

Abdalbasit Adam Mariod *Editor*

Wild Fruits: Composition, Nutritional Value and Products

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*This book is dedicated to the soul of my
beloved wife Amal.*

Preface

Although there have been articles in journals and chapters in books which have described some chemistry, composition, and health issues of wild fruits, a book devoted entirely to subjects such as composition, nutritional value, products, and medicinal uses has not previously been available.

This book presents 41 chapters on wild fruits. The first nine chapters (except Chap. 6) deal with economic contribution of wild fruits in rural people's income, sustainable rural development, and implications of wild fruits on food security and poverty alleviation. Chapter 6 describes wild fruits domestication using participatory methodology. Chapter 10 deals with wild fruits medicinal use and health benefits, as wild fruits are the potential supply of human health due to its energetic compounds that are chargeable for its various antioxidant, antidiabetic, antibacterial, antimalaria, and anticancer activities. Chapters 11–41 cover different contents from Africa to Asia to South America, investigating the phytochemical constituents, bioactive compounds, and traditional and medicinal uses of different selected wild fruits.

This book has been written to ensure that it will be of benefit to the industry, medicine, and food scientists. In addition, the book should appeal to academic scientists who require a good source of applications and a good set of references. Since wild fruits have diverse uses, it is hoped that the use of the book will not be limited to the food and medicine industry but will extend to related industries such as the pharmaceutical industry.

Ghibaish, Sudan

Abdalbasit Adam Mariod

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Chapter 1

The Role of Wild Fruits in Mitigating Hunger



Izzeldien Abdelhamid Al Faki Adam

1.1 Introduction

During the last decades, many rural communities in the African countries have faced successive short rainfall and drought hits that weakened their productive capacity, and hence resulted in profound food deficit and social problems. Moreover, these environmental problems are intensified by the effects of the economic crisis and the impact of the local war on the community of the war affected regions. For Sudan, environmental disasters and afflictions such as short rainfall, locust and agricultural pests...etc., which have been held responsible for its frequent traditional economy collapse were normal features of rural life, and until recent time people were managing to cope and recover without acute suffering. The implementation of the trade liberalization policy (i.e. devaluation, reduction of government expenditure, removal of subsidization) and deterioration of term of trade against primary products have intensified the effect of harvest failure particularly at the local level. The accumulation of these factors compounded by successive epochs of drought has weakened the traditional resilience systems and the capacity of the rural people to cope with and recover from the effect of the successive harvest failure. The situation culminated in the 1985 famine and the successive food shortage periods over many parts of the country during the last decades.

Like the other traditional African societies, people in rural Sudan have been subject to profound economic and social problems and crises due to drought and local resources decline. The people reacted to these crises by introducing new coping strategies. Most of these coping/survival strategies, including resort to wild food are already known in traditional areas, and usually resort to or being adopted during the frequent short-rainfall and food deficit periods.

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Collection of wild fruits is a traditional activity practiced by traditional people in rural Sudan as supplementary food and for delicious consumption; further some types of fruits became significant during acute food deficit and also a trade activity for the national and international markets. Beside that majorities of the rural Sudan rely on some wild fruits to ensure their primary health care, while in some urban Sudan access and use of some certain wild fruits is mainly for medicine or delicious consumption. Currently collection and use of wild fruit become more widespread and even more marketed in the rural markets of Sudan.

1.2 Wild Fruit Types and Uses in the Sudan

Throughout the diverse ecological zones of the Sudan a remarkable variety of wild fruit trees are grown in their own almost everywhere in the country, and most its fruits is utilized for subsistence. Even in some cases, some wild fruits trees and shrubs products trade have been well established activities not only for the local markets, but also found its way to the international markets for use in several industries. However collection and enterprise of wild fruit become more widespread and marked not only in the Sudan but in many countries in the tropical regions (FAO 2013).

However the use of particular wild fruit in the Sudan is often restricted to specific regions in which they are grown, but there is a wide range of wild fruits are used widely by both the rural and urban population all over the Sudan. The most important trees that are widely utilized by local communities for domestic consumption and sale include: *Balanites aegyptiaca* “Higlig” or “Lalob”, *Ziziphus spina-Christi* (Sidir tree) “Nabag”, *Hyphaene thebeica* “Dom”, *Adansonia digitata* “Tabaldi”, *Tamarindus indica* “Aradieib” and *Grewia tenax* “Godeim”.

