Journal of Agriculture and Rural Development in the Tropics and Subtropics
Vol. 115 No. 1 (2014) 1–7

urn:nbn:de:hebis:34-2014020344903 ISSN: 1612-9830 – journal online: www.jarts.info

Wild food trees in Eastern Nuba Mountains, Sudan: Use, diversity, and threatening factors

Nagwa Kamal-Eldin M. Salih [a,*], Abbas Hassan Ali [b]

[a] *Forestry Research Centre, Agricultural Research Corporation, Khartoum, Sudan*
[b] *Forestry Research Centre, Agricultural Research Corporation, El Obeid Research Station, El Obeid, Sudan*

Abstract

This study was conducted in 2010 in Eastern Nuba Mountains, Sudan to investigate ethnobotanical food and non-food uses of 16 wild edible fruit producing trees. Quantitative and qualitative information was collected from 105 individuals distributed in 7 villages using a semi-structured questionnaire. Also gathering of data was done using a number of rapid rural appraisal techniques, including key informant interviews, group discussion, secondary data sources and direct observations. Data was analysed using fidelity level and informant consensus factor methods to reveal the cultural importance of species and use category. Utilizations for timber products were found of most community importance than food usages, especially during cultivated food abundance. *Balanites aegyptiaca*, *Ziziphus spina-christi* and *Tamarindus indica* fruits were asserted as most preferable over the others and of high marketability in most of the study sites. Harvesting for timber-based utilizations in addition to agricultural expansion and overgrazing were the principal threats to wild edible food producing trees in the area. The on and off prevailing armed conflict in the area make it crucial to conserve wild food trees which usually play a more significant role in securing food supply during emergency times, especially in times of famine and wars. Increasing the awareness of population on importance of wild food trees and securing alternative income sources, other than wood products, is necessary in any rural development programme aiming at securing food and sustaining its resources in the area.

Keywords: wild edible food, multiple uses, Nuba Mountains, conservation, threats

1 Introduction

During food shortage rural communities adopt several survival strategies that based in some stages on increasing the consumption of wild foods (Loghurst, 1986; Moreno-Black & Somnasang, 2000; Ruffo *et al.*, 2002; Lulekal *et al.*, 2011). The physical and economic accessibilities of such food make it of great importance in coping with the adverse food conditions (FAO, 1991). Also during agricultural crops off-seasons wild food play a crucial role in securing food and providing a substitution source of income to the rural households (Msuya *et al.*, 2010; Balemie & Kebebew, 2006; Ali-Shtayeh *et al.*, 2008; Ibrahim *et al.*, 2012). Wild food plants are multipurpose and have non-food usages, as well as food (Ogle *et al.*, 2003). As to woody wild food trees, harvesting for non-timber forest products, in general, were found of less ecological destruction than timber and timber-based products (Arnold & Ruiz Perez, 1998).

In Kordofan states, Sudan, where food shortage occurs as a result of frequent fluctuations in agricultural crops production and the on and off prevailing armed conflicts in some states, wild food serves as an alternative income source and plays a significant role as an emergency food (Abd Ellatif, 2012). This study aimed

* Corresponding author
Forestry Research Centre,
Agricultural Research Corporation,
P.O. Box 13390, Khartoum, Sudan
Email: nagwa.salih@yahoo.com
Cell phone: +249 922195310

to contribute to a better understanding of the ethnobotanical importance of a number of wild edible fruits producing trees as a source of food and other non-food usages in Eastern Nuba mountains. The study meant to discuss the potential contribution of wild fruits production to rural development, poverty reduction and food security and investigate the factors that threaten the sustainability of these trees.

