

East African Journal of Environment and Natural Resources

eajenr.eanso.org

Volume 8, Issue 2, 2025

Print ISSN: 2707-4234 | Online ISSN: 2707-4242

Title DOI: <https://doi.org/10.37284/2707-4242>



EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift

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Article DOI: <https://doi.org/10.37284/eajenr.8.2.3622>

Date Published: **ABSTRACT**

11 September 2025

Keywords:

Endogenous
knowledge,
Fruiting,
Gathering,
Accessibility,
Food security,
South Kivu,
Albertine Rift.

This study was conducted in the mountainous region of South Kivu in the east of the Democratic Republic of Congo. Its purpose was to identify the edible wild fruits of this mountainous region of the West Albertine Rift. Data were collected through ethnobotanical surveys conducted at local markets and in rural households. A total of 800 informants participated in the data collection. The wild fruit flora recorded consists of 151 species divided into 54 families and 86 genera. They are dominated by the Solanaceae, Malvaceae, Rosaceae, Fabaceae, Arecaceae and Myrtaceae families. The morphological types are dominated by trees (48%), and woody species dominate the biological types. Berries (62 species) and drupes (53 species) are the main fruit categories. Although mainly consumed as table fruit, a large proportion is consumed as vegetables and spices. In terms of fruit availability and abundance at the sites, the results suggest that the city of Bukavu (37.50%), the territories of Kabare (29.08%) and Kalehe (17.99%) are the sites where the wild fruit species can be found, due to their proximity to the PNKB and the ethnic diversity in the city. Various wild fruits sold in markets in the study area also come from other provinces such as Kisangani (*Treculia africana*, *Dacryodes edulis*), low altitude areas (*Tamarindus indica*, *Mangifera indica*) and other Sudano-Zambesian regions, e.g. *Dovyalis macrocalyx*, *Syzygium guineense*, factors that may contribute to the prolonged availability of certain fruits in the area.

APA CITATION

Marie, C. F. De Dieu, M. M. J., Augustin, B. K., Josue, A. S. & Zabo, I. A. (2025). Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift. *East African Journal of Environment and Natural Resources*, 8(2), 561-586. <https://doi.org/10.37284/eajenr.8.2.3622>.

CHICAGO CITATION

Marie, Cakupewa Fundiko, Mangambu Mokoso Jean De Dieu, Basabose Kanyunyi Augustin, Aruna Sefu Josue and Idrissa Assumani Zabo. 2025. "Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift". *East African Journal of Environment and Natural Resources* 8 (2), 561-586. <https://doi.org/10.37284/eajenr.8.2.3622>

HARVARD CITATION

Marie, C. F. De Dieu, M. M. J., Augustin, B. K., Josue, A. S. & Zabo, I. A. (2025) "Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift", *East African Journal of Environment and Natural Resources*, 8 (2), pp. 561-586. doi: 10.37284/eajenr.8.2.3622.

IEEE CITATION

C. F., Marie, M. M. J. De Dieu, B. K. Augustin, A. S. Josue & I. A., Zabo "Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift", *EAJENR*, vol. 8, no. 2, pp. 561-586, Aug. 2025.

MLA CITATION

Marie, Cakupewa Fundiko, Mangambu Mokoso Jean De Dieu, Basabose Kanyunyi Augustin, Aruna Sefu Josue & Idrissa Assumani Zabo. "Diversity, Availability, and Uses of Wild Edible Fruits in the Montane South Kivu, D.R. Congo, Western Albertine Rift". *East African Journal of Environment and Natural Resources*, Vol. 8, no. 2, Aug 2025, pp. 561-586, doi:10.37284/eajenr.8.2.3622

INTRODUCTION

Globally, it is estimated that humans have used more than 10,000 edible plant species, of which only 150 are currently cultivated, with the rest remaining wild (FAO, 2023). Currently, it is estimated that there could be 75,000 plant species with good food potential, mainly found in tropical forest ecosystems. Therefore, of the 2,500 fruits of the tropical rainforest already identified, only 50 are well known and less than 15 are marketed on a large scale, according to FAO (2020) and Mialoundama (2020).

In tropical countries, the importance of wild plants for feeding rural populations is widely recognised. Various edible fruits come from wild food plants, which are plant species that are not cultivated but harvested from natural ecosystems for human consumption (Vwima et al., 2014; NZebo et al., 2018; Mialoundama, 2020). Similarly, various wild species with obvious food uses also exist in the Congolese flora, many of which have been used for thousands of years, but are currently rarely harvested (Vwima et al., 2013). While some species are less appreciated, others are ignored (Mangambu et al., 2015 and 2021).

According to the World Health Organization (WHO, 2023), edible wild fruits have many traditional uses and are an integral part of customs

and traditional cuisine. They contribute to food security and the local economy, either through direct consumption or through processed products. They can be eaten fresh, made into jams or juices, or dried for later use. Certain parts of the plant, such as seeds or bark, may also have specific uses. According to Mangambu et al. (2024), it is important to be familiar with these uses and to take the necessary precautions to safely enjoy their benefits.

Fruits contribute significantly to food security thanks to their nutritional richness, seasonal availability, and accessibility, particularly during periods of famine (Ouattara et al., 2016; Diarra et al., 2016). They are consumed in various forms (fresh fruit, beverages, condiments, oils, nuts) and also play an economic and medicinal role in several communities (Bayang et al., 2021; Monizi et al., 2019; Mawunu et al., 2023). For more than a billion people worldwide, edible wild species are an essential resource (Lulekal et al., 2011), particularly fruits, which are the main category of wild foods collected (Chua-Barcelo & Tan, 2014).

Furthermore, wild food plants and edible fruits constitute a valuable reservoir of genetic diversity that can contribute to the selection of new varieties that are resilient to future climatic and nutritional challenges (Upriety et al., 2012; Padulosi et al.,

2019). Their integration into agricultural policies, as well as the recognition of endogenous knowledge as intangible heritage, are essential for their preservation.

In the Democratic Republic of Congo (DRC), since Staner's first descriptions (1935), several studies have confirmed the richness of spontaneous fruit species (Monsango & Szafranski, 1985; Shango, 2010). More specifically, in the mountainous South Kivu region, wild fruits are an integral part of local food systems (Mangambu et al., 2024).

According to the FAO (2020), despite their nutritional and economic potential, edible wild fruits are marginalised in agricultural policies and food security programs. Their association with poverty, the lack of standardisation of their nutritional values and their low visibility in formal markets limit their recognition (Lukczaj et al., 2012).

However, endogenous knowledge related to their transformation and use represents a strategic lever for strengthening agrobiodiversity and the sustainability of food systems (Daudet, 2012 and Padulosi et al., 2019). In addition, the ongoing degradation of forest ecosystems due to deforestation, agricultural expansion, the introduction of exotic species, and climate change is undermining the natural regeneration of species, particularly herbaceous plants with low ecological resilience (Paluku et al., 2018; Sosef et al., 2021).

In mountainous South Kivu, malnutrition has not been an occasional or sporadic phenomenon for several decades. Rather, it has become widespread, particularly in rural areas (Mangambu et al., 2015). In this context of chronic food dependency, more than 70% of households practice subsistence farming on increasingly smaller plots of land (Adhama et al., 2013; Nyabienda, 2005). The use of wild fruits would be a significant alternative for

improving nutrition, diversifying diets and supporting rural incomes.

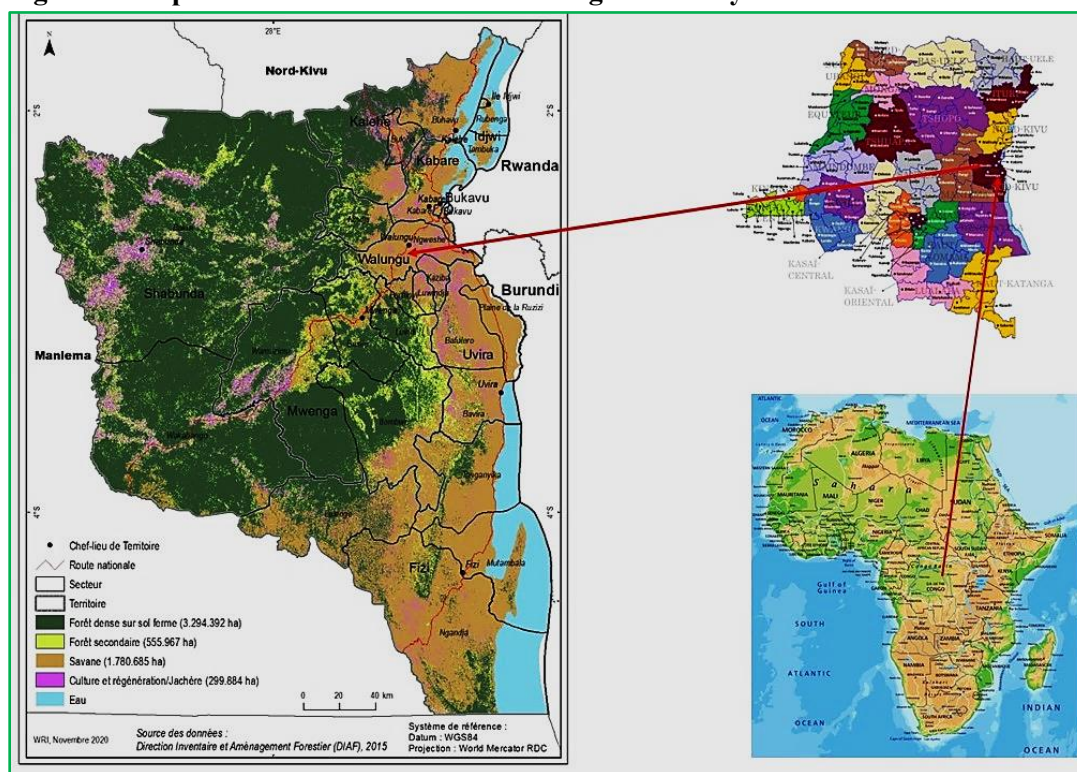
However, data on the characteristics, availability and local uses of wild fruit species remain fragmentary. The overall objective of this study is to inventory the wild food plants that exist in this region of Mount Mitumba in the Albertine Rift. Specifically, the study aims to (1) Inventory and consolidate knowledge on edible wild fruit species (spontaneous or sub-spontaneous) in the montane South Kivu, (2) Describe their ecological and morphological characteristics and modes of consumption, and assess their seasonal availability and modes of use, (3) Demonstrate the socio-nutritional importance of wild food plants in this region of the Albertine Rift.