1.2.1 *Balanites aegyptiaca* (Heglig)

“Heglig” is a small tree found in Africa in more humid areas, is an important multi-use tree in the traditional sector in the Sudan where it is known as soap berry and source of traditional medications, pesticides, edible oil and livestock forage. It is widespread throughout the Sudan, spreads all over the country in a diverse ecological distribution ranging from sandy soil, heavy clay soil, to the river soils along the water watercourses. The fruit of *balanites aegyptiaca* locally known as “Lalob”, Sudan is the main producer of it and consider as the most wild fruit trees that is grows in its own in almost all urban centers, including Khartoum, where is not uncommon to observe some *Balanites aegyptiaca* trees along street within the old residential areas of Khartoum and other urban centers of the Sudan. The fleshy pulp of the ripe and immature fruit is eaten dry or fresh for delicious consumption. In many parts of Sudan the *balanites aegyptica* lasted throughout the dry season, many

rural people relied on revenue generated from its fruit heavily until the rain returned. The fruit usually collected directly from the trees or from the ground, in western and central Sudan the fruits are collected by females and children and sold in the local market to provide supplementary income for the family especially in the short rainfall season and harvest failure. It considered as a laxative and purgative for stomach beside other traditional medical uses for treatment of several diseases include stomach pains, diabetics, healing of wounds, jaundice. Its oil is used locally for treating headaches; traditionally it is released from the kernels by boiling nuts in several water changes at least for four several times, to remove the unpleasant taste of the kernel. Soaked kernel is then used as snacks or mixed with honey and used to increase the male sexual motivation (Elfeel and Warrag 2011).

Generally speaking, utilized fruit plays a significant role in supplementing household income in many villages of the traditional sector in the Sudan especially during the drought season. In most rural Sudan “Heglige” is a very important tree, produces edible fruits and oil, potentially a source of traditional medications, pesticides, livestock fodder as well as income generating source (Fig 1.1).

1.2.2 *Ziziphus spina-christi* (*Nabig Sidr*)

Sidr *Ziziphus spina-christi* is a tropical evergreen tree of Sudanese origin belongs to the Rhamnaceae family; it is an edible and medicinal forest fruits distributed in warm areas and tropical regions. The common Arabic name is Sider as it mentioned



Fig. 1.1 *Balanites aegyptiaca* “Heglig” Fruit

in the Quran, accordingly this species are highly respected by the Muslims through the Middle East (Al-Khalifa and Al-Arif 1999). In the Sudan known as “Nabig” tree, grown throughout the country regions; desert and semi desert arid parts, found abundantly in Kordofan, Darfur and central Sudan states. It is one of the most common known indigenous fruits, bally in figure; the shiny skin colour is brownish to red.

“Nabig” is one of the most valuable fruits in the rural areas; usually small boys spend most of their time in the slack season, collecting the “Nabig” usually to generate income to supplement their own spending or household income. Some adults allocate much time for “Nabig” collection as a major source of income during the season. However, due to the increased demand for “Nabig” in the urban centers and the remunerative income from it, some communities in the productive regions have been incorporating their whole household labour supply in the process of the fruit collection.

The fruit is eaten fresh or dry, but sometimes processed as sheet for sale in the local markets, and also crushed to make liquid like porridge called “Nasha” or “Madedda”. Moreover, preservation of “Nabig” by jam making is also carried out by some housewives in the traditional sector for own consumption. Traditionally raw “Nabig” usually eaten by young people and school students in the urban center, currently the processed or added value products of this accessible fruit have gained considerable important among adults urban as good nutritional value and health fitness fruit. Also in some part of the Sudan i.e. South Kordofan children crush the hard seed and eat the internal kernel of the “Nabig”. In most rural Sudan “Nabig” is used as delicious consumption rather than household supplementary consumption. But in some rural of western Sudan it, supplement households consumption and constitutes a basic source of income for many poor people in times of harvest deficit or acute lack of income (Fig 1.2).

