PILOT ACTIVITIES RELATED TO THE USE OF GRASSES AS SOURCE OF HUMAN FOOD

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SUMMARY

The study on grasses as source of human food has been carried out in collaboration with four national NGOs operating in western Sudan. Its aim is to document the variety of plants, their distribution and adaptation, utilization for food or other purposes and socio-economic aspects related to management of sites where they grow and the roles of different members of the H/H in their collection, treatment, preparation for consumption and marketing.

Reference has been made to the wide range of plant species used as non-traditional food (NTF) and that some have become important items of local trade. Their utilization is not confined to periods of emergency but even in normal times most of the NTF species are important items in rural and particularly pastoral household diet. Many of these NTF species are also valuable forage plants and have an appreciated role in traditional medicine. Although different members of the H/H have their contribution, the study confirmed previous findings of the important and leading role of women in all processes from collection to marketing of NTF. These products also contribute to rural H/H income particularly women. Products from trees play a prominent role in this respect. Since most of NTF plants grow on communal land their tenure rights needs to be carefully settled. Traditional institutions and regulations would be the most suitable starting point to arrive at an acceptable and viable arrangement for this issue.

Unfortunately the role of NTF species and associated indigenous knowledge has not been integrated into rural development efforts. In addition there are worries about the loss of such knowledge and experience as the contacts between old and young generations are becoming weaker and the rapid social and demographic changes will disrupt the normal passage of knowledge to young generations.

Some recommendations were made including:

- Adoption of coordinated and integrated development planning approach in which local communities and their indigenous knowledge play a leading role.
- Continuation of the work initiated to cover identification of more NTF species, monitoring growth, production and impacts of various factors affecting these species.
- Settlement of tenure rights and enhancing community participation in the conservation and development of NTF species.
- Promotion of and providing support to establishment of income generating activities for women groups.
- Increasing awareness about the value and benefits accrued from NTF species, promotion of their sustainable use and conservation of their genetic diversity.
- Launching an integrated project for management of NTF plants in pastoral and agricultural systems.

LIST OF ACRONYMS

ARC: Agricultural Research Corporation
CBOs: Community-based organizations
FAO: Food and Agriculture Organization of the United Nations
FNC: Forest National Corporation
H/H: household
IDPs: internally displaced population
LOAs: Letters of Agreement
NGOs: non-governmental organizations
RPA: Range and Pasture Administration

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1. INTRODUCTION

1.1 General. This study on Pilot Activities Related to the Use of Grasses as Source of Human Food has been carried out to coordinate the documentation for the preparation and realization of a publication on Kreb and set up pilot activities related to the following:

- Collection of information in different ecosystems.
- Selection of pilot sites to initiate activities for in situ conservation.
- Establishment of links with ARC Plant Genetic Resources Unit to identify the possibility of ex situ conservation of selected Kreb species.

In addition the consultant will realize and coordinate with Sudanese NGOs documentation of grass species used in the Sudan for food production, their geographical distribution, present status of conservation, different uses, harvesting and management methods, and trade. This documentation will cover ecosystems as fallows, rangelands and grasslands as well as inundated plains.

The study was conducted during the period 4 August-31 December 2003. The approach followed to carry out this task is outlined in section 1.2 below.

1.2 Arrangements Made. Initially a brief introduction of the subject was prepared to form the basis for discussions with the selected four national NGOs: (i) Al Massar Charity Organization for Nomads Development and Environmental Conservation (MONEC, West Darfur State) (ii) Mandy National Charity Association (MANCHA, South Kordofan State) (iii) Sudanese Environmental Conservation Society, Al De'in Branch (SECS, South Darfur State) and (iv) Sudanese Mothers for Peace and Development (West Kordofan State). This introduction covered background information on non-traditional foods (NTF) in the Sudan, objective of the study, expected outputs, proposed activities, FAO contribution and reporting. Based on this introduction the FAO Representative in the Sudan was briefed about the study seeking his support to the consultant's visits to selected states, contacting states authorities and collaboration of FAO field staff located in some of the targeted locations.

Several meetings were held with national NGOs to discuss the goals of the study, their participation and roles. This was followed by drafting letters of agreement (LOAs) for signature by FAO Representative and the authorized officials of the collaborating NGOs. The terms of reference for the socio-economist were prepared and discussed with him together with the goals and activities of the study. The socio-economics questionnaire was reviewed then discussed with representatives of collaborating NGOs and selected collaborators in the field (Kadugli and Nyala).

Preliminary contacts were made with the Agricultural Research Corporation (ARC) in Wad Medani to identify their possible collaboration in ex situ conservation of germplasm of some of the targeted grass species.

1.3 Rationale and Objective. Increasing poverty especially in rural areas, sharp fluctuations in rainfall and the large expanses of land affected by land degradation emphasize the need for hardy species and survival plants that can grow in marginal lands, low fertility soils and habitats unsuitable for conventional crops. In addition

there is increasing interest and efforts to avoid the loss of germplasm of plant species as a result of recurrent droughts, mis-use of resources and land degradation. The alarming trend of rural-urban migration, the increasing disintegration of social fabrics of rural communities due to various factors, and the disruption of gradual processes of transfer of indigenous knowledge and experience from one generation to another threaten this wealth of information which may partially or totally be lost.

Darfur and Kordofan regions of western Sudan selected for conducting this study were among the worst parts of the country stricken by the Sahelian drought, particularly during 1984 and 1990. The selection of four states (Table 1) in these regions was based on the following aspects:

- Grasses and other plants that form part of the natural vegetation cover are traditionally utilized in various ways as human food.
- The two regions are affected by droughts, desertification and famines.
- They traditional pastoral and small holder farming communities.
- Remoteness and difficult accessibility either seasonally or through out the year.
- Marginalization of rural communities and fewer shares of development efforts.

The overall objective of this study is to enhance the sustainable use of native plants as human food by local communities, particularly poor rural households, thus improving their food security. The specific goal is the documentation of the native plant species used in the Sudan for food production, their other uses, their geographical distribution, present status of conservation, harvesting and management methods, and their marketability. The study also aims to draw attention to the present utilization of these species and their future potential.

