

GATHERING ACTIVITY AMONG THE CENTRAL KALAHARI SAN

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ABSTRACT The Central Kalahari San have been significantly changing their traditional subsistence and way of life under the influence of the sedentarization program of the Botswana government. However, they still continue gathering activities. Firewood and building materials are needed more than before. The purpose of this study is to analytically describe the features of present San gathering activities.

San gathering activities have changed remarkably in quantity but not in quality. The frequency, time length and harvest amount have lessened but their favorite plant species, methods and group formation in gathering have not changed. Gathering is more frequently done in groups than individually for greater efficiency. The size of a group depends on the seasonal and spatial change in plant distribution, and the distance to the collecting site. The author emphasizes the significance of social interaction such as cooperation and information exchange in group gathering.

Key Words: Gathering, Sedentarization, Group gathering, Efficiency, Social interaction

INTRODUCTION

The research on ecological anthropology concerning the San, a hunter-gatherer people in Africa, has shown that the gathering a mainly by women plays an important role in their diet (Lee, 1968, 1979; Tanaka, 1976, 1980; Silberbauer 1972, 1981).

This kind of research has been undertaken mainly by analyzing the frequency in the use of animal or vegetable resources, nutritive value (caloric intake), and labor needed for hunting and gathering (energy consumption). This research focuses on the behavioral aspects of how women gather.

Ten years have passed since the Central Kalahari San, the object of study, settled in the Xade area, and the sedentarization has greatly influenced their gathering activities. Gathering, which formerly supplied 80% of their diet in caloric value, has receded greatly, with the vegetable resources around the settlement overly exploited in a short period of time. Therefore, it is an urgent task to describe the present situation of gathering.

The influences of sedentarization on the San gathering activities are as follows. Firstly, the ratio of gathered goods to total foods has decreased due to the availability of well water and food rationing (Tanaka, 1987). Secondly, vegetable resources around Xade have been over-exploited, because many people now continue living for a long time in one place.

It can be inferred that the multiple effects of the depletion of wild vegetable resources, available water, and rationed foods have made gathering activities sluggish. However, even after sedentarization, people do gather of foods (Osaki, 1990). Also firewood and building material are needed more than before (Tanaka, 1987-a).

This study seeks to identify the essential changes in the gathering activities, and analyze its present situation by focusing not only on quantity, such as frequency, time length, and harvest amount, but also on quality, including plant species, preference, methods and gathering party formation.

Especially, I will focus on the features of the gathering activities by analyzing group formation. The issue addressed here is why the San women go gathering in groups although the activities are individual in nature.

As for the relationship between the quality of resources and the optimal size of foraging groups to supply these resources most efficiently, it has been generally inferred that the large groups can better deal with the concentrated but mobile resources and the small groups better deal with the dispersed but immobile resources (Smith, 1981). According to this hypothesis, it would be advantageous in hunting to form cooperating groups to find targeted animals, chasing them and killing them, while it would be advantageous in gathering to form smaller groups or even act individually (Steward, 1955). However, it is often reported that the San hunt individually or in smaller groups and gather by larger groups (Silberbauer, 1965; Lee, 1972; Marshall, 1976; Tanaka, 1980).

What factors concern the formation of groups in the gathering? I will discuss the relationship between the group size and time length as well as group size and distribution of plants. I will describe the difference in gathering efficiency of groups and individuals.

SUBJECT GROUP AND RESEARCH METHOD

The original data was collected from July 1990 to February 1991 in Xade area within the Central Kalahari Game Reserve, Republic of Botswana. I also referred to my data from a 10 month in 1988 to 1989.

There were 38 San camps and 7 Kgalagadi (one tribe of nomadic Tswana) camps dispersed in the study area. The latter had moved from surrounding areas. The population in Xade area as of July 1990 was 621 people (302 men and 319 women) for the San and 147 people (80 men and 67 women) for the Kgalagadi, for a total of 768 people.

The total number of Camp T residents as of 1990 was 33 (19 men and 14 women) and data on the gathering activities were collected targeting 10 women excluding 4 young girls (Table 1). An elderly woman, **Be**, did not go gathering at all because she could hardly walk.

Other women were counted only when they went gathering with those from Camp T. There were 7 such women in total: 5 from the adjacent Camps O, G, and L, and 2 who married out from Camp T into Camp K and M.

During the whole period of research, I examined who gathered what. The

gathering trips are defined as leaving one's camp for more than 30 minutes solely to gather and collect material. Collecting firewood on the way home or on the way to have a wash was not counted as gathering.

The attendance of the gathering activities was recorded for 77 days (Table 1). Constituent members were also recorded so that the group size could be counted. Each group doing the gathering activities (including group size of one) was defined as a gathering party. There were 105 gathering parties during the 77 days in which 251 people took part. One gathering activity by one person was defined as 1 person-trip gathering. There were 251 person-trips gathering. On 95 gathering parties, the camp-leaving time and camp-returning time were recorded and time length (elapsed time between departing and arrival) was calculated. Also, for 91 gathering parties out of 192 person-trips gathering, harvest amount (amount taken back to the camps) was measured with a spring scale.

I will explain the classification of the gathering trip. Firewood and grass for thatching roofs were collected in addition to wild foods, and each gathering trip was classified by "major gathered goods" (Fig. 1). Of 95 gathering trips, 42 cases

Table 1. Frequency of gatherings by each individual

Individual name	Days of gathering	Observation days	Frequency
Be ¹	0	77	—
Gu	35	77	2.2
Ko	33	77	2.3
Ka ²	14	56	4.0
Kk	37	77	2.1
Na	21	77	3.7
Ha ³	19	57	3.0
Gk ⁴	9	36	4.0
Ot ⁴	10	36	3.6
Da ⁴	9	36	4.0

1. **Be** did not go gathering because of her old age.
2. **Ka** visited the other camp from October 16 to November 25.
3. **Ha** visited her husband who worked in the construction site from January 12 to February 12.
4. She visited the other village from the end of June to December 2.