1.2.3 *Tabaldi Adansonia digitata*

In Sudan, the common Arabic lingua franca name of the *Adansonia digitata* is “Tabaldi” and its fruit is known as “Gungolez” or “Tabaldi” is predominant in the hot, dry regions of the Sudan, most frequently found on sandy soils and seasonal watercourses in the traditional sector of western Sudan and Blue Nile in the low grass and Savannas. In the Sudan, people have rights to collect wild food and fruits and seeds from the forests, from which they get most of their snacks or others food, no civil or customary law restrict their rights in utilizing their surrounding natural resources, but in some parts of Kordofan the “Tabaldi” *Adansonia digitata* are commonly owned and protected by households as water reservoir. However, in rural Kordofan people naturally settled close to the “Tabaldi” tree indicated that it is integral parts of human settlements in that area while, other people planted it as an avenue tree for a public gathering of the village.



Fig. 1.2 *Ziziphusspina-christi* (Sidr) “Nabig” Fruit

Similar to other wild fruits in rural Sudan “Gungulaize” is usually collected/harvested as off-farm activities, e.g. after crop harvest, fruits and seeds are visually collected starting from January onwards. The fruits are usually collected by picking the capsules attached to the branches using simple implements or by hand then are smashed with a stone or other solid tools. The capsule contains very delicious white-coloured pulp. The fruit is an edible powdery pulp, it is one of the most favourite wild fruits in the county, is eaten raw commonly chewed and sucked, unripe fruits are boiled and used as salad. The fruit pulp is also processed as a refreshing drink, it dissolved in water or milk or made into “Nasha” liquid like porridge (It used for juice usually presented in the tourist sites and hotels). Porridge is also prepared by mixing the acid pulp with milk. In recent years, processing and use of “Gungulaize” in the Sudan has increased and more and more it has been processed at a commercial scale in form of packed powder or pulp in the urban supper markets (Abdel Galil 1996). Indigenous people also use the early matured leaves at the start of rainfall for cure of some diseases. The fruits are usually stored for long time under dry conditions (Fig 1.3).

1.2.4 Hyphaene thebaica (Doum)

Hyphaene thebaica is a desert palm tree with edible oval shape fruit, locally in the Sudan known as “Doum”, originally native to the Nile valley, but it founds across the Sahel countries. The tree usually grows in groundwater soil, but also found in



Fig. 1.3 *Adansonia digitata* “Tabaldi” Fruits

oases and wades besides that it occurs on salty soils on river and watercourses banks and on the mountains slopes throughout Sudan (Kees 1995). In some parts of Eastern Sudan particularly in Dordaib the Doum Hyphae is an Indigenous tree fulfills many subsistence and economic needs in the district, it provides a range of products which contribute to livelihoods of community, particular importance is its income-generating capacity through the sale of the processed fruits and the use of palm leaves for basket production.

The fruit has a brown external fleshy cover which is normally chewed and spewed out; in urban Khartoum usually, people soaked it in water until the pulp becomes soft and syrupy is much enjoyed by children and adults. The internal unripe kernel can be processed and eaten, but it gets hard and inedible when it is ripped. The external coat of the fruit usually cut off in slices or processed to form powder for further processing and uses i.e. a flavouring additive. The fruit is used in different forms and have a wide use in folk medicine in everyday life of local population (El Gazali et al. 1987) (Fig 1.4).

1.2.5 Borassus aethiopum (Daleib)

The “Daleib”, *Borassus aethiopum* is a strong to massive tree with a very single trunk of about 50 cm diameters commonly known as African fan palm, it grows up to 30 m high. This palm grows in riverine forests and savannas particularly on sandy or alluvial soils (Bayton 2007). The fruit of the tree is massive with ovoid shape and



Fig. 1.4 *Hyphaene thebaica* Fruits “Doom”

orange colour at maturity. In the Sudan found in South Kordofan, is known as “Dalieb” and consumed in both rural collection districts and large urban centers, however the consumption pattern of the fruit is more diverse in the rural area. The fresh fruit contains yellow juicy fibrous flesh and have a nice smell, in rural of South Kordofan and Darfur circumstances people put in the ground the fruit seeds in large pits for more than 5 weeks to germinate. The germination shoot locally known as “Halook”, it boiled and eaten as delicious snacks which is most favoured and widespread in South Kordofan (Fig 1.5).