2 Materials and methods

This study was conducted on the clay plain of Eastern Nuba Mountains in Central Kordofan region, Sudan. The study covered seven villages; Sidra belongs to El-Rahad District, Abu-Karshola, ElFaid Um-Abdalla, Tagyek, Tandik and Rashad belong to El-Rashad District and Wad-Abid belongs to Abu-Gebeiha District. All the study sites belong to Southern Kordofan State except Sidra which belongs to Northern Kordofan State. All of the study sites fall within the low rainfall woodland Savannah (Harrison & Jackson, 1958) where mean annual rainfall is about 520 mm and the mean annual temperature is 29.9 °C. Sixty-five percent of south-Kordofan households are sedentary farmers, 23 % are nomadic pastoralists and 12 % are urban and semi-urban dwellers (WFP, 2010).

The study was conducted during December 2010 using a semi-structured questionnaire and a number of rapid rural appraisal methods which included key informant interviews, group discussion, literature review as a secondary data source and direct observations to collect quantitative and qualitative data. The data collected was related to diversity and importance of species and uses, preparation of edible parts for food purposes and factors that threaten the sustainability of 16 wild edible fruits bearing trees listed in Table 1. One hundred and five individuals (fifteen individuals from each of the seven study sites) of different gender and age were selected purposively for the semi-structured questionnaire interviews with assistance of village head (sheikh).

The importance of a certain plant species for a particular usage was quantified using the fidelity level (FL). FL was calculated as: $FL(\%) = (Np/N) \times 100$ where Np is the number of informants that claim a use of a plant species for a particular use, and N is the number of informants that use the plants for any given use category (Alexiades, 1996). Informant consensus factor (ICF) was employed to identify the agreements of the informants on the importance of each specific use category. ICF was calculated as: $ICF = (N_{ur} - N_t)/(N_{ur} - 1)$ where N_{ur} is number of use citations in each category and N_t the number of species used (Heinrich, 1998). The net annual income from sale of wild fruits was calculated from amounts and prices information of sold products provided by the sellers. The contribution of the sold fruits to family income was calculated as a percentage of the total annual income generated from the selling of wild fruits and other sources of income, mainly farming and pastoralism. The qualitative data was narrated to report the knowledge shared by the local population regarding edible parts and processing methods followed and factors that threaten specific food tree species.

Table 1: *Scientific, vernacular and family names of species under study*

Scientific name	*Vernacular name*	*Family*
Adansonia digitata Linn.	Tebeldi (tree), Gonglaise (fruit)	Bombacaceae
Annona senegalensis Per.	Gishta	Annonaceae
Azanza garckeana (F. Hoffm.) Exell & Hillcoat	Nakhgar	Malvaceae
Balanites aegyptiaca Del.	Higlig (tree), Lalob (fruit)	Balanitaceae
Borassus aethiopum Mart.	Deleib	Arecaceae
Cordia africana Lam. Tabl. Encyc.	Gimbil	Boraginaceae
Diospyros mespiliformis Hochst. Ex A. DC.	Goghan	Ebenaceae
Ficus sycomorous Linn.	Gomeiz	Moraceae
Grewia tenax (Forsk.) Fiori.	Guddeim	Tiliaceae
Hyphaene thebaica (Linn.) Mart.	Dom	Arecaceae
Sarcocephalus latifolius (Smith) E. A. Bruce	Karmadoda	Rubiaceae
Sclerocarya birrea (A. Rich.) Hochst.	Humeid	Anacardiaceae
Tamarindus indica L.	Aradeib	Fabaceae - Caesalpinioideae
Ziziphus spina-christi (L.) Desf.	Sidir (tree), nabaq (fruit)	Rhamnaceae
Vangueria madagascariensis Gmel.	Kirkir	Rubiaceae
Vitex doniana Sweet.	Um tugulgul	Verbenaceae