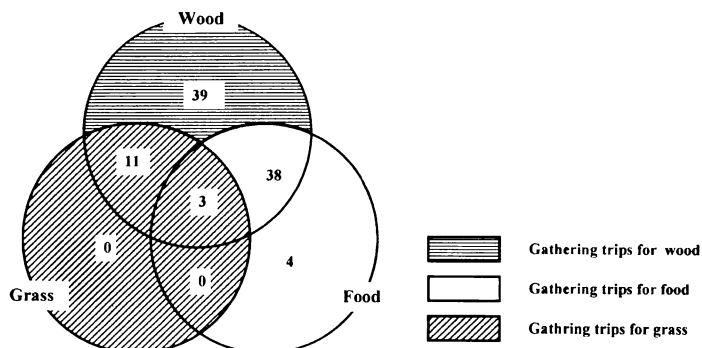


Fig. 1. Classification of gathering trips.

were classified as “foods trips”, 14 cases as “grass trips” and 39 cases as “firewood trips”. Food trips include those in which only foods (4 cases) or foods and firewood (38 cases) were the main purpose classified as “foods trips”. Trips mainly for thatching grass and firewood (11 cases) or grass, firewood and foods (3 cases) were classified as “grass trips”. Firewood was usually collected secondarily on the way home from collecting foods and grass. Thus, trips were classified as “firewood trips” in the cases only when the sole aim was to collect firewood (39 cases).

SEASONAL CHANGE OF THE GATHERING ACTIVITIES

Seasons researched were roughly divided into two: the rainy season and the dry season. Generally, the former is from December to March and the latter is from April to November. However, the amount of rain and the rainy period varies year to year. The San divide the year into four seasons.

‘!Nao’ (summer): December~January

Heavy rain frequently pours for several days. Plants grow well and flowers bloom. However, sometimes there is no rain for several weeks or no rain at all despite the rainy season.

‘Bara’ (autumn): February~March

This is the harvest season when plants bear fruits. It rains less and the temperature comes down.

‘Sao’ (winter): April~August

It seldom rains and the temperature is low. At night, the temperature reaches below zero. Plants wither and there is no grass on the ground.

‘!Khoo’ (spring~early summer): September~November

The mild spring season is short and the season changes suddenly from winter to summer overnight. Especially, October and November fall on the last period of the long dry season and are the driest and hottest. The temperature during the day often exceeds 40 degrees. It starts to rain usually in November and plants sprout all at once.

The gathering activity of the San varies according to the seasonal changes. Table 2 shows by month how many people went gathering per day for the 77 days of the researched period. In the dry season from July to November, few people went gathering (1.3~2.6 person-trips/day) and from December to February, many went gathering (3.3~6.0 person-trip/day) (U-test by Mann-Whitney, $u=0$, $n_1=4$, $n_2=3$, $p<0.05$).

In order to examine the seasonal changes in the harvest amount, I calculated the monthly harvest amount with which each individual returned per gathering trip (Table 3). The San women left their camps after determining the kinds of food needed and destinations. They collected several kinds of plants available at the same time. On their way home, they collected firewood and return to their camps with a harvest of 20 to 30 kilograms.

Firewood is collected almost all year round. In winter, people burn firewood to warm themselves. Also, firewood is indispensable, regardless of the season, to

Table 2. Gathering parties observed in each month.

Month	Ovservation days	No. of gathering parties	No. of people	No. of people / observation days
Jul	6	4	8	1.3
Aug	0	-	-	-
Sept	11	12	29	2.6
Oct	14	18	36	2.6
Nov	10	12	18	1.8
Dec	8	11	48	6.0
Jan	15	21	50	3.3
Feb	13	27	62	4.8
Total	77	105	251	3.3

Table 3. Amount of each gathered goods in each month (kg)

gathered goods	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
firewood	18.9(9)	-	20.3(25)	19.9(34)	18.6(18)	14.1(34)	9.8(38)	13.9(55)
grass	12.5(6)	-	16.4(13)	13.7(13)	0	18.1(1)	25.8(4)	0
foods								
rhizomes	-	-	3.5(4)	4.6(10)	5.7(7)	0	2.1(8)	3.1(15)
‡k'on leaves	-	-	0	0	0	13.7(13)	3.8(17)	0
lnone fruits	-	-	0	0	0	2.2(13)	0	0
kx'oam fruits	-	-	0	0	0	0.9(10)	0.9(12)	2.2(8)
llnṇ melons	-	-	0	0	0	0	9.7(3)	9.1(40)
qaā melons	-	-	0	0	0	0	9.4(19)	14.2(11)
wild plants	-	-	0	0	0	0	1.7(6)	(8)
green caterpillars	-	-	0	0	0	0	0	1.3(19)

cook. Grass for thatching roofs is supplemented all year round because it is blown away by the wind or taken for kindling. Grass is intensively collected in the rainy season to repair their huts.

Among wild plants, rhizomes were collected almost all year round. The amount was small from 2 to 5 kilograms, but was stable. Wild plants other than rhizomes could be collected only after December when the rainy season set in. In 1990, the first precipitation was on November 23, rather late compared to previous years. In December 1990, leaves of '‡k'oō', fruits of 'lnone' and 'kx'oam' could be collected.

San women ate as much '‡k'oō' or they wanted at the gathering place and then took the rest back to their camps. The amount was huge, 13.7 kilograms per person at one gathering as of December and the camps were filled with the green leaves. The gathering of '‡k'oō' and 'lgara' lasted for about 50 days from mid-December to late-January.

Fruit of 'lnone' and 'kx'oam' are tiny and it takes time to collect them. Therefore, at one gathering, only 1 to 2 kilograms of these fruits were collected. 'lNone' was exploited for about 10 days, while 'kx'oam' could be collected for a longer period.

From January, melons were collected; 'qaā' melons were collected first, and then 'llnṇ' melons followed. 'llNṇ' were sometimes consumed on the spot. In

contrast, since ‘qaā’ melon cannot be eaten raw, they carried these melons back to the camps. At one gathering 10 to 15 kilograms of ‘lṅṅan’ and ‘qaā’ were collected per person.

In February, green caterpillars could be collected. Only a week was available before caterpillars pupated. Since caterpillars are small and hide themselves behind leaves, only about 1 kilogram could be collected per person at one gathering.

GATHERING GROUPS

Party Size

I observed 105 gathering parties, ranging from 1 to 11 persons (Fig. 2). Many groups were only consisted of one person (39 parties) and 2 persons (32 parties), which accounted for 2/3 of the total. Those parties over 5 persons were recorded only once and it can be said that the parties over 5 persons are rare.

The result that the party size of one person was most frequent not necessarily shows that the number of women who gather alone was the highest. Compared with the total number of people, the ratio of single-person trips was only 15.5% (39 person-trips gathering) of 251 person-trips gathering.

Group gathering was more common: 2 persons (25.5%, 64 person-trips gathering), 3 persons (19.1%, 48 person-trips gathering), 4 persons (17.5%, 44 person-trips gathering).

Party sizes are closely related to the distribution pattern of gathered goods. The average party size is shown by gathered goods in Table 4. Party size was small for gathering rhizomes (‘!ʔomlke’ and ‘lkaā’), ‘lṅṅan’ melons, and firewood. These three kinds of wild plants have been so exploited that they are now sparsely distributed around the village.

