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Influential factors to the Consumptions of Edible Wild Fruits and Products in the Post Conflict District of Gulu, Uganda

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Abstract
Edible wild fruits are of great importance to many rural communities around the world. However, factors that influence the communities' to consume their fruits/products are in adequately documented. The objectives of this study were to document factors that influence the consumptions of the edible wild fruits/ products in Gulu District; establish community's' motivations to eating of the edible wild fruits; daily frequency of wild fruits consumption, and to establish the willingness of the community to include the wild fruits as part of daily meals. The edible wild fruit trees of interest were *Vitex doniana* Sweet, *Vitellaria paradoxa* Gaertn, *Borassus aethiopum* Mart., *Tamarindus indica* L. and *Annona senegalensis* Oliv. Data were collected using structured questionnaires and in-depth interviews among 350 respondents selected in a cluster sampling procedure from the sub-counties of Awach, Paicho, Patiko, Ongako, Lalogi and Bobi Sub-Counties. The main influential factors to community's fruit consumptions included sensory responses (55%); availability and accessibility of the fruits (16%), social factors (13%) and least was cultural values. Only 23.7% of the respondents showed willingness to include wild fruits into their daily meals. In conclusion, many factors influence the consumption of the edible wild fruits; hence there is need to develop studies that can mitigate the factors that influence negatively and develop ways to enhance community's' consumptions. The impact of consumptions of the fruits on the community's wellbeing needs also to be investigated.
Key words: Multipurpose trees, Non-Timber Forest and Natural Tree Products

1. Introduction

Consumptions of fruits and vegetables are important elements of a healthy and balanced diet both as part of the main meal or as a snack (EUFIIC, 2012; Paquette, 2005). Edible fruits fulfil a much more substantial role in daily diets (Karaan *et al.*, 2005). People who eat more fruits maintain a healthy weight (Tohill, 2004). Snacking on fruits keep people alert even after different meals Rahn, (2009) therefore fruits is one of the best choices of snack (Pritchard 2011). Parental modelling, support, self-efficacy and fruit availability are significant predictors of consumption habits (Vereecke *et al.*, 2005). The eating behaviours of parents usually influence children's preferences and behaviours (Young *et al.*, 2010). Household composition, its members' knowledge, and levels of education, habits, cultural norms, personal experiences and biological factors affect preferences (Ruel *et al.*, 2004).

Although fruit consumption is affected by many factors, the World Health Organization (WHO) greatly aims at promoting and increasing fruit and vegetable consumptions so that sufficient quantities become part of the daily diets in all countries (Agudo, 2004). Consumption of fruits in particular has much protective effect against many chronic diseases such as cardiovascular diseases, type 2 diabetes and certain cancers like those of the mouth, pharynx, larynx, oesophageal, stomach and lungs which are associated with lower fruit and vegetables consumption (Dauchet *et al.*, 2006). Sufficient intake of fruits is also a protective measure against obesity (Jansen *et al.*, 2010). The vitamin C in fruits is a powerful antioxidant that helps lessen oxidative stress to the body, and is thought to lower the risk of cancer (Bendich *et al.,* 1986).

There are fruit plant species that are traditionally consumed, and are very important supplements to local diets, particularly during times of food shortage (González *et al.*, 2011). However, in Northern Uganda the over 20 years of civil war in northern Uganda between the Lord Resistance Army (LRA) and the Government of Uganda between 1986-2006 disrupted fruits consumptions. Both the introduced and indigenous edible wild fruits were not readily available because of confinement of the community in the internally displaced persons

camps (IDPs) where access to any fruits especially those in the wild were limited. The community heavily relied on relief aids from agencies such as the World Food Programs aids consignments lacked fruits. Introduced fruits were mainly available in urban markets, expensive and only affordable to urban dwellers.