MATERIAL AND METHODS

Study Area

The East African Rift is divided into two main branches south of Ethiopia, one of which is the western branch, also referred to as the Albertine Rift. This rift extends across parts of Uganda, the Democratic Republic of Congo, Rwanda, Burundi, and Tanzania. It is characterised by a valley flanked by surrounding mountain ranges (Mangambu, 2016).

This study was conducted in the mountainous region of South Kivu, specifically in the territories of Kabare, Kalehe, Mwenga, Walungu, Idjwi, and the city of Bukavu (Figure 1). Wils et al. (1986) describe this area as consisting of administrative areas overlapping the Mitumba mountain ridge. This ridge is extended to the north and south by the watershed between the Graben depression to the east and the direct tributaries of the Lualaba to the west (Vwima et al., 2014). Most of the area is located at an altitude of over 1,250 meters, and annual rainfall at Lake Kivu (at an altitude of 1,463 meters) is around 1,200 millimetres.

Figure 1: Map of South Kivu Province Showing the Surveyed Areas

Source: *World Resources Institute, 2021, modified*

The average annual temperature ranges from 19 to 20 °C at an altitude of 1,500 m, with extremes ranging from 15 to 25 °C (Shamamba, 2021). With an average population density of around 159 inhabitants per km², which varies within the province, South Kivu is one of the most densely populated provinces in the DRC (Furaha et al., 2013).

The province is home to notable ethnolinguistic diversity in the study area, including the Shi, Lega, Havu, Tembo and Fuliru, and sometimes Bembe. These communities exhibit significant cultural, dietary, geographical and linguistic differences (Mubenga et al., 2020).

Materials

For the present study, plant material includes samples of plant specimens (or organs) collected from either the market or the wild in the study area.

Methods

This study employs an ethnobotanical survey methodology inspired by the approaches described by Monizi et al. (2018, 2019) and Mawunu et al. (2020). The researchers conducted semi-structured interviews alongside a survey questionnaire with the respondents.

Data were collected during the study through individual and group semi-structured interviews, as well as direct observations in the field with resource persons (Biloso & Lejoly, 2006; Mangambu et al., 2021 & 2024). Participants were selected based on their availability, involvement in agricultural sales or production, and consent (Mawunu et al., 2020).

Surveys were conducted from March 2022 to July 2024 in rural and urban markets and households in various locations, specifically in Kabare, Kalehe, Mwenga, Walungu, Idjwi and Bukavu, which were selected after preliminary surveys. Field inspections

were organised during both the dry and rainy seasons. A total of 800 people participated.

Additionally, direct observations of collectors and sellers of wild fruits were conducted in the localities and agglomerations of the study area. These observations enabled the collection of plant specimens or photographs for an herbarium. The types of fruit were then described using literature and online databases on flora. Commonly known species were identified in the field, while unidentified plants were sent to the Herbarium of the Lwiro Natural Sciences Research Centre in South Kivu for identification by a specialist. The statistical analysis tools used, including linear

regression, the chi-squared test and the Kruskal-Wallis test, provided an empirical basis for interpreting the results.

RESULTS

Socio-demographic Profile of Respondents

The socio-demographic characteristics of the respondents are presented in Table 1. These include gender, age group, level of education, marital status, and occupation. As shown in Table 1, the majority of participants were women (500, or 62.5 %). The largest group of participants were aged between 25 and 54 (74 %).

Table 1: Sociodemographic Profile

Variable	Number	%	Variable	Number	%
Gender (Sex)			Civil status		
Man	300	37,50%	Single	152	19%
Female	500	62,50%	Married	560	70%
Total	800	100%	Divorced	16	2%
Age group			Widowed	72	9%
<25	88	11%	Total	800	100%
[25-34]	208	26%	Profession		
[35-44]	200	25%	Leaf-picker	40	5%
[45-54]	184	23%	Researcher	40	5%
[55-64]	56	7%	Shopkeeper	64	8%
> 65	65	8%	Farmer	336	42%
Total	800	100%	Teacher	64	8%
Education			Student	40	5%
Illiterate	200	25%	Housekeeper	56	7%
Primary	272	34%	Salesperson	160	20%
Secondary	248	31%	Total	800	100%
University	80	10%			
Total	800	100%			

Older people aged 55 and over were less numerous. More than 70 % of participants are married. Most of them (65 %) have a basic education or have completed secondary school, while a quarter of participants are illiterate. In terms of professional activity, the largest group is farmers (42 %), followed by salespeople (20 %). There is also a

significant proportion of teachers and housewives, at 8% and 7 %, respectively.

List of Edible Wild Fruit Species in the Mountainous Region of South Kivu

Table 2 summarises the diversity and characteristics of some of the wild fruit species inventoried in this region. Data about the family, scientific name,

vernacular name, life forms, biological type, biotope, method of preparation, method of consumption and type of fruit are documented for each fruit category. A total of 151 wild fruit species were recorded in the surveyed sites.

Table 2: Diversity, Use and Category of Wild Edible Fruits in the South-Kivu

Family	Scientific name	Vernacular name	MT	HT	BT	CoM	FT
Anacardiaceae	<i>Mangifera indica</i> L.	Mwembe (S), Hembe(Sw)	Tree	Rud	MsPh	Fruit, Herbal tea	Drupe
Anacardiaceae	<i>Pseudospondias microcarpa</i> Engl.	Mwembe G'wemishugi(Sh), Ngobia (T)	Tree	PF	MsPh	Fruit	Drupe
Anacardiaceae	<i>Searsia natalensis</i> (Bernh. ex-Krauss) F.A.Barkley	Musagara (S)	Tree	SF	McPh	Fruit	Drupe
Anacardiaceae	<i>Searsia pyroides</i> (Burch.) Moffett	Kigalagala(H)	Tree	SF	McPh	Fruit	Drupe
Annonaceae	<i>Annona muricata</i> L.	Mustaferi(S)	Tree	Rud	Msph	Fruit	Berries
Annonaceae	<i>Annona senegalensis</i> Pers	Makalakonki, (Li, Ki), Bombi (T, Tw), Shira Shira	Tree	Rud	Msph	Fruit	Berries
Annonaceae	<i>Anonidium mannii</i> (Oliv.) Engl. & Diels	Kiombi(Le), Kiombi(T), cœur de bœuf sauvage (Fr)	Tree	PF	Msph	Fruit	Berries
Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A. Rich.	Poivre de guinée (Fr)	Tree	PF	MsPh	Spice	Pods
Apocynaceae	<i>Landolphia buchananii</i> Stapf	Magu (Le, T)	L	SF	Cl.Ph	Fruit	Berries
Apocynaceae	<i>Landolphia owariensis</i> Beauv.	Magu (T, Le), Matonge (L, K)	L	SF	Cl.Ph	Fruit	Berries
Apocynaceae	<i>Tacazzea apiculata</i> Oliv.	Inondo, Inondwe (Rw).	L	PF	Cl.Ph	Fruit	Berries
Aquifoliaceae	<i>Ilex mitis</i> Radlk.	Ikenzilu (T, P), Kaobeobe (Sh).	Tree	PF	MgPh	Fruit	Berries
Araucariaceae	<i>Araucaria bidwillii</i> Hook.	Arokaria(S), Bunya bunya (Sw)	Tree	Rud	Msph	Fruit	Cone
Arecaceae	<i>Borassus aethiopum</i> Mart.	Bukindo (Le), Bucindo (Sh)	Tree	FG	MsPh	Fruit	Drupe
Arecaceae	<i>Cocos nucifera</i> L.	Kokotii (Sw)	Tree	Rud	MsPh	Fruit	Drupe
Arecaceae	<i>Elaeis guineensis</i> Jacq.	Mungazi, Murhanda (S, H), Ngazi (Sw) Chimesa (S)	Tree	SF	MsPh	Fruit, Spice (Oil and Indigenous salt)	Drupe
Arecaceae	<i>Phoenix reclinata</i> Jacq	Bucindo (Sh), Bukindo (Le), Mushugushugu (Sh)	Tree	Rud	Msph	Fruit	Drupe
Arecaceae	<i>Raphia gentiliana</i> De Wild.	Lububi (T, P)	Tree	Wl	Nph	Oil/Spice	Drupe
Arecaceae	<i>Sclerosperma mannii</i> H. Wendl.	Mangobo (T), Mbya, (Le.)	Tree	SF	MsPh	Fruit	Drupe
Asteraceae	<i>Helianthus annuus</i> L.	Namwinama Kokoliko(Sw)	(S), An.H	Rud	Tsc	Vegetable, Spice	Achenes