Party size was much larger for fruits and leaves whose distribution pattern was concentrated (Table 4). Many people tended to go and gather ‘lnone’ fruits and ‘#k’oō’ leaves together since these were available for a short period of time and the gathering place was far, about 7 kilometers from the camps (Fig. 3). Green caterpillars were collected by fewer people because they were gathered near the camp site, although their distribution pattern was concentrated and could be collected only for a limited time.

Table 4. Distribution pattern and party size of each gathered goods.

Gathered goods	Distribution pattern	Party size Ave (min-max)	No. of parties
‘lnone’ fruits	concentrated	9.5 (9-10)	2
‘#k’oō’ leaves	concentrated	4.0 (1-11)	8
‘kx’oam’ fruits	concentrated	3.8 (2-11)	11
‘qaā’ melons	concentrated	3.1 (2-7)	12
grass	concentrated	2.7 (1-6)	14
caterpillars	concentrated	2.3 (1-3)	7
rhizomes	dispersed	2.3 (1-7)	27
‘lṅṅan’ melons	dispersed	2.3 (1-4)	19
firewood	dispersed	1.6 (1-5)	43

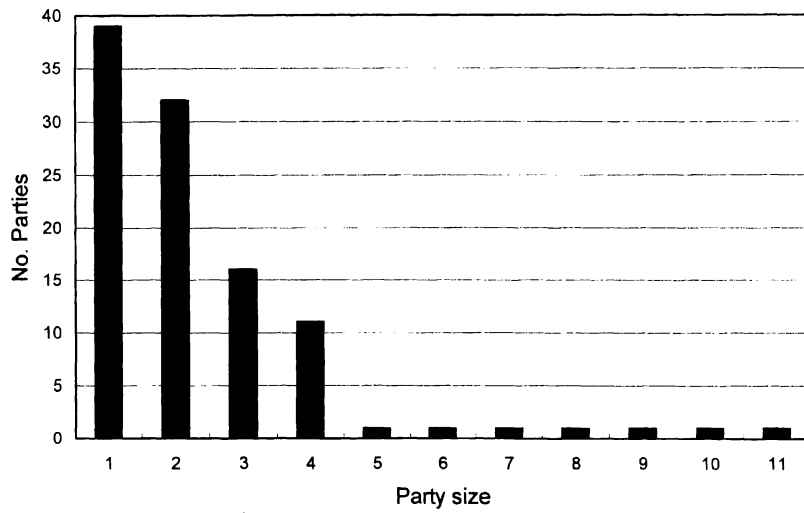


Fig. 2. Distribution of party size.

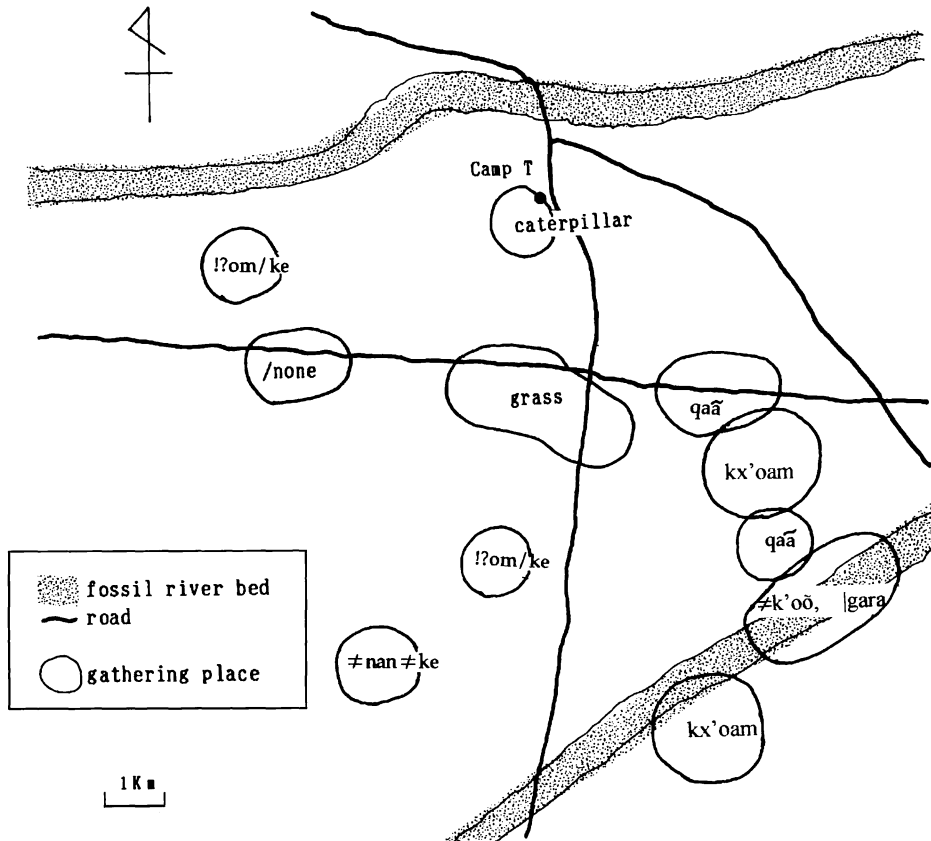


Fig. 3. Distribution of plants utilized by the members of Camp T.

These results show that women went gathering with consideration to the resource distribution from the geographical and seasonal points of view as well as the distance from the camp site. Party size tended to be larger when gathering goods concentrated in time and space located far away. The correlation between the party size and gathering time was significant for 95 parties with known gathering time ($r=0.430$, $n=95$, $p<0.01$). However, there may be a possibility that when many women went, they not only gathered but rested longer as well.

Group Gathering and Individual Gathering

The San women went gathering by groups for distant and concentrated goods, while they went alone to collect firewood near the camps.

The gathering by 1 person from the group gathering by more than 2 persons was examined to see if there was a difference in gathered goods or gathering time between the two. Since people in the same party always gather almost the same goods, the following analysis was for parties, not for individuals.

Table 5 shows the difference in the main gathered goods between group gathering and individual gathering. For collecting firewood, gathering alone was more common, while for collecting foods or grass, gathering by groups was more common ($\chi^2=23.78$, $df=2$, $p<0.01$).

As for time spent for gathering, group gathering tended to take longer than individual gathering (Kolmogorov-Smirnov test, $D_r=0.6228$, $p<0.001$). However, some people went gathering alone for as long as over 8 hours.

When I investigated the gathering time by the main gathered goods, I found that time spent for collecting firewood was within 3 hours and that time spent for collecting grass was within 3 to 9 hours. Time spent for food gathering was, most frequently from 5 to 7 hours.

