TAXONOMY, DIVERSITY, STRUCTURE, USES AND THREATS OF PLANT SPECIES IN CHERANGANI FOREST OF ELGEYO MARAKWET, KENYA

BY

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DECLARATION

Declaration by the student

This thesis is my original work and has not been presented for any academic award in any other institution. No part of this thesis shall be reproduced in part or full, or any format without prior written permission from the author and/or the University of Eldoret.

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DEDICATION

To my loving family for the sacrifice, they made seeing me through many hurdles in life including ‘taking me to school’ and seeing me ‘go through school’.

TO MY THIRD SUPERVISOR DR.BENARD KARIUKI WANJOHI, WHO PERISHED IN A GRISLY ROAD ACCIDENT IN VOI TOWN ON 1/7/2023 WHERE HE HAD GONE FOR FIELDWORK.

ABSTRACT

The pursuit for a local floristic database amidst, uncontrolled resource uses, an alarming rate of forest destruction and loss of species informed the need for a botanical inventory in five blocks of Cherangani forest. Fieldwork was conducted between May 2017 and March 2018 using exploratory surveys guided by transects (20m×20m) located in different plant communities. The purpose was to obtain data on species richness, forest structure, plant uses, and forest disturbance. Botanical work was carried out using standard botanical references and herbarium procedures. Forest structure was categorized by cover % and height of key species found in 50 plots (30m×30m). Ethnobotanical and forest disturbance data was collected using semi-structured questionnaires administered to 100 respondents purposefully selected. Statistical packages for social scientists (SPSS version 2.0), Microsoft Excel and ArcGIS software version 10.2.2 were used to analyse botanical, ethnobotanical, and geospatial data. Sorensen's similarity coefficient was used to compute beta diversity. Species importance was assessed using relative cultural indices (RCI). Plant families were listed phylogenetically using molecular-based current classification schemes with species listed alphabetically. The report presented the first identification key of the local flora including all plant life forms across families. They included 815 species in 128 and 450 taxonomic families and genera respectively. The study area being the fifth richest in species countrywide was represented by 11% species, 23% families, and 12% genera of Kenyan flora. The novelties included *Calceolaria tripartita, Nothoscordum bobornicum* and *Petunia species* as new records for Cherangani, Kenya and probably East Africa. There were 45 species of economic importance and 35 species listed under CITES. *Afrocarpus gracillior* was the most useful species locally, with encroachment and charcoal burning as the most rampant forms of forest disturbance. The local people recommended alternative income and sources of wood to save the forest. Fourteen vertical forest structures were discerned with blocks reporting a beta similarity of 47.9% in species composition. The study recommended that disturbance levels be checked especially in blocks with species protected under CITES. In addition, species with high RCI should be considered for further analysis to validate local claims and to explore possibilities of commercial exploitation. These findings are expected to reinforce the existing knowledge base, conservation and management of important resources in Cherangani forest.

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LIST OF ABBREVIATIONS AND ACRONYMS

APG:	Angiosperm Phylogeny Group.
Asl:	Above sea level
CITES:	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CHFSMP:	Cherangani Hills Forest Station Management plan
DNA:	Deoxyribonucleic acid
EAH:	East Africa Herbarium
FAO:	Food and Agriculture Organization
FTEA:	Flora of Tropical East Africa
GoK	Government of Kenya
GPS:	Global Positioning Systems
ICN:	International code of Nomenclature for algae, fungi and plants
ISBN:	International standard book number
ISSN:	International Standard Serial Number (ISSN)
IUCN:	International Union for Conservation of Nature
KFS:	Kenya Forest Service
KIFCON:	Kenya Indigenous Forest Conservation
KTSL:	Kenya trees shrubs and lianas.
KWS:	Kenya Wildlife Service
NMK:	National Museums of Kenya
PPG:	Pteridophyte Phylogeny Group
RCI:	Relative cultural index

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The loss of biodiversity at global and local level is a pressing and urgent issue that has attracted the attention of scientists and policy makers (Pimm et al., 2014).Hence, halting the loss has been and is the focus of numerous international agreements and targets (Sharrock et al., 2018). However, data on numbers, distribution, threats and protection of species are scarce and sometimes deficient in many regions of the world (Christenhusz & Byng, 2016). It is therefore important to document plant species diversity and distribution. Documenting plant species diversity and their distribution is crucial for protection and prevention of biodiversity loss (Sainge et al., 2019; FAO 2022). Whereas studies by Van & Wilson (2017) and Dani Sanchez et al., (2021) demonstrated that it is important not only to identify which plant species occur in an area, but also their vulnerability to threats such as loss of habitat and invasive species. This has prompted the urgent need to vigorously identify new plant species and document those already described.

As new plant species are still being named and described each year by scientists, others are on the brink of extinction (Antonelli et al., 2020). A detailed understanding of these two sides of the coin is critical to conserving plants, along with the useful characteristics they hold (Sauquet & Magallón, 2018; Pawar, 2015).These has been demonstrated by extensive studies at global level on forest plants (FAO & UNEP, 2022). These findings necessitate the need to identify the geographical regions to safeguard in order to sustain the most plant diversity which is central to the design of effective conservation (Keith *e*t al., 2020). In order to address these concerns, enhancement efforts to classify, name, describe and guard plant species against extinction are required (Nic Lughadha et al., 2019). If not, then there is the risk of losing useful plants before getting to know their real value.

The argument behind prioritization of conservation areas is that for conservation efforts to succeed, priorities should be defined, reassessed, and justified based on credible botanical databases (FAO,2022; Ekanayake et al., 2014). However, conservation funds are usually limited especially in the tropics where species diversity is highest (Pearson, 2018). This has prompted stakeholders to seek organized conservation knowledge (Van Proosdij, 2017). In the recent past, some studies have recommended that both species endemism and richness be used as the main criteria to set priorities in species conservation (Magurran, 2017).

Recent studies have shown that the Eastern Africa Afromontane regions that include Cherangani hills, constitute the ten most species-rich areas in the world both in overall and remaining natural vegetation (Abdi, 2015). This makes floristic inventory and diversity assessments necessary to understand the present biodiversity status and conservation in such forests (FAO & UNEP, 2020). However, due to population pressure in these regions, a decline of native forest cover even within these conserved areas has been noted. Further, due to inaccessibility caused by extreme isolation and harsh conditions, little research has been done on the plant species inventory, uses, and their vulnerability to forest disturbances (Sosef et al., 2020). Such knowledge gaps have in the past complicated several sustainable conservation projects (Abayneh et al.,2017: Wanjiru, 2020).This has prompted stakeholders to seek logical conservation knowledge.

Among some of the problems that affect quality of botanical surveys is lack of comprehensive studies, the use of incorrect or outdated botanical names, and the ever-increasing number of species described (Rouhan & Gaudeul, 2014). For instance, five studies in Kakamega forest over a period of 22 years from 1988 to 2010 produced a range of 823 species (KIFCON, 1994; Kokwaro, 2009; Fischer et al., 2010). This makes even the number of already described species difficult to state accurately (Cook et al., 2015). To address these problems, there are several key plant name resources at the heart of current knowledge of plant diversity (Turner & Govaerts, 2019). The International Plant Names Index (IPNI, 2022) and Plants of the world online (POWO, 2019) are among the main ones. This implies that studies which do not implement these efforts are prone to use of names that are not currently accepted. Therefore, extensive studies using current revisions need to be done to achieve full documentation (Govaerts et al., 2021).

In addition to correct names, studies on forest structure are crucial in multiple ways. Firstly, it is necessary to understand and manage forests by describing and categorizing their dynamic and complex spatial and structural components (LaRue et al., 2019). Secondly, for biomass assessment, age estimation, understanding of key species and disturbance regimes (Spracklen & Righelato, 2014). Thirdly, structural analysis together with floristic composition is essential for providing information on the vegetation of the forests (Dullinger et al., 2012). Finally, forest structure is correlated with animal diversity (LaRue et al., 2019). In the above perspective, information on structure helps in understanding forest ecology and ecosystem functions (LaRue et al., 2019). In conclusion, this may offer low-cost indicators for rapid assessment in tropical forest landscapes.

1.2 Statement of the problem

Cherangani forest has only ten percent of its original area remaining intact implying there is accelerated plant loss. This exposes the vascular plant diversity therein to unprecedented loss. Unfortunately, considerable uncertainty still remains in our knowledge of these vital resources. Currently, botanical baseline information and other conservation tools have not been prepared for this key water tower. Previous studies have not documented the distribution of species per block, the vertical structure, and the uses and threats affecting this forest. The scattered information available is old and unrepresentative of the actual species and vegetation in general. The few field guides at specialist libraries and bookstores in Kenya are either out of print, expensive, or have superseded content. In such case, users in Cherangani often find it difficult to access or procure the requisite literature. In addition, these publications are devoid of identification keys and current species lists that are specific to the flora of the Cherangani forest. Further, there is a great concern regarding how local knowledge is eroding between generations. Although local people have accumulated ethnobotanical knowledge for generations, this has not been documented except for a few studies on Ethnomedicine. This paucity of baseline plant data means that species diversity and habitats are not well understood, documented, and recognized for Cherangani. a biodiversity hotspot, and a key regional water tower. The totality of these factors has contributed to the deterioration of the forest's ability to perform its productive and protective functions. Consequently, this has led to inaccurate implementation of conservation projects and management in the past.

1.3 Justification of the study

Resources allocated for conservation are usually limited and therefore prioritization is paramount. In such circumstances, organized conservation knowledge happens to be the most appropriate criterion for selecting conservation sites requiring immediate attention. Identification keys and checklists are some of the most convenient tools used in plant identification, floristic knowledge and their distribution (Wäldchen & Mäder, 2018; FTEA 1948-2012). An understanding of plant uses as well as threats affecting them is crucial as it helps in protecting threatened and economically important species. Knowledge of structure of the forest is useful in identifying ecologically significant plants, assessing forest health status and biomass. In addition, it facilitates understanding of functional diversity of the forest and age estimation (Hamraz et al., 2017). Species richness information requires several expeditions over several seasons to achieve complete lists. With over 2000 species of new plants described annually and several names revised, there is a continuous need to amalgamate such information in checklists. More so the possibility of new species descriptions remains viable. The significance of ethnobotanical information in bioprospecting and preservation of diverse knowledge inherited from previous generations is not new and continues to attract attention with time (Mostacero León et al., 2017). Finally, such a study addresses taxonomic impediments by creating regional flora specialists. Therefore, the findings of this study will arm and guide conservation management and research of this critical resources.

1.4 Objectives of the study

Broad objective

To determine and develop a comprehensive database of vascular plant species and forest structure, for Cherangani Forest.

Specific objectives

1. To develop an annotated checklist with a taxonomic key of vascular plants Species found in Cherangani Forest.

2. To determine the major forest structures in terms of taxa assemblages of the Forest.
3. To assess and document economically important plant species of Cherangani Forest.
4. To determine the major disturbance regimes affecting the forest.

1.5 Research questions

1. Which plant species found in the Cherangani forest and their identities?
2. What are the primary forest communities and taxa assemblances that are distinguishable?
3. What are the economically important species and their uses found in the forest?
4. What are the major threats facing the forest and how can they be addressed?

