

**USE OF *UROCHLOA TRICHOPUS* AND *DACTILOCTENIUM SPECIES* IN  
NGAMILAND**

**DEPARTMENT OF AGRICULTURAL RESEARCH  
MINISTRY OF AGRICULTURE  
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USE OF *UROCHLOA TRICHOPUS* AND *DACTILOCTENIUM* SPECIES IN  
NGAMILAND

BY

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## ***EXECUTIVE SUMMARY***

### **1 The Objectives**

The Ngamiland Region has a wide range of annual grasses that support a variety of animal species found in the area. In certain parts of the region, some of these annuals have grain which also provide food to humans. They mature early and produce grain under relatively low rainfall conditions. Given their importance in providing staple food during drought conditions, it was found necessary to document information regarding these important grasses. The objectives of the study therefore were to (a) Identify edible grass species available, (b) Generate information on the utilisation of common grass species, c) Determine nutrient content available in stem, leaves, grain and chaff (d) Use information gathered as a base for conducting necessary experiments

### **2 Participating Institutions**

The survey was organized by the Production Systems Program of the Department of Agricultural Research. Funding for this activity was obtained from ICRISAT/SADC/OFDA Applied Drought Mitigation Research and Pilot Project. This study was carried out under the sub theme “enhanced information on household needs, priorities and/or coping strategies in rural areas in drought situations”

### **3 Contents of the Survey**

Major issues covered in the survey include, identification of types of edible grasses especially the popular ones, communities’ experiences in their uses and how the popular grasses compare to the known cereals in terms of taste. Other issues followed up are, marketing, problems with storage and utilization, traits desired during improvement, livestock grazing effect and nutritional content of leaves, stem, chaff and grain

### **4 Methodology**

Pre-survey visits by three scientists were organised to selected villages in Ngamiland West. The purpose of these visits were to obtain information on the types of grasses used for food in order to develop a checklist on all possible issues related to the edible grasses which were to be used in developing a detailed questionnaire. At the beginning of the survey a two day workshop was held to explain the purpose of the survey and the questionnaire as well as harmonizing the understanding of each question. The survey work was done by two teams consisting of seven enumerators per team. Each team was lead by the team leader who was responsible for the coordination of its day to day activities. Three districts of Ngamiland were surveyed. Okavango, Ngamiland West and Ngamiland East. Each district had three extension areas selected and each extension area had two villages targeted for the survey. In the exception of Mohembo East, all villages selected included the extension area. Ten farmers were randomly selected per village, hence a total of 180 farmers were interviewed

Samples of few popular edible grasses were collected and submitted to the herbarium at Sebele in Gaborone for identification. Grain was also harvested from the two popular species, ground into flour and both the flour, stem, leaves and chaff were sent to the plant laboratory at Sebele for nutrient content analysis.

## 5 Results

Although eighteen different grass types were identified as being edible, the two most popular species were identified as *Urochloa trichopus* (Phoka) and *Dactyloctenium species* (Ngarara). The *Dactyloctenium species* were further identified as *Dactyloctenium giganteum* and *D. aegyptium*. Some of the types of recipes are - consuming flour, cooking flour with milk, cooking flour with water, cooking flour with melon juice, making of cakes and beer. When comparing Phoka and Ngarara to sorghum, millet and maize, a small proportion of the respondents indicated that both grasses taste better than sorghum, millet or maize. Common problems identified ranged from damage by weevils, ants and rats during storage while problems associated with utilization include small quantities harvested in large areas. This is particularly the case with Phoka. Phoka has also been cited as being difficult to pound into flour. Both grasses have higher crude protein than sorghum or millet. Furthermore, Phoka has higher crude fibre as well as high fat content than Ngarara and the two cereals.

## 1 0 GENERAL OVERVIEW OF NGAMILAND REGION

### 1 1 Population

The population of Ngamiland excluding Chobe is estimated at 94,534 (Population and Housing Census, 1991) The population breakdown is as shown in Table 1 below

**Table 1 Population Distribution of Ngamiland Region**

District	Population		
	Total	Male	Female
Ngamiland South	55,469	26,769	28,700
Ngamiland North	36,723	16,350	20,373
Ngami Delta	2,342	1,191	1,151

Source Botswana Population and Housing Census of 1991

### 1 2 Soils and Vegetation

The major soil type in Ngamiland Region is the arenosols (Soil Map of Botswana, 1990), which is a typical Kalahari sand soil Other soils found through the region are -