1.2.6 *Grewia tenax* (Guddaim)

Grewia tenax “Guddaim”, is one of most valuable wild shrub in the Sudan, it is largely spread in arid and semi-arid areas in the country in rocky and semi-desert areas, at the Northern and Middle of Sudan. “Guddaim” almost is a 2 m tall shrub, its fruit is red to orange colored with 2-3-4 spheroid lobes (FAO 1988). The fruit collected from the shrub usually by women and children, especially in the traditional sector of the Sudan. In the past the fruit was collected in the production area mainly for luxury consumption, currently it gained good reputation among the Sudanese as favour iron transfer, consequently the demand for it has increased while its price has soared up very significantly. In some parts of Sudan especially in Kordofan, the traditional “Guddaim” juice is made by soaking the fruits for long time, pressing and purifying, then it either sweetening and gets ready for use or



Fig. 1.5 *Borassus aethiopum* “Daleib” Fruits

processed as Nesha by the addition of sugar and other additive. Traditionally the Nesha usually prepared for lactating mothers to improve their health and lactation. Guddaim is most favorite wild fruit among the Sudanese may eaten ripe as luxury consumption or kept for later usag, however currently it has been extensively consumed by both rural and urban population for its nutritional value (Fig 1.6).

1.2.7 *Tamarindus indica*

Tamarinds indica, “Aradeib” tree grows in the tropical region across African countries, in Sudan, it is located in the central Sudan and the traditional sector extends to the South, locally known as “Tamor-Hindi”, meaning date of India. The ripe fruit is edible, hard green pulp of early matured fruit somewhat sour but palatable eaten fresh or processed. This type of wild fruit is typically sweet and sour in taste and even get sweeter as it ripen and stored for long time. However the fruit is widely used in the cafeterias and hotels around the country, while the international hotels and cafeterias in Khartoum used to present fresh tamarinds, the local people usually prefer the juice of long stored fruits which is commonly presented in the local cafeterias and restaurants (Hassan 2006).

However, “Tamor-Hind” or “Aradeib” is a fruit that is popular in Sudan used to make juice which is used almost in all Sudanese households especially during Ramadan the fasting month. There are other several local uses of the “Tamor-Hind” such as seasoning or spice, in desserts as a jam and as traditional medicine specially treatment against malaria in the rural areas. “Tamarind” fruit is an important source



Fig. 1.6 *Grewia tenax* (Godeim)

of income for many people in both rural and urban areas in the country, is sold on local markets in the Sudan as well as on international markets (Fig 1.7).

1.3 Impact of Wild Food on Local Household Food

In the arid and semiarid land of the Sahel drought is a frequent natural disaster, which often causes frequent large food and resources deficit, famines and other economic and social problems. Food insecurity and malnutrition affect much of the rural African communities' population, especially in the sub-Saharan Africa (FAO 2011). The degree of vulnerability of the Sahel communities to the negative impacts of drought varies from country to another according to climate and prevailing environment and national policy in the country concerned. Moreover, the livelihood systems of the Sahel communities rely mainly on the rain fed cultivation and livestock, which are seriously affected by drought and short rainfall. Thus, drought



Fig. 1.7 *Tamarindus indica* Fruits

usually causes severe economic problems and affects the ability of communities to maintain their normal livelihoods. Rural communities that lack resilience or capacity to offset the resources deficit, usually tend to rely on a range of coping strategies to mitigate food shortage. These coping mechanisms usually include set of mechanisms and environmental adaptation aim at creation and improvement of the use of existing resources to maintain lowest level of sustainable existence. Wild fruits are known to make important contributions to livelihoods and hunger mitigation during acute food deficit periods in most sub-Saharan and Sahel countries. One way of diversification of food sources during drought and acute food shortage among these communities is the resort to wild fruits. There is, however many evidences emphasized the importance of wild fruits in contributing to rural livelihoods, mitigation of hunger and supplement people's income during periods of food shortage (Christine and Hannington 2016; Kabiru et al. 2015; Jatau 2008). Wild fruit trees play very significant role in most dry regions where harvests failure often cause food shortage and malnutrition of the local population (Maxwell 1991). Wild fruits provide a livelihood support system for many rural communities in terms of food, medicines, income and employment.

Collection of wild fruits and food in rural Sudan play significant role in mitigating hunger as substitute for some food items or supplementary consumption, moreover it constitutes the most important income generation activity for rural people in the traditional sector during the slack period. The process of wild fruits collection usually fills the slack period gap where farmers badly seek supplementary income

generating activities. Furthermore, fruits gathering job in the dry seasons provides alternative opportunities for household labour supply to earn money.