CHAPTER TWO

LITERATURE REVIEW

2.1 Background

Several questions have troubled plant taxonomists over generations (Victor et al., 2016). Firstly, how to develop a simplified method of identifying plants which for a long time had relied on morphology and anatomy (Bonnet et al. 2016).Secondly, how to develop a widely accepted classification system (Sosef et al., 2020) . Thirdly, a universal system of naming plants was sought (Miller & Ulate 2018). The 17th International Code of Nomenclature (ICN) of Algae, Fungi and Plants (Shenzhen code) is the most recent version and supersedes all previous editions (Turland, 2018). Recently, Klopper et al., (2016) observed that recommendations made in the versions of the Code are essential resources for all botanists all over the world.

2.2 Plant checklists and botanical surveys

Checklists are lists of plants in a particular region and are usually the first step in producing other regional synopses as more information is added (Aigbokhan, 2014). The types of additional information that are commonly included in annotated checklists and are highly recommended include; taxonomic details and references. For example, place of publication, specimen numbers examined, ecological and geographical range, and basic features of the plant (Pócs & Luke, 2007). If the list includes many descriptive details of the morphology of the plant, and especially if there are keys to help identify the species, then we have a Flora (FTEA 1948-2012). The term 'Florula' is occasionally used for publications with Flora-like detail, but covering a small part of one country (Palanisamy & Arumugam.2014). The most traditional approach to inventorying the plant diversity of a given area consists of the preparation of floristic lists (Noumi & Tagne Tiam, 2016). These are also referred to as floras or checklists based on area.

Although there is no consensus on rules to be followed in compiling a checklist, many authors have tried to provide some standards (Fischer et al ., 2010; Quentine,2005). A floristic inventory may be circumscribed to some taxonomic groups of plants e.g. phanerogams or bryophytes (Pócs & Luke,2007), as well as to artificial groups e.g. tree species or medicinal plants (Beentje, 1994; Amjad et al., 2017). Floristic lists are usually prepared by subjectively searching for and collecting plants and attempting to acquire a list of species as inclusive as possible (Senterre, 2016). Usually, the searching strategy simply follows the "botanic internal algorithm",which consists of a combination of ability, experience, expertise, and intuition (Chiarucci & Palmer,2009). One advantage of identifying species in the wild is that the risk of extinction or the arrival of invasive species is noticed and enables following changes in biodiversity over time (Larsen, 2016). In addition, it can lead to the discovery of many infrequent species (Schulz et al., 2012). According to Dosmann &Tredici (2017), such results are extremely variable in floras in terms of amount and the quality of data they provide.

Among some of the problems that affect quality of botanical surveys is the use of names that are not currently accepted, and the ever-increasing number of species described (Guerra-García,2008). For instance, five studies in Kakamega over a period of 22 years (1988-2010) produced a range of 823 species (Kokwaro 1994; KIFCON 1994; Beentje 1994). This makes even the number of already described species difficult to state (Cook et al., 2015).Therefore, to address these problems, there are several key plant name resources at the heart of our current knowledge of plant diversity (Turner & Govaerts, 2019). The International Plant Names Index (IPNI, http://www.ipni.org), Plants of the world online (POWO.2019) retrieved from *science.Kew.org* are the main ones. This implies that studies which don’t implement these efforts are prone to use names that are not currently accepted. Therefore, extensive studies using current revisions need to be done to achieve full documentation.

Other factors that influence the quality of results from botanical studies are Survey durations, and levels of taxonomic quality assurance (Roux *e*t al., 2017). In Europe, a review of 252 Parks surveys found checklists complete by an average of 65 % (Stohlgren et al., 1995). The authors found one such study in Colorado that collected vascular plants over 80 years to yield 920 species. Later surveys (1989-1992) added over 100 species to the Park's checklist (Hazlett, 2004). Findings from some studies taking long periods involving many botanists have produced checklists with little information on the completeness of combined survey effort (FTEA, 1948-2012). This was identified in the post FTEA analysis that recommended smaller surveys to record more species in short durations .

On the same note, methods used in botanical investigations have proved to be a pivotal factor in defining the quality of taxonomic assessments. In Cherangani, using rapid assessment methods, Musila et al., (2011) reported 188 species. while Mbuni et al., (2019) used extensive walks to report 1296 species in the same ecosystem. This implies that surveys that take very long or very short durations produce a less accurate picture of the species richness. Therefore, a combination of all these factors makes it difficult to fit accumulation curve of species to a mathematical model to predict the number of plant species.

An analysis of numerous studies has exposed the weaknesses of plot-based sampling techniques in botanical assessments. Scrutiny of 450 studies concluded that estimating total plant richness using plots has remained elusive (Stohlgren et al., 1995). The study postulated that this is due to constraints of time and cost as only a small portion of any landscape can be sampled. In the past, Systematic botanical surveys using plots have been used to provide information on the patterns of plant diversity (Wanjohi, 2017). However, such surveys have been hampered by bias associated with sampling designs that miss rare but important habitats, poor multi-scale sampling techniques, and subjective placement of plots (van Proosdij, 2017). Furthermore, inadequate mathematical models to assess sampling completeness and estimate overall plant diversity was mentioned by Pilliod & Arkle, (2013).

On a comparable note, a review by Fischer et al.,(2010) found Six checklists developed between 1988 and 2010 in Kakamega forest with species numbers ranging between 145 to 986 (P.134). An evaluation of methods used in these studies depicts that plot-based approaches yielded the least number of species This conclusively supports the hypothesis against the use of plots. Comparison of *species*–accumulation curves generated with each technique suggested that small, single-scale plot techniques might be very misleading because they underestimate species richness by missing locally rare species at every site. In another study (Barnett & Stohlgren, 2003), a combination of large and small multi-scale and single-scale plots greatly improves our understanding of native and exotic plant diversity patterns.

After analysing several plant surveys, it’s clear that Asteraceae and Orchidaceae possess the highest number of species. Recent studies (Christenhusz and Byng 2016; IPNI, http://www.ipni.org), estimates Asteraceae and Orchidaceae have 32,581 and 28,237 species respectively. Previously, Oneto & Sigala in 2011 noted that there are 23,600 species in Asteraceae and 22,075 in Orchidaceae while Fabaceae had 19, 400. This means that in five years, new species descriptions have increased by 8000 and

6162 for Asteraceae and Orchidaceae respectively. In East Africa, this trend was accepted by Vorgelegt, (2010) and rejected by Bytebier, (2008) who placed Fabaceae with most species. This order is also visible in Kenya (Zhou, 2017). Although Zhou and others (P.9), believed that this is the global trend, it's contrary to many voices raised above. However, some studies never recorded any species in Orchidaceae (Wanjohi, 2021; Musila et al., 2011). One study (Neldner et al., 2017), reviewed methods of botanical assessments and attributed such results to personal interests or biasness of a taxonomist.

Several other studies have obtained mixed results about family dominance. In the cape region, Scrophulariaceae leads other families followed by Asteraceae (Goldblatt & Manning, 2002). According to (Zhu et al., 2015) Fabaceae, Euphorbiaceae and Rubiaceae are the largest families in terms of species. In a rare case, two studies in Ethiopian woodlands had conflicting results. Fabaceae, Poaceae, and Caparidaceae dominate other families respectively with Asteraceae weakly represented in the first one (Aynekulu et al., 2012)**.** While Fabaceae and Asteraceae command the lead in the second study (Fikadue et al., 2014). According to conclusions made by Noumi & Tagne Tiam, (2016), this may raise questions on methodology and level of expertise used raised in other studies.

In the tropical wet evergreen forests, Lauraceae, Euphorbiaceae, and Rubiaceae are well represented (Giriraj et al., 2008). Woodlands and grasslands are bound to report more on grass families. In Nakuru national park (Mutangah,1994) found Solanaceae and Malvaceae as the most characteristic families that constitute 19% of the East African flora. This may raise questions about methodology, biasness, expertise, and timing of collection (van Proosdij,2017). Going by majority and seriousness of investigations, Orchidaceae and Asteraceae are arguably the richest families by species numbers.

Several factors probably contributed to the success of some families. First, disproportionate radiation has resulted in a majority of species falling in very few families and few genera having most species (Gastauer et al.,2017; Doyle, 1998). Some studies have shown that the number of species within any given region depends partly upon the rainfall received. For instance, Zhu et al., (2015) found that the numbers of genera and families are higher in montane zones than in the lowlands where precipitation is low and high fire cases. A review of studies in Mau over time has shown a decline in the number of species per family. Morphological adaptation too has been proved to influence family dominance. For example,Arasumani et al., (2018) noted that members of the grass family have tiny light seeds capable of being dispersed for long distances.

Various proportions of growth forms have been reported in tropical montane forests. In Cherangani, Mbuni et al., (2019) recorded 54.39% as herbs while in Kakamega forest Althof, (2005) found over 50% of the entire plant species population to be woody. Conversely, Gurmessa et al., (2012) noted herbs at less than 40% of the entire species composition. It has been suggested that due to the high availability of water from high precipitation and high relative humidity, epiphytes are usually the most frequent life forms aside from trees (Fikadu et al., 2014). In general, many studies within tropical forests show that herbs constitute 18-44% of all flora (Aigbokhan, 2014). Similarly, other studies reported more trees and epiphytes (Althof. 2005), whereas some authors (Sharma & Kant 2014), argue that edaphic conditions, weather, topography, and seasonal pattern catalysed by unregulated man-made disturbances have largely influenced the pattern and distribution of species in various growth forms.

In protected ecosystems, species diversity has been shown to be influenced by several factors**.** Some studies have demonstrated that disturbance regimes have a strong influence on species diversity. For instance, in Kakamega forest, Asamba ,(2014) established that disturbed sites provide favourable habitats for many species. Similarly, sites with a large perimeter to area ratio report a higher density of invasive (Olmstead, 2013). This is linked to disturbance from neighbourhoods. Secondly, a non-metric dimensional scaling analysis of species similarity between forests concluded that altitude is the most important factor in determining species diversity (Musila et al., 2011).

Studies have found contrasting relationships between altitude and species numbers. For instance, Aynekulu et al., (2012) identified a general trend in tropical forests of decreasing plant species diversity with increasing elevation. However In a study that involved analysing the species richness among five major mountains in East Africa Abdi, (2015) concluded that it is not significantly different from each other. This implies that altitude affects species composition in the same way on all mountains at a given altitude. On the other hand, in the central Ti- betan Plateau, Dorji et al., (2014) observed that species richness is sensitive to changes in temperature, water availability, and herbivore grazing.

Recently**,** for the first time ever, scientists assessed the state of all vascular plants in the world. According to the report released by scientists at the Royal Botanic Gardens, Kew, approximately 391,000 species of vascular plants are currently known to science (Antonelli et al., 2020). In the study, about 369,000 species (94 %) are flowering plants.

This comprehensive report provides for the first time a baseline information on all known vascular plants including new plant discoveries and associated threats.

In Kenya, botanical inventory has been ongoing for over a century, coinciding with the arrival of naturalists from other continents. This has been ongoing since the first collections in the mid-to-late 1800s (Greenway, 1963). Later on, based on the Flora of Tropical East Africa (FTEA), Zhou et al., (2017), tallied 6293 and 588 indigenous and exotic species respectively for Kenya. However, these estimates did not give the numbers of known species in the present day as they were based on old studies (FTEA 1948-2012). Recently, there has been a steady growth of plant surveys, frequency of inventory and encounters of new species that have considerably increased our knowledge base (Wabuyele et al., 2016). This necessitates reconciling our databases with respect to vertical structure of forest communities, vegetation or plant communities and non-rainforest vegetation.