3 Results

The local people of Eastern Nuba mountains were found to appreciate some edibles over the others in their utilization. The FL values (Table 2) showed that *Balanites aegyptiaca*, *Ziziphus spina-christi* and *Tamarindus indica* were asserted as most preferable over the other edibles in most of the study sites. Fruits, of nearly all of the recorded species, are usually consumed fresh as snacks without further processing. Pulps of *Adansonia digitata*, *T. indica*, *Grewia tenax*, *Sarcocephalus latifolius* and *Vangueria madagascariensis* are consumed as juices which could also be prepared into porridges. In addition to the fruits, the informants mentioned the consumption of raw fresh leaves of *A. digitata* and *T. indica* as salads with the addition of groundnut butter to improve the flavour. Seeds of *Vitex doniana* and *A. digitata* are roasted and pounded to make hot drinks consumed as coffee and tea substitutes. The seeds of *B. aegyptiaca* are crushed and the kernels are boiled with water to extract oil for cooking purposes. Also the hypocotyle of the newly germinated seeds of *Borassus aethiopum*, locally named "Halook", was mentioned as a highly popular edible part in Kordofan region. The boiled Halook is eaten with roasted ground nut. Some edibles are highly appreciated by a wide range of population while others; such as *Cordia africana*, *V. doniana*, *Diospyros mespiliformis*, *Sclerocarya birrea* and *Ficus sycomorous* fruits are said to be eaten by children only. Also the children eat the kernel of *Ziziphus spina-christi* after crushing the hard coat of the seed. In some villages interviewees indicated that wild fruits are occasionally eaten by adults and are not considered supplement to diets, especially during normal times when food from diverse domesticated food sources is available.

Analysis of use diversity revealed the importance of seven major uses in the region. Food, construction materials, agricultural tools, fuel wood, medicinal uses, furniture and fodder were found to contribute to 92 % of the total uses. Other uses such as fences, ornamentals, agroforestry, shade, rope and baskets making were considered of minor importance. ICF values (Table 3) provided general information on the ethnobotanical importance of each use category in each of the study sites. The ICF results indicated the importance of non-food categories over food use in all the study sites. In Table 4, the use categories that received FL values reaching 100 were shown to reveal the most appreciated uses for each species. *G. tenax*, *T. indica* and *A. digitata* seemed main sources for food and medicine, *S. latifolius* was acknowledged as a medicinal plant while *Ziziphus spina-christi* was appreciated as a source of food mainly. *S. birrea*, *D. mespiliformis* and *C. africana* were recognized as sources for furniture materials whereas *B. aethiopum* was affirmed as a source of construction materials. *B. aegyptiaca* seemed an important multipurpose tree with diverse uses; mainly food, fodder and fuel wood. The species that showed zero FL values for all the investigated use categories were signed excluded.

Table 2: *FL of different species as source of food in different study sites*

Species	*Sidra*	*Abu-Karshola*	*ElFaid*	*Tagyek*	*Tandik*	*Wad- Abid*	*Rashad*
Adansonia digitata	13	100	63	25	100	86	100
Annona senegalensis	0	0	100	100	80	0	0
Azanza garckeana	0	0	0	0	0	0	100
Balanites aegyptiaca	100	100	100	25	100	100	100
Borassus aethiopum	50	100	38	50	13	17	75
Cordia africana	71	38	17	50	25	0	0
Diospyros mespiliformis	0	75	57	17	60	0	57
Ficus sycomorous	0	100	0	100	100	0	71
Grewia tenax	14	100	71	0	71	100	100
Hyphaene thebaica	33	14	0	0	40	0	100
Sarcocephalus latifolius	0	0	80	20	0	33	100
Sclerocarya birrea	71	75	57	14	38	67	50
Tamarindus indica	100	100	88	100	88	100	100
Vangueria madagascariensis	0	0	75	100	0	0	100
Vitex doniana	0	0	25	100	40	0	100
Ziziphus spina-christi	100	100	100	100	88	100	100

As to economic importance, the market observations revealed high marketability of some wild fruits, especially the ones that have high edible preferences. Fruits from *A. digitata*, *B. aegyptiaca*, *Z. spina-christi* and *T. indica* were economically important species with high marketability. The other edibles were occasionally sold at local market (Souk). Our investigation revealed that most of the local families were wild fruits collectors, to various extents. Some of the population collects for their own consumption only while others collect for sale as well. The sale of the wild fruits was found to contribute to 50 %, 60 % and 75–100 % of the total annual family income in Wad-Abid, Abu-Karshola and Rashad, respectively. The contribution of the sale of wild fruits was 6 %, 12 %, 14 % and 29 % of the total annual family income in ElFaid, Tandik, Sidra and Tagyek, respectively.