During the time of encampment, areas outside the camps were inaccessible due to intense insecurity but at the same time a number of edible wild fruit tree species regenerated in the wild and in the abandoned homesteads (Oryema *et al*., 2013). Many such trees were out of reach of children hence no self-learning and indigenous knowledge (IK) transmission was possible. . Consequently, lot of information remained locked up with the elders. To this effect, many edible wild fruits are being rejected especially by the younger generations in preference for the introduced fruits preferred whose nutritional compositions are fairly known. In a bid to promote the consumptions of the edible wild fruits and to get information that can be used to enhance the consumption and the future of these edible wild fruits in community, a study of influential factors to the consumptions/ use of their products ought to be undertaken. Such factors are defined by Beaujanot *et al*., (2012) as a set of actions that define how people relate to others and food.

The study of factors that influence fruits and vegetables consumption is of public health priority (Beaujanot, *et al*., 2012**;** Jansen, *et al* 2010**)**. Lack of knowledge on perceptions of healthy eating is very influential to eating habits (Paquette, 2005). In this study, influential factors were taken as those factors that motivate or de-motivate the community to consume and utilize the fruits, and products. This study was designed to establish factors that influence the consumption and utilization of the preferred edible wild fruit species of Gulu district identified by Oryema *et al*. (2013).; establish community' motivations to eating of the edible wild fruits, daily frequency of fruit consumptions, active gender and ages in harvests/consumption and community's willingness to include them as part of their daily meals.

2. Methods

2.1 Study area

This study was conducted in six randomly selected Sub-Counties of Omoro and Aswa Counties in Gulu District. The Sub-Counties included Ongako, Bobi, Lalogi, Patiko, Awach and Paicho (Figure1).

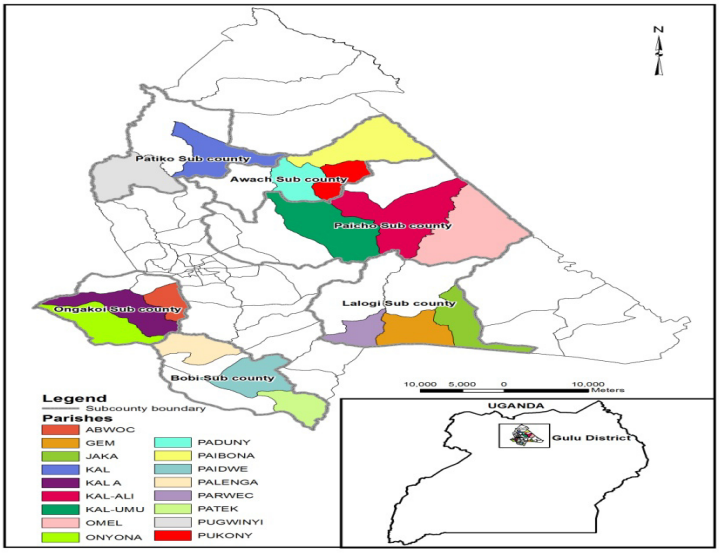

Figure 1. Selected Sub-Counties and Parishes under the study (Reference: Uganda, Gulu District, Counties, Sub-counties and parishes from shape files of 2006. Map made *on* 22nd 08 2012).

2.2 Study design

This was a case study which targeted heads of households from the age of 15 years. The choice for the age groups from 15 years bore the fact that the long period of insurgency left so many child headed household who lost their parents to the then situations. Two-days training were held to equip the field assistants with information on procedural identification of participants, questionnaire administration, recording of responses, respect for

participants and ethical considerations. Ethical clearance was obtained from the Research and Ethics Committee of the Faculty of Medicine, Gulu University and the Uganda National Council for Science and Technology (UNSCT). The research tools used in this study included the use of both closed and opened ended questionnaires, and interview guides previously pre-tested and piloted in Pader District to enhance precision of the planned research. The tools were administered by the researchers to the respondents. Observations, informal conversations, and interactions outside the designated time were other methods used.

The local leaders of the selected research areas were visited prior to the commencement of the study for authorization and scheduling of appointments for the visits. Both the leaders and respondents were informed of the purposes/objectives and benefits of the study. Anonymity of the respondents was respected. Respondents were informed of the confidentiality of the data collected. Informed consent was sought and forms presented for signatures/thumb prints before engaging them for the interviews.