In Kenya, a major effort to document the plants was captured in the Flora of tropical East Africa (FTEA 1948-2012) that was published in fascicles. The study involving 135 botanists from 22 countries compiled monographs, identification manuals and taxonomic treatments in a single flora. Traversing different vegetation zones, the team managed to document 12104 native species, 2500 of which are found nowhere else. Additionally, the study described 1500 species new to science 114 of them discovered within four years (Bytebier, 2008). Based on more than a million specimens preserved in many herbaria it is arguably the largest regional study (Bytebier, 2008). Of importance, FTEA recorded taxon names, life forms, altitudinal range, biogeography, lower-level classification and voucher specimen references except for some exotic plant species.

In Cherangani, plant diversity has been documented by a few studies. The main publication is the Kenya Trees Shrubs and Lianas (KTSL) that documented National woody plants (Beentje, 1994). The book builds on the first edition produced as Kenya trees and shrubs (KTS) covering native woody perennials (Greenway & Dale, 1961). Significantly in this edition, there are distribution maps for most of the species. More so, the compactness of KTSL makes it portable and easier to use. One limitation of this pivotal literature is the lack of subsequent editions, being out of print and stock. According to Rakotoarisoa et al., (2016) . Such literature is outdated considering that so many species may have been described in the recent past.

2.3 Approaches in local botanical surveys

In the last 50-100 years, a vague trend has been visible in the way botanical information is presented in publications. The transformation has been from rich text, fewer illustrations (Greenway& Dale,1963) to both an unillustrated key for field use or heavy tree floras (Agnew, 2013; Beentje, 1994). This has further gone to slimmer or "friendlier" guides often with a greater range of photos and greater use of illustrations (Blundel,1987). This is because the large pragmatic floras are inconvenient for field use. To have smaller guides but sufficiently accurate for the taxa to be covered, various approaches have been adopted, namely: Deal only with species of a particular group (Dharani, 2013), limit the geographical area of interest (Christine et al., 2011**)**, Reduce information per species (Kokwaro,1994). Reduce the taxonomic resolution e.g. Generic guides (Kokwaro, 1994), and finally deal with a subset of species from many families or functional groups (Maundu & Tengnas, 2000). However, the main problem in most of these is that they lack key information thus are rarely accurate. This presents challenges if identification must be conclusive in the field.

In Kenya, the purposes of documenting plants have been limited to the authors' priorities with many focusing on functional groups. One such study has been Medicinal Plants of East Africa first published in 1976 with later editions (Kokwaro, 2009). The current revised edition has over one thousand five hundred (1500) medicinal species with two hundred of them illustrated. In addition, there are species localities and ethnographic maps (detailing the tribes of herbalists). Similar localized studies followed thereafter but in form of research articles (Some, 2014). Other studies include; Acacias of East Africa (Dharani, 2002), woody plants of Kakamega forest (Christine et al., 20011), Flowering plant families of East Africa (Kokwaro, 1985). Kikuyu botanical dictionary (Gachathi et al., 1994) Common trees and shrubs of Kenya (Dharani, 2013). All these studies made a significant contribution to the understanding of national flora. However, they have associated limitations of scope that can amount to inaccuracy depending on the user's interests.

Today, botanical authors are still striving to improve on packaging taxonomic information in a 'friendlier manner. For instance, Agnew, (2013) provided more species, keys, illustrations, and descriptions. On the other hand, Beentje, (1994) provided local names, distribution maps, uses, and a few colour plates. Some authors excluded keys but provided annotated lists with details of herbarium spacemen and biogeographical affinities of species (Fischer et al., 2010). In addition to the above efforts, Quentin (2005) specified recent name changes and synonyms in respect of each species where applicable, and a more precise locality within the checklist area. A similar study by Maundu & Tengnas (eds),2000) transcribed names of species in Over 60 local dialects. Furthermore, they gave details of species uses, distribution maps and descriptions, color plates, illustrated glossary, further references, and illustrations. Generally, these studies don't follow phylogenetic classification schemes . Primarily they address portability and specific user interests, therefore users have a difficult time associating species. However, over time it has been shown that such checklists need additional information to support identification (Aigbokhan, 2014).

In the recent past, several studies have focused on producing literature with coloured photos, to attract users with various interests. One such example is the current edition of trees and shrubs of East Africa (Dharani, 2013). The book features over 400 common woody plants including 93 new species with over 400 additional photographs. The first comprehensive field guide for East African Acacias features 62 known species with additional information on a flowering calendar, glossaries, various uses, and application in medicine (Dharani, 2002). In Kakamega, Christine et al.,(2011) purposed to help people interested in the preservation of the endangered Kakamega forest. This prompted them to book 288 species of plants featuring, environmental conditions, and descriptions of woody plants, and about 2000 photos. Many of these publications are information deficient particularly for accurate identification and are specific on functional groups they address. Therefore, they have limited usage.

In Kenya, a major effort to document the plants was captured in the Flora of tropical East Africa (FTEA, 1948-2012). The study involving 135 botanists from 22 countries compiled monographs, identification manuals, and taxonomic treatments in a single flora. Traversing different vegetation zones, the team managed to document 12104 native species, 2500 of which are found nowhere else. Additionally, the study described 1500 species. new to science, 114 of them discovered within the last four years . Based on more than a million specimens preserved in many herbaria it’s arguably the largest regional study Bytebier, (2008). Of importance, FTEA recorded taxon names, life forms, altitudinal range, biogeography, lower-level classification, and voucher specimen references except for some exotic plants .

Beyond the rich information documented in FTEA, the single most limitation of this study is that the published fascicles have been superseded by current classification systems with many species described after some publications (The Angiosperm Phylogeny Group, 2016). In addition, several species have been described, revised, and probably some have gone extinct (Lastrucci et al., 2014). This makes it difficult to work alongside modern schemes.

After the FTEA, there was a study analysing the vascular plants in Kenya based on the final FTEA (Zhu et al., 2015). The authors converted their findings to the recent molecular systematic to develop a "Synoptic List of Families and Genera of Kenyan Vascular Plants (SLFGKVP). In addition, the authors explored taxa and regions by number of species with view of making recommendations for conservation. Their analysis gave 225 families, 1538 genera, and 6293 native species with Fabaceae leading at 98 genera and 576 Species. Two regions of Kenya, K4 and K7 are the species-richest in regard to both total and endemic species with 3375 and 3191 total species and 174 and 185 endemic species respectively. This national floral tally accounts for 3.5 % of global flora which makes Kenya a state rich in flora. Nonetheless, bearing in mind that the review fully accepted FTEA"s treatment on synonyms, the genera, and species number remained the same. This implies that taxonomic and nomenclatural revisions after the FTEA are not accommodated in this review, thus currently less accurate. Their recommendation for intensified studies and protection is clearly supported by the results.

After a simplified summary of taxa in East Africa Bytebier, 2008) and in Kenya (Zhou et al., 2017) basing on the study of FTEA, a few local studies have attempted to register all plants species in areas considered as biodiversity hot spots . In Taita hills, a leading inventory reported 1396 plant taxa in 145 families and 686 genera (Luke, 2005). This represents 44% of the coastal flora and 21% of the Kenyan flora. In Aberdare, Kipkoech et al., (2020) listed 1337 species, while in Nandi, Melly et al., (2020) registered 686 plant species after a similar study in the same forest recorded 321 species (Girma et al.,2014). while Zhou *e*t al., (2018) recorded 1335 species in Mt Kenya. In Nakuru national park, over 575 vascular plant species were recorded (Mutangah,1996). Similarly, in Kakamega 986 species were recorded (Fischer et al., 2010). Previously in the same forest, a survey had revealed about 400 vascular taxa (Althof 2005). One drawback linked to the study of Fischer et al., (2010) was that it took a long (8 years) to conclude (p.138 par.2), Therefore it was subject to failure in recognizing newer names and concepts.

In Cherangani, woody plants have been captured by very few studies. The main publication is the Kenya trees shrubs and lianas (KTSL) that attempted to documented woody plants countrywide (Beentje, 1994). The book builds on the first edition produced as Kenya trees and shrubs (KTS) covering native woody perennials (Greenway& dale, 1961). The KTSL includes an additional number of lianas, trees, and shrubs not previously listed or described during the intervening period. This adjusts the species population to about 1800 from 1000 in 137 families that are keyed out in a more ‘friendlier ‘manner. Significantly in this edition, there are distribution maps for most species. More so, the compactness of KTSL makes it portable and easier to use. One limitation on this pivotal literature is lack of subsequent editions, being out of print and stock. This implies that this literature is fairly outdated considering that so many species have been described in the recent past (Rakotoarisoa et al., 2016). Another study in Kenya (KIFCON, 1994) focused on providing estimates of forest areas and total standing volume by species. This study's main limitation was confinement to only trees and shrubs of known merchantable value.

Pertaining to non-wood vascular plants, the Cherangani forest is satisfactorily covered by Upland Kenya wildflowers (UKWF) which covers high potential Kenya (Agnew , 2013). It provides the most dependable treatment of over 3000 species including herbs, ferns, and graminoids. In addition, the book includes some species covered by KTSL as shrubs where such species does not fit well in the definition of either. The 1st and 2nd editions of the book did not enlist grasses and sedges (Agnew, (ed.) (1974 ;Agnew & Agnew (1994). However, the latest edition (3rd) in which the author claims to be completely revised boosts more species, illustrations and includes Pteridophytes (Agnew , 2013). Although the author deviated from the family arrangement used in the flora of tropical east Africa (FTEA), This work presents keys, extensive descriptions of species and 203 plates of illustrations of many species organized by family. However, the book does not cover the entire country, particularly the coastal flora which possess so many endemics (Luke, 2005) and has no coloured plate.

A few other studies have been dedicated to the plants of Cherangani, among them is a rapid botanical assessment (Kibet, 2016). This study analysed species in exactly the five blocks targeted by the current study. The author aimed at developing historical vegetation and altitudinal relationships. Using transects with plots following an altitudinal gradient, presence/absence data matrix was created. The data was analysed using TWINSPAN cluster giving five interpretable floral groups and defined species distributions along the altitudinal gradient. A total of 163 plant species from 71 families and 133 genera were identified, including the endemic *Senecio johnstonii* ssp.

battiscombei var. *cheranganiensis* and an invasive yellow cestrum (*Cestrum aurantiacum*). Because of the plot method used, it’s highly likely that many species lying outside the plots were disregarded. This certainly underestimates the inventory. Additionally, the study could have been reinforced by inclusion of disturbance and use data.

The majority of studies in Cherangani have focused on ethnobotany specifically Ethnomedicine. Among the three communities living in Cherangani Hills, Mbuni et al., (2020), recorded 296 medicinal species in 80 and 191 families and genera respectively. In keiyo, a total of 73 medicinal plant species belonging to 33 families were identified, as a treatment for 46 human and three veterinary diseases. *Leucas calostachys* was the most widely used species (17 medicinal uses). In Marakwet, Kipkore et al., (2014) identified 111 plants with medicinal or related uses while Kigen et al., (2017) in the same region noted different herbal preparations. These included fruits and healing vegetables employed in the treatment of various medical and veterinary conditions. Although the studies purposed to document medicinal plants used by the locals and provides comprehensive ethnobotanical information about herbal medicine and healing methods, these studies leave a remarkable gap on numerous other plants uses.