In fact, due to successive epoch of drought caused by climate change and civil conflicts in Kordofan and Darfur in general and other parts of the Sudan many rural people in these regions have been diversifying their livelihood systems so that they have alternative resources or enough income to maintain subsistence. This situation is particularly severed during the short rain periods and acute food shortage that people move to where they can collect wild fruits to maintain subsistence or sell for additional income. Yet these coping strategies constitute the main buffering mechanism through which most households offset food deficit and maintain the subsistence during acute food shortage periods in the traditional sector of Western Sudan. The wild food and fruit consumption varies from one area to another according to several factors including traditions and social stigma, food deficit or famine intensity and surrounding environment. However, there are many evidences indicated that wild food consumption is a function of income level in the drought times that is no one of high income group reported consumption of wild fruits or food hunger in famines and acute food deficit times (Al Faki 2006).

Most of the wild fruits are collected from natural forests and nearby resources, some of the fruits such as Higlig/Lalob from *Balanitesaegyptiaca* or Tabaldi from *Adansoniadigitata* are also collected from farm localized trees or natural garden which are owned by producers.

Collection of wild fruits usually take place in the slack period, some wild fruits, e.g. Tabaldi, Gudaim, Higlig and Daleib supplement people's income while certain wild fruits e.g. Kurssan supplement people's consumption as substitute for stable food at times of food scarcity. People have rights to collect the wild fruits from the forest and nearby bushes; no civil law or customary regulations restrict them in practicing these rights as far as its communal ownership.

Some wild fruit are typically seasonal and usually in rural Sudan be utilized in the situation of acute food shortage only that to serve as main substitute for the stable food, especially in states of drought, harvest failure or other natural afflictions causing food deficit. The list of these traditional wild food and fruits is fairly lengthy, but the most important one, which maintained many poor people during the famines of 1985 and 1991, is "Mukhiet" fruits, which sometimes called "Kurssan", the seeds of *genagalensis* shrub. "Kurssan" is already known in Sudan, but since 1984–85 famine have been playing significant role in mitigating food deficit among poor families during food crisis. According to Dewaall the wild food mainly Mukhiet fruits impact in mitigating the initial effect of harvest failure in 1984, 85 was greater than food relief (De waal 1989). Processing of "Mukhiet" fruit for consumption takes long time, soaked in several water exchanges over long period before being edible. It is either mixed with grain or use in its pure form. Most of the people who used "Mukhiet" during drought reported dilution of grain with "Mukhiet" cereal. The "Mukhiet" seed are very small and its shrub spread over wide area, therefore, its collection requires long marching for long periods. Its collection was not confined

to own or immediate consumption, stocking and sale of “Mukhiet” is reported post 1985 famine in different parts of North Darfur and Kordofan (De waal 1989).

However, with the successive drought hits, and climatic changes, in the Sahel zone some writers have assumed greater role for wild food and fruits particularly “Mukhiet” within Darfur economic and environmental crisis Elbashir Hamed has pointed out that:

...and God knows if it will one day be calculated as part of the regional Gross Domestic Production by economists. (Elbashir 1993)

It seems that such analysis stems from the investigation of the traditional coping strategies in their initial process of formation rather than deep investigation of the potential capacity and prospect of human interaction with the environment. Nowadays collection of wild food and fruits in Northern Darfur has been confined to delicious and supplementary consumption and sale in the urban centers. The people of Darfur have been able to solve the problem of frequent food shortage in the area in more dignified way, mainly expansion into Wades and clay soil cultivation.

One way of help to full the hunger gap of food during drought and acute food shortage in most parts of rural Sudan particularly in the traditional sector of Kordofan is the resort to wild food and fruits. (Elmola et al. 2015) reported that wild fruits in West Kordofan state provide significant source of income and secure alternative food source for many communities in the state moreover, it contains vital food ingredients which are essential for health. Beside that some fruits have flourished some local markets in state very significantly.

In Southern Kordofan state collection of wild fruits is an old established tradition, the rich forests of the region support collection of a wide variety of forest fruits. The easy and economic access of wild fruits counterbalances the low land productivity and prevalence of poverty intensified by the civil war. Most of the wild fruits of all types are normally eaten fresh for delicious consumption, but some are most preferable over the other edibles. The Nuba of SouthKordofan were found to appreciate some edibles over the others (such as *A. digitata*, *B. aegyptiaca* and *Z. spina-christi*) in their utilization as both supplementary food and cash source. The hypocotyl of the newly germinated seeds of *Borassusaethiopum*, locally named “Halook” is highly popular in South Kordofn as traditional food usually eaten with roasted ground nut or boiled. As to economic important (Salih and Ali 2014) reported that most of the rural families in South Kordofan are wild fruits collectors to supplement household consumption or sale for cash as well. Wild fruits role in poverty reduction among some Nuba mountain population is very significant, the income derived from the wild fruit is of particular importance to the poor household. In some parts of the state the contribution of wild fruit in the household budget is very significant amount to more than 75 percent of the total annual household income (Adam 2011).