The Sub-Counties, Parishes and Villages included in this study were selected randomly from the list provided by the district planning Unit of Gulu. Stepwise randomisation started with the sub-counties and followed sequentially up to village levels. In total, six sub-counties and 33 parishes were selected (Figure 1). The total population for the study was obtained from the formula developed by Leishly (1965). The households for the study were selected using a cluster sampling procedure. Using this procedure, the respective area local councillors identified an assumed centre of their village and moved with the research team strictly on the right hand side instantly picking households. A total population of 350 individual household heads (respondents) were included. To note, only willing household heads (female or male) in those villages were interviewed.

2.3 Data collection and analysis

The study was undertaken on previously identified five top most preferred edible wild fruit tree species (PEWFTS) (Oryema *et al*., 2013), and included *Vitex doniana*, *Vitellaria paradoxa, Borassus aethiopum, , Tamarindus indica,* and *Anonna senegalensis.* Data were collected using pretested questionnaire and interview guides. Both open and close ended questionnaires were administered by the researchers. Interviews included both individualized and focused groups discussions.

Responses to the questionnaire questions were marked against the coded proposed answers, while responses to the interviews were recorded in note books and also tape recorded. Quantitative responses were checked and entered in Microsoft Excel (Version 7) then exported to STATA 12 (StataCorp LP, College Station, and Texa, USA) for analysis. Descriptive statistic was used and results were presented in percentages in forms of tables and figures. Narratives were made for qualitative responses.

3. Results

3.1 Factors that influence the consumptions and utilizations of the fruit and products of the preferred edible wild fruits

Majority of the people (54.6%) mentioned sensory influence which encompassed tastes, appearances, scent and textures; followed by availability and accessibility (17%) and the least were those for cultural values (1.2%) (Table1). No one reported gaining economically from the fruits of *Vitex doniana* and *A. senegalensis*.

Table 1 Preferred fruit trees and factors that influence the consumptions of their edible products.

PEWFTs	Percentage responses to factors that influence the consumption of the preferred edible wild fruits (PEWFS) and products						
	Sensory influence	Hunger	Social interactions	Economic gains	Cultural values	Availability/ accessibility	Negative attitude
Vitex doniana	40	3	30	0	0	19	8
Vitellaria paradoxa	63	13	3	2	6	14	0
Borassus aethiopum	71	8	3	5	0	13	6
Tamarindus indica	53	0	6	29	0	12	0
Anonna senegalensis	46	0	27	0	0	27	0

3.2 Communities' motivations to the consumption of the preferred edible wild fruit species (PEWFS)

Most people reportedly ate the fruits to attain satisfaction, followed by those who ate for pleasure and the least to pass time (Table 2). No one mentioned eating *A. senegalensis* in order to gain strength.

Table 2 **Percentage responses to communities' motivations to the consumption of the PEWFS**

PEWFS	Satisfactions	Pleasure	Passing time	Feel refreshed	Gain Strength
Vitex doniana	30	24	14	15	18
Vitellaria paradoxa	31	26	6	21	15
B.aethiopum	28	28	10	21	13
T.indica	35	12	6	29	18
A.senegalensis	27	36	27	9	0

3.3 The most encouraged groups of persons in Gulu district to eat the PEWFS

All respondents reported encouraging all categories of persons to eat all the preferred fruits with exception of *T. indicum and A. senegalensis*. (Figure 2).