Family	Scientific name	Vernacular name	MT	HT	BT	CoM	FT
Balsaminaceae	<i>Impatiens burtonii</i> Hook. F.	Dondoli (T)	An.H	SP	Th	Fruit	Capsule
Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	Mushafe (T, P)	Tree	FP	MsPh	Fruit	Berries
Boraginaceae	<i>Cordia africana</i> Lam.	Omuvugangoma (S)	Tree	FP	MsPh	Fruit	Drupe
Burseraceae	<i>Canarium schweinfurthii</i> Eng	Musuku (T, Le), Kasuku (S), Ubani (Sw)	Tree	FP	MgPh	Fruit	Drupe
Burseraceae	<i>Dacryodes edulis</i> (G. Don) H. J. Lam	Nsafu (L, K), Safou (Fr), Ngobia (T), Bukobe (Le)	Tree	Rud	MsPh	Fruit	Drupe
Cannabaceae	<i>Trema orientale</i> (L.) Blume	Mushakushaku (S, H)	Tree	FS	McPh	Fruit	Drupe
Caricaceae	<i>Carica papaya</i> L.	Payipayi (Sw)	Tree	Rud	Msph	Fruit	Berries
Celastraceae	<i>Gymnosporia heterophylla</i> (Eckl. & Zeyh.) Loes.	Mushubi (Sh), Mutunga (L)	Tree	SP	McPh	Fruit	Capsule
Celastraceae	<i>Maytenus undata</i> (Thunb.) Blakelock	Kashugishugi (Sh)	Tree	SP	McPh	Fruit	Capsule
Celastraceae	<i>Salacia erecta</i> (G. Don) Walp.	Itse, Itsi, Umushashi (Rw, S)	L	SF	Phg	Fruit	Berries
Chrysobalanaceae	<i>Parinari excelsa</i> Sabine	Mukumbu (T, S, P)	Tree	PF	Mgph	Fruit	Drupe
Clusiaceae	<i>Garciniabuchananii</i> Baker	Musela (T,S, P)	Tree	PF	MsPh	Fruit	Berries
Clusiaceae	<i>Garcinia kola</i> Heckel	Bolale (L), Petit kola (Fr)	Tree	PF	Mgph	Fruit	Berries
Clusiaceae	<i>Lebrunia bushaie</i> Staner	Mashahi (S), Buchai(Le)	Tree	PF	MgPh	Oil	Drupe
Clusiaceae	<i>Symphonia globulifera</i> L. f.	Muzimba (T, S, P), Mulungu (T, P)	Tree	FP	Msph	Fruit	Drupe
Combretaceae	<i>Terminalia catappa</i> L.	Madame (L)	Tree	Rud	MsPh	Fruit	Drupe
Cucurbitaceae	<i>Lagenaria abyssinica</i> (Hook. f.) C. Jeffrey	Ntendagulwe (S)	An. G	Fa	Tsc	Vegetable	Berries
Cucurbitaceae	<i>Sicyos edulis</i> Jacq.	Dodoki (Sw), Shushuti (S, H, S)	PG	Fa	Ch	Vegetable	Drupe
Ericaceae	<i>Vaccinium stanleyi</i> Schweinf.	Umugonga (Rw), Bukaragata (F), Ishalula bahivi (S)	Tree	FS	McPh	Vegetable	Drupe
Euphorbiaceae	<i>Plukenetia conophora</i> Müll. Arg.	Bukaswa (Le,T)	Tree	PF	MsPh	Spice	Capsule
Euphorbiaceae	<i>Ricinus communis</i> L.	Lubonobono (S)	Tree	Fa	Tsc	Oil/Spice	Capsule
Euphorbiaceae	<i>Tetracarpidium conophorum</i> Hutch. & Dalziel	Kidombu Arachides Sauvages	Tree	PF	MsPh	Fruit	Capsule
Fabaceae	<i>Albizia adianthifolia</i> (Schumcher) W.F. Wright	Umusebeyi (Rw), Mushebeyi (Sh)	Tree	SF	Msph	Vegetable	Pods
Fabaceae	<i>Cajanus cajan</i> (L.) Huth	Nkunde (S)	Subshrub	Rud	McPh	Vegetable	Pods

Family	Scientific name	Vernacular name	MT	HT	BT	CoM	FT
Fabaceae	<i>Canavalia gladiata</i> (Jacq.) DC.	Cikubwekubwe (S), Cihingamukungwa(S)	PG	Fa	Ch	Vegetable	Pods
Fabaceae	<i>Mucuna pruriens</i> (L.) DC.	Monusco (Fr)	L	Fa	Cl.Ph	Vegetable, Spice	Pods
Fabaceae	<i>Pentaclethra macrophylla</i> Benth.	Bubala (Le)	Tree	PF	MgPh	Vegetable	Pods
Fabaceae	<i>Sesbania sesban</i> (L.) Merr.	Munyegenyeye(S)	Tree	SF	MsPh	Vegetable	Pods
Fabaceae	<i>Tamarindus indica</i> L. Tramil	Tamarin (Fr)	Tree	Rud	MsPh	Spice Herbal tea	Pods
Fabaceae	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Quatre cotés (Fr), Aidan Tree (Eng)	Tree	SF	MsPh	Spice	Pods
Lamiaceae	<i>Hoslundia opposita</i> Vahl	Kahengerihengeri (S)	Shrub	SF	MsPh	Fruit	Drupe
Lamiaceae	<i>Vitex doniana</i> Sweet	Muziroziro (S, H)	Tree	SF	Msph	Fruit	Drupe
Lauraceae	<i>Ocotea usambarensis</i> Engl.	Itugwe (T, F)	Tree	PF	MsPh	Fruit	Drupe
Lauraceae	<i>Persea americana</i> Gaert.	Voka (S)	Tree	Rud	Msph	Fruit	Drupe
Loganiaceae	<i>Strychnos innocua</i> Delile	Umuhonyo (Rw)	Shrub	PF	McPh	Fruit	Berries
Loganiaceae	<i>Strychnos spinosa</i> Lam.	Umukomo, Umukonyo(Rw)	Shrub	PF	McPh	Fruit	Berries
Malvaceae	<i>Abelmoschus caillei</i> (A. Chev.) Stevels	Ngombo (Sw)	An.G	Rud	Tsc	Vegetable	Capsule
Malvaceae	<i>Abelmoschus esculentus</i> (L.) Moench	Ngaï-ngaï (Sw), Dongodongo (L)	An.G	Rud	Tsc	Vegetable	Capsule
Malvaceae	<i>Cola acuminata</i> (P. Beauv.) Schott & Endl.	Ngongolia(R,T, H, S)	Tree	PF	MsPh	Fruit	Capsule
Malvaceae	<i>Cola diversifolia</i> De Wild. & T. Durand	Agbogbolia (L), Makasu (Sw)	Tree	PF	MsPh	Fruit	Capsule
Malvaceae	<i>Grewia mildbraedii</i> Burret	Muliwa(T), Mulewa(Le)	Tree	PF	MsPh	Fruit	Drupe
Malvaceae	<i>Grewia similis</i> K.Schum.	Mukorokombe(Sh)	Tree	PP	MsPh	Fruit	Drupe
Malvaceae	<i>Hibiscus noldeae</i> Baker f.	Ngaingai pori (Sw)	Shrub	Fa	Nph	Vegetable	Capsule
Malvaceae	<i>Pachira glabra</i> Pasq.	Kalangabazungu(Sw)	Tree	PF	Msph	Fruit, Spice	Capsule
Melastomataceae	<i>Bellucia grossularioides</i> (L.) Triana	Manono(T,L)	Tree	SF	MsPh	Fruit	Berries
Melastomataceae	<i>Bellucia macrophylla</i> Triana	Manono (T, L)	Tree	SF	MsPh	Fruit	Berries
Melastomataceae	<i>Dissotidendron melleri</i> (Hook.f.) Ver.-Lib. & G. Kadereit	Cirerabana(S)	PG	PF	Chdr	Fruit	Berries
Melastomataceae	<i>Dissotis brazzae</i> Cogn.	Cirerabana(S), mungobebe lilume (shi)	PG	Fa	Er. Ch	Fruit	Berries