The most significant and recent study on the vascular plants in Cherangani was reported in a checklist covering all the 12 blocks of the ecosystem (Mbuni et al., 2019). The data was obtained through intensive field investigations and matching of herbarium specimens. The authors proceeded to compare their findings with national flora to obtain 18.50%, 43.83% and 54.17% of the species, genera and families respectively. Significantly the authors presented the checklist using the most recent system of classification based on molecular data (Byng et al., 2018). Although the study is reported as the first exhaustive inventory of the terrestrial vascular plants in the region, still previous studies have reported species not mentioned in the checklist (Kibet, 2016). Some experts (Hassoon et al., 2016) contend that rather than using the checklist approach alone, it might be more useful to incorporate functional keys to facilitate identification.

From the available literature on Cherangani forest, it’s imperative that past studies have either been superseded by current classification schemes (except one) or contain inaccurate information through disregard of taxonomic revisions and taxa misplacement. In addition to these limitations, most studies have focused on Ethnomedicine and overlooked the wider utilization options for plants. Apart from Kibet, (2016), no other study attempted to define the forest structure of Cherangani. However, his results of structure analyses do not reflect characteristic species of Afromontane, therefore could mislead decision-makers. In addition, considering that a study in Cherangani prepared species area curves that didn’t reach asymptote signalling incomplete sampling (Musila et al., 2011). This implies extensive work still needs to be done to achieve full documentation.

2.4 Process of plant identification

One key subject area that has accompanied humankind, has been the discovering, recognising, and naming of plants (Hollingsworth et al., 2016). This is because ‘name’ is a key to information and considering that Plant names form the foundation principles of taxonomy. then stems the natural need for categorization and naming(Le, Tran &Hoang, 2012). Today, Speci*e*s identification still lies at the heart of most botanical studies, but it is recognized as a difficult and often frustrating task (Cope et al.,2012). Identification of plants is carried out based on the information available about the plant in each particular case .For a flowering plant, the first step usually is to discover to which family it belongs, With some experience, the families commonly encountered are soon known by observing key defining diagnostic features (Guerra-García, 2008). This according to Jacquemart et al.,(2016), is done by assigning a unique identity to an unknown plant by morphological character comparison.

With the development of science, today identification of plants is roughly divided into three categories namely; assisted, artificial, and automatic (Belhumeur et al., 2008). Assisted and artificial category uses existing data in physical or chemical methods to help in identification .The automatic method is based on computer vision to observe leaf characteristics. Computer vision technology can automatically complete plant leaf image processing and feature extraction and classification of plants (Jin et al., 2015). The artificial identification method refers to the use of plant characteristics of knowledge investigation form of learning, such as flora, etc. The methods require experts to master a wide variety of plant characteristics knowledge. Experts in the field can quickly identify plants through this method by the use of keys.

2.4.1 Automated plant species identification

Presently, the predominant culture of plant taxonomy is directed towards electronic dissemination of taxonomic information, leading to increased accessibility and connectivity (Victor et al., 2016). This is evident in the amount of digital information available online that has recently increased dramatically. Many efforts around the world have focused on storage of high resolution digital images of type specimens (Unger et al., 2016). It's notable that due to the huge diversity of plants existing on earth and large inter-species similarity, the manual process of identification (artificial and assisted) is difficult and at times may be confusing (Rouhan & Gaudeul,2014). This has led to an increasing interest in automating the process of species identification and related tasks to generate faster and accurate results (Asrani & Jain, 2015). A review by Pang and Lim,2017 showed that the development and ubiquity of relevant technologies, such as digital cameras and portable computers have bought these ideas closer to reality. This has been facilitated by the advent of digital technologies that enable the compilation of many colourful plant photos at minimal cost (Dressler et al., 2016).

Some more attempts to enhance automated identification have focused on the development of computer-based software (Bonnet et al., 2016). Even though many are still at proposal stage, there exists very few on the market. For some time, the best plant identification software according to this author has been leaf snap. It's dedicated to iOS users on 184 tree species of the North-Eastern United States. It works on the principle that a single leaf specimen is photographed on a solid light-colored background. The application can then compare with stored images and give the right name. Although this method is not time-consuming the investigator in convinced that it cannot always provide instant and accurate feedback on mobile learning. Again today, a huge number of people use android (Nguyen et al., 2013). Currently, most of these automatic identification software's focus on the features of leaf shape, venation, and texture, which are promising for the identification of some plant species (Jin et al., 2015)**.** Some analysts ((Cope et al., 2012)**,** presume that a robust automated species identification system would allow people with only limited botanical training and expertise to carry out valuable fieldwork.

In recent times, Content-based image retrieval (CBIR) has been a rapidly expanding area with wide applications. For instance, artificial neural networks have been successfully applied to problems in pattern recognition, classification, and image analysis (Asrani & Jain, 2015). These authors are convinced that they offer-potential advantages when the data is limited, and the species are difficult to differentiate. However, besides the usual challenges surrounding object recognition, it possesses additional difficulties, such as very high intra-class content variation . In addition, the method still encounters common difficulties faced in recognition, such as light, pose and orientation variations and other factors like the changing leaf shapes according to plant age (Anvarkhah et al., 2013). These have limited the practicality of CBIR techniques.

Because of the numerous weaknesses associated with automated recognition, it has been observed that it is quite difficult to develop a system that could process large information and provide correct identification (Carranza-Rojas et al., 2017). Consequently, many of the prominent solutions employed for general purpose content-based image recognition and retrieval fail to deliver desired accuracy levels (Unger et al., 2016; Yanikoglu et al., 2014). This limits the number of applications on the market. Therefore some authors (Cianciola et al., 2010) have advocated for molecular systematics as a solution to the problems associated with image recognition.

2.4.2 Molecular systematics in plant identification

The 2nd half of the 20th century has been a fascinating period in which plant systematics studies greatly profited from new techniques based on molecular data (Kress et al.,2015). The logic is that when a unique DNA sequence ('DNA barcode') is known for all species and one has the sequence of an unknown organism, then one can match it to our data bank to determine the name of a species. Today, the development of various computer programmes and molecular techniques that generate molecular markers has made it possible to accurately identify plants (Kress et al.,2015). This has uncovered a great deal about phylogeny and helps locate new species precisely (Hollingsworth et al.,2017). This revolutionary approach is feasible to be applied in the problems of biodiversity conservation (Harris & Marsico, 2017).

A further look at the attractive opportunities that DNA barcoding presents reveals it is no panacea. Ferri, (2009) remarked that ''DNA is simple in theory, but a lot more complicated in practice''. For instance, in some cases, genes are unanimous but morphological analyses give inconsistent results which implies that they can be misleading. In addition Doyle, (1998) found that DNA is susceptible to long-branch attraction and should be based on a sound and stable taxonomic framework of genera and species. But even for a comparatively well-known group like plants, this framework still has many weak spots. For example, by the year 2015, there were only 139 vascular plants with assembled whole genome sequences online (Hollingsworth et al., 2016). Again, the cost of infrastructure and expertise is a big setback (Rouhan & Gaudeul, 2014). This does not mean that DNA barcoding in plants has no role to play in species. identification or discovery in the future, but it is not integrated into the working practice of specimen-based taxonomy (Li et al., 2015). Despite these challenges, Hollingsworth and others in 2016 observed that major efforts are ongoing to create a worldwide DNA barcoding database.

Recent studies that discussed the history and general information on molecular phylogeny, reported that a new momentum to this field was provided by the availability of fast DNA sequencing techniques along with the development of robust statistical analysis methods (Kress et al., 2015). The authors believe that. although widely practiced even now, traditional morphology-based systems of classification of organisms have some limitations. They argued that although the use of molecular markers can complement the traditional morphology-based method for phylogenetic studies, numerous limitations still linger in the system. This has been supported by Tang et al., (2018) who concluded that although molecular methods are relatively recent in popularity are not free entirely of flaws.

2.5 Identification keys

Identification of plants can be a challenging and even intimidating task for both experienced and inexperienced researchers (Robroek, 2018). Dichotomous keys that follow a single pathway of character state choices to an endpoint have been the primary tools for identification for more than two centuries (Osborne, 1963). Various forms of “identification keys” have been developed (Makokha et al., 2018;Wäldchen & Mäder, 2018). The printable dichotomous is the earliest form of artificial identification (two alternatives) or polytomous forms. Many editors, therefore, recommend or require the use of dichotomous keys (Flores-Bastida *e*t al., 2017). In addition, a key may be a mixture of simple polytomous and complex dichotomous choices or sometimes referred to as a single-access key (Jacquemart et al., 2016). The equivalent term in computer science is decision tree (Pang & Lim, 2019). However, some authors (Dawson & Ford,

2010) agree that evenly splitting choices are desirable for users though cumbersome to develop among other short comings.

The use of keys comes with several shortcomings, the identification by conventional keys is complex and time-consuming (Belhumeur et al., 2008). Due to the use of specific botanical terms keys can be frustrating for many users especially non-experts (Agnew, 2013). Again, keys contain questions that are daunting to answer with certainty (Wäldchen & Mäder, 2018). Although it is theoretically possible to construct a polytomous key with Boolean lead statements, the practice by Blagoderov et al., (2012) has shown that the result is often akin to a logical riddle that required overcoming. Finally, keys have been known to contain many inconsistencies and sometimes just plain mistakes (Kokwaro, 1994). This is because, the other inexact part is that plants vary a lot in the wild (Hadjou Belaid et al., 2018). This instability of phenotypes as species responds to environmental factors makes this conventional method of identification meet difficulties. This implies no keys can take all the variations to account.

Beyond the work of FTEA (1948-2012) KTSL (Beentje 1994) and UKWF (Agnew 2013), very little has been done on keys of Kenya's plants. Away from the work of FTEA, the first detailed published key on woody plants was presented in the first edition of KTS (Dale & Greenway 1961). Including one thousand tree species, this key employed difficult botanic Latin terms skewing toward non-vegetative character thus proving unfriendly to non-technical users. However, its second edition keyed 1800 species in a more 'friendlier' manner. Despite all these efforts, the current version is 26 years old meaning some species and families have changed names. In 2011, Christine and others developed a key for about 300 common woody plants in Kakamega. This key only separated species into groups based on leaf division and the pattern of arrangement of leaves. This means that to reach a species name, one must go through the respective pages comparing descriptions and photos in books with species at hand. Though this is tedious, the user avoids taxonomic terms.

In East Africa, common flowering plants and Acacias (Kokwaro, 1994; Dharani, 2013) have been keyed. However, in these studies, species were classified using old systems and some plant names have changed in recent taxonomic revisionary works. This means their findings stand partially inaccurate. In addition, the keys covered a very limited number of species, therefore, cannot apply to broad taxa. In reference to herbs (including ferns) in Kenya, a few keys are in focus (FTEA 1948-2012;Agnew, 2013). The keys make a first attempt to recognize natural groups using morphological attributes. However, considering the large number of species (e.g. orchids and ferns) that closely resemble, this presents segregation hurdles. This prompted the authors to use a lot of morphometrics.