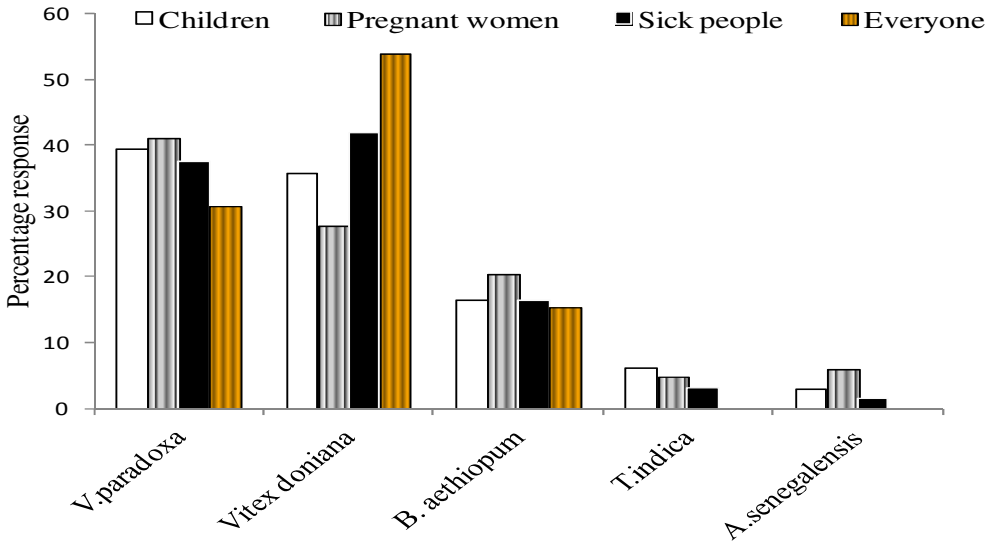

Figure 2 The most encourged groups of persons in this community to eat the each PEWFS

Figure 3 Children chewing the fruits of *B. aethiopum*

3.3 Daily frequency of PEWFS consumption by the respondents

Most respondents ate the PEWFS twice (Table 3). This is followed by those who ate once but no one ate *A. senegalensis* many times in a day.

Table 3 PEWFS versus the number of times their fruits are eaten on daily basis by the respondents.

PEWFS	Once	Twice	Thrice	Many times
Vitex doniana	52	36	11	2
V. paradoxa	7	33	11	48
B. aethiopum	42	34	18	5
T. indica	29	53	12	6
A. senegalensis	55	36	9	0

3.4 The most preferred time of the day by the respondents for eating the preferred edible wild fruits

Most respondents preferred to eat all the PEWFS at any time in the day, followed by those who preferred afternoon hours and least were those for evening hours (Table 4).

Table 4 **The most preferred time of the day for eating the PEWFS**

PEWFS	Preferred time for consuming the fruits			
	Any time	Afternoon	Morning	Evening
Vitex doniana	66	18	11	5
V. paradoxa	69	14	9	9
B. aethiopum	62	21	5	12
T. indica	65	18	18	0
A. senegalensis	56	36	9	0

3.5 Willingness and preferred time of the respondents to include the PEWFS as part of their daily meals

More respondents (76.3%) did not express willingness to include these edible wild fruits as part of their daily meals (Figure 6). Of those who showed willingness, more people (68.7%) preferred to eat the fruits after meals than those who opted to eat them before.

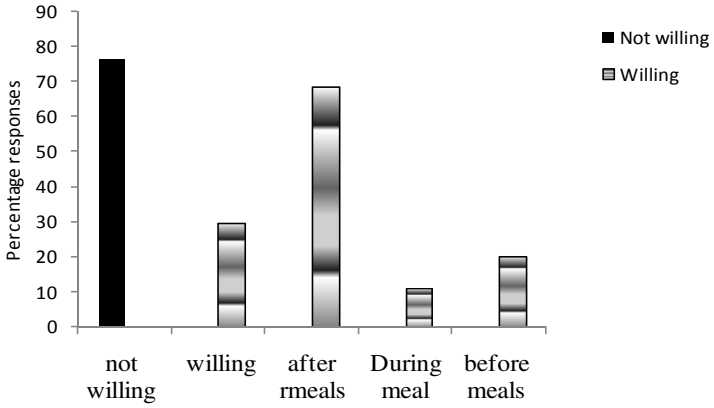

Figure 4 The willingness of the community to include the PEWFS as part of daily meals and the preferred time for inclusion.