- a) The gleysols, found in the lower fringes of the delta
- b) The luvisols, found in the lower end of the delta
- c) The calcisols, found in Sehitwa areas
- d) The phaeozems, found in Nokaneng and the area southeast of Tsau

The arenosols are further divided into smaller types, and these types follow -

- I) The haplic arenosols This type surrounds most of the delta, extending to Caprivi and area bordering Namibia
- ii) The second in size of cover is the Ferralic arenosols This type covers most of the area bordering Namibia
- iii) The luvic arenosols This is found in Nxai Pan National Park extending north of the park
- iv) The last type is the gleyic arenosols, which is found in the delta and southeast of Beetsha

The vegetation of the region can be broadly divided into the Northern Kalahari Tree and Bush Savanna and Aquatic Grassland (Wear and Yalala, 1971) The Vegetation Map of Botswana, 1991 further divides the vegetation into smaller types which are listed below,

- a) *Terminalia sericea, Lonchocarpus nelsii/Acacia erioloba* This vegetation is found in the west of the delta, extending to the Namibian border
- b) *Terminalia sericea Lonchocarpus nelsii/Acacia erubescens* is found around Toteng and south of Thamalakane River
- c) *Terminalia sericea, Lonchocarpus nelsii/Combretum spp,* found north of Thamalakane River
- d) *Colophospermum mopane Terminalia sericea/Lonchocarpus nelsii,* cover the area north and east of the delta
- e) *Terminalia sericea Baphia massaiensis, Peltophorum africanum, Combretum hereroense,* found along Caprivi strip
- f) *Acacia tortilis Phragmites australis, Acacia erioloba, Terminalia prunoides,* found along Thamalakane River
- g) *Imperata cylindrica, Setaria sphacelata Hyparrhemia rufa association and Hyphaene petersiana, Garcinia livingstone/Lonchocarpus capassa, Acacia nigrescens* association and *Phragmites australis, Schoenoplectus corymbosus, Cyperus articularis,* found in the fringes of the delta
- h) *Cyperus papyrus, Miscanthus junceus association and Hyphaene petersiana Garcinia livingstone/Phoenix reclinata Ficus verruculosa* association found in the bottom of the delta
- i) *Colophosperm mopane Acacia tortilis,* found in the Mababe Depression

### 1 3 Climate

The climate of Ngamiland Agricultural Region is very diverse due to the extent of the region which runs from Kuke in the south west to Shakawe in the north The dependable crop yield achievement is quite high, above 75% in most years (Land Suitability Map for Rainfed Crop Production 1992) All the rain falls during the hot summer months (Table 2) and winters are generally dry and cool

**Table 2 Monthly Rainfall(mm) in Maun 1993 to 1998**

Month	1993	1994	1995	1996	1997	1998
January	77 3	302 2	27 4	134 0	157 3	128 4
February	117 3	71 1	32 0	260 0	19 2	18 6
March	18 6	6 0	48 3	9 0	113 0	58 6
April	47 2	0 0	0 0	0 4	0 0	32 6
May	0 0	0 0	0 0	2 9	0 0	0 0
June	0 7	0 0	0 0	0 0	0 0	0 0
July	0 0	0 0	0 0	0 0	0 0	0 0
August	0 0	0 0	0 0	0 0	0 0	0 0
September	8 2	0 0	21 6	0 5	9 7	4 1
October	14 1	2 5	11 2	1 3	29 6	1 7
November	48 7	41 2	16 6	100 9	24 1	50 5
December	154 7	15 2	54 1	47 6	67 8	105 7
Totals	487 1	438 9	211 2	557 2	420 7	400 2

Source Adapted from Monitoring Services Irrigation Report (un-published)

#### **1 4 Water and Hydrology**

Surface water is predominant in this region with the Okavango river basin feeding water to the Delta, which in turn feeds rivers such as Thamalakane and Boteti River channels (Thaoge, Jao, Ngoga etc) are fed by the Okavango and the many river tributaries branch out and form the swampy delta

The long term average inflow to the Delta is around  $10 \times 10^9 \text{ m}^3$  per annum, peaking between mid March and early May with minimum discharges at Mohembo in the range of 120 - 200  $\text{m}^3/\text{s}$  (SMEC, April 1989) Rainfall contributes about  $4 \times 10^9 \text{ m}^3/\text{as}$  additional run off, but this figure largely depends on the rainfall situation from year to year