Melastomataceae	<i>Dupineta brazzae</i> (Cogn.) Ver.Lib. & G.Kadereit	Birerabana(S), Birembabana(H)	PG	Fa	P. Ch.	Fruit	Berries
Meliaceae	<i>Carapa procera</i> DC.	Bugwere, Igwerhe(S, P), Mugweti, Buweci(T)	Tree	SF	MsPh	Herbal tea	Capsule
Meliaceae	<i>Ekebergia benguelensis</i> Welw. ex C.DC.	Sirita (T,S, P) Kiringe (T, P), Mushwati(Le), Igwerhe (Shi)	Tree	PF	MsPh	Fruit	Berries
Meliaceae	<i>Ekebergia capensis</i> Sparrm.	Mufumba (S)	Tree	PF	MsPh	Fruit	Berries
Moraceae	<i>Morus indica</i> L.	Flesi (S)	Tree	Fa	McPh	Fruit	Compo und fruits
Moraceae	<i>Morus nigra</i> L.	Noberu (H), Amakerere(T), Mpuhuhu(S, H)	Tree	Fa	MsPh	Fruit	Compo und fruits
Moraceae	<i>Treculia africana</i> Decne.	Bushinge(Re), Fusa(Te)	Tree	PF	MgPh	Vegetable, Spice	Compo und fruits
Musaceae	<i>Ensete livingstonianum</i> (J.Kirk) Cheesman	Kirhemberhembe (T), Cirembo (S, H), Buligaliga	PG	SF	Grh	Starch	Berries
Musaceae	<i>Ensete ventricosum</i> (Welw.) Cheesman	Kirhemberhembe(Tw), Buligaliga(T), Chirembo(Sh), Butembe (Le.)	PG	SF	Grh	Starch	Berries
Myristicaceae	<i>Myristica fragrans</i> Houtt .	Noix de mouscade(Fr)	Tree	PF	MsPh	Spice	Drupe
Myrtaceae	<i>Myrcianthes fragrans</i> (Sw.) McVaugh	Clou de gironfle (Fr)	Tree	Rud	MsPh	Spice, Herbal tea	Berries
Myrtaceae	<i>Psidium guajava</i> L.	Mapera(S, Sw)	Tree	Fa	McPh	Fruit	Berries
Myrtaceae	<i>Syzygium cordatum</i> Hochst. ex-Krauss	Mugore(S, Tw)	Tree	SF	Msph	Fruit	Drupe
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Prunier noire (Fr)	Tree	Rud	Msph	Fruit	Drupe
Myrtaceae	<i>Syzygium guineense</i> (Willd.) DC.	Mugore(S, Tw)	Tree	Wl	Msph	Fruit	Drupe
Myrtaceae	<i>Syzygium jambos</i> (L.) Alston	Pommier (Fr)	Tree	Rud	Msph	Fruit	Drupe
Olacaceae	<i>Strombosia scheffleri</i> Engl.	Umushyika(Rw.)	Shrub	PF	McPh	Fruit	Drupe
Olacaceae	<i>Ximenia americana</i> L.	Prune orangée	Shrub	SA	McPh	Fruit	Berries
Oleaceae	<i>Olea europaea</i> L.	Mzetuni (Sw, S)	Tree	Fa	MsPh	Fruit	Drupe
Oxalidaceae	<i>Averrhoa carambola</i> L.	Nkapakapa (Le), Carambola	Tree	SF	MsPh	Fruit, Juices	Berries (Pomme)
Pandaceae	<i>Panda oleosa</i> Pierre	Kalanga pori(Sw)	Tree	PF	Msph	Fruit	Drupe
Passifloraceae	<i>Passiflora caerulea</i> L.	Marakuja ya pori(S)	L	SF	Cl.Ph	Fruit	Berries
Passifloraceae	<i>Passiflora edulis</i> Sims	Marakuja(Sw), Irakuja(S)	L	Fa	Cl.Ph	Fruit	Berries

Passifloraceae	<i>Passiflora foetida</i> L.	Marakuja ya pori(S)	L	Fa	Cl.Ph	Fruit	Berries
Pedaliaceae	<i>Sesamum indicum</i> L.	Kakarakata (S), Sésame(fr), Wangila(Ki)	An.G	SF	Ch	Vegetable	Capsule
Phyllanthaceae	<i>Bridelia brideliifolia</i> (Pax) Fedde	Mujimbu (S)	Shrub	SF	McPh	Oil	Drupe
Phyllanthaceae	<i>Bridelia micrantha</i> (Hochst.) Baill.	Mujimbu (S)	Shrub	SF	McPh	Oil	Drupe
Phyllanthaceae	<i>Uapaca benguelensis</i> Müll.Arg.	Musela, Musera, Le	Tree	FG	MsPh	Fruit	Berries
Phyllanthaceae	<i>Uapaca guineensis</i> Müll.Arg.	Bokongo, (T)	Tree	Wl	MsPh	Fruit	Berries
Phyllanthaceae	<i>Uapaca heudelotii</i> Baill.	Bokongo(T), Kasera Kulongo(T)	Tree	Wl	MsPh	Fruit	Berries
Phyllanthaceae	<i>Uapaca kirkiana</i> Müll.Arg.	Kasera Kulongo(T), Kaselankulongo,Le	Tree	FG	MgPh	Fruit	Berries
Piperaceae	<i>Piper capense</i> L.f.	Ketchu (T,S)	L	SF	Nph	Spice	Drupe
Piperaceae	<i>Piper guineense</i> Thonn.	Njululu(Le,T), Ketcho(Sw,S), Bujululu(S)	L	SF	Phgr	Spice, Herbal tea	Drupe
Poaceae	<i>Eleusine coracana</i> (L.) Gaertn.	Bulo(S)	An.G	Fa	Chp	Starch	Caryopses
Poaceae	<i>Sorghum bicolor</i> (L.) Moench	Mahemba (S, H, T), Budwakali(S, H,), Mbogobogo(H)	An.G	Rud	Tsc	Starch	Caryopses
Primulaceae	<i>Ardisia staudtii</i> (Gilg) Mez	Muhondo (S)	Tree	PF	Msph	Fruit	Berries
Proteaceae	<i>Faurea saligna</i> Harv.	Musungwa(S, F,T)	Tree	PF	MsPh	Fruit	Achenes
Rhamnaceae	<i>Maesopsis eminii</i> Engl.	Mezopsisi (S, Sw)	Tree	PF	MsPh	Oil	Drupe
Rhamnaceae	<i>Scutia myrtina</i> Kurz	Umugaga, Umunyarutete(Rw)	Shrub	SF	McPh	Fruit	Berries
Rhanunculaceae	<i>Thalictrum rhynchocarpum</i> Quart.-Dill. & A.Rich.	Mubaka mberege(S,F), Mubaka (T), Kalanja(H)	An.G	Rud	Gr	Vegetable	Achenes
Rosaceae	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Mzeituni(S)	Tree	Rud	Msph	Fruit	Drupe
Rosaceae	<i>Rubus apetalus</i> Poir	Makangahwa (Le), Mangaka(T, S, H)	Subshrub	SF	McPh	Fruit	Drupe
Rosaceae	<i>Rubus kirungensis</i> Engl.	Makeleri, (S, H), Fraise	Subshrub	SF	Phg	Fruit	Drupe
Rosaceae	<i>Rubus niveus</i> Thunb.	Makangahwa(H), Mangaka(S)	Subshrub	SF	Nph	Fruit	Drupe
Rosaceae	<i>Rubus pinnatus</i> Willd.	Makangahwa(S)	Subshrub	SF	Nph	Fruit	Drupe
Rosaceae	<i>Rubus rigidus</i> Mercier	Mugenge(S), Makangahwa(Le)	Subshrub	SF	Phg	Fruit	Drupe

Rosaceae	<i>Rubus runssorensis</i> Engl.	Mangaka(T)	Subshrub	SF	Nph	Fruit	Drupe
Rosaceae	<i>Rubus steudneri</i> Schweinf.	Mangaka(H), Makangahwa(Le)	Subshrub	SF	Cl. Ph	Fruit	Drupe
Rubiaceae	<i>Coffea arabica</i> L.	Kafe (S) Or Vert	Shrub	Rud	McPh	Herbal tea	Berries
Rubiaceae	<i>Coffea eugenoides</i> S.Moore	Muberamabuye(Sh), Caff��ier sauvage	Shrub	PF	McPh	Herbal tea	Berries
Rubiaceae	<i>Gardenia ternifolia</i> Schumach. & Thonn.	Umunanira, Umutarama(Rw)	Tree	SF	McPh	Fruit	Capsule
Rubiaceae	<i>Keetia gueinzii</i> (Sond.) Bridson	Mushashi(S)	Shrub	PF	McPh	Fruit	Berries
Rubiaceae	<i>Vangueria apiculata</i> K.Schum.	Mukondokondo(H,S)	Shrub	SF	McPh	Fruit	Berries
Rubiaceae	<i>Vangueria infausta</i> Burch.	Umuhamu(H)	Shrub	SF	McPh	Fruit	Berries
Rutaceae	<i>Citrus limon</i> L.	Ndimu buchungu (Sw), Ndimu (S)	Tree	Rud	MsPh	Fruit, Juices	Berries
Salicaceae	<i>Dovyalis macrocalyx</i> (Oliv.) Warb.	Nakumbu (Te), Sh	Shrub	SF	McPh	Fruit	Berries
Sapindaceae	<i>Allophylus africanus</i> P. Beauv.	Kashushumuhandu (Te,Tw)	Shrub	SF	McPh	Fruit	Drupe
Sapindaceae	<i>Nephelium lappaceum</i> L.	Ramboutan (Fr)	Tree	PF	MsPh	Fruit	Drupe
Sapindaceae	<i>Zanha golungensis</i> Hiern	Magogomere (Sw)	Tree	PF	MgPh	Fruit	Drupe
Solanaceae	<i>Capsicum annuum</i> L.	Pili-Pili(Sw), IPiri-Piri(Sh), Losolo(L)	An.G	Rud	Ch	Vegetable, Spice	Berries
Solanaceae	<i>Capsicum frutescens</i> L.	Pili-Pili(Sw), IPiri-Piri(Sh), Lushenda (S, H), Kasololo(T), Losolo(Le)	An.G	Rud	Ch	Vegetable, Spice	Berries
Solanaceae	<i>Lycianthes biflora</i> (Lour.) Bitter	Ndakala (T)	Shrub	PF	McPh	Fruit	Berries
Solanaceae	<i>Physalis angulata</i> L.	Mbuma(Sw, S)	An.G	Fa	Th	Fruit	Berries
Solanaceae	<i>Physalis peruviana</i> L.	Mbuma(Sw), Flesi(S)	An.G	Fa	Th	Fruit	Berries
Solanaceae	<i>Solanum aculeastrum</i> Dunal	Ntobololo (S)	PG	Fa	McPh	Vegetable	Berries
Solanaceae	<i>Solanum anguivi</i> Lam.	Ndakala(S), Kashongwe(Sh, Tw)	Shrub	Rud	Nph	Vegetable, Fruit	Berries
Solanaceae	<i>Solanum betaceum</i> Cav.	Iprini(Sw), Puruni(Sw)	Shrub	Fa	NaPh	Fruit	Berries
Solanaceae	<i>Solanum cyaneopurpureum</i> De Wild.	Ntolya (S)	Shrub	SF	McPh	Vegetable, Fruit	Berries
Solanaceae	<i>Solanum incanum</i> L.	Kasongo (S)	Shrub	SF	McPh	Fruit	Berries
Solanaceae	<i>Solanum lycopersicum</i> L.	Ntamati(S,H)	An.G	Rud	Tsc	Vegetable	Berries
Solanaceae	<i>Solanum nigrum</i> L.	Mulunda(S), Mirunda(H), Mboga	An.G	Rud	Tsc	Vegetable	Berries