Table1. States Included in the Study and Tribes Encountered in Sites Covered

State	Tribes in the Study Sites
South Darfur	Beni Halba, Fellatah, Habania, Rizeiqat, Taisha
West Darfur	Fur, Masaleet, Beni-Hussein, Rizeiqat, Taisha
South Kordofan	Ajang,Ama, Finda, Gulfan, Hawazma, Karungo
West Kordofan	Meseiria, Dajo, Nuba

2. NON-TRADITIONAL FOODS IN THE SUDAN

A wide range of plant species including trees, shrubs, forbs and grasses are utilized as non-traditional, emergency and seasonal food in different parts of the Sudan (Annex 1). These species make appreciable contribution to human nutrition and rural household income. Some NTF are consumed in both normal and drought years while some are utilized during droughts and critical food shortage periods. Leaves, fruits, seeds or roots are collected and treated in various ways then consumed. Leaves are used as salad or cooked in a manner similar to spinach. Fruits are consumed fresh or dry, and some types

are treated and prepared in different ways to produce porridge, cake, jam or drinks. Seeds (grains) are ground then used to produce porridge or a sort of local bread. Roots are boiled then consumed or soaked repeatedly in water to get rid of undesirable taste or substances, dried, ground and used to prepare "Asida" (Annex 2). Several of these plant products are important items of traditional medicine. Some have entered local and national trading activities as for instance "Quonqlaiz", "Nabaq", "Aradeib", "Qudeim", "Dome" and "Laloab". These products form an important source of income for small holders and rural households particularly in the event of crop failure. This type of utilization should be guided and encouraged when compared to the undesirable activities of fuel wood collection and cutting of trees and cultivation of marginal lands widely practiced by rural households especially the poor.

Perennial and annual grasses have significant potential as source of food, forage and other benefits (enhancing ecosystem processes in aquatic habitats, soil binding, medicinal value and as raw material for rural crafts). Prominent among these are species of Brachiaria, Cenchrus, Dactyloctenium, Ecchinochloa and Oryza. Oryza "Ruz Alwadi" is considered as a prestigious type of food and is more expensive than millet. Al-Tunisi as early as 1845 or earlier referred to importance of grasses as food in Darfur: "In Fur land there is a kind of rice that grows naturally in ponds and swamps that is collected and cooked with milk as a delicacy. They also have Difra (Echinochloa colona) grains similar to rice but flattened and whitish in colour which people like more than rice."

Rottoebellia exaltata:
This perennial tall grass is part of the vegetation of the Acacia seyal-Balanites savanna alternating with grass areas (700mm/annum). It grows on wetter parts of this zone on dark clay soils. In southern Sudan women go out in groups to collect grains of this species after they dry and fall on the ground. Some of the grains are collected by ants. Collected grains are taken home where they are pounded in "Funduk", soaked in water then pounded again to obtain flour. The flour is subsequently used to prepare "Asida" which is consumed with milk, "Moulah" or fish. When grains fallen on the ground are exhausted women fetch them from ants mounds.

The Sudan Biodiversity Country Study Report, published by the Higher Council for Environment and Natural Resources in collaboration with IUCN in April 2000, has listed several wild food species utilized by local communities in Darfur region. Wild okra (Ablemoschus sp.) is both collected and grown in rain-fed areas. The pods are usually dried, ground and used as vegetable powder. Cucumis melo var. argestis grows wild and is some times cultivated. Other wild plant species including Momordica balsamina, Sonchus cornatus, Gynandropsis gynandra, Solanum nigrum, Farsetia streopetra, Chenopodium murale, Portulaca oleracea and Corchorus sp. are used as leafy vegetables.

Collection and utilization of NTF is an important coping mechanism and a common strategy adopted by rural populations during seasons of plenty as well as periods of stress and scarcity. They are particularly important for pastoralists who utilize remote areas, have better knowledge about native plants and who play a major role in collection. For these groups grains from naturally growing grasses have traditionally been an important source of food. Several other species provide in situ source of food for pastoralists while they are tending their herds. Although increasing numbers of pastoralists have also reverted to cultivation as a secondary activity to meet H/H cereal requirement yet many, who still maintain their traditional mobility, rely more on native grasses and other sources

of NTF to meet a reasonable share of their needs. Resorting to collection of these foods produced by natural vegetation growing in nearby or distant habitats has been widely practiced during normal or emergency periods. During the recent droughts of 1984 and 1990 such sources of food were found to contribute significantly to population diets particularly poor households. Resorting to NTF helped some rural populations and pastoralists to survive food shortage and famine resulting from these droughts. Several sources have indicated that such foods had a greater impact on survival of rural populations in regions such as Darfur and southern Sudan. El-Bashir (1994) stressed on the fact that since 1984 severe drought NTF has assumed increasing importance in rural Darfur. The contribution of NTF was greater than that provided by relief operations. Reference has been made to the use of "Koreib" or Kreb as an emergency food during the siege of El-Obeid in Kordofan by Al-Mahdi army in 1883. During the 1970s (the beginning the Sahelian drought) "Koreib" was served as one of the main dishes during an official invitation organized by the governor of Darfur for a high level delegation from Khartoum. A witness of the occasion referred to the appreciation and acceptance of the dish which has been relished by the delegation.

Brachiaria obtusiflora "Koreib"

This grass is also known as "Um Chir". It grows on alluvial, sand clay and clay soils in areas with rainfall 400mm/annum and above. It is common in rangelands where its grains can be collected freely but also on private land where permission from farm, orchard or scheme owner is required before outsiders are allowed to collect the grains. It is an important forage plant well appreciated by pastoralists as grazing material for their herds. In West Darfur Brachiaria xantholeuca is known as "Koreib Umdifera". In this State "Koreib Umdifera" grows close to the water edge on the moist clay soils of "Hafir Adar". The densest stands were located along the part of the "Hafir" inundated immediately after the rainfall season starts and which dries out shortly after that. Seed heads are harvested then threshed to separate the grains. When grains are dry enough some is stored and part is ground. The resulting flour is used to prepare "Asida" or "Madida" with milk.

The fruits of Boscia senegalensis "Mukheit" are widely used as non-traditional food in western Sudan. Its value as an important source of food during emergencies and periods of scarcity has been mentioned by Al-Tunisi (1965). It has saved life during 1984 drought and alleviated the suffering of communities during the 1990 poor rainfall season when harvest failed.

Boscia senegalensis "Mukheit"

This is an evergreen shrub that grows in the Semi-desert and Low Rainfall Savanna zones of the country. It is found growing on "Wadi" floor into the northern limits of the former Zone where rainfall is around 100mm/annum. Women are the ones responsible for most of the work of collection, treatment and preparation of food from "Mukheit". They may spend few days away from home to collect "Mukheit" fruits from distant habitats. The fruits are collected, dried under the sun, pounded to remove the outer coat then treated by a series of soaking in water to get rid of bitterness and undesirable substances. Soaking may continue for 2 to 7 days depending on the frequency of changing water. The seed is boiled with water, some times local potash may be added before boiling then soaked in cold water to remove the potash. They are then salted and consumed with or without "Samn/Ghee". "Balila" is prepared from "Mukheit" seeds which are boiled with salt and oil until they become soft then consumed. Alternatively the dried seed is ground by "Murhaka" to obtain flour which is made into "Asida",

"Qorrassa" or "Kisra". Some times the flour is mixed with that of sorghum to improve its taste.

The leaves which are rich in starch are macerated in water for a few days then sun dried, pounded and cooked with "Samn/Ghee".