Within the Delta, half of the 22, 000  $\text{km}^2$  could be considered as permanent dry land even though flooding usually takes place Waters of the Okavango are of low salinity hence suited to a variety of uses (United Nations Development Plan (UNDP), Food and Agricultural Organisation (FAO), ROME 1987) The dynamics of the Delta is however ever changing with the decline of the Thaoge river which until the 1980's flowed as far as Lake Ngami, the Delta therefore remains sensitive

## 1 5 Land Use

The five major land uses in Ngamiland Region are, tourism, wildlife, forestry, livestock and crop production (National Land Use Map, 1989) The majority of livestock is kept under communal grazing system which utilises land around villages, most of which is north west of the delta Commercial livestock production is mostly practised in the Hanavelde ranches

Wildlife Management areas take most of the delta and also includes the area towards Movombe and Zibadianja-Lediba from the delta, and the area south east of the delta This is a major hunting area in the region There are also game reserves and national parks such as the Moremi Game Reserve, Chobe and Nxai Pan National Park

Two major cropping systems exist and these are the Dryland and Molapo Molapo is mainly practised along the Okavango and Thamalakane rivers This system combines the use of flood moisture and rainfall Crop lands under the Molapo are smaller than those under Dryland production system with most farmers having fields in both the Molapo and the dryland system However, crop land under the Dryland production system is on the increase due to increase in population pressure and the utilization of the Drought Relief Scheme

## 2 0 BACKGROUND

*Urochloa Trichopus* (Phoka) and two *Dactyloctenium species* (Ngarara) are wild annual grasses In certain parts of Ngamiland region grain from these grasses is used as food These grasses have an outstanding adaptation to sandy soils with low fertility and low water holding capacity *Urochloa trichopus* grows to about 70 cm and is found mostly in disturbed sandy soils and is a major animal feed which maintains quality through out the dry period *Dactyloctenium giganteum* (Ngarara) is robust, tufted with a small terminal leaf blade, dark nodes and dark leaf collar It grows in open range land or disturbed areas on river banks or near water and often in shade The grass grows to over 60 cm in height At an early stage of growth, Ngarara provides good grazing for livestock and lose quality as the plant matures As the plant growth progresses, the translocation of nutrients to the grain results in coarse and fibrous stems with relatively less nutrients The species are both annuals They mature early and produce grain under low rainfall conditions Both *Urochloa Trichopus* and *Dactyloctenium species* have for years provided some communities in Ngamiland with a fall back strategy particularly during years when rainfall is low In drought years families usually go to areas where these grasses grow in abundance and harvest the heads for grain Given their tolerance and the use of their grain as human food, there is need to understand these grasses more It is important therefore that information regarding *Urochloa Trichopus* and the two *Dactyloctenium species* be clearly documented hence the need for this study

## 2 1 Objectives

The objectives of this study were to (a) Identify edible grass species available (b) Generate information on the utilisation of common grass species (c) Determine nutrient content in the stem leaves, grain and chaff (d) Use information gathered as a base for conducting necessary experiments

## **3 0 METHODOLOGY**

### **3 1 Funding and Initial Plans**

Funds for the study were obtained from the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) /Southern Africa Development Community (SADC) /Office of Foreign Disaster Assistance (OFDA) Applied Drought Mitigation Research and Pilot Project This particular study was carried out under the sub theme “enhanced information on household needs, priorities and/or coping strategies in rural areas in drought situations” An amount of US \$7,026 25 was allocated by SADC/ICRISAT Sorghum and Millet Improvement Programme to facilitate the above study The study was carried out by the Production Systems Programme of the Department of Agricultural Research

A pre-survey visit was organised by three scientists (two Agronomist and an Agricultural Economist) The purpose of the visit was to obtain information on edible grass species The visit took two days and it involved open discussions with key informants e g elders, chiefs and extension staff at Gwekatsumu, Tubu, Etsha, Shakawe and Xakao The information gathered was used to develop a questionnaire

### **3 2 The workshop**

The survey was carried out from the 5<sup>th</sup> to 17<sup>th</sup> May 1998 The first two days were used for training of interviewers The purpose of this workshop was to explain the purpose of the survey and the questionnaire as well as harmonizing the understanding of each question On the second day of the workshop, interviewers visited two villages to pre-test the questionnaire (Appendix A) Each interviewer was given a chance to ask questions during the pre-testing exercise