3.6 Perceived active gender by the respondents in daily the harvest and consumption of the PEWFS

Females were perceived by the respondents as the most active members of the community in both harvest and consumption of PEWFS (Figures 7 and 8). Males were noted as eating these fruits many times in a day.

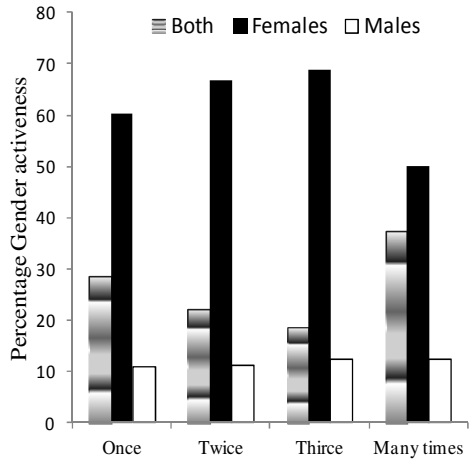

Figure 5 Perceived active gender and frequency of daily harvest of PEWFS

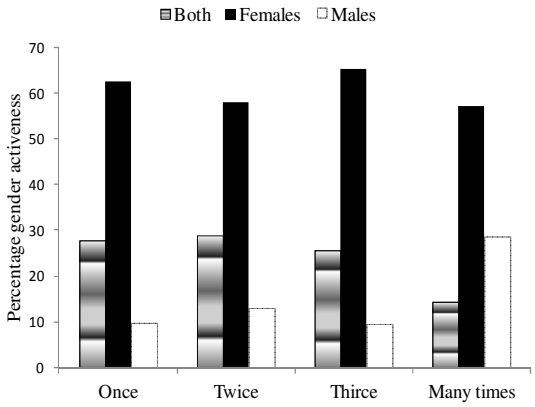

Figure 6 Perceived active gender and frequency of daily consumptions of PEWFS

3.7 The most active age groups in PEWFS harvest and consumption

The respondent perceived that, the most active age groups in harvesting and consumption of the PEWFS were those between the age of 4-10 years (63%), followed by those between 11-15 years (29%) (Figure 9). The least were those who observed that all age groups were active.

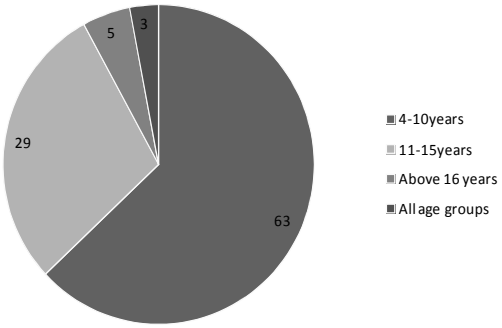

Figure 7 The most active age groups in fruit harvests and consumptions

4.0 DISCUSSIONS

4.1 Influential factors to the consumptions of the preferred edible wild fruits (PEWFTS)

The factors identified in this study as the most influential to the consumptions of edible wild fruits by the community of Gulu district are similar to those established for imported fruits (Ganasegeran, *et al*., 2012; Reinaerts, *et al.*, 2007). Fruit characteristics play essential roles in enhancing/reducing their rate of fruit consumptions. The preferred edible wild fruit species (PEWFS) such as *Vitex doniana*, *Vitellaria paradoxa* and *Annona senegalensis* with sweeter tastes, are eaten more regularly compared to those with sour or bitter tastes (*Tamarindus indica*). Similarly, fruits with bright colors or with glabrous textures are more commonly consumed than those with hard covers (eg *Borassus aethiopum*).

Although few respondents eat most PEWFS because of hunger, it is an important factor that plays a crucial role in enhancing fruits consumption. Eating fruits in response to hunger leads to satiation consequently reducing hunger itself (Tohill, 2004). Eventually, this condition reduces the probability of over eating unhealthy foods throughout the day.