After analysing several methods, it’s clear that plant identification problem is still far from easy and no single method provides a panacea for all identification problems (Byng et al., 2018). However. appropriate methods should be chosen for each case to address the diversity in Plants. For example, after analysing several image recognition methods, it’s impossible to attain 100% results generated for an image based search engine only using single features(Yanikoglu et al., 2014). Both automatic and gene markers require extensive expenditures (Endress et al., 2000), However, they can be improved (Asrani & Jain, 2015). Although automated matching to digital databases of images or gene sequences is currently feasible for some groups, the implementation of these systems is still unrealistic goal, for most taxonomic identifications(Ferri et al.,2009). This has made some researchers like Hassoon et al., (2016) conclude that conventional taxonomy is an irreplaceable discipline.

In the recent past, some of the most significant trends in plant taxonomy have been a synthesis between the older and new methods in our knowledge of plants (Goëau et al., 2012). This has been done because, to effectively address the current and future challenges of plant identification, one requires collaborative taxonomic expertise from both classical and molecular approaches (Kueffer et al., 2012). A more ‘integrative approach would be to combine the strengths of both contemporary and molecular evidence and maximize their synergistic use to potentially produce new tools for plant identification. For example, molecular tools have been used to assist in detecting and identifying finer scale morphological differences in both genotypes and hybrids (Cianciola et al., 2010). This facilitates more rapid and accurate differentiation in the field and further enriching taxonomy overall. But all this notwithstanding, it has been stated (Endress et al., 2000) that it is no exaggeration that morphological data, based on the external form of organisms, have been, and still are, used most in plant identification.

The comparative study of plant morphology and anatomy has always been the backbone of plant systematics, which endeavours to elucidate plant diversity, phylogeny and evolution (Rouhan & Gaudeul, 2014). Morphological features have the advantage of being easily visible, (Belhumeur et al., 2008). This makes their variability appreciated more than that of other kinds of features. Plant morphology in all its aspects is still hugely important because, with proper weighting, morphological characteristics remain the most valuable tool in the phylogenetic tree (Kueffer et al., 2012). Secondly, all herbaria around the world use species descriptions based on morphology and anatomy (Walter & Winterton, 2007). Therefore, in this regard, reliable determination keys based on morphological characters continue to be a major information source for species identification. However, reliable plant keys require data from both classical taxonomists and molecular biologists (Kueffer et al., 2012). But then a majority of nonspecialists will never have access to molecular methods nor the skills to use them for distinguishing species.

2.6 Species of conservation significance

As of December 2019, a total of 20.334 tree species had been included in the IUCN Red List of Threatened Species (IUCN, 2020), of which 8 056 were assessed as globally threatened (Critically Endangered, Endangered or Vulnerable). In total, the East African region has 51 genera in 20 families with over 1200 endemic species (Bytebier, 2008). Tanzania is the richest in endemic genera, which are found throughout the country. The poorest in generic endemism is the Nyanza region of Kenya with a single genus (Bytebier, (2008). Endemism in the coastal forests of East Africa is widely discussed by Lovett, (1998). By regions in Kenya, K4 and K7 have the highest number of endemic species at 174 and 185 respectively. K3 and K5 have the highest density of both total and endemic species. Finally. in Cherangani, Mbuni, et al., (2019) listed 17 endemic species with reference to FTEA, however they failed to mention some species like *Aloe cherenganiensis*.

Endemism of species has been a key measure in conservation . At global level, by the end of 2019, a total of 20334 species of trees had been listed under the IUCN Red List of threatened species (IUCN 2020). This includes 8056 assessed to be endangered, critically endangered, or vulnerable. Although data In East Africa, on endemic species are still incomplete some published records show that 4.1 %, 0.6%, and 11.2% of species in Kenya, Uganda, and Tanzania respectively are endemic (Bytebier, 2008). The FTEA concluded its report in 2012 had listed 467 endemic vascular flora but the list did not include any gymnosperm. The list was dominated by 459 angiosperms and 8 pteridophytes with 3 lycophytes found in Isoetes a genus with 4 Kenyan species. Similarly, three Monilophytes in the genus Marsileaceae and a fourth one unnamed Asplenium (Zhou et al., 2017). The study noted that the country has no endemic family but possess only one endemic genus Dibrachionostylus. By family, Euphorbiaceae, Fabaceae, and Acanthaceae dominate with 50,40 and 33 species respectively with nine other families exhibiting more than ten species. In Xanthohoeaceae almost 40% of all species are endemic.

2.7 Forest structure

Physiognomy (community architecture) or the external appearance of a community refers to the vertical structure of the forest and the dominant growth forms of the characteristic species (Neldner et al., 2017). Similarly, a plant community is regarded as a group of recurring species that share a characteristic habitat and collectively create a unique physiognomy to attain a typical range of species richness (Caicoya et al., 2014). On the other hand, a vegetation type is composed of many communities that differ only in the identity of dominant or associated species in a similar physiognomy and environment (Giorgini et al., 2015). The description of forest structure" or physiognomy is usually regarding how the attributes of trees are distributed within a forest ecosystem (Hamraz et al., 2017). Although trees are sessile, they are living entities that propagate, grow and die, this has revitalized discussions on the existence and measurement of layers in forest stratification (Lopes et al., 2014), and controversial concepts of forest ecology.

Existing systems categorize forest structure, but these have tended to focus on particular attributes of the forest. First, is the tree physiognomy, which is the shape of individual crowns (Lopes et al., 2014). Secondly, the height diversity (vertical distribution of canopy components (Lee et al., 2013). Thirdly, the stratification (predictable vertical separation into distinct horizons (Aynekulu et al., 2012) and lastly, the fractals i.e. a fragmented geometric shape that can be subdivided into parts, each with scale-invariant statistical properties (Nadkarni et al., 2008). Therefore, many questions that concern forest structure requires that a researcher select only a subset of all the components present. This means one must filter out certain components of forest structure.

A number of recent publications conclude that there is no consensus on the most appropriate method of describing the vertical structure of forest communities (Lopes et al., 2014). However, while some systems classify vegetation based on the tallest stratum, the Queensland Herbarium uses the predominant layer (Neldner et al., 2017). These schemes have attracted criticisms of how actual structural measurements and how they are visualized or even analysed and reported (Nadkarni et al., 2008). Thus according to Sharma and Kant, (2014), the collected data might constitute different categories than the conceptual view of the researcher's unit of interest.

Several methods have been used to classify forests structures in East Africa based on altitude, moisture and vegetation (Hamraz et al., 2017), while some are classified purely on physiognomic and floristic composition features (Greenway,1943). The conventional system has been to name every plant community after its dominant species that is characterized by a roster of associated species and their combined architecture (Chai & Wang, 2016). Several studies have concluded that most plant populations do not grow in isolation and single populations do not usually monopolize habitats (Rita et al., 2017). Therefore, wherever a particular habitat repeats itself within a region, many of the same species recur (Mezgebe & Mezgebe, 2019). Though the species composition does not replicate itself completely, there is a nucleus of species that does repeat (Chai & Wang, 2016). These clustered species are said to be associated with each other and to be members of a biotic community (Sharma & Kant, 2014) and therefore the best and easiest way to refer to a forest community.

In floristic and species diversity assessments, several parameters are considered. First, the total number of plants in an area or sample unit is regarded as census together with presence or absence of a species in a sample unit (van Proosdij, 2017). These are the most basic measures which can be obtained from most investigations (Aggemyr et al., 2018). These figures can be converted to frequency by calculating the proportion of sample units occupied. On the other hand, density is the number of individual plants or plant units per unit area. This is a highly quantitative and precise measure but is only applicable where individual plants or plant units are discrete (Palanisamy & Arumugam, 2014). Similarly Cover is a quantitative measure of the percentage proportion of ground surface covered by the vertical projection of the plant (Tabor et al., 2010).This measure applies to virtually all growth forms and is a good measure of biomass and hence dominance (Karpatne et al., 2012). However, the cover is time-consuming to measure precisely (Pilliod & Arkle, 2013). This explains why it is often estimated visually (Caicoya et al., 2014) thus becoming less precise and semiquantitative.

Some studies have demonstrated that disturbance is a major force for the development, structure and function of forests (Wanjohi, 2021). In Cherangani the presence of alien species, weeds and colonizer species was identified as disturbance (Kibet, 2016). Similarly, in Bhutan, the high number of species is attributed to the heavy presence of colonizer species (Tenzin & Hasenauer, 2016). Such species are common in forests at the early stages of succession. Similar studies in Mt. Elgon and Kakamega forests have captured colonizer species such as *Solanum mauritianum* Scop. following anthropogenic disturbances to the forests (Althof, 2005). However, there are major difficulties in the formal characterization of disturbance and recovery thereafter (Chaturvedi & Raghubanshi, 2014). As to the latter, the acceptance of classical generalizations of the nature of succession has led to difficulties in the assessment and interpretation.

In another study, an assessment of the degree of similarity in floristic composition between Nandi and Cherangani forests using the non- metric multidimensional scaling (MDS) differentiated three clusters (Musila et al.,2011). The plots from Cherangani Hills were distinctly dissimilar from Nandi Forest plots. Plots sampled in Cherangani Hills, Kerer Forest block, were markedly dissimilar from all other sampling plots. Sample plots from North and South Nandi Hills Forest formed one cluster though a closer look showed ‘‘loose or unclear separation between them’ ’stated the investigators. Therefore, it’s evident from the study that establishment of a local floristic database is imperative to fill obvious gaps in vegetation studies revealed by the study.

There is still considerable uncertainty with regard to the forest classification of Cherangani which many studies in the area did not address (Rotich, 2019; Cherangani Hills Strategic Ecosytem Plan 2014). Furthermore, considering the threats and other changes over time, periodic data collection is needed (Holtmeier & Broll, 2018). Using systematic collections and GIS data can be used to determine coverage of the target species (Hasanah et al., 2020). This can provide the most crucial information which are interpreted primarily through the use of maps to help in identifying areas of high priority for conservation (Wen et al., 2015). An ideal method would be to collect field data collection (ground truthing) and use it to classify satellite imagery.

2.8 Plant uses

Plants are essential for life on Earth and serve multiple purposes. As ethnobotanical studies rely heavily on indigenous and local knowledge (ILK), they face the challenge of adequately bringing evidence from these information systems (Hoffman & Gallaher, 2016). The challenge arises not only because undocumented forms of knowledge can be cumbersome to transpose into written scientific studies (Mostacero León et al., 2017), but is that scientific studies might decontextualize and confiscate the information from the cultural environment that gives it significance (Ranfa & Bodesmo, 2017). There is consensus from researchers in different disciplines that humans have customized environments throughout history to favour their survival (Chebet, 2019). These have produced effects that are persistent (Amjad et al., 2017). In this case, some scholars suggest that new generations take over modified environments changed by past decisions (Albuquerque et al., 2019). This may influence the knowledge and present use of plants for dissimilar uses.

One study in Embobut forest of the Cherangani ecosystem sought to document the various ethnobotanical uses associated with local plant species (Rotich, 2019). Out of the 42 respondents interviewed, 95.2% of them mentioned grazing, building poles, wild fruits and bush meat as the primary products derived from the forest. The study recommended the implementation of the Cherangani Hills Forest Strategic Management Plan (2015-2040) to address the existing challenges of exploitation. Integration of the indigenous communities into the political processes especially around land-use issues and forest management will also be critical to ensuring their future well-being while concurrently achieving conservation goals, the study added.