The study investigated the importance of over grazing, agricultural land expansion, fuel wood collection, selective logging, uncontrolled fire, pests and diseases and drought as threatening factors to sustainability of food trees. In Rashad, Wad-Abid and Tagyek, agricultural expansion was rated as the principal threatening factor. Overgrazing was mentioned as principal threat in ElFaid and Tandik villages. Uncontrolled fire setting was another important threat in ElFaid District. Interviewee indicated that fire setting is a community tradition practiced to clean the land from grasses before and after harvesting of agricultural crops. Fuel wood collection was mentioned as a common threatening factor in all the study sites. Nuba mountains population has also mentioned the selective logging as an important factor threatening *S. birrea* and *C. africana* which have high timber quality widely used for furniture purposes. It is

Table 3: *ICF values for different use categories at all the study sites*

Use category	*Sidra*	*Abu-Karshola*	*ElFaid*	*Tagyek*	*Tandik*	*Wad- Abid*	*Rashad*
Food	0.78	0.84	0.78	0.66	0.78	0.79	0.85
Fodder	0.85	0.88	0.89	0.89	0.90	0.89	0.82
Fuel wood	0.83	0.82	0.79	0.89	0.85	0.93	0.83
Medicinal use	0.88	0.84	0.87	0.88	0.86	0.82	0.82
Construction material	0.67	0.87	0.81	0.84	0.87	0.92	0.83
Furniture	0.76	0.90	0.86	0.86	0.85	0.88	0.84
Agricultural tools	0.71	0.87	0.67	0.93	0.88	0.93	0.87

Table 4: *Use Categories with FL Values Reaching 100 for the Different Study Sites*

Species	*Sidra*	*Abu-Karshola*	*ElFaid*	*Tagyek*	*Tandik*	*Wad- Abid*	*Rashad*
Adansonia digitata	M	F, M	M	M	F, M	M	F
Annona senegalensis	EX	M	F, W	F	C	EX	EX
Azanza garckeana	EX	EX	EX	EX	EX	EX	F
Balanites aegyptiaca	F, W, M	F, FD,W	F, FD, W	FD, W, A	F	F, FD, W, A	F, FD, W,A
Borassus aethiopum	C	F, C	C	C	C	C	C
Cordia africana	FN, A	FN	FN	FN	FN	FN	C, FN
Diospyros mespiliformis	FN	FN	FN	FN	FN	EX	W
Ficus sycomorous	FD	F,W	EX	F	F	EX	FD
Grewia tenax	M	F, M	FD	EX	M	F	F
Hyphaene thebaica	C, FN	C	EX	EX	C	EX	F
Sarcocephalus latifolius	M	M	M	M	M	M	F, M
Sclerocarya birrea	FN	FN	FD	FN	FN	FN	C, A
Tamarindus indica	F, M	F, M	M	F, M	M	F	F, M
Vangueria madagascariensis	EX	EX	W	F	EX	EX	F
Vitex doniana	EX	EX	W	F	FN	EX	F
Ziziphus spina-christi	F, FD	F, W	F, FD, W	F	FD, C, A	F, C	F, FN, A

Use categories: F= food, FD= fodder, W= fuel wood, C= construction material, FN= furniture, M= medicine, A= agricultural tools; EX=excluded

worthwhile to mention that the continuous peeling of bark, for rope making, of *A. digitata* causes the death of a large number of the trees. Also the popularity of *A. digitata* fruits in and outside its natural niche might cause low availability of the seeds for new regeneration inside their natural habitat. *B. aethiopum* was found to be endangered due to high preference of the hypocotyl as food. The interviewee mentioned the shrinkage of the food trees in the study area.