Concerning the time the parties left their camps, there were two peaks at 9 to 10 am and 4 to 5 pm (Fig. 4). The morning peak was for gathering major foods and the evening peak was for collecting firewood. No party left the camps at the hottest time of the day (1 to 3 pm).

As for the time parties returned to their camps, there was a small peak of 12 to 1 pm and large peak at 6 to 7 pm (Fig. 4). This was because the parties which left their camps in the morning either returned to their camps by 1 pm, the hottest time of the day or in the evening after taking a rest at noon under a tree at the gathering place. In either case, they tended to avoid moving at the hottest time. Sandy earth became too hot to walk on with bare feet, around 1 to 3 pm in the summer.

Table 5. Difference of major gathered goods between in gathering alone and in gathering by groups.

Major gathered goods	By groups	Alone	Total	χ^2	significance
firewood	12 (23.4)	< 27 (15.6)	39	13.885	$p<0.01$
grass	12 (8.4)	> 2 (5.6)	14	3.857	$p<0.05$
food	33 (25.2)	> 9 (16.8)	42	6.036	$p<0.05$
Total	57	38	95		

* Figures indicate the number of gathering parties.

In the parentheses, figures indicate the expected values.

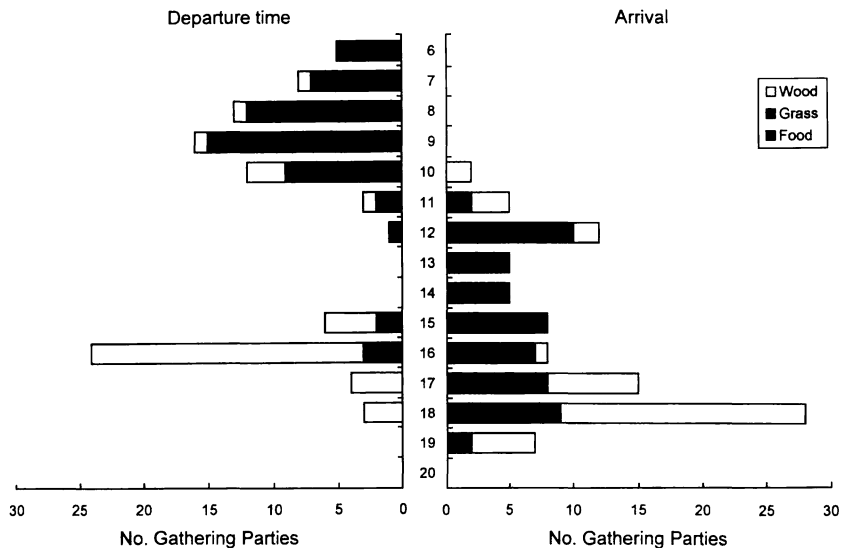


Fig. 4. Time for departure and arrival by gathering parties.

The above shows that short-time firewood collecting was done by individual gathering, while long-time food or grass gathering from the morning was done by group gathering.

TIME SPENT ON GATHERING

Efficiency

Did differences exist between individual gathering and group gathering in gathering amount or efficiency? Here, in order to verify the yield from gathering, weight value was employed for collecting only firewood and caloric value is employed for collecting foods, on which significance was tested respectively.

The relationship between gathering time and the gathered amount for firewood by individual gathering and group gathering was significant for the former ($r=0.739$, $n=27$, $p<0.01$), but not for the latter ($r=0.108$, $n=9$, n.s.) (Fig.5). That is, when one went firewood gathering, the longer the gathering time, the greater the amount gathered. On the other hand, when gathering in groups, they attained the 'goal amount' of around 25 kilograms in a short time but after this, more time did not necessarily increase the amount gathered.

For food gathering, the gathered amount was larger for group gathering than for individual gathering (Fig. 6). In individual gathering, the amount increased according to the time spent ($r=0.604$, $n=9$, $p<0.05$). But in group gathering, there was no correlation between amount and time ($r=0.125$, $n=30$, n.s.). This means that given the same time for gathering, group gathering was more efficient than individual gathering. However, for group gathering such efficiency was lost the longer the time spent in gathering.

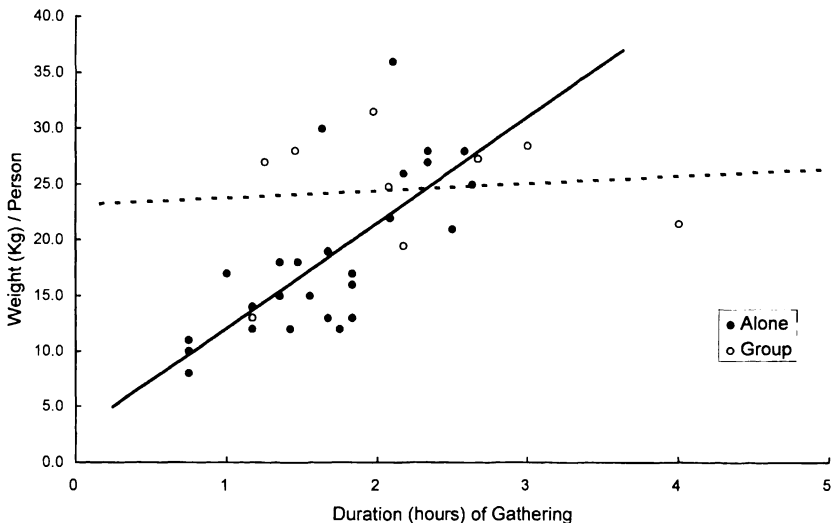


Fig. 5. Efficiency in collecting firewood.

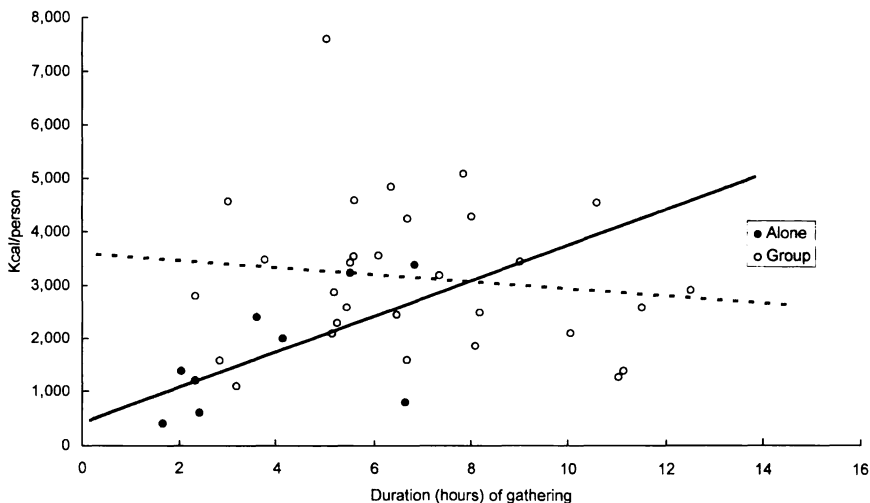


Fig. 6. Efficiency in collecting foods.