### **3 3 Survey teams**

A total of twelve interviewers participated in the survey Interviewers were divided into two teams Each team consisted of five interviewers and a team leader The purpose of the team leader was to coordinate daily activities of the team Teams consisted of Technical Assistants (TA), Senior Technical Assistants (STA), Technical Officers (TO) and Agricultural Research Officers (ARO) Other support staff included three drivers and two Field Assistants Field Assistants served as interpreters (Appendix B) Two double cab vehicles and two land rovers were used during the survey

### **3 4 Techniques and Approaches**

The survey was conducted in three districts of Okavango, Ngamiland West and Ngamiland East. In each District, three extension areas and two villages in each extension area were selected for the study. In exception of Mohembo east, all villages selected included the extension area (Appendix C). Ten interviewees in each village were randomly selected for the interview. Each time the survey team went to a village, local leaders were approached by the team leader, briefed on the purpose of the visit before interviews were conducted. A one to one interview method was used in administering the questionnaire.

### **3 5 Grass collection for species identification**

Fourteen specimens of edible grasses were collected within the survey area. The specimens were collected randomly from the following locations: Xakao, Etsha, Shorobe, Gumare, Danega, Gwekatsumu, Qhaweshi, Mogotlho, Chanoga, Matlapaneng and Boro. The specimens were collected from sandy loam and silty clay soils. There were no signs of overgrazing in the locality of collection, and the collected plants were relatively healthy. The grass specimens were up-rooted from the soil, pressed and sent to the herbarium at Sebele in Gaborone for identification.

### **3 6 Grain harvest for laboratory analysis**

People were hired to harvest two alleged edible grass species. These grasses were harvested at Qwekatsumu and Etsha where they were abundantly growing. After harvest, the grasses were dried separately for three weeks before they were threshed into grain. About five kilograms of grain of each grass was pounded into flour. Samples of flour, stem, leaves and chaff of the grasses were sent to the Plant laboratory at Sebele for nutrient content analysis.

## **4 0 SURVEY RESULTS**

### **4 1 Grass identification**

Out of the fourteen grass specimen sent to the herbarium, seven specimen were identified as *Urochloa Trichopus*. Locations from where the grass specimen were collected are Xakao, Etsha, Shorobe, Gumare, Danega, Gwekatsumu and Qhaweshi.

From the remaining seven specimen three were identified as *Dactyloctenium giganteum*, while four were identified as *Dactyloctenium aegyptium*. *D. giganteum* was collected from Mogotlho, 6 km on the Etsha/Gumare road from Etsha and Chanoga, while *D. aegyptium* was collected from 10 and 38 km on the Nokaneng/Xangwa road from Nokaneng, Matlapaneng and Boro. The collection of the two *Dactyloctenium* species may indicate lack of overlap of the two species, because no one site produced both. However the collector did not realize he was dealing with two species.

## 4 2 Data Analysis

Data was entered in pre-designed data-entry forms using Lotus-123 computer package Analysis, mostly on frequency of variable occurrence was then done using the SAS package The whole process of post-coding, data entry and processing took 4 weeks The total number of respondents were 180 Of these, 57 8% were females while 42 2% were males (Appendix D) Only 1 1% of the respondents were less than 21 years of age, while over 50% were over 50 years of age (Appendix E)

### 4 2 1 Types of edible grasses

The type of grasses the respondents were aware of are as indicated in Table 3 A total of nine grasses were mentioned as being edible The other grasses mentioned but of low importance are, Chita, Jata, Kashiambetete, Nxuvunxuvu, Ntota, Molemogale, Moxodo, Ruperere and Chokwe A high proportion of respondents were aware of Phoka, Ngarara and Mojakobo (Table 3) However, the most frequently used types were Phoka and Ngarara For the rest of the analysis, only Phoka and Ngarara were used

**Table 3 Awareness and experience in using (percentage) and years of utilization of edible grasses ( n=180)**

Grass Name	Frequency		Experience (Freq)		Years using					
	Aware	Not Aware	Using	Not using	Currently	< 1	1-5	6-10	>10	no idea
Phoka	99	1	94	6	3	11	23	11	46	6
Ngarara	68	32	52	48	3	5	13	5	26	48
Mojakobo	33	67	17	83	2	3	2	3	7	83
Todwa	5	95	5	95	0	2	1	2	0	95
Ping	1	99	1	99	0	1	1	0	0	98
Nxandabe	1	99	1	99	0	1	0	0	0	99
Matengere	1	99	1	99	0	0	1	0	0	99
Momishongo	1	99	1	99	0	0	0	0	1	99
Kandangavi	2	98	2	98	0	1	0	0	1	98

#### 4 2 2 Experience, years of utilization and types of recipes prepared from Phoka and Ngarara

Experience on the utilization of Phoka and Ngarara was another attribute measured. Ninety-four percent and fifty-two percent of the respondents have utilized Phoka and Ngarara respectively (Table 3). From the same Table, majority of respondents have indicated that they have utilized Phoka and Ngarara 10 years back, while 3% are currently utilizing the two grasses.