4 Discussion

The rich forest flora of South Kordofan (El Tahir *et al.*, 2010) supports a wide diversity of forest uses and products. The similar reported for species uses in different study sites could be attributed to the similarity in culture between the different communities. The consumption of raw wild food in a number of countries e.g. Zimbabwe (Campbell, 1987; Maroyi, 2011), Cyprus (Della *et al.*, 2006), Spain (Pardo-de Santayana *et al.*, 2005), India (Rashid *et al.*, 2008) and Ethiopia (Balemie & Kebebew, 2006) and various parts of food trees (e.g. Maroyi, 2011; Samant & Dhar, 1997) shows similarities in food tradition between countries. The boiled or roasted hypocotyle of *B. aethiopum* seems a traditional food in different Sahelian parts of Africa (Ali *et al.*, 2010). In other countries, such as Tanzania (Hines & Eckman, 1993) and Zimbabwe (Maroyi, 2011), as well as in Kordofan region, wild fruits were seen as a free source of nutritious snacks for children. Inverse relationship between the availability of cultivated food varieties and the consumption of wild forest foods was reported (Msuya *et al.*, 2010). The low appreciation of wild varieties in Wad-Abid and the other villages that belong or adjacent to Abu-Gebeiha district, where a wide plantation of mango gardens exist, could be explained by the inverse relation mentioned above. Also the importance of non-food categories over food use, indicated by ICF values (Table 3) for different use categories, confirms the low appreciation of wild food use during cultivated food crops availability. However, under the current situation, of on and off prevailing armed conflict in the area, the role of wild edibles is increasingly recognized in securing food for the local population (Abd Ellatif, 2012). Even the less preferable food becomes more appreciable during times of food crisis Edibles that showed zero FL value are mostly of very low availability in the study site.

Income derived from the trade of non-timber forest products, in particular wild food and herbal medicines, was found to be of particular importance to the poorer communities in almost all Africa (Barirega *et al.*, 2012). The low cost of collection and unrestricted access to forests encourage the trade of wild food (FAO, 1991; Aryal *et al.*, 2009; Adam, 2011). In Southern Kordofan the low returns from cultivated crops in addition to prevailed poverty necessitate diversification of incomes from other resources (El Tahir & Gebauer, 2004). The potential of wild edibles in Wad-Abid, Abu-Karshola and Rashad for income generation was significant. Some of wild edibles, especially the ones that have high food preferences, such as *A. digitata*, *B. aegyptiaca* and *Z. spina-christi*, reported in this and other studies (Adam, 2011) showed high marketability. The role of these edibles in poverty reduction was reported in the study of Adam (2011) who estimated the contribution to total household's income of the trade of *A. digitata*, *Z. spina-christi* and *B. aegyptiaca* fruits to reach 51 %, 42 % and 26 %, respectively in south Kordofan.

Threats and constraints to sustainability of non-timber forest products, in general, in South Kordofan were reported by El Tahir & Gebauer (2004). The great agricultural expansion in the three sites (Rashad, Wad-Abid and Tagyek) explained the high ICF values (Table 3) for agricultural tools in the three sites. Selective logging of some high quality timber species was reported in this and another study (El Tahir *et al.*, 2010) to cause depletion of *C. africana* and *D. mespiliformis*. The vulnerability of the three species, *C. africana*, *D. mespiliformis* and *S. birrea*, to genetic erosion was indicated by the high FL (Table 4) for furniture use category. The over exploitation of *C. africana* for its timber was also reported in Ethiopia as an important factor threatening the existence of the species (Balemie & Kebebew, 2006). Abdelmuti (2006) found no justification, except in emergency times, for extensive consumption of *B. aethiopum* hypocotyls, which is considered the principal factor threatening the species, as its nutritional value was found to be much less than that of the fruits. Communities' competition for the highly popular food trees in their overlapping ecological niches puts more pressure and increases the vulnerability of the plants. These particular threatening factors in addition to the general ones might create an unsustainable ecological situation and damage the balance between community and nature in a way that threatens the livelihood of population.