There are worries that the valuable information about and experience of handling these foods, normally passed from one generation to another, is likely to be lost with time. Rural- urban migration, migration to irrigated agricultural areas, disintegration of social ties, increasing dependence on other sources of food and local conflicts and insecurity are among the reasons that may accelerate this unfortunate trend. In South Kordofan the internal conflict that inflicted the State for several years has resulted in loss of lives, weakening of social fabrics and loss of contact and interaction between generations thus disrupting the normal flow of traditional knowledge and experience from old to young generations. In addition the relatively long period without a severe drought and sharp food deficits made people particularly young generations less knowledgeable about plants that can be used as emergency food.

Food security as an issue was not of concern in the Sudan until the occurrence of the 1984 drought and the resulting famine that devastated large areas of the country. Since food security came into focus, it revealed the wealth and traditional knowledge about local sources of NTF. As a consequence it became clear how vital these foods have been during years of drought and the harsh episodes of hunger when normal sources of food became deficient.

Although NTF are important, yet their full utilization is far below their real potential. This is attributed to the fact that government planning lacks the application of bottom up approach which encourages the collaboration of communities in sustainable utilization of resources and enhancement of agricultural production systems. A study on adaptation to living under the arid conditions of Dar Zaghawa in North Darfur proposed integration of traditional conservation measures of natural resources into agricultural interventions targeting the improvement of livelihoods of local communities. The study concluded that integration of Zaghawa botanical and water resources indigenous knowledge and techniques could bring more lasting results than those introduced from outside.

3. FINDINGS AND CONCLUSIONS

3.1 Findings

3.1.1 Socio-economic Aspects

Several reports referred to socio-economic aspects related to the collection and utilization of grasses and other plants products and their role as food source for human beings during emergencies and normal periods. A major finding denotes the primary and leading role of women in this respect. "Food substitutes and famine foods are known and located by women to process, prepare and store away for appropriate use and time" (Mustafa, 1995). This is in line with the potential role women can play in sustainable management of natural resources for household and community food security in drought prone areas. Women's coping mechanisms to confront environmental degradation are direct and indirect management of resources for the ultimate goal of food production (Mustafa, 1995). Women make better use of naturally occurring (non-cultivated) plants than men. The latter role in providing food for the household is concentrated on hunting, harvesting

some tree products and the best of cultivated crops. Women draw most of their plant material requirements (for food, fibre and medicinal purposes) from naturally growing plants. In many areas women drive almost half of their income from these plants. Children particularly girls participate in collection and in South Kordofan contribute to marketing.

El-Bashir (1994) reported that "wild food consumption in rural Darfur varies as a function of location as well as among households and ethnic groups". He stated that such food is gradually assuming its position in the local socio-economic fabric. He drew attention to the early indications that this practice is being absorbed in the local tenure system based on "Hukra" and individual ownership of plots. Rules prohibiting cutting trees that provide NTF are set by some villages. This is also true for trees as Tamarindus and Adansonia in Kordofan.

In this study, and in addition to the background information generated from reviewing literature, the approach used included the following: (i) a questionnaire designed for conducting a brief survey on the socio-economic aspects of NTF in use (ii) focus group discussions (iii) interviewing community leaders, elderly and females and (iv) market surveys. The questionnaire targeted collection of information from rural market places in selected States where NTF are known to be in use by the local population. In most cases focus group discussions (FGD) were held with key informants including women who are active in collection of non-traditional foods, traders of these items and those living in the proximity of sites where these species grow and where the potential exists for the introduction of some interventions. The FGD were semi-structured and employed the following guidelines:

- Introduction of the purpose of the survey.
- Distribution of grasses used as source of non-traditional food.
- Use of these types of food by different members of the community.
- Preparation, cooking and preservation of these foods.
- Seasonality of production and availability.
- Marketing and exchange of these items in the local economy.

Market places are chosen as end points for the products, on the assumption that such places attract a large number of customers which facilitates a wide generation of information, allows assessment of the economic value of the products as entering trade and build a picture of the contribution of this form of production to household food support.

The items investigated by the questionnaire covered:

- State and village market places
- Inventory of NTF products found in the markets
- Persons trading the products
- Quantities reaching the market

- Other kinds not reaching the market (if any)
- Prices of products by quantity and products
- Ways products are used (eaten fresh, prepared as stew, mixed with other food items, etc)
- Motives behind use in specific years
- Tenure rights over resources of products- communal/private
- Ecological categorization- as permanent, seasonal and coverage.
- Hazards affecting continuity and productivity of plants
- Degree of community awareness of the benefits and importance of the products
- Population segment directly involved in the handling of production and marketing
- Size of employment and level of income derived from engagement in the production activity
- Community perception of people dealing with wild plants, in collecting, marketing and consumption.

The questionnaire was applied in the four Sates covering about ten market places.

Adopting the above check list of the topics contained by the questionnaire and the information gathered during field visits the results obtained are analyzed as follows:

Inventories of Plants Used for NTF Products

The inventories obtained denote two types of plants from which these products are obtained. The first is of wide national use, as being not limited to the area of survey, but of popular consumption in the different parts of the country, and by the different population segments in rural and urban areas. This is represented by the fruits of certain trees including "Laloab", "Quonqlaiz", "Qudeim", "Nabaq" and "Aradeib". While the national use of the above five trees is limited to the consumption and/or processing of their fruits, we find that, and specific to the areas surveyed, other than their fruits the local population derives additional foods from three of them:

a. Balanites aegyptiaca "Hejleij" with the kernel extracted, eaten fresh or boiled and in some areas (e.g. North Kordofan State) pressed using traditional camel driven pressers to produce edible oil (of low quality) for use in food in bad crop years. Also the green leaves of the tree are cooked and consumed. In 1998 a large population displaced from the South in Mujlad area (West Kordofan State), were mostly dependent on the kernels for daily food.
b. Andansonia digitata "Tabaldi" tree producing "Quonqlaiz" the bush leaves of the tree are collected, chipped and mixed with sesame or peanut butter and eaten as a salad which is locally known as "Afoos".
c. Tamarindus indica "Aradeib" the pods are collected green, boiled, salted and eaten as a kind of salad.

The second is an array of indigenous plants of confined use to the areas surveyed, mostly of herbaceous species. These can be classified according to the product derived from them; i.e. seeds, leaves, roots and fruits.

In the majority of cases, members of the household collecting these foods are found to be women and young girls, with men seldom engaging in the activity except in the collection of fruits of some of the previously mentioned trees and in years of severe food shortage, and being limited to items substituting starch foods. The amount gathered are generally small and mainly for household consumption, with the surplus for those looking for additional income taken to the market. By essence the following activities fall under the women domain:

- taking to the market of fresh eaten products,
- drying for most of the leafy and some of the root products,
- fermented and processed into balls specifically "*Kawal*",
- bleached by repeated soaking and boiling, specifically "*Mukheit*",
- grinding into flour of some of the grains in use; and
- cooking for preparation into food.

Hence, future work for the promotion of the production and processing of NTF is by essence to target mainly the female population in the communities, where such foods are in use.