Different recipes have been identified. Some of these recipes are - consuming as flour, cooking flour with water, cooking flour with milk, making cake, cooking flour with melon juice and beer. The most popular recipes are cooking with milk, consuming as flour and cooking with water (Table 4). While beer has been cited, 12 and 33% of the interviewees indicated having some experience with Phoka and Ngarara respectively (Table 4).

**Table 4 Recipes of Phoka and Ngarara identified (Percent)**

Grass name	consuming as flour	cooking with water	cooking with milk	cake	cooking with melon juice	beer
Phoka (n=169)	90	71	93	30	33	12
Ngarara (n=94)	67	83	87	14	36	33

#### 4 2 3 Taste of Phoka and Ngarara Compared to Sorghum, Millet and Maize

Taste rankings are indicated in Table 5. In these rankings, 34% of the respondents indicated that Phoka is much more palatable than sorghum while 21% feel phoka tasted the same as sorghum. However, 41% of the respondents indicated that Phoka taste poorer than sorghum. Less than 10% of the respondents had no idea on the taste differences between Phoka and sorghum. A large proportion of respondents indicated that Phoka tasted better than maize, with only a few respondents (12%) indicating that Phoka meal taste the same as maize meal. Thirty-eight percent of the respondents nevertheless indicated that Phoka tasted poorer than maize. When Phoka was compared to millet, 12% of the respondents felt phoka tasted better while 37% felt both tasted the same. About 46% of the respondent however felt Phoka tasted poorer than millet, while 5% indicated that they don't have any idea as to which one tasted better than the other. About half of the respondents (49%) had no idea on taste differences between Ngarara and cereals (Table 5).

**Table 5 Taste comparison between Phoka, Ngarara, Sorghum, Millet and Maize (Percent)**

Comparison type	Better	Same	Poor	No idea
Phoka vs sorghum	34	21	41	4
Phoka vs maize	46	12	38	4
Phoka vs millet	12	37	46	5
Ngarara vs sorghum	9	16	26	49
Ngarara vs maize	17	6	28	49
Ngarara vs millet	6	13	32	49

With regards to selling or buying of Phoka and Ngarara, the majority of the respondents (over 90%) indicated that they do not either sell or buy grain or flour of the two grasses (Table 6)

**Table 6 Percent of those who sell/buy Phoka or Ngarara**

	Phoka	Ngarara
Buy	7	0
Cannot buy	93	100
Sell	2	1
Cannot sell	98	99

#### **4 2 4 Problems associated with storage and utilization of Phoka and Ngarara**

Majority of respondents indicated that Phoka can store for more than 6 months while Ngarara can be stored up to six months before it can be attacked by storage pests. Phoka seems to store longer when compared to Ngarara (Table 7). Identified storage pests for both grass species include weevils, rats and ants.

**Table 7 Duration in storage of Phoka and Ngarara (%)**

Grass name	<1 month	1-3 months	4-6 months	>6 months	Never store	No idea
Phoka	2	7	12	58	11	10
Ngarara	2	4	48	31	5	10

The majority of the respondents indicated that small quantity of grain is obtained from large portion of harvest and difficult to pound as the major problems associated with utilization of Phoka. Itching was singled out as a major problem associated with Ngarara (Table 8)

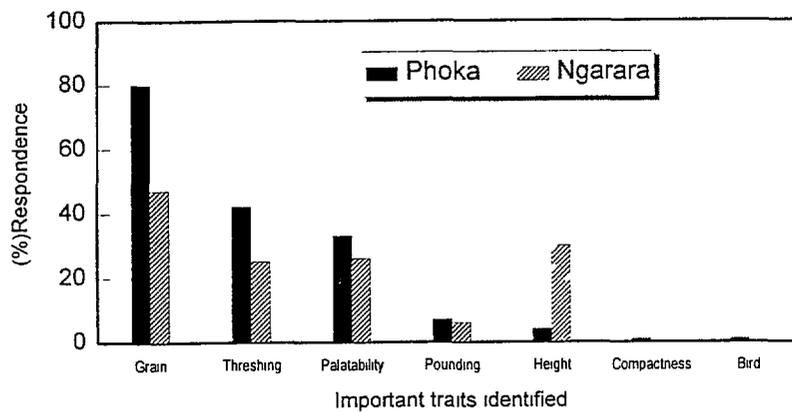
**Table 8 Problems associated with utilization of Phoka and Ngarara (%)**