The efficiency for individual gathering and group gathering can vary by the target goods as well as total time spent for gathering.

Time Allocation in Food Gathering

I have already mentioned that the food gathering is done in groups, but how do they gather foods?

The targeted goods and place are determined beforehand and the parties leave the camp for the destination. Sometimes the women collect wild plants and rhizomes on their way.

When the women reach the gathering place, they decide to make their station under a large tree with a shade. They unload their burden and scatter for gathering. After collecting a certain amount, they carry these goods to the station and rest for a few minutes. This activity cycle is repeated several times with a break in between. When they finish gathering, they return to the station one by one to rest, eat, drink water, chatter and pass tobacco around .

During the break, they separate the edible parts from the non-edible, tie these goods with leather strings to pack up. After a full break and packing up, all stand up to leave. Usually, they continue to gather in several places.

After such series of gathering, the women go back to their camps. Since they have a load of 10 to 20 kilograms, they frequently take a rest in a shade, sitting down for several minutes with their packs unloaded. They often just stand under a tree with heavy packs carried on their back, supporting themselves with the digging sticks. Especially, during the day light hours in early summer, they sometimes rest until dusk.

When the women come to within 2 to 3 kilometers of their camps, they collect firewood. They pick up or snap off withered twigs, and when the total weight with the firewood reaches 20 to 30 kilograms, they walk back to their camps without any break.

Time allocation for moving, the gathering activities (picking up fruits and digging out rhizomes), and for resting (short break is included) is shown for 7 cases with different gathering goods (Fig. 7). Time for moving took from 1 to 4 hours. The farthest gathering place for a day trip, took 2 hours one way and the

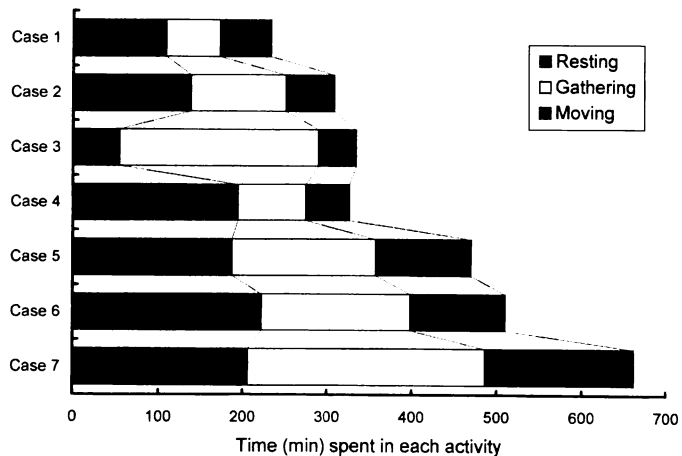


Fig. 7. Time allocation for gathering activities.

case 1. gather rhizomes and grass by 4 women

case 2. gather rhizomes and 'lṅṅ' melons by 2 women

case 3. gather green caterpillars by 2 women

case 4. gather 'ḥk'oō' leaves and 'kx'oam' berries by 11 women

case 5. gather 'qaā' melons and 'kx'oam' berries by 3 women

case 6. gather 'ḥk'oō' leaves, 'qaā' melons and 'kx'oam' berries by 7 women

case 7. gather 'lṅṅ' berries by 10 women

distance was less than 10 kilometers.

Since quite a long time is spent in moving, time spent for the gathering activity itself was unexpectedly short, namely, 1/3 to 1/2 of the total gathering activities, taking 1 to 3 hours.

Time spent on the gathering of 'ʰk'oō' leaves and 'qaā' and 'lṇaṇ' melons was relatively short but it took many hours to collect green caterpillars and fruits.

The rests taken halfway towards the gathering place and between the gathering added up to 1 to 2 hours. It is possible to say that the gathering activities were more than just the "labor" of walking to and from the camps and gathering. It is necessary to take a break to recover from the fatigue from "labor", and the women vary their resting time according to the intensity of the "labor". Even a short repose taken at the interval of the gathering activities is important for their mental refreshment and such activities as chattering, eating together, and passing around tobacco are clearly regarded as social activities.

The gathering of 'lṇone' on December 13 took a long time, over 11 hours of gathering time (example 7). It took as much as 4 hours for the gathering operation although the gathering itself was relatively easy with some patience required for snapping the twigs with fruits out of the trees and picking up fruits from the twigs under the tree. Also, since the women collect these fruits with their mouths, it can be inferred that a considerable amount of fruit is actually consumed during the gathering.

For December 13, the resting time was long, at 3 hours, including a nap for about half an hour altogether, to wait out the hottest time of the day. It seemed that women enjoyed themselves fully during time spent together under the tree, eating 'lṇone' fruits and rhizomes, passing around tobacco and water, talking and sometimes singing songs.

DISCUSSION

Why Do the San Women Gather Even Today?

What kind of effect does the sedentary life of more than 10 years have on the gathering activities by the Central Kalahari San? What are the changes in the gathering activities between the pre- and post-sedentarization for their thatching grass, firewood and food?

Building a new hut has come to require a lot of labor and manpower as people come to live in bigger and firmer huts. The size of huts in their nomadic era was 2 meters in diameter and about 2 meters in height (Tanaka 1980), but now it is about 3.8 meters in diameter and the floor size is 4 times as large as it used to be. Since huts have become larger, thicker and longer building materials are more needed. In order to build a hut, over 200 kilograms of building material are needed since wood and grass only help to fill the hut.

At present people live on corn, sorghum, and peas obtained through ration or purchase. Also tea with sugar came to stay in their diet as a way to satisfy hunger. All these foods require cooking and the change in their diet has

increased the necessity for firewood. In their traditional lifestyle, they used to eat food without heating and there used to be plenty of firewood around their camps, so collecting firewood required not much labor. Now firewood is needed to warm themselves and to cook.

In traditional gathering activities, food gathering constituted the major part, but now firewood collecting takes up more than 1/3 of the total activity. Women collect firewood everyday, when they happen to leave the camps for having a wash or visiting, not to mention on the way back to the camp from food gathering. Firewood has been exploited around the camps, and men sometimes go far with donkeys to collect firewood. Thus, securing firewood has become an urgent matter to maintain their daily life.

In the traditional collecting method, the women used to gather within the range of 5 kilometers around the camp. When food within this range had been exploited, they moved to a new place (Tanaka, 1980).