Another factor of interest is social interactions among the peers (both the old and young) in many social gatherings and organizations such as garden/farms fields, schools, at home, churches, interactions with parents (family members) and/or when people are in groups. Many adults and adolescents in this district carry out a number of activities while in groups, which gathering provides a groups opportunity for fruit consumption. Groups such as those known as '*Kalulu*' a local term used to describe digging in groups and in turns, and local saving scheme known as '*boli cub'* (Okello Pers. Com.) are good examples. Such groupings provide good opportunities for edible wild fruit (EWFS) consumptions in case if any less known or unknown edible fruits are encountered. Tate (2001) recognized such groupings as an important developmental point of reference, especially for the adolescents from where they gain understandings of the world outside their families. Through such peer interactions, children especially can learn to differentiate various fruit species of edible and non-edible nature. Consequently, those with low attitude towards fruit consumption imitate the behavior of others and start to eat them.

Interactions with parents (or family members) highly influence the consumptions of many things in homes. Early support and guidance by parents can enhance children's knowledge and strengthens their fruit consumption capacities. It is noted that, parental guidance at an early age has a permanent mark on the future habits of a child (Lindström *et al.,* 2001; Dubowitz, *et al.*, (2008). Exposing children to edible wild fruit species by parents at an early age provides adequate knowledge of these fruits. Similarly, if parents taste such edible wild fruits in the presence of their children, they get motivated to eat them more. Observing and imitating eating behavior of others, particularly parents influence children's preferences and behaviors (Brug *et al*., 2012, and Young, *et al*.,

2004). In line with Kremers *et al*., (2003), children of parents with indulgent parenting styles consumed more fruit than adolescents from authoritarian or neglected homes.

T. indica fruits are the most PEWFS for their economic viability. The fruits and products from these fruit species are accepted because they contribute substantially to household income in this community'. '*Women and children greatly benefit from collecting and selling of these fruits'* (Akullo, pers. Com.). Shackleton, and Shackleton, (2004) recognized edible wild fruits in contributing to many household livelihoods among the South African. Fruit sales can thus complement the diversified sources of incomes of the poorer households.

Vitellaria paradoxa is a well-known fruit tree with diverse cultural values in the Acholi culture. The Shea butter from *Vitellaria paradoxa* are highly valued culturally (Maranz, *et al*., 2003, Okullo, *et al*., 2010). In addition, both its fresh pulps and the dried pulp cakes are culturally treasured by this community. The dried pulp cakes are especially important when the fresh fruits are out of stock or when there is shortage of food.

Availability and accessibility are other important factors which determine the extent to which most PEWFS and products are consumed. These factors are similar to the environmental factors reported by other researchers (Rose and Richards, 2004; Simitu, 2009). The PEWFS which are closer or at ease of reach by the community can thus be consumed much more than those far and or out of reach. This shows therefore that, many such fruits be conserved near home if increased consumption is to be achieved especially during seasons of availability.

Physical characteristics of some fruits discourage many people from eating them. Negative perceptions affect how much of such fruits are consumed. Such factors are also cited by other authors (Martens *et al*., 2005, Simitu *et al*., 2009). The bluish-black color of the fruits of *Vitex doniana* for example discourages many children from eating the fruits because of the belief that once eaten their teeth as well as their feaces turn black. Although preferred, hard fibrous epicarp of the fruits of *B. aethiopum* contributes greatly to their low acceptability. This is because the process of making them edible is tedious. It is however, unwise to reject any fruit due to its physical characteristics. Otherwise, one can miss valuable nutrients which are necessary for many physiological and biochemical activities of the body from the fruits. This attitude depicts the low knowledge of the community on the nutritional compositions of the PEWFS. This therefore calls for the need to analyze the fruit contents for their nutrient compositions and then communicating it to the community.

