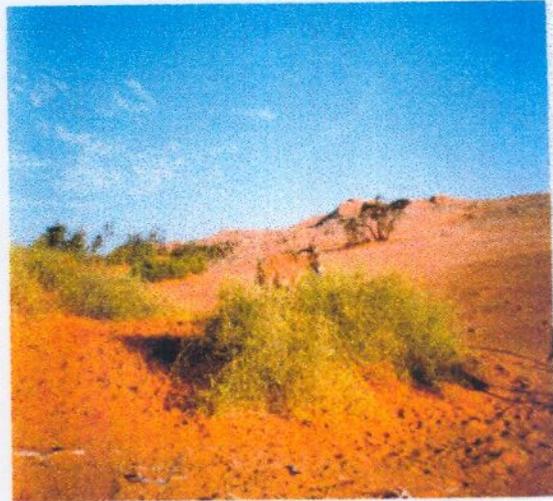
1. Impact of donkeys on the !Nara plants
2. Pictures taken during interviews
3. Questionnaires on the harvesting procedures

Appendix 1:

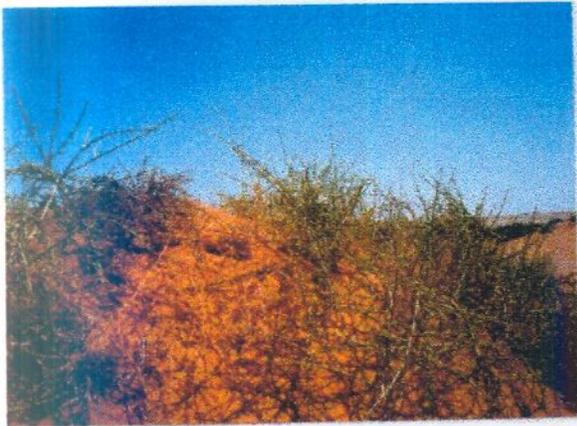
The impact of donkeys on the !Nara plant



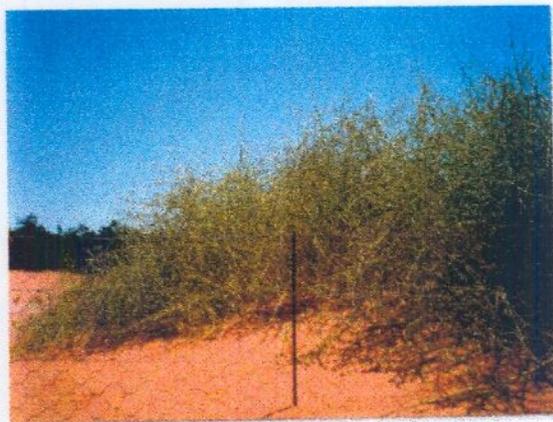
Picture 1.



Picture 3.



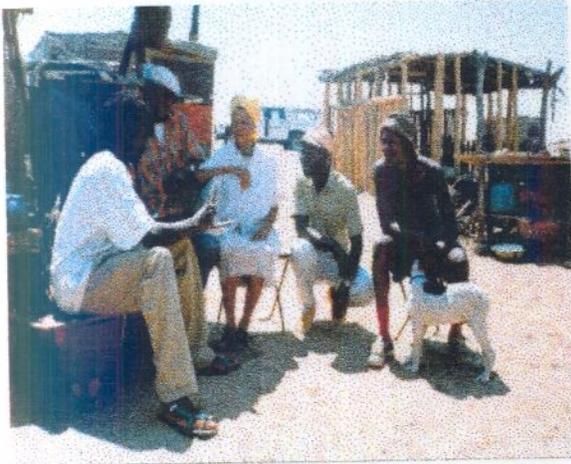
Picture 2.