However, after sedentarization, the distance to the gathering place has doubled to about 10 kilometers at the maximum. Accordingly, the burden for one gathering trip has become greater and time for gathering has increased from 1 to 5 hours formerly (Tanaka, 1980) to 1 to 13 hours (5 to 7 hours were the most frequent).

Since the burden for the gathering activities has grown and corn flour became the major food, the frequency of food gathering has decreased from almost everyday (Tanaka, 1980; Silberbauer, 1981) to once in 3 to 5 days. The amount gathered per trip has decreased as well. For example, one family used to take in 20 kilograms of 'llnan' melons a day (Tanaka, 1980). Presently this amount has been cut in half to about 10 kilograms.

In contrast, the kinds of favored plant food have not changed very much. Even now, 10 out of 11 kinds of plants Tanaka (1980) cited as "major foods" or 9 out of 12 kinds of plants Silberbauer (1972) cited as "major importance" are utilized. Furthermore, their seasonal gathering method with minimum storage, and the cooking methods of wild plants, have not changed between the pre-and post-sedentarization.

The food gathering techniques have not changed either, and they still utilize only the digging sticks and leather wrappers. Recently, people have come to own donkeys (Osaki 1984), but women do not use them for their activities yet although it is possible for them to own animals. The conservative nature of women's gathering techniques is in marked contrast to that of men's hunting, where of horses, donkeys and dogs have been successively adopted (Osaki, 1984; Ikeya, 1989).

I believe that the present gathering activities by the San have the following significance. Firstly, firewood and building material have become more important than before because of sedentarization. Secondly, gathering wild plants are necessary to supplement the corn flour diet lacking vitamins. Thirdly, the gathering methods have not changed and people still prefer wild plants as foods.

I also hypothesize that the San carry on the gathering activities in order to confirm their identity. Shostak (1981) recorded the following remark by a !Kung San women.

“Milk and food from the garden are village foods. Even if we have enough in the village, we still go to the bush to get our food; our hearts yearn for the taste of it.”

Women of the Central Kalahari San also consider wild foods as “foods of ourselves”.

The new sedentary life and contact with the “external culture” represented by corn have made continuing their own daily life connected with land and season necessary to confirm their own culture.

The gathering activities also diversify the social lives of women. Sometimes, a woman who quarreled with someone was seen gathering alone, which she may have done in order to get away from the friction with others and to be alone.

Conversely, when the women go gathering by groups, they feel free among good friends. Whether going to have a wash in the bush away from the camps, or loosening their clothes afterwards, the women looked less reserved, singing and dancing. They go gathering with intimate friends from other camps and sometimes talk among each other at the gathering place about topics which are hard to talk about in their camps. Thus, gathering activities help ease the tension of social relationships caused in the sedentary life of the camps and to have a complementary quality to the life in the camps.

Why Do the San Gather by Groups?

The San women usually went gathering in groups of 2 to 4 people. Shoener (1971) has advocated three hypotheses for why foraging groups are formed. (1) To avoid carnivores by forming groups. (2) To better gather concentrated resources. (3) To enhance the foraging efficiency per individual. Now, I would like to add to the discussion of why the San go gathering by groups.

There are many poisonous animals lurking in the bush such as snakes and scorpions. There is a serious possibility of losing one's life to these dangerous animals. Therefore, the San kill snakes on seeing them, regardless of whether they are poisonous. Sometimes, such carnivorous animals as lions or leopards come close to the settlement. If people move in bush by groups, the chances are that even such animals may run away or someone in the group may notice the animal first. During the gathering activities, I have seen the San women club snakes to death with digging sticks.

Other than this, there is also danger of becoming suddenly ill or being wounded by an accident in the bush. Also, a person may get lost and have to wander about the bush without water. To prevent such an accident, the women form groups, especially for long-distance gathering trips.

I also observed that the San women change party size according to the concentration of goods. It was often the case that 3 to 4 people went gathering plants concentrated by geography or season, while 1 to 2 people went gathering sparsely distributed plants. However, the variation in distribution was little and it may be more appropriate to predict that women went gathering alone for firewood, and 2 to 4 people for foods.

The group size variation for firewood and food may be rooted in the traditional nomadic life of the San. When they lived a nomadic life, there used to be much firewood around their camps and an individual collected firewood when

necessary. Food gathering was done in groups even then, and Lee (1972), for example, reported the group size to be 3 to 5 people.

Collecting foods has another function, that is of snacking. The San women have minimal privacy in their daily life (Draper 1976). Eating, too, is mostly shared with others and it can be said that women go gathering together in order to eat together. Thus, the issue of group size is affected not only by the ecological distribution, but also by San culture.

Lastly, gathering by groups is usually more efficient than gathering alone. Winterhalder (1981) cited information exchange at a central place (in case of the San, it is their camp) as a potential advantage of foraging groups. It was often observed that in the San camp, when word spread that someone was immensely successful in gathering, others soon went gathering for the same goods, forming parties within several days. For example, since the gathering place for 'Inone' was distant from the camps and the harvest time was short, women tried to keep up on every news on 'Inone'. When they finally decided to go gathering, upon learning the ripeness of the fruits near their camps and hearing that someone had already gone gathering, a large gathering group of 9 people was formed at once. Then, three days later, a group of 10 people went gathering again, exploiting most of the fruit. Thus information is crucial in avoiding the risk of coming home in vain from a gathering trip.

There is a tendency that, with important information, more people are willing to take part in more reliable gathering activities. In food gathering, greater efficiency per person could be expected, the larger the party size became, and on average, the most efficient group size was 4 people. However the group size of 2 people was most frequently formed. It is difficult to assert at this point that, like as hunting, people adjust the group size to maximize the efficiency per person (Smith, 1981; Ichikawa, 1986). Rather, many people take part in such gathering activities that can expect a large harvest amount. Therefore, perceived reliability, based on new information, may be becomes the most important factor in deciding group size, and the women exchange such crucial information through chattering and other socializing in the camp.

In general, less efficiency could be expected within longer hours they spent on gathering. However, groups are what enabled the women to continue gathering in a long and inefficient gathering trip. Passing around tobacco, chattering, singing songs and eating were thus indispensable in such trips.

In San society, labor and leisure are intertwined (Tanaka, 1987-b). In gathering activities as well, such secondary activities as conversation and passing around tobacco have just as important a function as the major activity of actual gathering, and the San women easily shift their attention between primary and secondary activities.

Also the gathering activities are social as well as determined by ecological factors and confirming their cultural identity. In this respect, the gathering activities indicate diverse significance. Thus, the gathering activities are multi-dimensional phenomena (Bird-David 1992). I hope to elaborate further the social dimension of the gathering activities in the near future.