4.2 Communities' motivations to the consumption of the edible wild fruits

Most preferences are based on personal experiences, reasons, and interests. The experience of attaining physical satisfactions on consuming these PEWFS is a very important phenomenon for this peasant community. This is a farming community who spend several hours in the gardens on an empty stomach hence they know how much satiated they get whenever they eat the edible wild. These PEWFS are also very useful for the children who remain alone at home for a long time with no cooked food. It is therefore important that these edible wild fruit trees are conserved near homes so that the children spend minimum stress in search of such fruits.

The fact that some respondents reported eating these PEWFTS only for pleasure or to pass time or only to get refreshed, is an indication of ignorance of the any valuable nutrients derived these fruits. Although there is inadequate documented information on the availability and contents of nutrients in the edible wild fruits of Gulu District, there are those who gain strength after eating these fruits. Holz, *et al.* (2012) confirmed unavailability of appropriate food composition table for Uganda foods for use. Besides, information on nutrients of similar edible wild fruits from the neighboring districts is notably not communicated to this community. Therefore, the PEWFS and availing the nutrient contents to this community is quite useful. This knowledge may enable them to diversify their choices of fruits and enhance the conservation of such fruit trees.

4.3 Categories of persons in the community that are most encouraged to eat the PEWFS

Besides the inadequacy of documented nutrients and nutritional information on the edible wild fruits in this community, different categories of persons are still encouraged to eat these fruits. The encouragement if based on the different experiences of the individuals respondents on each PEWFS. Children are particularly encouraged to eat so as to get physical satisfaction and forget about food while their parents are in the gardens. Encouraging people to eat fruits is a priority of nutrition education (FAO, 2003a). The reasons for encouraging the pregnant women include: suppression of soil craving, to eat for pleasure and fulfill their anxiety for fruits. There is inadequate knowledge among the respondents of the fact that the fetus derives its nutrients from the mother. FAO, (2003a) however advanced that children and pregnant women should be the most encouraged to eat fruits because they are the most vulnerable to complications which could result from nutrient inadequacies. Fewster (2012) further noted that pregnant women require more fruits and vegetables than usual at this time

because of the extra demands on the body. Dieting during pregnancy is very important because it has the potential to affect airway development and to promote T-helper-2–cell responses during fetal development (Willers *et al*., 2008). Thus, if these women adequately eat these PEWFS, they can obtain all the nutrients and minerals required during their pregnancy.

4.4 Frequency of consumption of PEWFS in a day

The frequency of PEWFS harvest and consumption as for this study is the number of times these fruits are harvested and consumed on daily basis. The choice to eat the fruits once or twice a day could be because most of these fruits are easily snacks on by the respondents on their way to and from the gardens. These frequencies of consumption are inadequate according to nutritionists. White (2011) observed that, eating fruits more regularly in substantial amounts is more beneficial than eating them in bulk at a time. This could be because fruits contain different amounts of antioxidants, fiber and nutrients such as vitamins A and C, potassium and folate that play important roles in maintaining good health and probably work at different times. Therefore, it can be said that the respondents who eat these PEWFS thrice and many times benefit more from these fruits than those who eat once or twice as long as the quantities consumed are regulated. It is thus advisable for the community to space up their fruit consumptions intervals if they are to maximally benefits and utilization the nutrients and minerals by the body.

The presence and/or absence of some edible wild fruit tree (EWFT) species in some place also have a bearing on the choices and frequency of consumption. Frequencies could also be affected by availability and accessibility of some fruits. Therefore, the more accessible the fruits are, the higher the rates of consumptions.

4.5 The most preferred time of the day to eat the PEWFS

Most respondents prefer to eat these wild fruits at any time of the day. White (2011) advanced that, eating fruits at any time in the day can only beneficial if eaten in small quantity at a time. These are actually famers who just eat to pass time, and are not aware of the values of fruits in the body. There is therefore need to advised this community to check on the amount the fruits they consume if they are to benefit.

Nutritionists encourage eating fruits on an empty stomach because it detoxifies the body and supply a great deal of energy necessary for other activities. It also eliminates the chances of getting stomach problems when the fruits get into contact with food.