Cassia obtusifolia "Kawal"

This is a perennial leguminous herb which grows on different types of soil particularly sandy clays. It grows in dense clusters of unpalatable deep green vegetation. Its density may range from 15 to 20 plants per square meter. Green leaves of this plant are harvested by women and are then fermented underground in the absence of air for about one month. The fermented material is made into small balls then dried under the sun. It normally has an unpleasant odour. The dry material is then added, as an appetizer, to other ingredients to prepare "Moulah". Some poor H/Hs use "Kawal" as a substitute for "Sharmout" to prepare "Moulah". The dry "Kawal" balls are a common commodity in the local markets of western Sudan and sells for about $2/kg.

Marketing

With the exception of products of national use, namely the fruits of the four previously mentioned trees, the quantities of the other products sold to other members of the community or traded at the local markets are generally very small, for a number of reasons including:

- food habits, not all the population of the surveyed areas regularly consume NTF,
- seasonality of production, the fresh types are only available as of mid-rainy season, through the harvest time,
- the seed quantity gathered from some plants like "Haskaneit", "Abu Asabei", "Um Chir", "Al Beyeid" and "Mukheit" are usually small, for the difficulty of collection and their targeting as emergency foods by those householders experiencing shortage in starch foods; and for the limited number of species that may be gathered, dried and stored for prolonged use like "Ruz Alwadi", wild okra and "Abadeib".

Dactyloctenium aegyptium "Abu Asabie"

This is an annual grass that grows on "Naqa'a", "Atmur" soils and "Qoz" sands. It is an early maturing range species, very palatable and is widely used in range reseeding in western Sudan. The area of Kass and eastern Jabel Marra are very famous habitats for the growth of this species. Different methods of harvesting have been described to collect seed heads which are then threshed to separate the grains. Some times the grains are harvested directly from the standing stalks. In some areas severely affected by sharp food deficits and famine, following 1984 drought, needy groups resorted to ant mounds to obtain grains of "Abu Asabie" stored by these insects and used them as source of food. The grains may contain about 12% protein and 4.6% fat. The small grains are ground and the flour is used to prepare "Asida" or "Madida". Some of the grains are stored for time of need. They are claimed to keep their quality for several years. Consumption of food prepared from "Abu Asabie" for long periods can cause constipation.

Persons trading in the products are mainly the initial collectors, for a good part of the products are sold fresh or exhibited in the market places, by women. In West Darfur marketing was found to be the sole preserve of women especially the senior female figure in the H/H. Males and some females practicing vending trade are to be found too as collectors and traders especially in those of the products that are comparatively of wider use like *"Ruz Alwadi", "Aradeib"* and *Kawal* with some quantities taken to outside markets. Men are involved in sale of products to whole sale merchants or middle men. They are not involved in retail sales may be to avoid embarrassment of engaging in an activity which is the domain of women.

Oryza punctata/ O. barthii "Ruz Alwadi"
This grass is also called "Ruz Alkhala" "Ruz Baladi" and "Um Jibeiti". It is an annual plant associated with inundated habitats and swamps. The plant is readily utilized by grazing animals. Reference was made to the utilization of this species as early as 1845 when Al-Tunisi visited Darfur and wrote "In Fur land there is a kind of rice that grows naturally in ponds and swamps. People harvest part of this natural crop and cook it with milk and consider it as a delicacy." The grain bearing stalks are harvested by women while the plants are still submerged in water. After threshing the dry grains are pounded in "Funduk" to get rid of the reddish outer cover. During this process some of the grains are broken. The grains are prepared like cultivated rice or are cooked with milk and sugar or salt. Part of the grains may be ground and the resulting flour used to prepare "Asida" or "Madida". These are common dishes in the diet of inhabitants of Buram, Idd El Fursan, Rehaid El Birdi and Tullus areas of South Darfur. When production from this plant is large the surplus is marketed by semi-nomadic groups. The grains can be stored for two years without losing their quality. In Buram area it is estimated that there are about 250 seed heads per square meter.

The prices of products are determined by the season of the year when it is on offer, annual production, whether it is a produce of this or previous season, frequency of use (as permanently or seasonally used) and are influenced by the availability of the product, consumption habits, and as entering the national market. The leafy plants e.g. Moleita, Tamalika and the leaves of Tabaldi, etc, the fruits/vegetable ones e.g. Alsingil and Alsitib whose availability is confined to the rainy season are sold in small quantities for petty prices, in the range of 250 Sudanese Dinars. Daleib is sold by piece. Certain products that are of continual use as "Quonqlaiz", "Aradeib" "Laloab" "Karkar" and "Nabaq" are sold in certain local measurement "Kora" (equivalent to 3 kg), at more regular prices. Table2 indicates price of some NTF in South Darfur at the time of the survey (October-November 2003).

Table2. Price per Kora or Koam (in Sudanese Dinar)* for Selected Products

Koreib	75/Kora
Abu Asabei	50/Kora
Ruz Alwadi	100/Kora
Lubia Al Ghazal	50/Kora
Um Arnofa	75/Kora
Um Fakhaia	75/Kora
Molokhiya	10/Koam
Al Kadarnah	20/Koam
Moleita	20/Koam

Kawal	50/koam
Um beiji	50/Koam

*1 US$=263 Sudanese Dinar

The four products that enter the national trade "Laloab", "Quonqlaiz", "Nabaq" and "Aradeib" are sold by "Malwa" (3 kg) for prices ranging from 200-500 SD.
Incomes raised by producers vary according to the type of the product. The seasonal items contribute little to practitioner income, while the permanent ones (from trees) yield up to 30% of their annual income. In view of the importance of tree products, their various uses and monetary returns some community members protect and control the utilization of trees as Adansonia, Balanites, Borassus, Tamarindus and Ziziphus that grow on their lands. Owners fence or guard these trees during fruiting and until harvesting the products. Fruits of these trees are harvested for H/H consumption and for sale. Some are consumed fresh, others are dried and stored. In the past such protection and exclusion of others from benefiting from the production of these trees is against local traditions and customs.

Ways Products are used:

Some of the leafy types are eaten fresh or mixed with other ingredients after certain treatment e.g. "Moleita", leaves of "Tabaldi", "Habashtour" and fruits of "Gumeiz". Others are cooked as stew e.g. "Tamalika", wild Okra, wild "Molokhiya" *and* "Lubia Al-Ghazal" then eaten with "Asida" or "Kisra", the local bread. Others are boiled, applicable to most root products. The ones used as substitute to starchy foods "Koreib", "Abu Asabei" "Ruz Alwadi", are ground into flour and made into "Asida". "Mukheit" is different in that the seed contains some toxic materials and needs to be treated by repeated soaking, with the seed thereafter dried and ground and cooked as "Asida". Most of the grinding is done by women at home using primitive stone grinder "Murhaka", for the quantities are small to be handled by modern flour mills, and for fear of mixing with normally used grains. Roots of "Al Kardallah" and "Um Beiji" are soaked several times to get rid of undesirable substances then either consumed directly or dried, ground and used to prepare "Asida".