Grass name	Not easily available	Difficult to harvest	Difficult to thresh	Difficult to pound	Small quantity harvested from large area	Not Palatable	Itching
Phoka	18	28	44	70	80	4	1
Ngarara	17	17	17	45	42	2	54

#### 4.2.5 Traits that require improvement on Phoka and Ngarara

Traits that the respondents felt need improvements on the two grass species are shown in Figure 1. The majority of respondents indicated that grain size, easy of threshing and palatability need improvement. However, less than 10% of the respondents indicated that pounding easy, increase height, compact head and bird tolerance also need to be improved. Traits range from large grain to drought tolerance, threshing ability and to palatability.

**Figure 1 Traits that require improvement on Phoka and Ngarara**



#### 4 2 6 Livestock Preference and Impact on Grazing Phoka and Ngarara

Respondents indicated that both Phoka and Ngarara were liked by livestock (Figure 2) Majority of the respondents felt that grazing of Phoka by livestock has a negative effect while about 42% of the respondents had no idea on the effect of grazing on Ngarara However, less than 24% of the interviewees indicated that grazing had no effect on the yield one would get from both grass species (Figure 3) The negative effect grazing has on Phoka and Ngarara is due to excessive removal of grass tissues by livestock

**Figure 2 Livestock preference on Phoka and Ngarara**

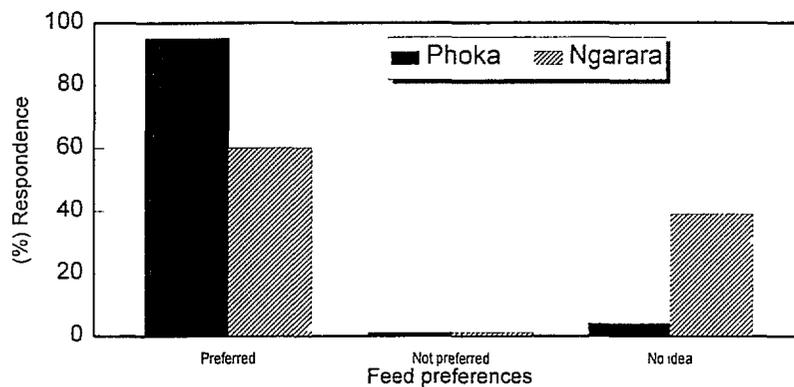
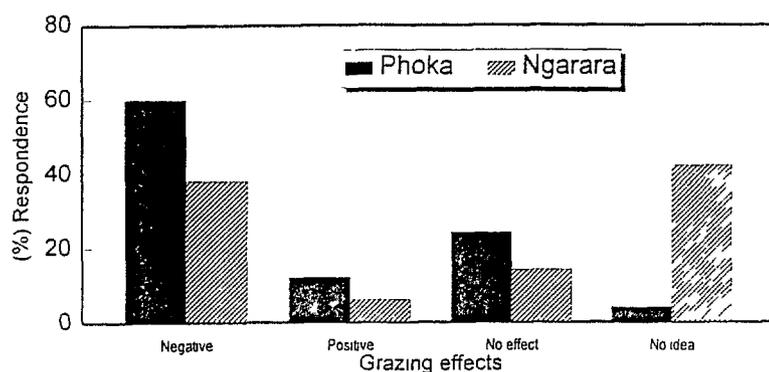


Figure 3 Livestock grazing effect on Phoka and Ngarara



#### 4.2.7 Nutrient analysis from stem, leaves and chaff

Nutrient analysis was done on *U. Trichopus* and the *Dactyloctenium* species. The two species of *Dactyloctenium* were not separated. Table 9 shows the analysis in respect of Crude Protein (CP), Phosphorous (P), Calcium (Ca), Ash, Dry Matter (DM), Dry Matter Digestibility (DMD), Organic Matter Digestibility (OMD), Acid Detergent Fibre (ADF) and Nutrient Detergent Fibre (NDF) for the stems, leaves and chaff. The materials were collected after maturity when plants had dried up. Thus, the plants had excessively lost nutrients. Crude protein was relatively lower in the stems and leaves of both species but high in chaff. Dry matter digestibility was relatively low as reflected by the high fibre content, this being due to mature condition of the plants. These residues can be used as animal feed especially when supplemented with a protein and mineral source.