			bucungu (Sw), Kalanja(T), Mushogolera(S,Fl)					
Solanaceae	<i>Solanum</i> Ortega	<i>violaceum</i>	Ndakala(S, T), Kashongwe(T)	Subshr ub	Fa	Nph	Vegetab le	Berries
Urticaceae	<i>Musanga</i> Hauman & J. Léonard	<i>leo-errerae</i>	Kumbukumbu (S), Musanga(Fr)	Tree	SF	MsPh	Fruit	Berries
Urticaceae	<i>Myrianthus</i> Beauv.	<i>arboreus</i> P.	Bwamba(T)	Tree	SF	MsPh	Fruit	Berries
Urticaceae	<i>Myrianthus</i> Engl	<i>holstii</i>	Okomu (Shi)	Tree	SF	MsPh	Fruit	Berries
Urticaceae	<i>Scepcarpus</i> hypselodendron (Hochst. ex A.Rich.) T.Wells & A.K.Monro 12x		Kitumbe, Inkeri (R,T), Mushe(S)	L	SF	Phgr	Fruit	Capsul e
Urticaceae	<i>Scepcarpus</i> (Hochst.) T.Wells & A.K.Monro	<i>trinervis</i>	Mushe(Sh)	L	SF	Phgr	Fruit	Berries
Verbenaceae	<i>Lantana camara</i> L.		Kahengerihengeri (H,S)	Shrub	Fa	Nph	Fruit	Drupe
Verbenaceae	<i>Lantana trifolia</i> L.		Butolya(T), Kahengerihengeri(Le, S), Kashukanshuha(S)	Shrub	Fa	Nph	Fruit	Drupe
Zingiberaceae	<i>Aframomum</i> (Oliv. & D.Hanb.) K.Schum.	<i>giganteum</i>	Bitakumburwa (S), Tolo(R), Tondolo(K)	PG	Wl	Grh	Fruit	Berries
Zingiberaceae	<i>Aframomum sanguineum</i> (K. Schum.) K. Schum.		Mondongo (Ki, Li), Piment de guinée (Fr)	PG	Wl	Grh	Fruit	Berries
Zingiberaceae	<i>Aframomum laurentii</i> (De Wild. & T.Durand) K.Schum.		Bitakumburwa (S), Tolo(R), Mitero(Le), Tondolo(Ki)	PG	Wl	Gr	Fruit	Berries
Zygophyllaceae	<i>Balanites</i> <i>aegyptiaca</i> (L.) Delile		Dattier du désert (Fr) Lalobo (F)	Tree	SF	Msph	Fruit	Drupe

Legends: **MT: Morphological Type** (*Tree, Shrub, Subshrub, L: Liana; PG: Perennial Grass, An.G: Annual Grass*), **HT: Habitat Type** (*PF: Primary forest; SF: Secondary forest, Rud: Ruderal, Wl: Wetland, Fa: fallow*); **MoP: preparation method**, **CoM: Consumption method**, **FT: Fruit type**, **Languages:** (S: Shi, Le: Lega, T: Tembo, Fr: French, Fl: Fliro, H: Havu, Tw: Twa, Sw: Swahili; Li: Lingala, Ki: Kikongo); **BT: Biological Types** (*MsPh: mesophanerophytes; NaPh: nanophanerophytes; McPh: microphanerophytes; Gr: Rhizomatous geophytes, Th: Therophytes Ch: Chamaephytes, Cl.Ph: Climbing phanerophyte*).

Taxonomic Groups of Sub-spontaneous Fruits

From a taxonomic perspective, the recorded flora comprises 151 species. The major taxonomic groups are dominated by 86 genera and 54 families. Angiosperms dominate the inventory of fruit plants, accounting for 53 families (98.1%), 85 genera (98.9%) and 150 species (99.3%). Dicotyledons constitute the largest group, with 139 species (92.1%), while monocotyledons are less prevalent in the study area. Gymnosperms are also less prevalent than angiosperms, with only one species present: *Araucaria bidwillii*.

Table 3: Taxonomic Distribution of Wild Fruit Species

Groups	Major subdivisions	Familias	%	Genera	%	Species	%
Angiosperm		53	98.1	85	98.8	150	99.3
	Monocot	3	10.9	11	12.7	11	6.2
	Dicot	50	71.7	74	86.1	139	92.1
Gymnosperms	Pinopsida	1	1.9	1	1.2	1	0.7
Total		54	100	86	100	151	100

Some Wild Edible Fruits in Mountainous South Kivu



Légend: (1) Several fruits sold. (2) A woman seller of wild edible fruits. (3). Divers fruits sold: *Aframomum* spp, *Landolphia* spp, *Passiflora* spp. (4) *Landolphia owariensis*. (5) Fruit of *Myrianthus holstii*. (6) *Solanum betacea* plant. (7) seeds of *Carapa procera*. (8). *Physalis peruviana* plant. (9). *Solanum betacea*. (10) Rural women collecting fruits of *Capsicum frutescens*. (11) *Aframomun laurentii*. (12) Several fruits and vegetables sold on the market. (13) *Cocos nucifera*. (14) *Sorghum bicolor* sold on the market

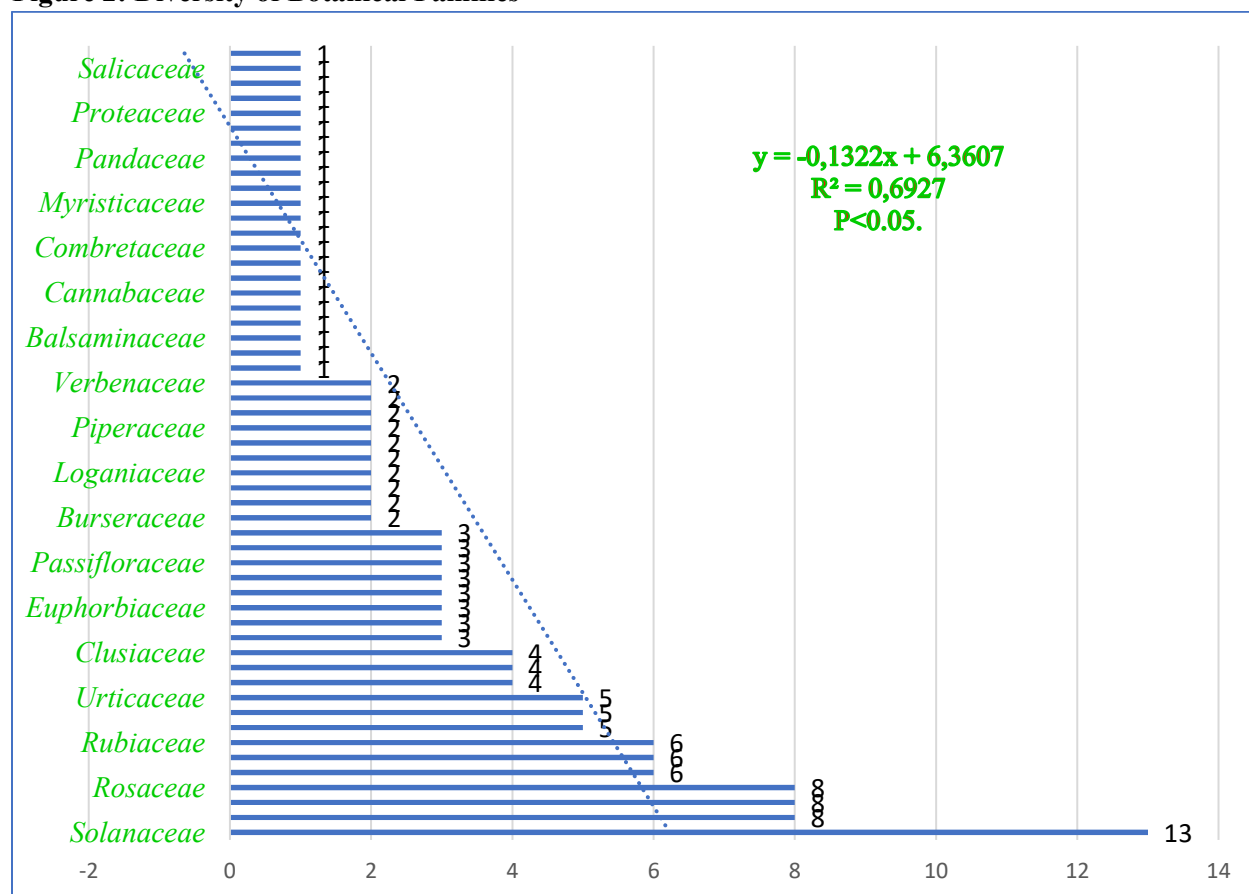
Diversity of Wild Edible Fruit Families

The recorded fruit species are distributed into 54 botanical families. The Solanaceae family is the most represented, with 13 species in total. This is followed by the Malvaceae and Rosaceae families with eight species each; the Fabaceae family with seven; the Arecaceae and Myrtaceae families with

six each; and the Phyllanthaceae family with five. The remaining families are represented by between one and four species each, as shown in Figure 2. The results of the statistical analysis of the biological spectra ($R^2 = 0,6927$, close to 1) highlight an almost balanced biological spectrum that is greater than 0.5 and $P < 0.05$.