"Lubia Al-Ghazal"

This is an annual leguminous herb that grows on "Qoz" sands and alluvial soils in areas with rainfall of about 500mm/annum of South Darfur State. It produces abundant pods compared to cultivated local cowpea. Both leaves and seeds are edible. Leaves are cooked as spinach while seeds are either boiled with salt then consumed or are ground first then cooked with onion, oil and spices to prepare "Moulah". This latter product can then be consumed with "Asida" made from sorghum, millet or "Abu Asabie" flour.

"Al Kardallah"

This annual plant grows on "Qoz" reddish sandy soils of South Darfur. It is grazed by livestock. People consume its roots. These are dug out, soaked several times in water and the water discharged to get rid of undesirable substances. The treated roots are then consumed directly without further treatment. It is not normally sold hence it is not displayed as other non-traditional foods in the local markets. In South Kordofan it grows under trees on clay soils. Its immature seeds are treated to get rid of bitter taste then mixed with peanut butter and consumed. The mature fruits, which have sweet taste, are consumed fresh. Roots are collected dried whole or chopped then stored for subsequent use. Other uses include chewing without swallowing as a gargle, roots are used for treatment of diabetes and roots used to clarify drinking water.

"Um Beiji"

This is a climbing plant which grows on mounds in areas with sandy soils of western Sudan during the rainy season (June-October). The plant has broad leaves and yellow flowers but some times other colours may be found depending upon variability within the species. It is a common species in southern Sudan where its roots form an important source of food for local groups. It is grazed by livestock. In South Darfur its roots are dug out, pealed and chopped. Then the chopped material is wrapped a mat "Sausal" made from ropes which is then soaked in "Rahad" water for 3-5 days to get rid of bitter taste. During this period the material is tested to ensure that its taste becomes acceptable. At that stage it is pulled out of water rinsed and dried. The dried chopped roots can be stored for few months, sold or can be consumed. The treated roots are then dried and ground. The flour thus obtained is used to prepare "Asida" or "Madida". Meat is cooked separately to prepare a sauce which is then mixed with the "UM Beiji" meal.

Tenure Rights over Land of Products:

All unregistered land is officially in the hands of the government. People are allowed to use such land on the basis of communal or usufruct rights. In practice right of use and control of communal lands are handled by local community leaders whose powers are vested in the native administration. As the plants producing NTF grow wild, communal tenure is the mode practiced, especially for most of the herbaceous species, and practitioners go freely collecting their needs. Exceptions are with the trees whose produce enters distant trade namely "Quonqlaiz" and "Aradeib" which in most cases are privately owned. Individual ownership may also apply to some of the grain producing plants e.g. "Abu Asabei" and "Ruz Alwadi" in small acreage with allowance for non-owners to collect from these by taking permission from the owner. In West Darfur when a site containing target plants is to be grazed livestock owners should get permission which is normally given after sufficient collection of grains for human consumption has taken place. Rarely collection is done in privately owned holdings. In this case those interested to collect any type of product must obtain prior permission from the owner. In West Kordofan mutual arrangements between tribes allow the use of grazing lands, where non-traditional food plants are normally abundant, without restrictions. Collection of grains and other non-traditional food items, by outsiders, during emergency periods is more tolerated and accepted particularly as those involved are poor and needy H/Hs who deserve to be assisted. Some times members of the local tribe who have the right of use of land resources assist those outsiders by providing them with milk and other food items. If a conflict arises then different levels of tribal leaders will work together to settle disputes. Rarely security and judicial authorities are involved.

There are no indications of the existence of specific rules or regulations for protection of areas from which these products are collected other than the traditional tribal and local communities arrangements to manage their communal resources.

Stability of Producing Area:

Products of trees tend to be stable in areas as they are well protected from damage. Threats may come from man activities as charcoal making (Balanites), expansion of cultivation (various species), uncontrolled burning (Balanites, Borassus, Ziziphus, Tamarindus) and land degradation (various species). A general observation is the slow or

lack of regeneration of some trees as the majority of present stands or individual trees are old specimens e.g. Adansonia, Borassus and Tamarindus. Acreage of herbaceous plants also shows a level of relative stability, as areas are apparently not or are decreasing at a very slow rate. This latter group suffers the impact of general rain failure in some years, and other destructive effects like fire out-breaks. In South Kordofan some undesirable changes have taken place that reduced the period of flooding in part of the habitats where "Ruz Alwadi" grows. The ultimate result is that some stands do not reach seed maturity and areas where this plant grows are shrinking. Trees and herbaceous plants are reported to be affected by certain pests as locusts, ants and bugs.

Community Perception towards Use of Products:

Regular collectors, mostly come from the poorer segment of the population, practicing collection as a part-time activity outside their farming/pastoral engagement. Poor H/Hs within settled communities, especially those with small land holdings are prominent collectors. However, during low rainfall seasons when the harvest is poor even better off H/Hs would also flock to potential sites to collect grains from native grasses to see them through the hungry period that culminates during the dry season. This finding agrees with earlier reports that poor resource-less H/Hs are more likely to rely on NTF (AL-Bashir, 1994). Intermediate status groups also consume these foods but at a lower degree. Well-resourced H/Hs utilize NTF on a limited scale. Since a good part of these foods are of popular use, with some of them qualifying as emergency food substitutes which is resorted to by the majority of the population in bad years, people don't perceive NTF dealings negatively, since these foods regularly enter their diet.

3.1.2 Non-traditional foods in the selected states with emphasis on grass species

The four states included in this study have lands that extend from the Semi-desert (75-300 mm/annum) as the case of West Darfur, through the Low Rainfall Savanna (300-800 mm/annum) to the fringes of the High Rainfall Savanna (800-1300) as the case of West Darfur, South Darfur, West Kordofan and South Kordofan. Topography is also variable comprising the highest mountain range in the country (Jabel Marra in Darfur), the Nuba Mountains in South Kordofan, stabilized sand dunes, clay plains, natural depressions that are seasonally inundated and a network of "Wadis" and seasonal water courses. These states also have various types of soils including sandy, alluvial, non-cracking clays, cracking clays and various localized hill and mountain soils. This large variability has its clear effect on the resulting vegetation communities and species represented.

Plant species that can provide some kind of edible product are part of the natural vegetation of all ecological zones of the Sudan. Even the desert zone have habitats, mainly "Wadis" and seasonal water courses, that support the growth of trees and shrubs as Balanites, Boscia, Capparis and Ziziphus that provide edible fruits or fruits that can be treated then consumed.

Habitats and distribution: These grasses fall into three broad groups according to habitat and site adaptability. "Ruz Alwadi" is mainly confined to seasonally inundated depressions, natural water channels, swamps and ponds. "Abu Jigri", "Um Chir" "Koreib" and "Difra" are associated with moist habitats but do not require standing water and flooding as "Ruz Alwadi". In West Kordofan some of these species may be found at a lower density on the "Qoz" sands as compared to moist habitats. "Abu Asabie" grows more on "Atmur" and "Qoz" while "Haskaneet" prevails more on "Qoz" and sand sheets.