Picture 4. Control / encloserer

Appendix 2:

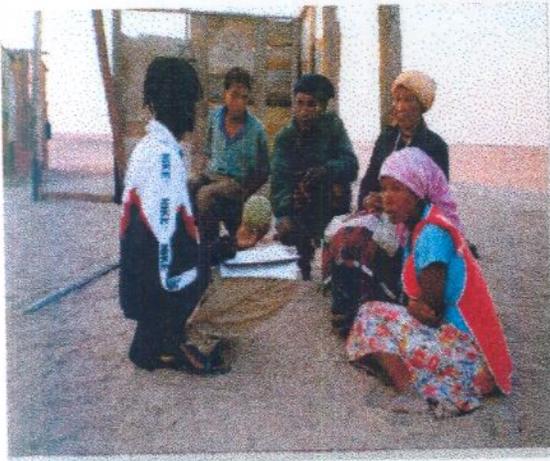
Pictures taken during interviews



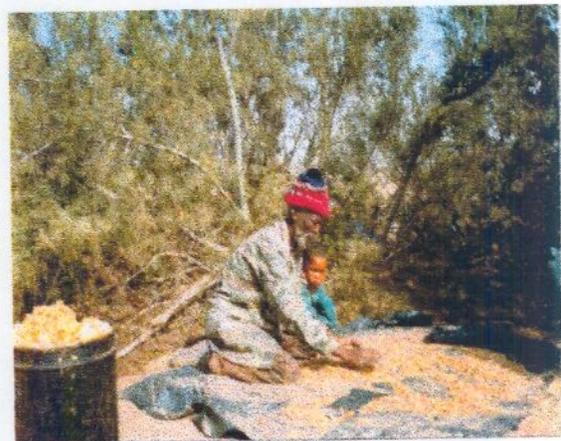
A. Interaction with the Topnaar community



C. Preparations of the !Nara melons



B. Interview with the community on use of !Nara melon by ranking methods.



D. Preparation of !Nara seeds

Appendix 3.

Questionnaires on the Harvesting procedures

Informant..... Age

Settlement.....

1. Wat is die bron van jou inkomste?
2. Vergelyk (rangskik) die belangrikheid van !Nara met die bron van ander inkomste byvoorbeeld pension, lewendehawe of vee(bokke, skappe, beeste, ens)?
3. Vergelyk die !Nara plant van die mees na die minste hoodsaaklike bv. Vrug(te), pit (tjie) en Wortels?
4. Vergelyk en rangskik die inwerking van enige aspekte wat jy dink wat verant woordelik is vir lae produktiwiteit van !Nara bv. menslike aktiwiteit en anders
5. Enige ander gebruike van die plant behalwe as om dit te eet?
6. Wat is die ander voedings alternatiwe vir die mense in geval van aarm produksie?
7. Wat dink jy is die rede dat sommige mense gebruik maak van yster om die bitter skille van die !Nara plante uit te trek en watter invloed het dit op die plant?
8. Min of mear hoeveel vrugte het julle verlede jaar geoes en van hoeveel plante af?
9. Hoeveel vrugte kry julle gedurende die goeie en slegte tyd van produksie?
10. Hoeveel mense in die !Nara velde?
11. Hoe wil jy hê watter prosedure moet gevolg word tydens oestyd?
12. As daar in verandering is, hoe groot is dit tydens oest? Rangskik dit van seisoen tot seisoen.
13. Hoeveel sakke pitte het julle verlede jaar verkoop en wat is die prys per kilogram?
14. Enige idee hoeveel mense kom uit bv. van Walvisbaai vir oes?
15. Hoeveel mense is dit in vergelyking met tien jaar gelede?.
16. Hoeveel mense is gevesting oor naweke en vakansie dae by die huise?
17. Wat is jou idees om kompetisie te verhoed?
18. Wil jy graag terug gaan na die ou tradisie van plant eienaarskap. Gee rede vir jou antwoord?
19. Vergelyk die kontras wat die jong mense gebruik in vergelyking met die ou mense tydens oestyd
20. Watter tyd van die dag vind gewoonlik oestyd plaas?
21. Wat is jou perspektief teenoor !Nara plant in vergelyking met die anders bv. belangrikheid van *Faidherbia* en *Acacia erioloba* vir medisionale waarde?

22. Wat is die lewensduur van die !Nara plant en hoe weet jy dit?
23. Wat het die !Nara plant nodig om n bestaan te maak om meer te produseer?
24. Hoeveel ryp vrugte vat dit om n kg pitte vol te maak?
25. Wat is die ander insig wat jy van buite soek behalwe van navorsing, om beter vooruitgang van !Nara plant te verwerf en die produktiwiteit daarvan?
26. Is die !Nara plante wat uit dood/ af sterf, of is dit die vrugbaarheid van die plante, wat al hoe minder word? Wat is die oorsaak daarvan?