Most ethnobotanical studies in Cherangani have focused on ethnomedicine. A recent study recorded 296 species in 80 families and 191 genera used medicinally by three communities living in Cherangani Hills (Mbuni et al., 2019). In Keiyo, 73 medicinal plant species placed in 33 families were identified to treat 46 common human and three veterinary diseases (Kigen et al., 2017). Among them, the most widely used (17 medicinal uses) was *Leucas calostachys* Oliv. In another study, Kipkore et al., (2014) identified 111 plants with medicinal or related uses. Veterinary uses and pesticides were also recorded. The study provided comprehensive ethnobotanical information regarding herbal medicine and healing methods.

2.9 Threats affecting forest plants

There is scientific consensus that the greatest threat to forest biodiversity is loss of habitats and species due to deforestation and forest degradation (FAO & UNEP, 2020). In many parts of the world, the principle forest threatening agents have been reported to be primarily linked to anthropogenic factors. For instance, a recent study by FAO, (2022) showed that forest loss is caused by a number of factors namely; deforestation (90%), agricultural expansion (85%) and fire (53%). Others included over-harvesting, commercial and-use practices, foreign debt servicing, alien species and inviable populations of species (Monica et al., 2016). In phytodiversity hot spots, common threats to the forest included logging, encroachment, invasive species, ecosystem destruction and climate change (Abebe, 2018). These threats have endangered the survival of most forest dwelling organisms.

A few studies in Kakamega forest shed some light on primary threats to our forests. For instance, one socioeconomic study demonstrated that there is high dependence on the forest by the local communities (Asamba 2014). Another study sought to determine the socio-economic characteristics of the households around the forest (Chebet, 2019). The study noted logging, encroachment and unemployment as main threats. It recommended the need to establish forest plantations to supply the requirements of local communities for wood fuel, charcoal, poles and timber much of which is presently obtained from the indigenous forest of Kakamega. Similarly, many unemployed dependents on the forest and politics are cited as the main culprits of plant loss (Bala et al., 2020). The investigators believed that the result of this was excessive exploitation of species and natural areas for resources (food, timber and medicine). The authors further noted that excisions and encroachment have affected the forest regeneration negatively. Recognition of such threats is fundamental to initiating conservation measures.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

Cherangani ecosystem is comprised of a series of forest reserves, about 15 forest blocks, approximately 95,600 ha in the gazetted area (Birdlife International, 2009). Nevertheless, Cherangani Forest Station Management Plan CHFSMP, (2015-2040) estimates the area to be 114,416.2 ha. Records indicate that, of this, about 60,500 ha is closed-canopy forest, with the rest under scrub, rock, bamboo, grassland, heath or moorland. Farmlands and plantations cover nearly.4, 000 ha. Kipteber, Kapkanyar, and Kapolet Forest Reserves form the western block totalling c 20, 000 ha. The eastern part comprises blocks including; Lelan, Kipkunur, Sogotio, Cheboyit Embobut, Kerrer, Toropket, Koisungur, Kapchemutwa, and Chemurgoi. The specific five blocks that comprise Cherangani forest station are located on the western part of the entire ecosystem of 15 isolated blocks. The study area is mostly mountainous comprising Kerrer, Koisungur, Toropket, Chemurgoi, and Kipteber (Figure 3.1). The blocks are in Elgeyo Marakwet County box defined by 1^{o} 16' North 35^{o} 26' East.

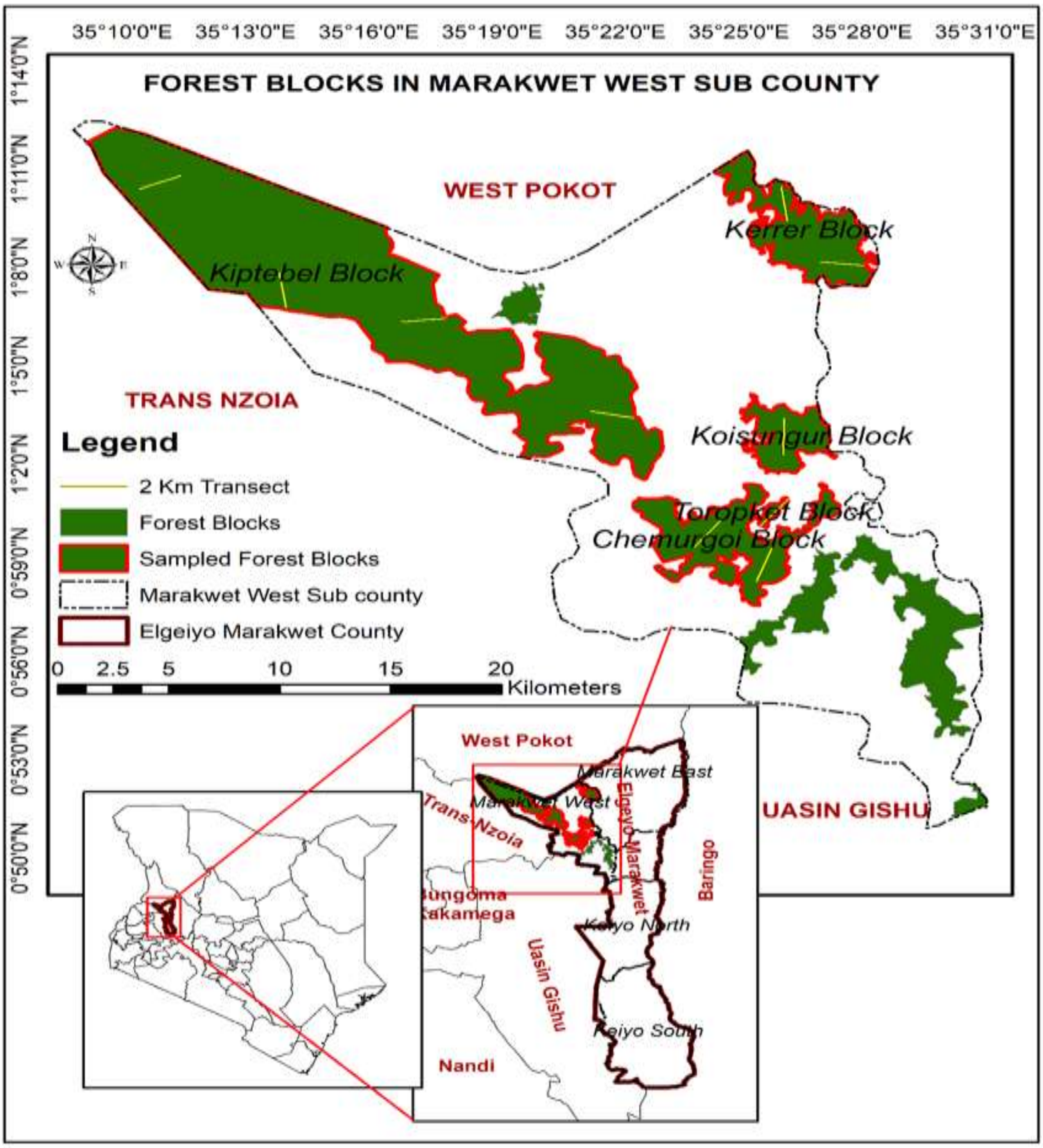

Figure 3.1: Map of Marakwet West showing position of Cherangani Forest blocks and forest station

3.2 Fieldwork

Fieldwork was conducted in 2018 preceded by studying the GIS maps of the study area. The primary method of investigation was exploratory surveys guided by linear transects (Sharma & Kant, 2014). Inventory of the plant species was undertaken. in ten transects (20 m wide and totalling 20 km long) at intervals of at least 5 km (Gonçalves & Goyder, 2016). This amounted to about 1% of the total area. The transects were located well inside the forest and at times extended to the forest margins. As a general rule, baseline surveys have approximately one site per 600 hectares of native forest Mueller-Dumbois, & Ellenberg, (2002). In addition, geographical spread and a range of topographical positions of other site factors were of primary consideration.

In the transect (strip) sampling it was assumed that all plants within the strip were detected. This was a form of plot sampling where plots were long and narrow (Buckland et al., 2007). Effort was made to cover all surrounding fragments, the main forest blocks as well as different succession stages and different habitats.

Community analysis was carried out after the rainy season when most of the plants were at the peak of their growth and flowering between May and November of the year. The sampling strategy was influenced by the problem of access. For transects crossing inaccessible areas, adjacent similar vegetation was assessed (Larsen, 2016). Species occurring outside transects but inside the forest were recorded. Data on the access routes to the various transects was collected to build up an understanding of the vegetation patterns and their relationships to the environment Mueller-Dombois, & Ellenberg, (2002).

3.3 Plant collection and identification

Taxonomic data collection was carried out according to standard plant collection protocols (Rabeler et al., 2019; Bridson & Leonard , (1999). Photographs were taken for all species to back up determination and confirmation. Identification of the species was carried out using standard references (Agnew, 2013; FTEA, 1948-2012) together with online virtual herbaria (POWO, 2019; IPNI, 2022). Regional floras and field keys were used. Due to limited updated previous botanical work in the region, it was not possible to name all collections made, particularly sterile material, but the complete specimens were determined to species level in the field. This was important as field identification enables one to take note of the risk of species extinction or the arrival of invasive species and follow the changes in biodiversity over time. In cases of plants not identified in the field, herbarium specimens were prepared and presented to experts for assistance in identification and comparison with collections at the East Africa Herbarium (EA) and University of Eldoret herbarium. Duplicates were deposited at the University of Eldoret Herbarium.

3.3.1 Annotated checklists for vascular plants

Nomenclature and circumscriptions of angiosperm, pteridophytes and gymnosperms families have been realigned after the updated molecular based schemes (The Angiosperm Phylogeny Group, 2016; Pteridophyte phylogeny group I (PPG I) ,2016;Christenhusz et al., 2011). This sometimes diverges from traditional concepts followed in Flora of Tropical East Africa (FTEA). A brief taxonomic account of some families is given in the checklist. Taxonomic categories below the rank of species notably, subspecies, variety, and form are not recognized formally as separate entries in the Checklist. The Authors' citation was standardized according to Brummit and Powell (eds) (1992). List of species protected under CITES was extracted from the IUCN databases (CITES Appendix I Version 2021-1. http://www.iucn¬redlist.org. [Downloaded on 22 June 2021).

Very little work was done on graminoids, but all native, exotic and naturalized species of vascular plants encountered were included in the checklist. For each taxon listed, family, distribution per forest block and the growth habit was provided. A taxon is assigned to life forms based on field observations followed Mueller-Dombois, & Ellenberg, (2002). Since the focus was only on vascular plants, no collection of bryophytes or lichens was made. Care was taken to incorporate contemporary taxonomic viewpoints from recent taxonomic monographs, reviews and revisions. In this regard, The International Plant Names Index (IPNI,2022) retrieved from *http://www.ipni.org* was used as the standard for up-to-date taxonomy plant species names (Synonyms have not been included). The nomenclature of all the species names was further verified using online plant databases like Plants of the World online (POWO.2019). Data analysis consisted of creating species lists for each monitoring point for each forest block them amalgamating into one list but retaining block sources.

The species diversity of every studied site was compared with each other (Beta-diversity) using Sorensen's similarity coefficient (Sørensen, 1948), The index assisted in comparing different habitats or sites floristically to determine whether their species composition was related or different. This coefficient compared the number of species found in two samples and weights matches in species composition heavier than mismatches. With increasing similarity in species composition, the coefficient's value increased, S = 1 is 100 % similarity. Such indices form the basis of classification of different communities. Such indices form the basis of classification of different communities.