Collection, treatment, storage and preparation for consumption: As has been mentioned earlier collection of grains from native grasses is mainly a female domain. While women are active in this regard in some instances (West Darfur) girls are tasked to gather both "Koreib" and "Abu Asabie". They collect seed stalks into small bundles. Collected material is left to dry under the sun before threshing to separate the grains. Threshing is done by heaping the dry material on the ground and beating with a stick. In some cases threshing of the small grains of species as "Abu Asabie" is done manually by hand rubbing. The threshed grains are put in "Tabaq" then manually sorted out to remove any chaff and other foreign materials, a time consuming process. In West Kordofan "Abu Asabie" and "Abu Jigra" are collected from natural stands by women holding "Tabaq" and beating seed bearing stalks in a manner that will cause the grains to fall on the container. Alternatively a container may be placed on the ground under the standing "Abu Asabie" plants, and the seed head rubbed to separate grains which are received in the container below. The seed obtained is transferred to another container and the process is repeated until a reasonable amount is harvested. This method save threshing efforts, reduce time for cleaning and give a reasonable harvest. In the same State harvesting of "Ruz Alwadi" and "Um Chir" is done by stripping seed heads causing the separation of grains, however, this method is said to be tedious. In most cases the pure grains are normally stored in jute sacks, earthen jars or in special storage structure known as "Sueiba" prior to consumption or sale. It is claimed that grains of both types, if properly stored, may be suitable for human consumption for up to ten years.

Grains are normally ground using "Murhaka". Some claim that grinding by mechanical mills exposes the product for mixing with other materials and may spoil its flavour and taste. The flour obtained can then be used to prepare "Asida", "Kisra" or "Madida". Some times the flour from these grasses is mixed with that of millet or sorghum to prepare these foods. These preparations are then consumed with milk, ghee or "Moulah". Very poor H/Hs reported eating "Asida" or "Madida" with salt or sugar only.

"Ruz Alwadi" is collected, treated and stored in a manner similar to that described for "Koreib" and "Abu Asabie". Some times wind may be used to separate the heavier rice grains from the light chaff and stalks. In South Kordofan it is claimed that "Ruz Alwadi" can be harvested twice per year if its wet habitat is maintained moist and its harvesting is carried out in a certain way.

Before cooking rice the outer husk is removed by partial grinding using "Murhaka" or pounding using "Funduk". The grains are then prepared in a manner similar to cultivated rice. It is then served either with milk or "Moulah".

3.1.3 Nutritional value

There is limited work on nutritional value of non-traditional foods in the Sudan. An exception to this is comprehensive work done by Abdelmuti (1991) and the observations of Berry (1985) cited by the former which will be referred to frequently in the following brief. Famine foods consumed in western Sudan would appear to have comparable food value to that of normal dietary components (Berry, 1985). This author made a comparison in which he indicated that "Mukheit" (Boscia senegalensis) and "Koreib" (Dactyloctenium aegyptium) are similar in their nutritional value to the standard cereals, while "Dome" palm kernel (Hyphaene thebaica) to nut legumes and "Kawal" (Cassia obtusifolia) to cultivated vegetables. Potentially a balanced diet can be obtained from a

combination of these types of non-traditional foods. As a result of chemical analysis of a wide range of these foods collected in Darfur and Kordofan Abdelmuti (1991) concluded that the overall quality of grains of "Haskaneet", "Koreib", "Difra" and "Ruz Alwadi" protein is broadly similar to that of local cereals (staple food). Lysine is the limiting amino acid in these non-traditional foods. "Ruz Alwadi" has an identical score to that of millet "Dukhun" the staple cereal in Darfur. His work showed that grains of famine foods have starch content that renders them nutritionally acceptable substitutes for the staple food grains millet and sorghum. Millet, "Haskaneet", "Koreib" and "Difra" were very rich in iron when compared to the other cereals. The iron content of "Ruz Alwadi" was found to be exceptionally high.

Not all famine foods are throughout acceptable and readily consumed. Some may be less acceptable to children. Abdelmuti (1991) referred to the high fibre content and greater bulk of these materials when they are compared to normal food. Berry (1985) draw attention to the need to consider the possible adverse effects and hazards associated with the consumption of some of these foods particularly when not properly treated and prepared. Al-Bashir (1994) referred to mixed opinions about some NTF ranging from nutritious and can treat some diseases in some views, to causing health problems in the opinion of others. "Korieb" from Brachiaria is claimed to cause constipation and in some instances diarrhea. "Mukheit" causes diarrhea, throat problem and is claimed to negatively affect fertility in both sexes. It is known to be problematic and can be fatal if not treated by boiling/soaking and discharging water several times to get rid of harmful substances.

Information obtained from West Kordofan during this study revealed that "Koreib Um Difera" (Brachiaria xantholeuca) is the most productive and favoured source of food of the target grasses. It is followed by "Um Chir" (Brachiaria obtusiflora) which is difficult to harvest and clean. Those interviewed claimed that Nilotic tribes (Dinka, Nwair and Shuluk) strongly believe in the nutritional value of "Um Chir" as well as its value for treatment of fertility problems and sterility in men. "Ruz Alwadi" comes as the third favourite grass food in spite of its desirable taste. "Abu Asabie" comes last and is claimed to require mixing with millet to give food of better consistency and taste when compared to the grass alone. "Abu Jigra" is claimed to be feed for horses and "Haskaneet" for livestock more than human food. In South Kordofan "Asida" prepared from "Abu Asabie" flour is rated good and nutritious food which does not require addition of other grains (sorghum or millet) to improve its value and acceptance. In West Darfur FGD organized at "Hafir Adar" indicated that respondents prefer "Abu Asabie" which is collected immediately at the end of the rainy season. Once it has been harvested people will start collecting "Koreib". This reflects regional variability in non-traditional foods preference as well as local names.

3.1.4 Collection of seed and plant specimens

All participating national NGOs have, in collaboration with members of local communities in the respective states, collected samples of seed of the target grasses. Most of these samples will be deposited with ARC Plant Genetic Resources Unit when official arrangements through FAO Representative Office are completed. Few plant specimens have been collected for identification.

3.1.5 Identification of sites for in situ conservation and/or reseeding

National NGOs have, in collaboration with local communities, proposed some sites which can be developed with these communities for conservation of target and other non-traditional food species or for reseeding/planting of these species for multiple uses. The proposed sites in the four states are:

- South Darfur. Khor Omar, Raqabat Hawaiya and Sibdo in Abu Matariq Locality, Butat Al Nazir and Butat Showtar in Al De'in Locality.
- West Darfur. Hafir Adar and Rahad Tori in Al-Geneina Locality (maps of the two sites are attached to the report).
- South Kordofan. Al-Hejeirat and Hajar Al-Sultan of Dilinj Province.
- West Kordofan. Lagawa, Ras Al-Feil and Al-Harazaia in Lagawa Province.