Botanical Families Importance Value

The family importance index is a quantitative measure used to evaluate the local significance of wild plant families, providing insight into the extent to which a specific botanical family is recognised and valued within a community. The results of this study show significant variation in this index. The Solanaceae family (1.11) is the most dominant in terms of importance. This is followed by Fabaceae and Malvaceae (both 0.83), Rosaceae (0.76), and Arecaceae (0.61).

Figure 2: Diversity of Botanical Families

Morpho-ecological Features

Life forms: A total of five morphological types were identified: trees, shrubs, subshrubs, herbaceous plants(grasses), and lianas. Figure 3 shows the distribution of species according to the five life forms.

Trees dominate the most important fruit-bearing plants (48% of species), followed by shrubs (20%).

Herbaceous plants(grasses) represent 27.18% of species, while vines and sub-shrubs account for 12.8% and 8.6% respectively. Forest tree species mainly produce fruit throughout the year, and the population maintains a few specimens in their plantations, forest reserves and/or agricultural fields.

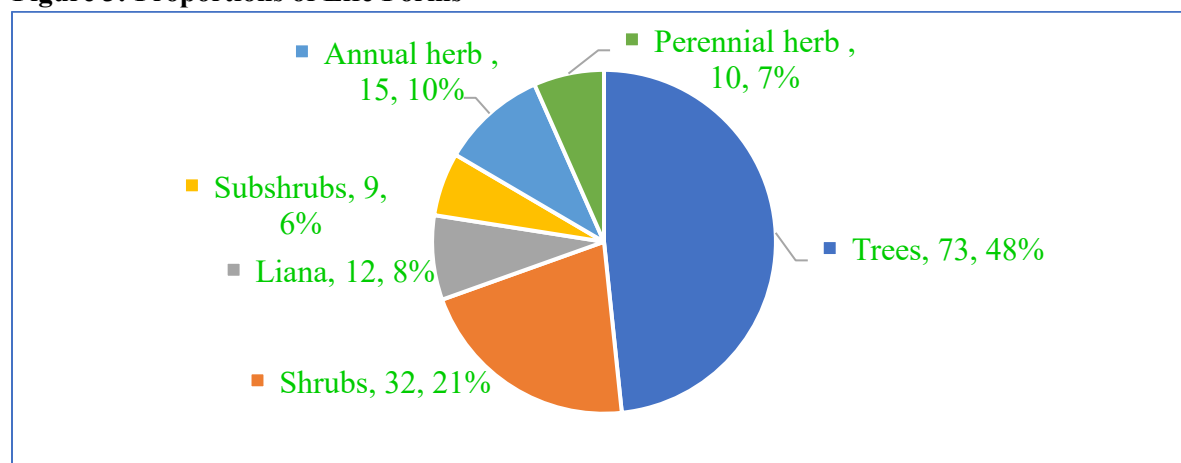
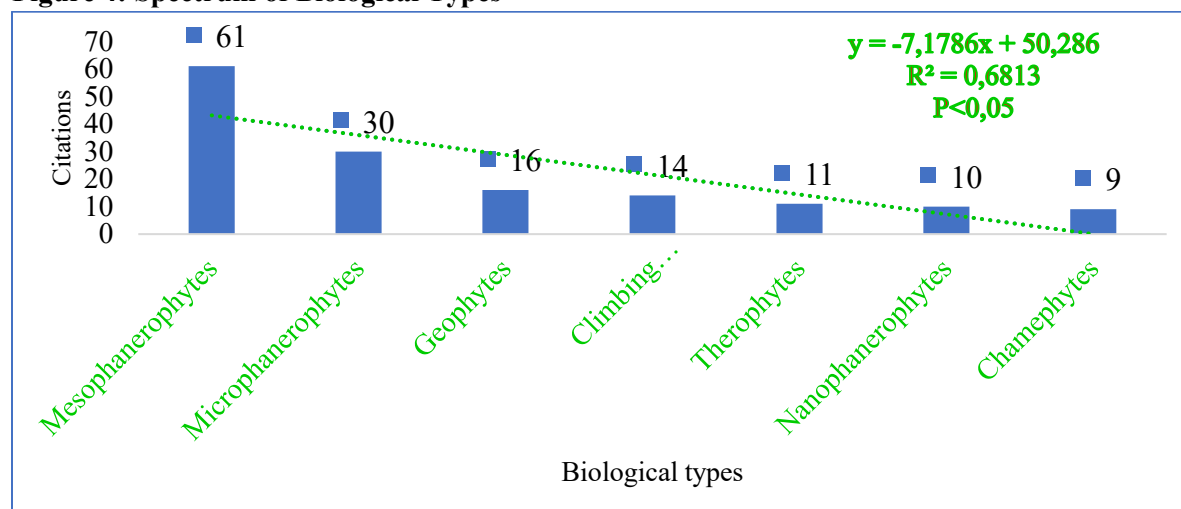
Figure 3: Proportions of Life Forms**Biological types:**

Figure 4 shows the spectrum of biological types of the inventoried species. They are dominated by phanerophytes.

Figure 4: Spectrum of Biological Types

The subcategories that produce the most fruit are mesophanerophytes (61 species), microphanerophytes (30 species), climbing phanerophytes (14 species) and nanophanerophytes (10 species). Geophytes (16 species), therophytes (10 species) and chamaephytes (10 species) are the least represented. Despite the fact that mesophanerophytes and microphanerophytes dominate the flora of the fruit plants collected, the results of the statistical analysis of the biological spectra ($R^2 = 0,68$, close to 1) highlight an almost

balanced biological spectrum that is greater than 0.5 and $P < 0.05$.

Fruit Categories and Methods of Consumption

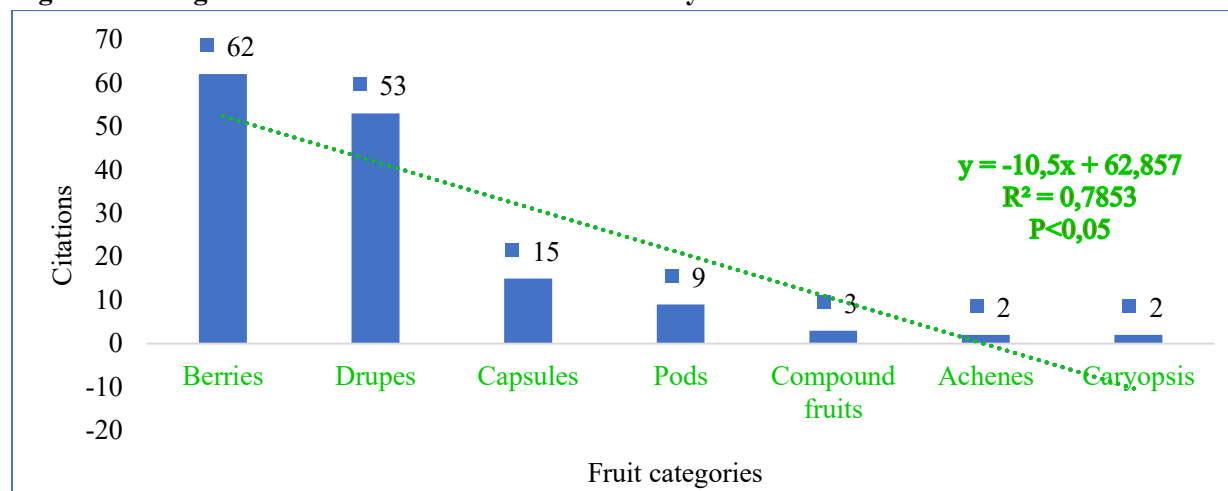
Types of fruit: The results show that berries (62 species) are the most prevalent type of wild fruits in the study area. These are followed by drupes (53 species), capsules (15 species) and pods (nine species). The least prevalent categories are compound fruits, achenes and caryopses. These results suggest that, alongside the trend of eating more vegetables for nutritional reasons, there is also

a trend of consuming more plant protein in the form of fruit, nuts and seeds to improve good health.

The results of statistical analysis of the fruit availability by site show that R^2 at 0.78 is close to 1,

therefore highlighting a near equilibrium of availability spectra that is greater than 0.5 and $P < 0.05$.

Figure 5: Categories of Wild Edible Fruits in the Study Area

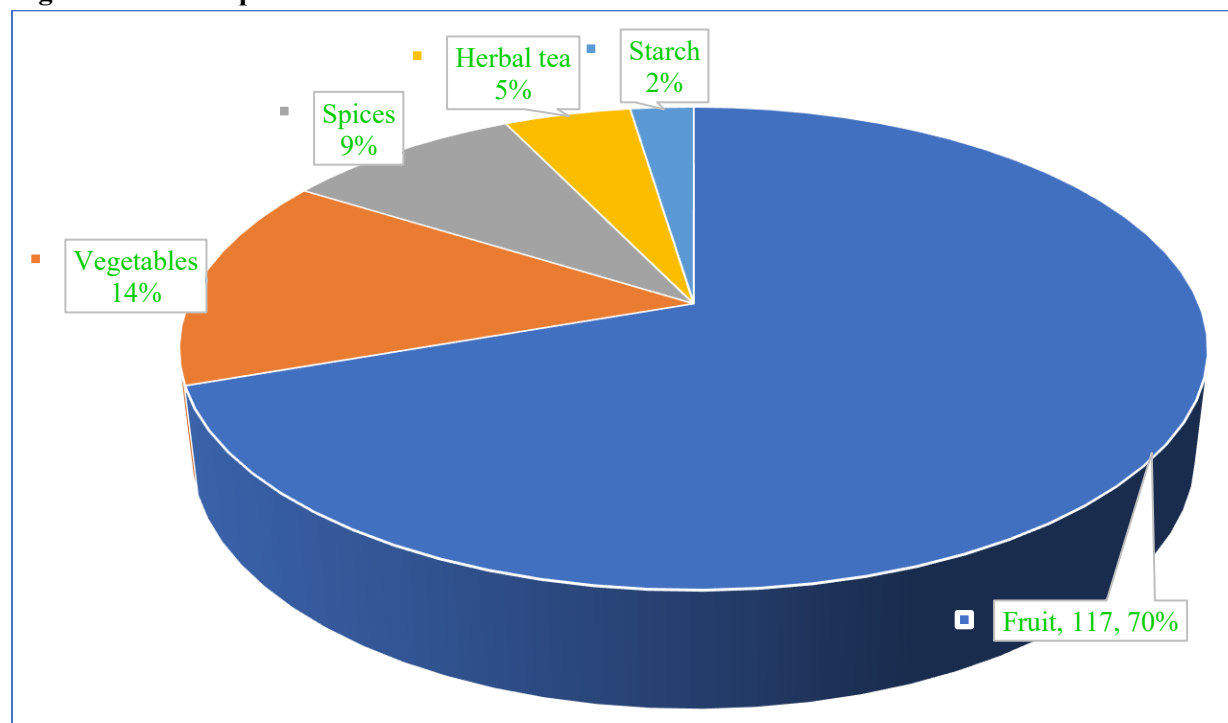


Consumption Patterns:

Figure 5 shows the consumption patterns of the wild fruits inventoried. Most of the fruits listed are eaten

raw once ripe (70%), depending on the part used (pulp, seeds, etc.).

Figure 6: Consumption Patterns of Wild Edible Fruits

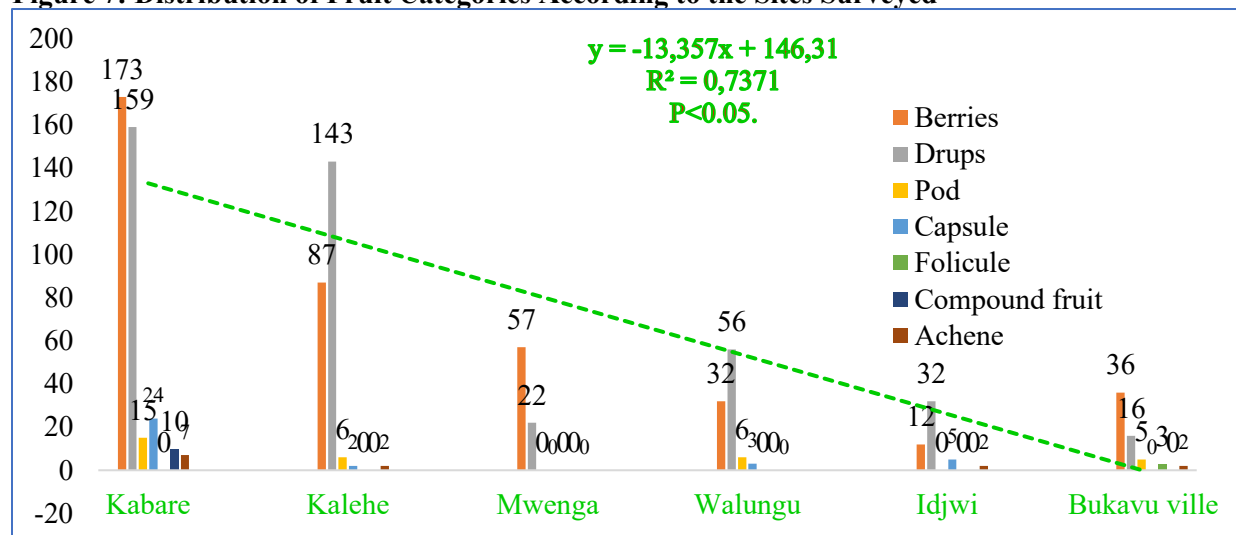


Distribution of Fruit Categories According to the Sites Surveyed

Figure 7 summarises the distribution of the different fruit categories according to the sites surveyed.

Regardless of the localities, berries and drupes dominate the fruit categories at the various sites investigated. Volcanic soils provide ideal conditions for plants to bear fruit daily and in abundance.

Figure 7: Distribution of Fruit Categories According to the Sites Surveyed



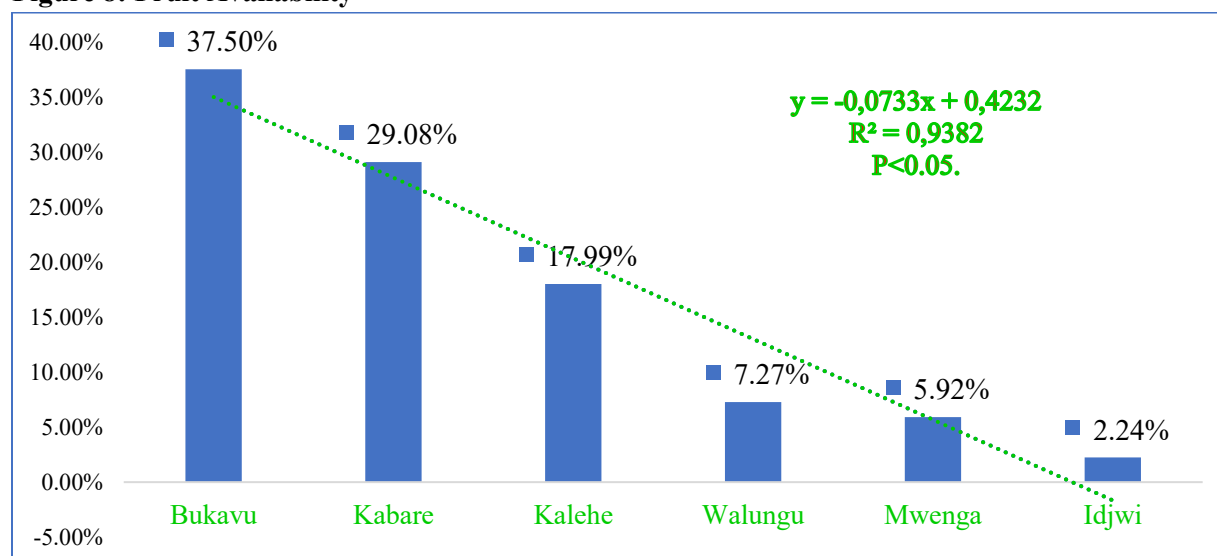
In Kabare, next to the Kahuzi-Biega National Park, as in many community forests, a variety of local and tropical fruits are available. Seasonal fruits are commonly available and are also collected by the indigenous Twa (Pygmy) people. More traditional fruits and citrus fruits can also be found there. In particular, the mid-altitude area offers a diversity of

fruits, ranging from tropical lowland fruits to those from the equatorial mountain region.

Availability of Fruit According to Location:

Figure 8 summarises the data on their presence or availability at the sites.

Figure 8: Fruit Availability



In terms of the availability and abundance of fruit in different locations, the results suggest that Bukavu (37.50%), Kabare (29.08%) and Kalehe (17.99%) are the locations where the most wild fruit species can be found. This could well be explained, on the one hand, by the proximity of these sites to the forest ecosystems of the Kahuzi-Biega National Park (KBNP) and the city, which offer facilities for the harvesting, transport and marketing of such products on the markets.

The high availability of wild fruits in the city of Bukavu may be influenced by ethnic diversity in urban areas. The people's diet habits and behaviour are strongly influenced by ethnic, cultural, and social factors. Such factors are further reflected in food choices, methods of preparing dishes, and the meaning given to food. In addition, several wild fruits sold on the markets in the study area introduced from other provinces, such as Kisangani (*Treculia africana*, *Dacryodes edulis*), low-altitude (*Tamarindus indica*, *Mangifera indica*) and other Sudano-Zambezian regions, e.g., *Dovyalis macrocalyx*, *Syzygium guineense*. Such factors likely contribute to the prolonged availability of certain fruits in the area.

The results of statistical analysis of the fruit availability by site show that R^2 at 0.93 is close to 1, therefore highlighting a near equilibrium of availability spectra that is greater than 0.5 and $P < 0.05$.

Fruiting Period of Some Wild Edible Fruits

The fruiting period corresponds to the presence of fruits from the identified fruit species. In the study area, the fruiting period for wild species producing berries, drupes, pods, and follicles varies throughout the year, between January and December. It depends on the phenology of each species. Some fruits are available year-round (both in the rainy and dry seasons, as in the case of *Piper guineense*), while others are seasonal and represent 45% of the identified species. Furthermore, the availability of wild fruit products is closely linked to product

preservation strategies after harvesting. Dried and/or processed preserved products are often available longer than freshly harvested fruits. Thus, *Piper guineense* fruits were available at all sites at all times. While the oils of *Lebrunia bushaie*, *Ricinus communis*, *Elaeis guineensis* are also available all year round on the markets.

DISCUSSION

Fruit Diversity

An assessment of the level of knowledge regarding the diversity of traditional uses and the availability of fruit plants revealed that the diversity of resources contrasts with the limited number of plants known and commonly used by the population of mountainous South Kivu. The results obtained in this study highlight the importance of edible wild fruits in traditional food systems in mountainous South Kivu. These fruits represent an essential nutritional, medicinal, and economic resource for local communities, particularly during difficult times, as also reported in other studies in other countries (Lulekal et al., 2011; Diarra et al., 2016a).

The results of this study show significant variation in this index of importance across edible wild fruit families. The Solanaceae family (1.11) appears to be the most important. This is followed by Fabaceae and Malvaceae (with 0.83 each), Rosaceae (0.76), and Arecaceae (0.61). According to Ali et al. (2025), the high value of this index illustrates that these families are particularly familiar and appreciated in the local community, especially for their medicinal and dietary uses. While other families are rarely used because they are less well-known.