Sørensen's similarity coefficient.

$$SS = \frac{a}{2a + b + c}$$

SS = Sørensen's similarity coefficient

a = Number of species in sample A and sample B (joint occurrences)

b = Number of species in sample B but not in sample A

c = Number of species in sample A but not in sample B

3.3.2 Identification key for vascular plants

The taxonomic key was developed by having plants organized in groups based on similarity of observable features. All characters and character states used in the key fabrication were morphological and anatomical and did not recognize phylogenetic systematics in their entirety. Instructions for developing the key have been done as per Jacquemart et al., (2016). Taxa character matrix and all sequential was organized using the Microsoft Excel 2019.

3.4 Vegetation mapping and characterization of forest structure

Vegetation mapping was carried out according to Tempfli et al., (2009). The process involved pre-processing satellite images, visual image interpretation, field data collection (ground truthing), field data analysis, and digital image classification. The land sat 8 images of paths 169 and 170 and row 059 taken on 21st February 2019 was downloaded from https://earthexplorer.usgs.gov/ (USGS, 2019). The Landsat imageries had already been processed to image quality level 1 according to the National Landsat Archive Production System (NLAPS). The images were mosaicked and analysed using the ArcGIS software version 10.2.2. Forest cover sizes were calculated in Excel using 30 m pixels.

Landsat TM and ETM+ data with 30 meters' resolution was chosen for interpretation after considering different options, overall, the data had good quality and the conclusion was made that 30 meters resolution was suitable for this study. This being a qualitative research, sample selection was to target 'information-rich areas' (Kumar, 2013). Fifty plots of Cherangani forest were selected for studies on plant communities. Plots were selected based on the interpretation of satellite images and reconnaissance surveys. This was to ensure that the plots selected represented the array of vegetation communities present in the forest. Classification of plant communities was based on the floristic-physiognomic approach according to Peltorrine, (2004). Description of forest structure was based on two or three dominant species (Height classes and covers %). Canopies and heights of descriptive species were determined using altimeters and clinometers.

3.5 Assessment and documentation of economically important plants

In collecting ethnobotanical data, an inventory interview was done using semi structured questionnaires (Silva et al., 2014) administered in September 2019 in Marakwet dialect and a few in Kiswahili (Appendix V). A cross section of 100 Key Informants was interviewed. Participants were interviewed in isolation from others in the community to satisfy the requirement of statistical independence. There were guided field visits and discussions with key informants. The study focused on plant identification, uses, and threats to the forest. The collected specimens were prepared following standard herbarium procedures and identified using various floras (Agnew 2013).

Ethnobotanical data was analysed according to ethnobotanical methods recommended by Hoffman & Gallaher, (2016) Using Statistical Package for Social Science (SPSS) Version 2.0. A checklist of all recorded species of major economic importance was compiled, including their indigenous, common and scientific names, plant origination (i.e. indigenous or exotic), growth form (e.g. tree, shrub, and herb) and use.

All qualitative data from questionnaires after cleaning were coded and analysed by use of SPSS (version 23). Frequency tables, graphs, bar charts and pie charts were used to present the results.

3.6 Determination of major threats to the forest

All respondents were interviewed on the kind of threats they think affect the forest. Forest disturbance was assessed based on the presence of indicator species and the views of respondents. Frequency tables were used to present the various threats to the forest as mentioned by respondents.

CHAPTER FOUR

RESULTS

4.1 Taxonomy and diversity of plant species

4.1.1 The Checklist

A total of 815 plant species were recorded with details of the block from which each species was found. In addition, the details of family, botanical names, reference specimens' growth habits and biogeographical affinities of species was captured. The details of growth habits (7) and biogeographical affinities (8) were taken and presented in Appendix I.

4.1.2 Major groups of taxa

Most of the species were Eudicots and Monocots (93, 3 %) and the least were Lycophytes and Magnoliids consisting of 1% each of the total species' composition (Table 4.1)

Table 4.1: Major taxonomic groups of plants identified in numbers and as a percentage of the total count

Plant group	Number of species	As % of the total count
Lycophytes	1	0.27
Monilophytes	46	5.6
Gymnosperms	7	0.86
Basal angiosperms	0	0.0
Magnoliids	1	0.27
Eudicots	539	66.1
Monocots	221	27.1
Total	815	100

4.1.3 Lower taxonomic ranks of plants and their origin

128 plant families representing 56.4% of all identified taxa native to Kenya belonged to 450 genera. Comparatively, nearly 60% of all plant families and 12.3% of all species native to Kenya were present in Cherangani The indigenous species were classified into 128 Families and 450 Genera. The rest of the species constituting 8.5% were introduced (Table 4.2).

Table 4.2: Number of vascular taxa of Cherangani forest station compared to National records

		Kenya	Cherangani	Percentage
Indigenous	Families	225	128	56.4
	Genera	1538	450	29.3
	Species	6293	765	12.3
Exotic	Families	62	16	25.8
	Genera	302	39	12.9
	Species	588	50	8.5
	Total species	6881	815	11.84

4.1.4 Largest families and groups

The ten largest families constituted 49% of all species. Asteraceae 11.17% and Orchidaceae 8.2% were the most dominant families with Solanaceae 2.1% and Euphorbiaceae at 2.1% being the least. The remaining 118 families accounted for 54% of all inventoried species (Figure 4.1).

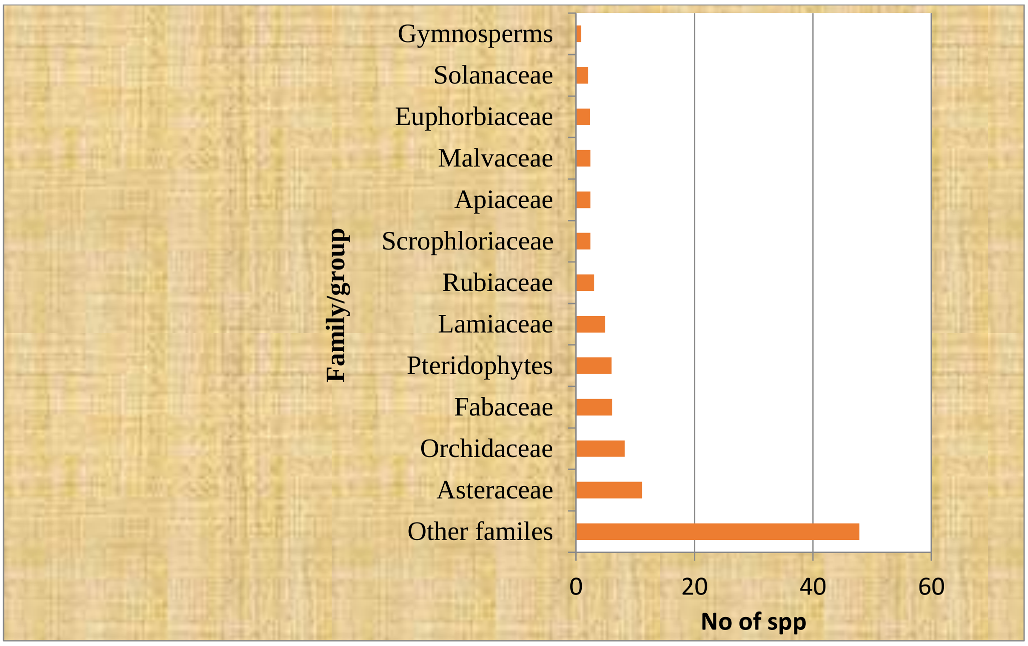

Figure 4.1: Showing the largest families and groups as a percentage of species sorted after their dominance

4.1.5 New records (Novelties)

The research did not identify any species new to science, however, three species, *Calceolaria tripartita* (Plate 4.1), *Petunia* species and *Nothoscordum borbonicum* were new records of Cherangani and Kenya (Plate 4.3-4.4). In addition, eight other species were reported for the first time in Cherangani but are common in other parts of Kenya (Table 4.3).

Table 4.3 New records of species in Kenya and Cherangani. A CITES

Family	Species	Remarks
Calceolariaceae	*Calceolaria tripartita* Ruiz & Pav	1st record in Kenya. East Africa (Probably Africa).
Amaryllidaceae	*Nothoscordum borbonicum* Kunth	Serious weed in tree nursery First record in Kenya
Hypericaceae	*Harungana magascariensis*Lam. ex Poir	1st record in Cherangani
Fabaceae	*Acrocarpus fraxinifolius* Am	1st record in Cherangani
Fabaceae	*Fraxinus pennyslivanica* Marshall	1st record in Cherangani
Canellaceae	*Warburgia ugandensis* Sprague	1st record in Cherangani
Martaceae	*Lophostemon confertus*(R.Br.) Peter G.Wilson	1st record in Cherangani
	Pinus radiata D.Don	1st record in Cherangani plantation sp in Koisungur
Fabaceae	*Senna septemtrionalis*	First record in Cherangani possible invasive. Chemurgoi

Plate 4.1: ***Calceolaria tripartita*** **Ruiz & Pav leafy stem in Kapcherop**

Plate 4.2: ***Calceolaria tripartita*** **Ruiz & Pav flowering stem in Kapcherop**

Plate 4.3: ***Petunia*** **species. in Cherangani Forest Nursery**

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Plate 4.4: ***Nothoscordum bobornicum*** **Kunth in Cherangani Forest Nursery**

4.1.6 Recent taxonomic and nomenclatural changes of taxa

Twenty-three genera among those found in study area have recently changed their taxonomic position within the last 15 years (Table 4.4).

Table 4.4 Recent Changes in taxonomic position of genera encountered

Taxon	Previous position	Current Position
Dombeya	Sterculiaceae	Malvaceae
Valeriana	Valerianaceae	Dipsacaceae
Albuca	Anthericaeae	Asparagaceae
Androcymbium	Hyacinthaceae	Iridaceae
Aloe	Aloaceae	Xanthohoeaceae
Nuxia	Loganiaceae	Stilbaceae
Myrsine	Myrsinaceae	Primulaceae
Triumfetta	Tilliaceae	Malvaceae
Halleria	Scrophloriaceae	Stilbaceae
Nuxia	Loganiaceae	Stilbaceae
Cuscuta	Convolvulaceae	Cuscutaceae
Periplocca	Asclepiadaceae	Apocynaceae
Clutia	Euphorbiaceae	Peneaceae
Rapanea	Myrsinaceae	Primulaceae
Afrocrarnia	*Afrocrarnia*	*Cornus*
Trema	Ulmaceae	Cannabaceae

4.1.7 Plant species Identification key

A taxonomic key to the vascular plants encountered in Cherangani is presented. See (Appendix II). It includes all the species listed in. The main key separates Pteridophytes from other vascular plants dichotomously. Plants are then keyed from growth habit and leaf attributes followed by other diagnostic details necessary to seggregate closely related species.