REFERENCES

- Bird-David, N. 1992. Beyond "the original affluent society": A culturalist reformation. *Current Anthropology*, 33: 25–47.
- Draper, P. 1976. Social and economic constraints on child life among the !Kung San. In (R. B. Lee & I. Devore, eds.) *Kalahari Hunter-Gatherers: Studies of the !Kung San and Their Neighbors*, pp. 199–217, Harvard Univ. Press, Cambridge.
- Ikeya, K. 1989. Hunting activity among the Central Kalahari San: about the hunting with dog (in Japanese). *Kikan-Jinruigaku*, 20 (4): 284–332.
- Ichikawa, M. 1986. Ecological bases of symbiosis, territoriality and intra-band cooperation of Mbuti Pygmies. *Sprache und Geschichte in Afrika*, 7-1: 161–188.
- Lee, R. B. 1968. What hunters do for a living, or how to make out on scarce resources. In (R. B. Lee & I. Devore, eds.) *Man the Hunter*, pp. 30–38, Aldine, New York.
- 1972. The !Kung Bushmen of Botswana. In (M.G. Bicchieri, ed.) *Hunters and Gatherers Today*, pp. 326–368, Holt, Rinehart and Winston, New York.
- 1979. *The !Kung San: Men, Women, and Work in a foraging Society*. Cambridge Univ. Press, Cambridge.
- Marshall, L. 1976. *The !Kung of Nyae Nyae*. Harvard Univ. Press, Cambridge.
- Osaki, M. 1984. The social influence of change in hunting technique among the Central Kalahari San. *Afr. Stud. Monogr.*, 5: 49–62.
- 1990. The influence of sedentism on sharing among the Central Kalahari Hunter-gatherers. *Afr. Stud. Monogr. Suppl.* 12: 59–87.
- Schoener, T. W. 1971. Theory of feeding strategies. *Ann. Rev. Ecol. Syst.* 2: 369–404.
- Shostak, M. 1981. *Nisa: The Life and Words of a !Kung Woman*. Harvard Univ. Press, Cambridge.
- Silberbauer, G. B. 1965. *Report to the government of Bechuanaland on the Bushman survey*. Bechuanaland Government, Gaborone.
- 1972. The G/wi bushmen. In (M. G. Bicchieri, ed.) *Hunters and Gatherers Today*, pp. 271–326, Holt, Rinehart and Winston, New York.
- 1981. *Hunter and Habitat in the Central Kalahari Desert*. Cambridge Univ. Press, Cambridge.
- Smith, E. A. 1981. The application of optimal foraging theory to the analysis of hunter-gatherer group size. In (B. Winterhalder and E. A. Smith, eds.) *Hunter-gatherer Foraging Strategies*, pp. 36–65, The Univ. of Chicago Press, Chicago.
- Steward, J. H. 1955. *Theory of Culture Change*. Univ. of Illinois Press, Urbana.
- Tanaka, J. 1976. Subsistence ecology of Central Kalahari San. In (R. B. Lee and I. Devore, eds.) *Kalahari Hunter-Gatherers: Studies of the !Kung San and Their Neighbors*, pp. 98–119, Harvard Univ. Press, Cambridge.
- 1980. *The San, Hunter-Gatherers of the Kalahari: A Study in Ecological Anthropology*. Univ. of Tokyo Press, Tokyo.
- 1987-a. The recent changes in the life and society of the Central Kalahari San. *Afri.Stud.Monogr.*, 7: 37–51.
- 1987-b. Social participation of children among Bushman (in Japanese). In (K. Iwata, ed.) *Children' Culture of the World*, pp. 96–113, Sogen-sya, Tokyo.
- Winterhalder, B. 1981. Optimal foraging strategies and hunter-gatherer research in anthropology: theory and models. In (B. Winterhalder and E. A. Smith, eds.) *Hunter-gatherer Foraging Strategies*, pp. 13–35, The Univ. of Chicago Press, Chicago.
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Appendix 1. Plants eaten by the Central Kalahari San¹

Scientific name	!Gui name	Used part	Observation 3
Agavaceae			
<i>Sansevieria aethiopica</i> Thunb.	!gui	root	
Amaranthaceae			
* <i>Amaranthus thuurretii</i> Moq.	‡?ore, ‡kabere	leaf	X
Asclepiadaceae			
<i>Brachystelma</i> sp.	!lkara	root	
<i>Brachystelma</i> sp.	!lgao	root	
<i>Brachystelma</i> sp.	!lk'ore	root	X
<i>Caralluma knobelii</i> or	gyiagyiaba	stem	
<i>C.lutea</i> N.E.Br	gyiagyiaba	stem	
<i>Huerniopsis decipiens</i> N. E. Br.	!lqx'aya	stem	
<i>Pergularia daemia</i> (Forsk.) Chiov.	naahari	leaf, stem	
<i>Raphionacme burkei</i> N. E. Br.	bii	root	
* <i>Tenaris schultzei</i> (Schltr.) Phill.	!lgao	bulb	X
Apocynaceae			
<i>Strophanthus</i> sp.	‡keba	root	
Boraginaceae			
<i>Ehretia rigida</i> (Thunb.) Druce	!lgaa	berry	
Burseraceae			
<i>Commiphora africana</i> (A. Rich.) Engl.	zaā	root	X
<i>C. angolensis</i> Engl.	!kana	root	
<i>C. pyracanthoides</i> Engl.	!?uu	root	
* <i>C. mollis</i> (Oliv.) Engl.	!koro	berry	
Capparidaceae			
<i>Boscia albitrunca</i> (Bruch.) Gilg and Ben.	!none	berry, leaf	X
Combretaceae			
<i>Terminalia sericea</i> Burch. ex DC.	!gaa	leaf	X
Compositae			
* <i>Kleinia longiflora</i> DC.	!lk'aabere	leaf, stem	X
Cucurbitaceae			
<i>Acanthosicyos naudiniana</i> (Sond) Jeffrey	qaā	fruit, seed	X
<i>Citrullus lanatus</i> (Thunb.) Matsumura & Nakai	!lnān	fruit, seed	X
<i>Coccinia rehmannii</i> Cogn.	!kaā	root	X
<i>Corallocarpus bainesii</i> (Hook. f.) A. Meeuse	!heregu	leaf, stem	X
* <i>C. triangularis</i> Cogn.	‡gei	leaf	X
<i>Cucumis anguria</i> L.var.	‡nham‡nhorogu	fruit	X
<i>longipe</i> (Hook. f.) A. Meeuse			
<i>Cucumis kalahariensis</i> A. Meeuse	!?om!?e	root	X
<i>Kedrostis foetidissima</i> (Jacq.) Cogn.	tuu na gyie	leaf	X
* <i>Momordica balsamina</i> L.	!?aa!?aru	berry	
Euphorbiaceae			
<i>Cephalocroton mollis</i> Klotzch	‡nenagu2	tuber	
Leguminosae			
<i>Acacia erioloba</i> E. Mey	!lkara	gum	X
<i>A. erubescens</i> Welw. ex Oliv.	‡gare	gum	X
<i>A. fleckii</i> Schinz	!qx'an!lkane	gum	X
<i>A. hebeclada</i> DC. subsp. <i>hebeclada</i>	!lnaa	gum	

Appendix 1. (cont.)