Some wild fruits are highly marketable especially the ones that have high edible preferences such *A. digitata*, *Z. spina-christi* and *B. aegyptiaca* which contribute very significantly to households trade and income in the area. However, under the

current situation, of the prevailing armed conflict and displaced people and closed districts in the Nuba mountain it is most likely that the wild edibles is increasingly playing vital role in securing food for the blocked population.

In some parts of the traditional sector of Western Sudan, mainly the far south of South Kordofan people usually practice subsistence economy with limited cash crops production and livelihoods options or employment opportunities. The ecological zone of the area is rich with diverse wild fruits trees, hence the fruits are collected for households' consumption needs and incomes generation. (Ibrahim et al. 2014) reported Wild fruits collection is the sole source for income generating in Abyii, Elsalam, Elsanout, Lagawa, Elmerum and Keilack localities during dry seasons.

... wild fruits can be used as substitutes of seed grains to reduce hunger and alleviate poverty... It was also shown that fruits returns contribute to family daily expenses and education fees. Moreover, it supported rural people food security, enterprises and met environmental objectives. (Ibrahim et al. 2014)

The role of wild fruits in hunger mitigation in the central Sudan and the other irrigated livelihood systems in the country is very limited due to the round year cultivation and existing of other sources of income. However, wild fruits in these areas are extensively used as delicious consumption includes "Gambil" *Cordiaafricana*, "Homeid" *Sclerocaryabirrea*, "Medaika" *Ximeniaamericana*, and "Joghan" *Diospyrosmespiliformis*. Some fruits are very popular, usually harvested and eaten by people as 'snacks' like "Joghan" *Diospyrosmespiliformis* and "Tamarhindi" *Pithecellobiumdulce* (Jens et al. 2002). The list of survival strategies adopted by food insecure households in the rural areas of White Nile State Central Sudan are vary from least severe to most severe including substitute food items, economization on food use and meals frequency and resort to food or cash borrowing. In the dry season indicated that rural people with lowest income levels in the White Nile of Central Sudan depend heavily on most severe coping strategies wild food and fruits to mitigate food shortage (Ahmed et al. 2011).

1.4 Conclusion

Sudan has numerous natural resource rich in edible food with many varieties of wild fruits and seeds as well as medicinal herbs, while remarkable sectors of the population, particularly in the traditional sector are involved in the collection and trade of wild fruits. The physical and economic accessibilities of such wild fruits make it a part of the normal diet of many people and of great importance during agricultural crops off seasons as well as coping with the adverse food conditions. Rural people in the Suda used to adopt various coping strategies to mitigate hunger during famine and food deficit periods based mainly on resorting to use of wild fruits as a substitute for some stable food as we have seen in Darfur people were tending to substitute millet cereal by "Mukhiet" cereal. However, wild fruits use and consumption are well recognized even during normal times when cultivated food is bandanas

especially, as a free source of delicious consumption for children. The use of wild fruits as delicious consumption, i.e. snacks, juice, flavour has been becoming more familiar to the urban population in the Sudan.

Wild fruits in the traditional sector of Sudan constitute a substantial economic opportunity to the poor people, particularly women, in general sale of wild fruits plays significant role in supplementing their income to meet basic needs especially when other incomes, particularly agriculture, are out of reach.

Furthermore, traders and vendor chain of transaction of these products has been increasing as both rural and urban markets grow due to the increasing demand locally and abroad for wild fruits for consumption and medicinal purposes.

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Chapter 2

Wild Fruits and Sustainable Rural Development



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Abbreviations

NTFPs	Non Timber Food Products
RD	Rural Development
RESAP	Red Sea Area Program
RSS	Red Sea State
SARDF	South African Rural Development Framework
SRD	Sustainable Rural Development

2.1 Introduction

The term “wild” is linked with plant species that grow spontaneously in localized natural or semi-natural environments and can exist independent of direct human action (Vernon 1999). The term is sometimes used for exotic, underutilized, or neglected and less known plants. Wild natural products contribute to energy by supplementing more calories to diets and offering quality attributes to enhance as well as providing micronutrients to rural population (Bell 1995; FAO 2005).