Table 9 Nutrient content of *U. Trichopus* and *Dactyloctenium* Species

Nutrient	<i>Urochloa Trichopus</i>			<i>Dactyloctenium</i> Species		
	Stem	Leaf	Chaff	Stem	Leaf	Chaff
CP	2.06	4.12	8.01	5.44	4.63	7.20
P	0.05	0.10	0.19	0.06	0.09	0.19
Ca	0.28	0.52	0.36	0.40	0.75	0.45
Ash	6.25	16.05	16.63	10.00	12.50	8.40
DM	95.45	94.80	93.51	95.85	94.70	91.95
DMD	34.00	40.51	49.31	44.50	49.52	29.74
OMD	34.29	45.97	60.24	45.28	51.73	33.27
ADF	47.00	38.70	39.40	40.90	39.10	35.00
NDF	80.70	72.30	68.10	71.50	71.70	80.60

#### 4 2 8 Nutrient Analysis from gram when compared to other cereals

Both Phoka and Ngarara have higher crude protein when compared to a millet variety called serere and a sorghum variety called Segaolane (Table 10) Phoka also has a higher crude fibre (CF) than Ngarara and the two cereals Fat content is also higher in Phoka than in Ngarara, but the fat content is equivalent to that of sorghum and millet varieties

**Table 10 Crude Protein, Fat, Crude Fibre, Ash and Mineral content of different cereals in percentage**

Cereals	CP	Fat	CF	Ash	P	K	Ca	Mg	Na
Phoka	15 58	7 48	11 20	4 15	0 34	0 47	0 05	0 15	0 01
Ngarara	13 14	1 74	3 80	8 95	0 40	0 35	0 88	0 23	0 01
Serere 6A	9 65	7 72	3 20	1 45	0 28	0 41	0 30	0 13	0 02
Segaolane	8 68	6 65	3 80	1 95	0 43	0 41	0 04	0 23	0 02

## 5 0 DISCUSSION AND RECOMMENDATIONS

### 5 1 Discussion

Botswana possess grass types with a variety of uses including thatching of houses and feed for livestock Some of these grasses have edible grain The need to understand the contribution of these grasses to human beings is essential

The survey that was conducted identified eighteen edible grasses in Ngamiland The most common edible grass species identified were *Urochloa trichopus* (Phoka) and two *Dactyloctenium* (Ngarara) species, *giganteum* and *aegyptium* *Phoka* is an annual with a height of approximately 70 cm (Field, 1976) and coarse tufted (Russel, 1991), and can root from lower nodes The grass is found in a wide variety of biomes, but most common in disturbed sandy soils The grass is a major animal feed which maintains quality throughout the dry period

*D giganteum* is robust, tufted with a small terminal leaf blade, dark nodes and dark leaf collar, while *D aegyptium* is mat-forming with light nodes, light leaf collar, and roots from the lower nodes *D giganteum* occur on open rangelands or disturbed areas on river banks or near water, and often in shade The grass grows to over 60 cm in height *D aegyptium* is found on disturbed areas near water (Russel 1991) The grass is also known to be used as medicine and in fish poisoning (Russel, 1991) The grass grows up to 50 cm in height (Field, 1976)

Table 9 shows crude protein and dry matter digestibility of Phoka residues to be very low, however, Field (1976) showed that *Phoka* has 10.7%, and 7.8% CP and 59% and 25% DMD in wet and dry seasons, respectively. This shows that during the wet season animals that graze Phoka can put on a reasonable amount of weight while during the dry period they could receive enough CP for maintenance. The *Dactyloctenium species* are known to have a poor forage value. The residue could, however, be used as base feed supplemented with high quality concentrates.

Since these grasses grow wild, there is competition between humans, livestock and birds. At a succulent stage they provide good feed for livestock. Suggestions for improvement made include improving the grain size, palatability and easy grinding into flour.

## **5.2 Recommendations**

1. There is need to collect other grasses species that have been identified as being edible for correct characterisation.
2. The most commonly used grasses could be domesticated and where possible their positive characteristics be exploited in the breeding programmes.
3. Germplasm of these grasses should be stored to safeguard biological diversity.