Scientific name	Gui name	Used part	Observation 3
<i>A. luederitzii</i> Engl. var. <i>luederitzii</i>	!goō	gum	X
<i>A. mellifera</i> (Vahl) Benth. subsp. <i>detinens</i> (Burch.) Brenan	!lqx'oa	gum	X
<i>A. nebrownii</i> Burt Davy	!l?ari	gum	
<i>Albizia anthelmintica</i> (A. Rich.) Brongn.	kx'eru	gum	
<i>Bauhinia petersiana</i> Bolle subsp. <i>serpae</i>	‡nan‡ke	bean	X
* <i>Hoffmannseggia burchellii</i> (DC.) Benth. ex Oliv. subsp. <i>burchellii</i>	‡?ee com	root	X
* <i>Tephrosia purpurea</i> (L.) Pers. subsp. <i>leptostachya</i> (DC.) Brummitt var. <i>leptostachya</i>	k'aē tsoo	root	X
<i>Tylosema esculentum</i> (Burch.) Schreiber	!xoi, !kam	bean, root	X
<i>Vigna oblongifolia</i> A. Rich.	!xane	root	
<i>Vigna</i> sp.	kare!kazuru2	bean	
Liliaceae			
<i>Aloe littoralis</i> Bak.	!lgoru	leaf	X
<i>A. zebrina</i> Bak.	!lgoru	leaf	X
<i>Dipcadi marlothii</i> Engl.	!gom2	bulb	
<i>Dipcadi viride</i> (L.) Moench	!nau!kari2	bulb	
* <i>Dipcadi</i> sp.	‡k'oō	leaf	X
* <i>Dipcadi</i> sp.	!gara	leaf	X
* <i>Dipcadi</i> sp.	!l?aa gubo	bulb	X
<i>Eriospermum</i> sp.	!lkoō !?uru	bulb	X
<i>Ledebouria apertiflora</i> (Bak.) Jessop	quare	bulb, leaf	X
<i>Ledebouria</i> sp.	coō	bulb	X
<i>Ledeibouria</i> sp.	!lgama	bulb	X
<i>Ornithogalum</i> sp.	‡agubu2	root	
Loganiaceae			
<i>Strychnos cocculoides</i> Bak.	!gua	fruit	
Malvaceae			
* <i>Sida ovata</i> Forssk.	‡nhenagu	berry	
Ochnaceae			
<i>Ochna pulchra</i> Hook.	!kara	berry	X
Olacaceae			
<i>Ximenia americana</i> L.	!gebi ‡?oori	berry	X
<i>X. caffra</i> Sond. var. <i>caffra</i>	‡?oori	berry	X
Orchidaceae			
<i>Eulophia hereroensis</i> Schltr.	‡qaoguna	root	
Polygonaceae			
<i>Oxygonum alatum</i> Bruch.	‡nao	leaf, stem	X
* <i>O. delagoense</i> Kuntze	gue ‡nao	leaf, stem	X
Portulacaceae			
* <i>Talinum arnotii</i> Hook. f.	!lgabe	leaf, stem	X
<i>T. crispatum</i> Dinter	!lgabe	leaf, stem	X
<i>T. tenuissimum</i> Dinter	gyem ‡k'abugu	leaf, stem	
Rhamnaceae			
<i>Ziziphus mucronata</i> Willd.	‡qx'aro	berry	X

Appendix 1. (cont.)

Scientific name	!Gui name	Used part	Observation 3
Solanaceae			
<i>Solanum catombelense</i> Peyr.	manchu2	leaf, stem	
* <i>S. coccineum</i>	tshabera	berry	
Sterculiaceae			
* <i>Melhania burchellii</i> DC.	!qx'ori qx'ao	root	
Terfeziaceae			
<i>Terfezia sp.</i>	khuuts'i	truffle	X
Tiliaceae			
<i>Grewia avellana</i> Hiern	!noo#kuri	berry	X
<i>G. flava</i> DC.	kx'oam	berry	X
<i>G. flavescens</i> Juss.	!kore	berry	
<i>G. retinervis</i> Burret	!lqane	berry	X
Verbenaceae			
<i>Clerodendrum uncinatum</i> Schinz	gyuag!la2	berry	

1. This appendix was made based on 60 speices from Tanaka (1980: 56-57)'s list. !Gui name was collected and phonetic notation of these !Gui name was made by Imamura-Hayaki. 16 speices (with*) were newly gathered by me. And they were identified by Mrs. L. Fish of the Botanical Research Institute, Pretoria, South Africa.
2. !!Gana name (Tanaka, 1980).
3. Species confirmed to be eaten by direct observation.

Appendix 2. Plants utilized for firewood and huts by the San*

Scientific name	!Gui name	Use
Gramineae		
<i>Eragrostis lehmanniana</i> Nees var. <i>lehmanniana</i>	!k'oo!k'obu	thatching
<i>E. pallens</i>	!ʔoba	thatching
<i>Stipagrostis</i> sp.	!k'ao	thatching
Capparidaceae		
<i>Boscia albitrunca</i> (Burch.) Gilg & Ben.	!none	huts, firewood
Combretaceae		
<i>Terminalia sericea</i> Burch. ex. DC.	!gaa	huts, firewood
Leguminosae		
<i>Acacia erioloba</i> E. Mey	!lqx'ara	huts, firewood
<i>A. luederitzii</i> Engl. var. <i>luederitzii</i>	!goō	firewood
<i>A. mellifera</i> (Vahl) Benth.	!lqx'oa	huts, firewood
<i>Albizia anthelmintica</i> (A.Rich.) Brongn.	kx'eru	firewood
<i>Lonchocarpus nelsii</i> (Schinz) Schinz ex Heering	!lxamts'a	huts
Tiliaceae		
<i>Grewia flava</i> DC.	kx'oam	huts
Ochnaceae		
<i>Ochna pulchra</i> Hook.	!kara	huts, firewood

* Identified by the Botanical Research Institute, Pretoria, South Africa.