Human being, in their development, started by collecting what is available in nature from food items. Through the course of evolution, customary habits of utilization were introduced. Modern agriculture and urbanization have eroded a great part of local knowledge (Dweba and Mearns 2011).

Local populations have adapted their livelihood in order to maintain their food security and nourishment habits, in this context a sizable number of wild plants received attention through systematic conservation, propagation, processing and marketing. Their dispersion, preservation, mode of collect by local people and ideal utilization requires regional efforts.

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The nutritional qualities of some of these wild plants which were rich in their carbohydrate sugars, proteins, fats and some other qualities related to aroma and taste were used during food shortage (Saka and Msonthi 1994; Saka et al. 2002; Kwesiga et al. 1998; Kwesiga et al. 2000).

2.2 Wild Fruits Security Contribution in Food and Nutritional

The limited access of poor families to wild fruits, remain as key factor for under nourishment in developing countries (Andersen et al. 2003; Adebayo and Phillips 2006). According to Belcher et al. (2005); Narendran et al. (2001); Scherr et al. (2004), the survival and coping mechanisms of local inhabitants emanated from the significant added value of these wild plants as part of the food chain for rural areas (McSweeny 2004; Takasaki et al. 2004; Mojeremane and Tshwenyane 2004; Getachew et al. 2005; Redzic 2007).

Household subsistence and economy can be enhanced through production, utilization and sales of wild fruits which act as cushioning effect for socio-economic parameters (Mahapatra et al. 2005; Bharuch and Pretty 2010).

Other factors impacting the utilization and significance of Non Timber Food Products (NTFPs) (wild natural products) to households in their tribal groups: Ethnic groups vary by their social strata, territorial provenance and history as well as their livelihood generating activities. Besides, they appear to utilize certain plant parts with respect to alimentation, vitality supply and pharmaceuticals (Bussmann et al. 2006).

The South African Rural Development Framework (SARDF) the concept of Rural Development (RD) refers to processes of improving living conditions and infrastructure of rural areas. On the other hand, sustainable rural development (SRD) attempts to maximize the influence of rural communities with regard to the planning and execution of their development goals with the ultimate creation of awareness and confidence to manage their own affairs and development goals (Krzywinski and Holton 2001). RD concentrates on the diversification of activities related to community objectives which enhance competitiveness of their living and non-living resources of agriculture and forestry, land management and, at the same time taking into account the uniqueness of its, environment, quality of life and continuation of nature's diversity and culture for the continuation of generation (Harris et al. 1982). RD, also includes, the translation of the community priorities through assessment and analysis of the economic, social and environmental strategy within national priorities.

In rural areas, factors affecting the fate of a plant species survival and continuity require an understanding of the intimate relationship between the land, its vegetation, and the populations surviving on its resources and the cultures surrounding them. Rural populations, often need to adjust and cope with the changing nature and exploit the advantages for their continued presence as part of the overall adaptations for life.

Tree population's survival is correlated with a complex of edaphic and environmental factors of which rain fall pattern and amount is the most important. The tree cover may take contrasting effect if factors such as elevation and high land formation, exists within an ecological set which dictate different plant species availability and regeneration. In general, wild tree distribution depends on their establishment and maintenance and the availability of ample climatic resources. The vegetation responds to the limiting factors through adaptations which limits survival and reproduction of each individual plant and also dictates its zonation.

In nature, however, there is a definite vegetation zonation related to the cross section land undulations.