5 Conclusion and recommendations

Most of the wild food trees in the study areas need to be protected, especially the low land vegetation, which are the potential sources of wild edibles. Wild food use was found not to be a well-recognized usage during normal times when cultivated food is abundant. Uti-

lization of wild food trees for timber products purposes threatens the existence and causes depletion of genetic resources of some of highly preferred wood species. A forest management system that sustains the household's subsistence needs and generates income opportunities is needed. Also, increasing the awareness and managing the economic wild food species by farmers in their farmlands as agroforestry or garden trees should be encouraged.

Acknowledgements

We are grateful to all people in the studied villages for their kind hospitality and share of knowledge. Also we thank the officers of Forest National Corporation in El Rashad and Abu-Gebeiha districts for their great helps.

References

Abd Ellatif, H. A. A. (2012). *Food security in South Kordofan State: A food poverty and livelihood perspective*. Master's thesis Sudan Academy of Sciences Sudan.

Abdelmuti, O. M. S. (2006). Chemical and nutritional composition of Daleib (*Borassus aethiopium*) and its hypocotyl "halook" utilized in Western Sudan as a famine food. *Sudan Journal of Agricultural Research*, 6, 53–60.

Adam, Y. O. (2011). *Contribution of local-level trade in non timber forest products to rural development in Rashad locality of Nuba Mountains, Sudan*. Ph.D. thesis Technical University of Dresden, Faculty of Forest, Geo and Hydro Sciences, Germany.

Alexiades, M. N. (1996). Collecting ethnobotanical data: An introduction to basic concepts and techniques. In A. M. N. (Ed.), *Selected guidelines for ethnobotanical research: a field manual* (pp. 53–94). The New York Botanical Garden, Bronx, New York.

Ali, A., Fadimatou, B., Tchiegang, C., Saidou, C. & Adji, M. B. (2010). Physico-chemical and functional properties of bâtchi or hypocotyle axes of *Borassus aethiopum* Mart. *African Journal of Food Science*, 4 (10), 635–641.

Ali-Shtayeh, M. S., Jamous, R. M., Al-Shafie', J. H., Elgharabah, W. A., Kherfan, F. A., Qarariah, K. H., Khdair, I. S., Soos, I. S., Musleh, A. A., Isa, B. A., Herzallah, H. M., Khlaif, R. B., Aiash, S. M., Swaiti, G. M., Abuzahra, M. A., Haj-Ali, M. M., Saifi, N. A., Azem, H. K. & Nasrallah, H. A. (2008). Traditional knowledge of wild edible plants used in Palestine. *Journal of Ethnobiology and Ethnomedicine*, 4, 13.

Arnold, J. E. M. & Ruiz Perez, M. (1998). The role of non-timber forest products in conservation and development. In E. Wollenberg, & A. Ingles (Eds.), *Income from the Forest: Methods for the Development and Conservation of Forest Products for Local Communities* (pp. 17–24). Centre for international forestry research, Bogor, Indonesia.

Aryal, K. P., Berg, Å. & Ogle, B. (2009). Uncultivated plants and livelihood support – A case study from the Chepang people of Nepal. *Ethnobotany Research and Applications*, 7, 409 – 422.

Balemie, K. & Kebebew, F. (2006). Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 2, 53.

Barirega, A., Tabuti, J. R. S., Damme, P. V., Agea, J. G. & Muwanika, V. (2012). Potential for commercialization and value chain improvement of wild food and medicinal plants for livelihood enhancement in Uganda. *Current Research Journal of Biological Sciences*, 4 (2), 108–116.

Campbell, B. M. (1987). The use of wild fruits in Zimbabwe. *Economic Botany*, 41, 375 –385.