3.2 Conclusions:

- There are indications that the overall use of wild foods in the Sudan has declined. This does not mean that they are no longer important as part of the diet in some areas and for some groups as well as a safety net for disadvantaged rural H/Hs. In a country where IDPs have been and are still a sizeable part of the population, poverty particularly in rural areas is increasing and land and natural resources degradation are a major challenge, many of these NTF will continue to be an important source of emergency food and source of income.
- Several of the NTF species are also key grazing plants hence overgrazing may threaten areas covered, production and spread of some of the target grasses particularly those growing in wet season grazing areas. In these areas utilization commences early in the rainy season without observation of range readiness and before plants sufficiently grow to withstand grazing and trampling. The situation may differ in case of plants that grow in dry season grazing areas where pastoral groups arrive with their herds mainly at or after seed maturity. At that time fire may be more damaging to seed crop and survival of some grasses than grazing.
- Preserving indigenous knowledge and experience related to the harvesting, treatment, preparation and utilization of NTF is threatened by several factors as:
    - changes towards modernity which include changing food habits,
    - an increasing rural-urban migration,
    - limited contact and interaction between old and young generations,
    - formal education ignorant about and ignoring the issue.

There are indications that the flow of information and traditional knowledge from one generation to another is disrupted due to socio-economic, demographic and insecurity reasons.

- Currently there is no provision for control and management of NTF species that grow on communal land.
- Considerable potential exists for sustainable management of habitats that support target species as well as their efficient harvesting and processing. In all cases success of proposed interventions will depend on community, particularly women, participation and active involvement.
- Several species of leafy vegetables are found and are utilized as fresh salad or cooked in various ways to be consumed with "Asida" or "Kisra".

- Trees are increasingly becoming an economic asset for small holders particularly when crops fail or yields of these crops are very low. Tree products, mainly fruits, are important for H/H consumption but also as source of income to meet different H/H requirements including some food items as sugar and meat. The returns and benefits from trees may draw the attention of poor rural H/Hs away from destructive practices as tree cutting to sell fuel wood and cultivation of marginal land thus accelerating the rate of desertification.
- The wide use of NTF by the local population, in many areas of the Sudan, the entrance of some of the products in the national trade and people's food habits, and their role as emergency foods at hand, especially in years of below normal rainfall and droughts, entail that more attention be given to this sector of production, by considering the following:
    - Substantiating the present findings, by coverage of new areas not included in the present survey for the ecological variance of the country, and the difference in communities' food habits.
    - Working towards availing the taxonomy of the plants in use, as to their distribution, floral characteristics and factors conditioning their growth.
    - Documentation of the indigenous knowledge possessed by local communities, that had built with the practicing of NTF collection as to harvesting, processing, preparation into food and conservation of species in use, with the intention of incorporating this knowledge in future development interventions.
    - Conducting laboratory work on the nutritional value derived from these products to stand on their contribution to local diet, included in this, how to improve on their potential in terms of processing, storage and preparation into foods.
    - As women are closely tied to NTF production, future programmes targeting food security should incorporate a women component on NTF prospects.
- Realizing the socio-economic, nutritional, medicinal, environmental and emergency period benefits of NTF species the potential exists not only for meeting traditional needs and markets but also prospects exist for providing materials for more diverse and rewarding uses in the future. Changing socio-economic and environmental conditions may pave the way for large scale utilization of some of these species.

4. RECOMMENDATIONS

4.1 General

+ Efforts to improve long-term sustainability of these sources of food and the livelihoods of dependent groups must consider establishment of effective links with the wider development environment. A coordinated and integrated development planning approach in which local communities and their indigenous knowledge play a leading role should be adopted by all concerned parties. Within this context it is vital to recognize indigenous knowledge and practices as a basis on which to found habitats and non-traditional food species sustained management and effective utilization.
+ The work initiated by this study should be continued with focus on (i) proper identification of plant species (ii) monitoring of growth, productivity, seasonality of production, impacts of different methods of harvesting, impact of burning and habitat degradation (iii) determination of nutritional characteristics and role of NTF in the nutrition of target members of poor H/Hs as children, pregnant females and the elderly.

4.2 Socio-economic Aspects

+ Tenure arrangements and right of use of areas utilized for the collection of non-traditional foods should be worked out and officially recognized based on broad categories including common property tenure for grazing lands, private ownership for individual holdings and village title for community/village forest. For common property and community forest local community institutions should define rules and regulations for the use of these resources, their protection and sustainable development.

+ Enhance income generating activities of women by proper utilization of non-traditional foods and easing constraints that may hinder their full realization of economic benefits from this resource. Efforts in this direction may include the establishment of women groups or providing support to existing ones for the purpose of sustained utilization, processing, marketing and preserving indigenous knowledge associated with harvesting, treatment and preparation of these foods within their communities. These women groups could assist their members to establish village/rural restaurants and small packing units for these products. The groups could also act as effective channels to introduce interventions for improvement of harvesting methods, threshing, storage and preparation of different products. These women groups should be assisted by training, extension and establishment of a revolving fund to help them meet some of the requirements for developing income generation activities.

4.3 Extension and Awareness

+ There is a need to establish a network of concerned NGOs, CBOs and other institutions to handle campaigns for the promotion of the sustainable utilization of non-traditional foods and to assist in ensuring the preservation and passing down of information and inherited experience between generations. This network should also engage in increasing awareness of decision makers and planning authorities about the importance, uses and benefits of non-traditional food species. They should be assisted to recognize indigenous systems of knowledge and practices associated with these species to subsequently integrate them in conservation and sustainable development efforts or when preparing rehabilitation strategies. They should be made aware about the dangers that threaten their habitats, regeneration and production. Awareness campaigns should give attention to schools, youth centres and young generations who need to be well informed about the multiple benefits and roles played by these species and the need to preserve knowledge and experience related to their rational utilization.

+ Extension work and training of local communities so that they use friendly harvesting practices, proper grazing/browsing management and approaches for propagation of both herbaceous and woody species. They should also be assisted with proper handling of collected product, marketing and food preparation.

4.4 Community Role and Participation

+ It is clear from field visits and information gathered that this issue of non-traditional foods collection, utilization and marketing is a local community business with no support or guidance from any external entity. The lands where such food species grow are mainly communal lands controlled and regulated by traditional rules and local institutions. Consequently the community role should be officially recognized, strengthened and built upon to guide and ensure the sustainable utilization and development of this local resource for the socio-economic benefits of local population. A community-based

participatory approach can be adopted to organize and guide local community efforts to manage and optimize benefits and returns from non-traditional foods.