2.3 Red Sea State (RSS) Profile

The Red Sea State is located between latitudes 16° and 22° north and longitudes 35° and 37° east in the extreme northeastern part of Sudan. As an administrative unit, the RSS occupies an area of 218,887 km² (10% of the area of Sudan) with a total population of 1.7 million persons, representing 3.4% of Sudan population (reported from last Red Sea State census of 2008). The Average population density is about 7 persons per km², but it considerably varies between the localities of the state (Ahmed 2013). Physically, most studies classify the Red Sea region in to the broad physical units roughly parallel to the coast. The nature of each of these units as well as how humans interest with it, has its implications on the land use and the production systems. These units are:

- (a) The Red Sea shore which extends as a demarked plain from the coast to the hill premises (20–30 km wide). Soils are composed silt and sand with gravel that gets coarser towards the foot of the hills. A narrow strip of recent coral reef deposits bound the plain from east, extending up to 2-km inland.
- (b) The Red Sea Hills which has been classified as being developed by the extension of Great Rift Valley to East Africa. It extends for approximately 500 and 1200 meters above sea level. The base rock is predominantly pre-Cambrian Basement Complex and volcanic and as such is a very poor aquifer. This limited the amount of underground water and made recharge occurs only with exceptionally high rainfall, and *Khors* not helped with topography, it normally occurs at the bottom of the that intersect the mountain range, and
- (c) The western plain is composed mainly of superficial deposits of alluvial and, mostly, Aeolian origin. The area is underlain by the basement complex rock and the surface dominated by scattered rock outcrops, gravel and sands which increase considerably toward the west.
- (d) In the state, the status of cultivation and distribution of the various species of edible woody plants within the area or farming systems, are related to their various uses and roles in providing food. For instance, important fruits and vegetables are often located in Wadies crisscrossing the area near homesteads. According to (Knut) the vegetation cover which exist in highland areas of

Red Sea State (RSS) include *Adansonia digitata*, *Annona squamosa*, *Grewia tenax* (Guddaim), *Ziziphus spina-christi*, *Balanites aegyptiaca*, *Detarium microcarpum*, *Nopal cactus* (*Opuntia ficus-indica*), *Antidesma montanum* or *Antidesma angustifolium*, *Calamus manillensis*, *Debregeasia longifolia*, *Azanza garckeana* L, *Hyphaene thebaica* Doum (Fig. 2.1), *Borassus flabellifer* L Palmyra palm (Daleeb), *Ceratonia siliqua* (carob), and *Vaccinium myrtoides*. Away from highlands and particularly in Tokar Delta, Khor Langeb, and khors Arab and Derudeb, species such as *Tamarix aphylla* and *Hyphaene thebaica* grow in deep soil with easily accessible ground water.

- (e) These zonal variations dictate the types of wild fruits which can flourish and adapt to changing environmental conditions. In particular, trees figure prominently in several of our studies. They are not only the most visually prominent form of vegetation; they also set lower limits for the survival of pastoralism and thus become a reference point for important social values. There is clear evidence of recent deforestation in some areas.

These units are:

- (a) The coastal plain extending from the coast to the foot of the Red Sea Hills (20–30 km wide) covered by slit, sand and gravel that gets coarser towards the foot of the hills. A narrow strip of recent coral reef deposits bound the plain from east, extending up to 2-km inland.



Fig. 2.1 *Hyphaene thebaica* (Doum)

- (b) The Red Sea Hills which represent the western edge of the Great African Rift Valley. It extends for approximately 500 and 1200 m above sea level. The base rock is predominantly pre-Cambrian Basement Complex and volcanic and as such is a very poor aquifer. This limited the amount of underground water and made recharge occurs only with exceptionally high rainfall, and Khors not helped with topography, it normally occurs at the bottom of the that intersect the mountain range, and

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2.4 Population Dynamics Ethnicity and Tribal Identity

The physical, practical and emotional capacity gained through this process has, over time, come to constitute an integral part of its cultures. Those cultures are, however, formed not only by external natural forces but also by the inner force of ideas embodied in myths, beliefs and traditions as well as by the transformations induced in them when natural conditions alter or people change their habitats. One of the predominant influences of local livelihoods is that of tribal identity. According to (knut) the tribal structure is segmented into lower kin-based units (diwabs), which control territories. Rights to land access, including also water sources are critical livelihood resources-land for agriculture, pasture, trees for firewood, charcoal, and water. Tribal norms dictate many aspects of life, including the management of resources.

2.5 Population and Demographic Features

The population growth and intensity measures are essential to strategic planning of growing nations and for food security estimations.

The estimated number of people in Red Sea State is found to be 1.7 million by midyear 2018 at a growth rate of 1.4% per annum. Whereas males constitute 57% of the total population females share the remainder (43%). Table (2) represent the locality, population and villages in Red Sea State. (UNDP 2014) human health measures on global bases indicated that Sudan showed a HDI (0.473) in year 2013 (ranking as number 166) which is a low indicator.