The choice to eat fruits in the morning and evening is preferred by respondents who get so engaged in field activities for long hours. They eat these fruits very early morning on their way to and in the evening when returning from the field. Having planned time for eating these fruits encourages bulk eating which is not healthy at alone. Eating fresh fruits in the morning is however important for it can provide substantial nourishment, and also leaves one feeling satisfied for a longer period of time. Welter (2011), advanced that having a whole fresh fruits in the morning not only leaves one feeling full but also reduces the chance of overindulging with unhealthy food because fruits contain high amounts of water and fiber.

4.6 Willingness to include preferred fruits as part of daily meals and preferred time

Most respondents are unwilling to include these fruits in their daily meals because of the fear of getting satiated before eating their real meals. Such unwillingness could be explained by the fact there is inadequate awareness of the nutritional benefits obtained from PEWFs. This is in line with the report of Beaujanot *et al*. (2012) for exotic fruits in some schools of the Metropolitan Region of Santiago, Chile.

Of the few respondents who showed willingness to integrate these wild fruits into their meals, majority also opt to eat them after meals probably for the same reason of avoiding satiation. It is perceived that getting satiated with fruits interferes with enjoyment of their local meals. To the contrary, Niedziocha, (2011) acknowledged eating fruits before meals as a healthier and a more advisable practice. Rolls *et al*., (2004) acknowledged it as an effective strategy for weight management. Otherwise, these edible wild fruits are in plenty within the communities and freely picked from open communal lands, which availability could motivate them to include them as part of their diets.

4.7 Perceived active gender and age groups in fruit harvest and consumption

The females are perceived as the most active harvesters of the PEWFS because of their active roles in the welfare of the family or households' welfare. Women pick these fruits from anywhere, on their way to and from the gardens, water points, from firewood collections (Legwaila, *et al*., 2011) among others. Despite the frequent encounter with PEWFS by men in the course of digging, hunting, grazing cattle, collection of constructions and art/craft materials, only a few of them harvest and bring these wild edible wild fruits at home. This is because they consider carry food items as the responsibilities of the females hence brings shame to them.

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Children are the most active age group in harvesting and consuming the edible wild fruits for the reasons that they are less involved in field activities hence have the time to search for them from the wild. The most active age groups (4-15 years) fall within the age bracket of 2-17 recognized as the right age bracket for adopting healthy eating habits (FAO, 2003a). Encouraging these children early enough enables them to become more exposed and acquainted with a variety of edible wild fruits. Hence they can learn to eat more fruits, many more times in a day and can become less prone to a number of health complications. This can make the family members to learn and appreciate the benefits of eating these fruits early enough and probably develops healthy eating patterns at an early age. What enhances these children's active participation is the free and easy means of harvesting and consuming most of these fruits. The children can therefore do this alone with very minimal help and guidance of the elders.

Early exposure of children to such fruits helps them to gain adequate indigenous knowledge (IK) which they grow with to old age. Having such IK can also lead to the sustainable utilization and conservation of these edible wild fruits. In line with the FAO (2003b), the advantage of exposing people to a wide variety of fruits during their childhood is that they often continue eat them through adulthood to old age. The parents of this community are thus urged to make concerted effort to make their children know these fruits early enough, contrary to the times of the insurgency.

Conclusion

The consumptions of the edible wild fruits in Gulu district are influenced by many factors which significantly determine the rate of fruit consumptions and habits of most respondents. The children, pregnant women and the sick are the most encouraged categories group of persons in the community to consume these fruits mainly to get satisfactions. Most respondents are unaware of the nutritive benefits derived from consuming these fruits consequently, low willingness to include these fruits as part of any meals. Among the adults, females are the most active harvesters compared to the males. Children, irrespective of sex difference are the most active in both harvests and consumptions of the wild edible fruits.

Recommendation

There is need to design nutritional practical studies to analyze the nutrients compositions of the PEWFS determine the nutritional availability of these nutrients in the body when eaten and create awareness program of the benefits of consuming these PEWFS.

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