The same observation was made by Abalo et al. (2010) in their studies on the diversity of wild woody fruit trees in Togo and Betti et al. (2016) following an ethnobotanical study of wild food plants sold in the markets of Yaoundé, Cameroon. These different authors note that the species of these families identified are widely distributed.

Finally, ecologically, the fruit flora studied is dominated by woody species, while herbaceous plants are poorly represented. Fruit-bearing herbaceous plants are often quickly eliminated during land clearing, or the latter, being particularly vulnerable, are often uprooted during clearing activities, and their perennial organs have difficulty surviving the unfavourable period once they have fruited. The most represented botanical families are Solanaceae, Malvaceae, Fabaceae, Rosaceae, and Myrtaceae, whose species often enjoy strong ecological and economic potential.

In terms of fruit plant distribution, the flora of the fruit species studied is dominated by tropical species with a wide distribution, of which pantropical species occupy a significant place. Similar results reported by Mawunu et al. (2023) showed a high proportion of pantropical species that benefit from strong adaptive and dispersal abilities in different environments.

As for the actual consumption of fruits, a disparity can be observed in the appreciation of fruit products. Some species, quite widespread in the vegetation, are well known to the villagers in this mountainous area. For example, *Psidium guajava*, *Physalis peruviana*, *Annona senegalensis*, *Syzygium guineense*, *Myrianthus arboreus*. However, their consumption arouses little enthusiasm among the rural and urban populations. Indeed, according to Kouakou et al (2020), the level of knowledge of the uses and the intensity of consumption of plants are influenced, among other things, by easy access (therefore their availability), the taste qualities of the fruit and its processing products, ease of conservation and multiple uses of the parts used. While other species have succulent fruits, they are limited to a particular habitat in gallery forests, such as *Uapaca benguelensis*, *Uapaca kirkiana*, *Tetracera stuhlmanniana*, shrubby fallows (*Lantana camara*, *L. trifolia*, *Passiflora edulis*, etc.), and primary forests, only those populations that encounter them enjoy them.

It is noted that knowledge and actual consumption of fruit trees, therefore, appear to be closely linked to three factors: the distribution of the species concerned in the study region, their availability over time, and the taste of the fruits (Abalo et al. 2010; Betti et al., 2016; Chakravarty et al., 2016). The majority of well-known species belong to the dominant landscape, i.e., forest vegetation. Among these, plants whose fruits meet the other two criteria of availability and taste are the most commonly used for food.

The species identified in this study present a great functional diversity because these species share similar roles in an ecosystem. They are the essential support of ecosystem services in their habitats. In addition to being food, others are the basis for the production of other products other than wood: For example, *Elaeis guineensis* is the host of certain categories of caterpillars, *Bridelia brideliifolia* is also a host for caterpillars and other insects useful for food. Through their inflorescence, certain wild fruit species promote pollination, thus strengthening agrobiodiversity and the production of other Non-Timber Forest Products of animal origin (honey, edible insects, etc.), which can enter the value chain.

Through the presence of wild fruit trees, this part of the Albertine Rift maintains an ecological balance in this ecoregion, which is particularly important for the conservation of endemic biodiversity, as it is home to more vertebrate species than any other region in continental Africa that assume seed dispersal. It contains many endemic species. According to Dupain et al. (2002), Ngbolua et al. (2014), and Kambale et al. (2022), various wild fruit trees are consumed by primates and other animals to meet their nutritional needs and with beneficial effects for their health, following the therapeutic value that some plants contain. Basabose et al. (2024) observed an increase in the frequency of visits to *Myrianthus holstii* by primates and other animals of the KBNP during the fruiting period of this plant. According to the indigenous people of the study area, primates play a crucial role in seed

dispersal and possess extensive knowledge of food plants. Some authors, such as Dupain et al. (2002), Ngbolua et al. (2014), and Kambale et al. (2022), have stated that varied diet and behaviour of primates, including fruit consumption and dispersal via faeces, contribute to forest regeneration. While Masi and Breuer (2018) report that many primate species, including chimpanzees, ingest plants with both nutritional and medicinal value, suggesting that these secondary metabolites could be beneficial to the consumer's health.

Thus, primate conservation is essential for maintaining ecosystem health, particularly for seed dispersal and forest regeneration (Roberfroid, 2000; Krief et al., 2011).

Traditional Use of Wild Edible Fruits

In addition to their consumption as edible fruits, several species are used as condiments, spices, or traditional beverages (herbal tea). For example, the fruits of *Elaeis guineensis* are used to produce oil, while their seeds can be eaten. Similarly, *Tetrapleura tetraptera* is used both as a spice and in traditional medicine for infertility, corroborating the findings of Konaré et al. (2022) and Nzebo et al. (2018).

Nutritional benefits of wild fruits include their high micronutrient, vitamin, fibre, and antioxidant content. Studies conducted in other regions (Ambé, 2001; Ouattara et al., 2016; Bayang et al., 2021) have observed better nutritional health among children living near forests and with access to fruit resources. The data from this study confirm these findings, particularly for species rich in oils and essential nutrients, such as *Myrianthus holstii* and *Ensete ventricosum*, commonly harvested by the Twa indigenous peoples living in the study area.

Seasonal Availability

The seasonal availability of wild fruits depends heavily on the phenology specific to each species (Ambé, 2001). Approximately half of the species surveyed in this study (45%) produce fruit year-

round, which is consistent with the results of Mawunu et al. (2023) and Monsango & Szafranski (1985), in similar contexts in Angola, Côte d'Ivoire, and other provinces in the Democratic Republic of Congo. The results show that species such as *Piper guineense*, *Pachira glabra*, *Panda oleosa*, *Treculia africana*, and *Musanga leo-errerae* are available year-round, while *Tetracarpidium conophorum*, *Psidium guajava*, *Pentaclethra macrophylla*, *Myrianthus arboreus*, and *Myrianthus holstii*, among others, are seasonal fruits (3 to 4 months) available for harvest. These results are therefore similar to those found by Monsango and Szafranski (1985) in their study of wild fruit trees in Kisangani.

Towards Sustainable Conservation

The greatest threat to edible wild fruit trees in the study area is the advanced deforestation of the explored sites, which are located around protected areas. Mukhtar et al. (2016) suggest that the socio-ecological impact of wild fruit collection is a factor of the interactions between the collected species, their ecosystems, and land use patterns. For the sustainable conservation of wild fruit trees, a combination of a community-based *ex situ* conservation approach with *in situ* forest management should be considered.

To curb the destruction of forests and areas with high human density, such as Kabare, Kalehe, and Walungu, it is important to reforest degraded lands with preferred wild fruit trees. The choice of species to preserve and promote should be guided by the preferences of local communities and indigenous peoples (Termote et al., 2012). It is therefore very important to conduct periodic inventories to identify species that villagers know and value.

To this end, the agroforestry model in the Batéké Plateau proposed by Biloso & Lejoly (2006) could be adapted to the study area. Thus, for the study, this model will help to categorise fruit trees; these correspond to different levels of knowledge, consumption, and preference.

The edible wild fruit trees listed here have multiple uses. In addition to their dietary uses, many species have proven pharmacotherapeutic properties, as revealed by studies by Cakupewa *et al.* (*in progress*) and Kamungu *et al.* (2015), while others are an integral part of the diet of various primate species endemic to Mountainous South Kivu (such as the Grauer's Gorilla). The case of *Myrianthus holstii* fruits is used as an important indicator of the presence of certain animal species in PNKB (Basabose *et al.*, 2024).

CONCLUSION

This study contributes to the database on wild fruit plants used for food in the mountainous South Kivu region of eastern Democratic Republic of Congo. Several localities in the territories of Kabare, Kalehe, Walungu, Mwenga, and Idjwi Island were surveyed. Data were collected through occasional ethnobotanical surveys on local markets and rural households. A total of 800 informants, 61% of whom were women, participated.

This study identified and described 151 wild fruit-producing species in the study area. They are divided into 54 families and 86 genera. Plant species are dominated by the Solanaceae, Malvaceae, Rosaceae, Fabaceae, Arecaceae, and Myrtaceae families. Morphological types are dominated by trees (48%), and woody species dominate the biological types. Berries (62 species) and drupes (53 species) constitute the main fruit categories inventoried. Although mainly consumed as edible fruits (70%), a significant part of the wild fruits of the area is consumed after preparation as vegetables and spices or herbal tea.

Some fruits are also recognised and consumed in other similar phytogeographic areas outside the study area. Edible wild fruits are more available in the markets of the city of Bukavu (37.50%), the territories of Kabare (29.08%) and Kalehe (17.99%), probably due to their proximity to the PNKB and its forest ecosystems, which offer opportunities for gathering and marketing. In

addition, the presence of ethnic diversity in the city of Bukavu contributes to the seasonal availability of these resources on the market. Various wild fruits sold on the markets in the study area also come from other provinces and other ecosystems, such as Kisangani (*Treculia africana*, *Gnetum africana*, *Dacryodes edulis*), low altitude (*Tamarindus indica*, *Mangifera indica*), and other Sudano-Zambezian regions, e.g. *Dovyalis macrocalyx*, *Syzygium guineense*. Such factors likely contribute to the prolonged availability of certain fruits in the area.

Acknowledgement: With gratitude and respect, we remember Prof. Dr. Basabose Kanyunyi Augustin (RIP 18th August 2025), who can no longer witness the publication of this manuscript, whose support, contribution and dedication significantly shaped this work. His memory will continue to inspire the present and next generation of scientists.

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