## Appendix A Survey schedule

Date	Time	Activity
4/5/98		Participants arrive in Maun
5/5/98	0815-0850	Introduction and objectives of the Urochloa survey in the Ngamiland Region (Mr Modiakgotla)
	0830-0850	Questionnaire Design (Mr E Makhwaje)
	0850-0910	Questionnaire interpretation (Mr E Makhwaje)
	0910-1000	Questionnaire translation (Participants-led by Mr E Makhwaje)
	1000-1030	Tea break
	1030-1230	Questionnaire Pre-test (Participants - led by Mr Nkhori)
	1230-1345	Lunch break
	1345-1600	Questionnaire Pre-test (Field visits - led by Mr T Mbulawa)
6/5/98	0800-0830	Questionnaire Pre-test Evaluation (Mr E Makhwaje)
	0830-0900	Questionnaire administration (sample choice and size)-- (Mr E Makhwaje)
	0900	Participants leave to Beetsha (Team A) and Etsha (Team B)
7-8/5/98		Interviews at Beetsha and Godikwa (Team A) Interviews at Etsha 6 & 8 (Team B)
8/5/98		Team A leave to Seronga and Team B to Gumare
9-10/5/98		Interviews at Seronga and Mokgacha (Team A) Interviews at Gumare and Tubu (Team B)
11/5/98		Team A leave to Xakao and Team B to Qangwa
12-13/5/98		Interviews at Xakao and Kaukwı (Team A) Interviews at Qangwa and Xaixai (Team B)
14/5/98		Team A leave to Shorobe and Team B to Sehitwa
15-16/5/98		Interviews at Shorobe and Sankoyo (Team A) Interviews at Sehitwa and Bodibeng (Team B) Teams A and B camp at Chanoga
17/5/98		Interviews at Phuduhudu (Team B) Interviews at Chanoga (Team A) Teams A & B return to Maun
18/5/98		Participants return to their duty stations

## Appendix B List of Survey Participants

NAME	POSITION	LOCATION
1 C Mahilo	STA	Mahalapye
2 N Mchumaeli	TO	Mahalapye
3 R Kemotso	TA	Mahalapye
4 D Nkoketsang	TA	Francistown
5 K Kelemogile	TO	Francistown
6 M Monyadzwe	TA	Francistown
7 M Haushiku	STA	Maun
8 T Manase	TO	Gumare
9 F Phindela	TO	Maun
10 G Moruemang	STA	Gumare
11 K Tomande	FA(Interpreter)	Gumare
12 M Rangosa	FA (Interpreter)	Gumare
13 W Mafa	Driver	Maun
14 K Maupong	Driver	Mahalapye
15 M Kashe	Driver	Maun
16 T Mbulawa	ARO(Team Leader)	Maun
17 S Nkhoru	ARO(Team Leader)	Mahalapye

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TA = Technical Assistant

STA = Senior Technical Assistant

TO = Technical Officer

FA = Field Assistant

ARO = Agricultural Research Officer

## Appendix C District, Extension area and Villages surveyed

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DISTRICT	EXTENSION AREA	VILLAGES
OKAVANGO	Beetsha	Beetsha Godikwa
	Seronga	Seronga Mokgacha
	Mohembo East	Xakao Kauxwi
NGAMILAND WEST	Etsha 6	Etsha 6 Etsha 8
	Gumare	Gumare Tubu
	Qangwa	Qangwa Xauxai
NGAMILAND EAST	Shorobe	Shorobe Sankoyo
	Chanoga	Chanoga Phuduhudu
	Sehitwa	Sehitwa Bodibeng

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**Appendix D Sex of respondents ( n=180)**

sex	freq	%
female	104	57.8
male	76	42.2

**Appendix E Age group of respondents ( n= 180)**

class	freq	%
less than 21	2	1.1
21-30	13	7.2
31-40	32	17.8
41-50	35	19.4
51	98	54.4

## List of reference

- 1 Field, D 1976 Hand Book of common grasses in Botswana Ministry of Agriculture Gaborone, Botswana
- 2 Population of towns, villages and associated localities central statistics, Ministry of Finance and Development Planning Gaborone Printer August, Printed 1992
- 3 Wear, P R and Yalala, A 1971 Provisional map of Botswana Government Printer, Gaborone, Botswana
- 4 FAO/UNDP 1992 Land Suitability map for rainfed crop production
- 5 Russel, G E G, L Watson, M Koekemoer, L Smook, N P Barker, H M Anderson and M J Dallwitz 1991 Grasses of Southern Africa National Botanical Gardern/Botanical Research Institute South Africa