4.5 Conservation Efforts

+ The initial contacts and sites selection should be used to establish, in close collaboration with local communities NGOs and CBOs, pilot in situ conservation and improvement or rehabilitation foci. These sites should be expanded to cover grazing lands, seasonally inundated areas, natural ponds, swamps, community forests and seasonal water courses. They should be used to conserve the genetic diversity of these plants by proper management, protection from uncontrolled fires, protection from destructive land use activities and by reseeding and /or planting of target species. They should be protected from pollution by pesticides, industrial effluent and other sources.

+ Additional attention should be given to collection, proper handling and storage of seed and other propagation materials. Efforts should be made to encourage rural nurseries at village and/or H/H level to enhance planting and expanding the areas under these multi-purpose species. In this regard collaboration should be thought with ARC Plant Genetic Resources Unit, RPA seed collection and reseeding activities and FNC tree planting and community forest activities.

+ Bush fires, "Hariq" cultivation, charcoal kilns and other man activities cause limited or large scale fires which destroy large expanses of natural vegetation thus threatening the diversity and germplasm of many useful plant species. The last few years have witnessed a sharp decline in the abilities of local councils and RPA offices to establish fire breaks on grazing lands. This is attributed to limited funds and facilities as well as failure of concerned government institutions to convince and motivate rural populations to play a major role in carrying out this work. The result is destruction of vegetation on large areas with known and unknown negative impacts on vegetation and other resources. The present situation requires motivation and encouragement of local communities to be actively involved in establishment of fire breaks. Local councils should be equipped so that they can provide technical support/advice to select appropriate sites, vegetation clearance techniques and monitoring to enable local communities carry out the actual establishment of these breaks.

4.6 Integrated Management of Non-traditional Food Plants in Pastoral and Agricultural Systems

+ The vital role played by non-traditional food plants during drought and other emergencies, their increasing importance as source of income for small holder and poor pastoral and farming H/Hs and the multitude of potential uses requires launching community-based long-term actions for the sustainable utilization of this resource and expansion or at least rehabilitation of areas covered. The purpose is to increase food security, improve livelihoods and reduce poverty among rural populations while ensuring sustainability of natural resources. This requires external assistance to formulate and implement a programme to fulfill this objective (Project Summary Annex 3). Until then both FAO Regular Programme and Emergency funds should be provided to continue and expand the work initiated for the benefit of rural communities in general and IDPs and the poor in particular.

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Annex 1
List of Some Non-traditional Food Species

a) Trees and shrubs

Scientific name	Local name	Edible part(s)	State(s) reported
Adansonia digitata	Tabaldi	leaves, fruits	SD, SK, WK
Balanites aegyptiaca	Hijleij	leaves, fruits	SD, SK, WK
Borassus aethiopum	Daleeb	fruits	SK
Boscia senegalensis	Mukheit	fruits	SD, WD
Capparis decidua	Tundub	fruits	SK
Ficus sycamorous	Jumaiz	fruits	SD, SK
Grewia tenax	Qiddeim	fruits	SD, SK
Hyphaene thebaica	Doam	fruits	SD, SK
Philosigma reticulatum	Al Kharoub	leaves, fruits	SD, SK
Sclerocarya birrea	Himmaidh	fruits	SD, SK
Tamarindus indica	Aradeib	leaves, fruits	SD, SK, WK
Ziziphus spina-christi	Sidir	fruits	SD, WD, SK, WK

b) Herbs

Amaranthus graccianis	Tamaleika	leaves	SK
Cassia obtusifolia	Kawal	leaves	SD, SK, WK
Commelina subulata	Al Beidh	leaves	SK
Corchorus sp.	Molokhiya	leaves	SD
Gynandropsis gynandra	Tamaleika	leaves	SK
Hibiscus sabdarifa	Karkadeh	leaves, seeds	SK
Ipomea coptica	Hantud	leaves	SK
Ipomea sp.	Arkala	leaves	SK
Leptadenia lancifolia	Sha'aloab	leaves, flowers	SD, SK
Portulaca oleracea	Rijlah	leaves	SD
Soncus cornatus	Moleita	leaves	SD, SK
Tribulus teristris	Dreisa	grains	SD

c) Grasses

Brachiaria obtusiflora	Koreib	grains	SD, WD, SK, WK
Brachiaria xantholeuca	Koreib Umdifera	grains	WD
Cenchrus biflorus	Haskaneet	grains	SD, WK
Dactyloctenium aegyptium	Abu Asabie	grains	SD, WD, SK, WK
Echinolcoa colona	Difra/Koreib	grains	WD
Rottoebellia exaltata		grains	SD
Oryza barthii	Ruz Alwadi	grains	SD, WD, SK, WK
O. breviligulata			
O. longstaminata	Ruz Alwadi	grains	
O. punctata	Ruz Alwadi	grains	WD, SK

Other plants reported include: Al Qarqadan, Um Bekheisah, Um Madeiko, Al Kurmadoda, Al Jughan, Al Kursan, Um Taqalqal, Al Qembeil, Al Abanoos, Al Tartar, Al Sanjani, Al Habashtour, Al Urrli, Einab Barri, Al tetras (mushroom), Al Faio.

Annex 2
Glossary of Local Names

Afoos: young leaves of Adansonia treated with peanut butter or ground sesame and consumed as salad.
Aradeib: the pods of Tamarindus or the tree itself.
Asida: a thick type of porridge prepared from flour of cereals, grains on native grasses or roots of certain plants.
Atmur: slightly elevated areas of stabilized sand dunes.
Balila: grains or seeds boiled in water to which salt is added, it is eaten with sugar and ghee.
Dome: fruits of Hyphaene.
Funduk: wooden mortar for grinding/pounding.
Hafir: a dug-out for collection and storage of runoff water for use by human and/or livestock.
Hariq cultivation: a type of traditional cultivation practice in which the vegetation and stubble on the cultivation plot is burnt before the rainy season in preparation for planting.
Hukra/Hakura: this term is related to traditional tenure and it means an area belonging to a specific tribe.
Kissra: a thin type of traditional bread prepared from the fermented flour of sorghum, millet or other grains.
Koam: a small heap.
Kora: bowl.
Laloab: fruits of Balanites.
Madida: a thick milk shake type of drink prepared by cooking flour in milk or water.
Malwa: a metallic container for measurement of crops and other products, its capacity is about three kg.
Moulah: a thick meat sauce, some times made from ingredients other than meat.
Murhaka: traditional manual grinding unit consisting of two stones.
Nabaq: fruits of Ziziphus.
Naqa'a: a flat area of non-cracking clay.
Qorrassa: a sort of pancake.
Qoz: stabilized sand dune, used to describe the undulating sandy soils of western Sudan.
Qudeim: fruits of Grewia tenax.
Qunqulaiz: fruits of Adansonia, also the term is used to describe the seed coated with the characteristic white powder.
Rahad: a natural depression in which water collects following seasonal rainfall.
Samn: melted butter or ghee.
Sharmout: dried beef strips.
Sueiba: a grain storage structure made from mud, wood and grass.
Tabaq: a tray made from palm leaves or grass used to cover food.