Della, A., Paraskeva-Hadjichambi, D. & Hadjichambis, A. C. (2006). An ethnobotanical survey of wild edible plants of Paphos and Larnaca countryside of Cyprus. *Journal of Ethnobiology and Ethnomedicine*, 2, 34.

El Tahir, B. A., Fadl, K. E. M. & Fadlalmula, A. G. D. (2010). Forest biodiversity in Kordofan region, Sudan: effects of climate change, pests, disease and human activities. *Biodiversity*, 11 (3 & 4), 34–43.

El Tahir, B. A. & Gebauer, J. (2004). Non-timber forest products: opportunities and constraints for poverty reduction in the Nuba Mountains, South Kordofan, Sudan. Conference on International Agricultural Research for Development. Deutscher Tropentag, Berlin. URL `http://www.tropentag.de`.

FAO (1991). *Household food security and forestry an analysis of socio-economic issues*. FAO, Rome, Italy.

Heinrich, M. (1998). Indigenous concepts of medicinal plants in Oaxaca, Mexico: Lowland Mixe plant classification based on organoleptic characteristics. *Journal of Applied Botany*, 7 (1/2), 75–81.

Hines, D. & Eckman, K. (1993). Indigenous multipurpose trees of Tanzania: uses and economic benefits for people. Working Paper. FAO.

Ibrahim, H. A., Ali, S. G. Y., Halliru, N., Usaini, S. & Abdullahi, I. I. (2012). Ethnobotanical survey of the wild edible food plants consumption among local communities in Kano State, North – West, Nigeria. *International Journal of Science and Technology*, 2 (10), 713–717.

Loghurst, R. (1986). Household food strategies in response to seasonality and famine. *IDS Bulletin*, 17, 27–35.

Lulekal, E., Asfaw, Z., Kelbessa, E. & Van Damme, P. (2011). Wild edible plants in Ethiopia: a review on their potential to combat food insecurity. *Afrika Focus*, 24 (2), 71–121.

Maroyi, A. (2011). The gathering and consumption of wild edible plants in Nhema communal area, Midlands Province, Zimbabwe. *Ecology of Food and Nutrition*, 50 (6), 506–525.

Moreno-Black, G. & Somnasang, P. (2000). In times of plenty and times of scarcity: non-domesticated food in Northeastern Thailand. *Ecology of Food and Nutrition*, 38, 563–586.

Msuya, T. S., Kideghesho, J. R. & Mosha, T. C. E. (2010). Availability, preference, and consumption of indigenous forest foods in the Eastern Arc Mountains, Tanzania. *Ecology of Food and Nutrition*, 49 (3), 208–227.

Ogle, B. M., Tuyet, H. T., Duyet, H. N. & Dung, N. N. X. (2003). Food, feed or medicine: the multiple functions of edible wild plants in Vietnam. *Economic Botany*, 57, 103–117.

Rashid, A., Anand, V. K. & Serwar, J. (2008). Less known wild edible plants used by the Gujjar tribe of District Rajouri, Jammu and Kashmir state, India. *International Journal of Botany*, 4, 219–224.

Ruffo, C. K., Birnie, A. & Tengnäs, B. (2002). Edible wild plants of Tanzania. Regional Land Management Unit (RELMA), Nairobi, Kenya: Swedish International Development Cooperation Agency (Sida).

Samant, S. S. & Dhar, U. (1997). Diversity, endemism and economic potential of wild edible plants of Indian Himalaya. *International Journal of Sustainable Development & World Ecology*, 4 (3), 179–191.

Pardo-de Santayana, M., Tardio, J. & Morales, R. (2005). The gathering and consumption of wild edible plants in the Campoo (Cantabria, Spain). *International Journal of Food Sciences and Nutrition*, 56, 529–542.

WFP (2010). Emergency food security assessment – South Kordofan, Sudan. World Food Programme (WFP). URL `http://home.wfp.org/stellent/groups/public/documents/ena/wfp232447.pdf`.