Table 4.5 Taxonomic field key to the vascular plant species listed in appendix I

Key Number	Key details
0	Main key
1	Ferns and fern allies
2	Herbs with compound leaves
3	Herbs with spines
4	Woody and semi woody climbers
5	Trees
6	Asteraceae with alternate leaves
7	Herbs with simple opposite or whorled leaves
8	Shrubs
9	Woody epiphytes
10	Monocotyledons
11	Herbs with milky exudates
12	Herbs with simple opposite serrated leaves
13	Asteraceae with opposite and serrate leaves without stipules
14	Woody herbs

Main key

1	Plants with fronts and reproduce by the use of spores (excl. palms)....Ferns & fern allies… key 1
	Plants with or without leaves and reproduce utilizing spores/seeds..........2
2	Leaves parallel-veined flower whorls usually in threes...Monocots Plus Arisaema (Palmately digitate with spathe) .... Monocots key 10
	Leaves net veined/leafless...*Eudicots/basal angiosperms*..........3
3	Plants trees, shrubs and generally woody excl. suffrutescent..........9
	Plants herbaceous-incl suffrutescents……………..,4
4	Leaves compound.…Oxalidaceae, Fabaceae, Brassicaceae *(Rorippa pinnata & Cadamine*, 3/foliate streamside) *Ranunculus oreophytus Basal rosette*) *Anemone thomsonii*/*Artemisia*…compound herbs key..…………… key 2
	Leaves simple/absent..........5
5	Milk absent……………………6
	Milk present ……………………. milk herbs (key 11)
6	Leaves opposite or whorled..........8
	Leaves Alternate..........11
7	Stipules present......Rubiaceae, Urticaceae, Geraniaceae, Caryophyllaceae (*Silene, Stellaria)*……………………..…sow (key 7
	Stipules absent... Amaranthaceae, Asteraceae, Scrophulariaceae, Balsaminaceae, Gentianaceae, Acanthaceae, Lamiaceae, Crassulaceae, Verbenaceae, Nyctaginaceae, Melastomataceae, Kalanchoaceae, Hypericacеae..........*19*
8	Leaves palminerved………,,………*Arisaema mildbraedii* (A. enneaphyllum has 5-11 foliolate)
	Leaves not palminerved……………………..…18
9	Plants trees or shrubs exl. Suffrutescents..........10
	Plants woody scandent or woody epiphytes..........Fabaceae, Rutaceae, Piperaceae,Viscaceae,Santalaceae, Phytolacaceae, Ochnaceae, Celastraceae, Rubiaceae, Apocynaceae, Rhamnaceae, Oleaceae, Hyppocrateaceae, Rosaceae.Loranthaceae, Viscaceae ....,,,,,,,,,,..........29
10	Plants trees..........…………… .trees key if not key in shrubs. …..Key 5
	Plants shrubs..........shrubs key. Key 8
11	Leaves lobed, or pinnately dissected...Apiaceae, Cucurbitaceae, Rosaceae, Asteraceae (Echinops, Carduus, without (Alchemilla), Plantaginaceae (Plantago palmata), Ranunculaceae, Rununculus multifidus/Delphinium……………......35
	Leaves not lobed or dissected..........12
12	Leaves succulent……………………..19
	Leaves not succulent …- Rosaceae, Impatiens irvingii, (not Alchemilla), Ranunculaceae, Portulacaceae / Polygonaceae, Plantaginaceae. P. lanceolata, Onagraceae. Malvaceae. Fabaceae, Menispermaceae, Piperaceae, Phytolacaceae, Boraginaceae, Asteraceae. Solanaceae, Amaranthus hybridus, (Amaranthaceae), Boraginaceae, Plantago lanceolata. Conv……………......13
13	Plants not erect (Climbers, prostrate, repent, basal rosette, or epiphytic)...Crassulaceae (Umbilicus botryoides)...Fabaceae, menisperma, Piperaceae, Phytolacca, Aristolochia.convul, Violaceae……..……,……………,……41

	Plants erect…. Fabaceae...Rosaceae, Ranunculaceae, Portulacaceae/Polygonaceae, Oxylacaceae, Onagraceae, Malvaceae, Fabaceae, Boraginaceae, Solanaceae, Amaranthus hybridus, (Amaranthaceae), Boraginaceae,………………………..14
14	Receptacle enlarged with phyllaries modified into pappus………………………………..…key 6
	Receptacle not enlarged with phyllaries not modified into pappus..15
15	Plants with stipules...Polygonaceae, Malvaceae, Fabaceae, Rosaceae..................................... 37
	Plants without stipules...Ranunculaceae, Portulacaceae. /, Onagraceae., Menispermaceae, Piperaceae, Phytolaccaceae, Boraginaceae, Solanaceae, Amaranthus hybridus,(Amaranthaceae)...Brassicaceae (Thlaspi toothed clasping leaves, Arabis star hairs repent, streamsides)……………………………………………54
16	Plants epiphytic...Orchidaceae ……………………………………………Epiphyte's key 9
	Plants not epiphytic...Orchidaceae, Commelinaceae, Poaceae, Cyperaceae, Amaryllidaceae, Hypoxidaceae, Eriocaulaceae, Eriospermaceae, Asparagaceae, Juncaceae……….MONOCOTS .key ……………………………………………………………..10
17	Aromatic smell in crushed parts.......Lamiaceae (plus Oenanthe Procumbens S/O/E/xs.Lamiaceae)
	Aromatic smell absent in crushed parts.. Amaranthaceae, Scrophulariaceae, Bal, Melastomataceae, Kalanchoaceae,…………………………….......18
18	Leaves succulent...Crassulaceae, Kalanchoaceae………………………………………… 157
	Leaves not succulent,……………………,……………………………………,…………19
19	Leaves serrate...Verbena bonariensis (with spur Balsaminaceae) ………………S/O/S/XS Key 12
	Leaves entire...*Acanthaceae, Amaranthaceae, Scrophulariaceae, Caryophyllaceae, Gentianaceae, Nyctaginaceae, Melastomataceae*……………………………..........21
20	Leaves with all veins emanating from leaf base and terminating at the apex...*Melastomataceae* ..sow. key…………………………………………………………………………… 7
	Leaves with all veins not emanating from leaf base and terminating at the apex...*Amaranthaceae, Scrophulariaceae, Caryophyllaceae, Gentianaceae, Verbenaceae, Nyctaginaceae* 22
21	Nector disc in the ovary with bracts...*Scrophulariaceae*……......... S/O/E/xs SOW @ 31.Key 7
	Nectar disc not in ovary no bracts... *Amaranthaceae, Caryophyllaceae, Gentianaceae,* ……………………………………………………………………………………23
22	Fruit with sticky projections...*Nyctaginaceae. Commicarpus plambagineus / pedunculosus, Amaranthaceae*………………………………………………………………………...24
	Fruit without sticky projections………………………………………………………….25
23	Leaves with wavy margin………………………………………………………,……...81
	Leaves without wavy margins………………*Amaranthaceae*…………………………….....30
24	Young stem 4 angled...*Verbenaceae*……………………….. key 13
	Young not stem 4 angled.....*Caryophyllaceae, Gentianaceae* ……………………………......…26
25	Plants with hairs...*Caryophyllaceae* (*Silene & Stellaria media*)……………………………… key 7
	Plants without hairs...*Gentianaceae* (*Swertia, Sebaea*.) *Hypericaceae, Acanth*………...….. … 27
26	Leaves sessile...*Hypericaceae*……………………………………………… Key 7 S/o/w @ 33
	Leaves peltate...Gentianaceae, Apocynaceae, Swertia, Sebaea, Acanthaceae…………………… 28
27	Conspicuous bracts present white milk absent...Acanthaceae……………………......…………95
	Conspicuous bracts absent white milk present...Apocynaceae Swertia, Sebaea…………...…....31
28	Plants epiphytes...Loranthus, Viscaceae, Santalaceae…………………………… epiphytes key 9
	Plants not epiphytic...woody scandent (Fabaceae, Rosaceae, Piperaceae, Crassulaceae, Phytolacaceae, Ochnaceae, Celastraceae, Rubiaceae, Apocynaceae, Rhamnaceae, Oleaceae, Hyppocrateaceae, Rosaceae)…………………………………………………………… …32
29	Thorns present...*Rosaceae, Fabaceae, (Pterolobium stellatum, Rutaceae* …………...……key 3
	Thorns absent....woody scandent (*Piperaceae, Crassulaceae, Phytolacca, Ochnaceae, Celastraceae, Rubiaceae, Apocynaceae, Rhamnaceae, Oleaceae, Hyppocrateaceae*...Climbers ……………………………………………………………………………..12
30	Interpetiolar stipules present, rusty pubescent...*Keetia guineense*
	Interpetiolar stipules absent, not rusty pubescent...woody scandent., Phytolacaceae, , Celastraceae, Apocynaceae, Rhamnaceae, Oleaceae, Hyppocrateaceae....................................32

31	White milk present.....*Apocynaceae Saba comorensis, Periploca, Pentarrhinum Campanulaceae, Monopsis stellarioides, Canarina abyssinica* ……..……………..…………………..………key .12
	White milk absent…woody scandent (*Piperaceae, phytolacaceae, Ochnaceae, Celastraceae, Rhamnaceae, Oleaceae, Hyppocrateaceae,* ……………………………………...……………………………………………………...33
32	Leaves lemon-scented when crushed, presence of pellucid punctuate glands.......*Toddalia asiatica*
	Leaves not lemon-scented when crushed, absence of pellucid punctuate glands…... *Rosaceae, Fabaceae* (*Pterolobium stellatum*), ………………………………..…..…..…Climbers. Key 4
33	Leaves compound... *Vitaceae, Dioscoreaceae, Oleaceae, Apiaceae Oenanthe*-…….….… key 4
	Leaves simple......woody scandent (Piperaceae, Phytolacaceae, Ochnaceae, Celastraceae, Rhamnaceae, Hyppocrateaceae, Menispermaceae. Pedialiaceae………….….…Climbers- key 4
34	Plants with tendrils.....*Cucurbitaceae/Vitacea*……………………..….…………..……………114
	Plants without tendrils... *Apiaceae, Rosaceae* with st (*Alchemilla*), *Plantaginaceae* (*Plantago palmata*), *Ranunculaceae (Delphinium macrocentron, Ranunculus multifidus),* Asteraceae.....36
35	Flowers in umbels………………………………….…………………..……….…*Apiaceae*…..84
	Flowers not in umbels………. *Rosaceae with st (Alchemilla), Plantaginaceae (Plantago palmata*), *Ranunculaceae, all, Ranunculus multifidus / Delphinium*....................................37
36	Spurs present, flowers blue green-…………………….……......……*Delphinium macrocentron*
	Spurs absent flowers, not blue-green………………………………………..….…..……..38
37	Stipules present..... *Rosaceae, with st (alchemilla), Polygonaceae*……………..………..…..…40
	Stipules absent...*Plantaginaceae (Plantago palmata), Ranunculaceae , Ranunclus maltifidus*..39
38	Flowers in heads……Asteraceae………………………………………...Asteraceae key 6
	Flowers not in heads……………………………………………….…*Ranunculus multifidus*
39	Plant basal rosette leaves... *Anemone thomsonii*, Plantaginaceae (P.palmata, Carduus,Haplocarpha…………………..……………………….……………..…………..144
	Plant without basal rosette leaves...*Malvaceae, Ranunclus, maltifidus, R. volkensii*………...…47
40	Plants decumbent...*Rosaceae* with st *(alchemilla*)……………………..…………..……..……48
	Plants not decumbent...*Polygonaceae. ....Fagopyrum esculentum*
41	Plant with thorns………………………………..……...……..……………..…………key 3
	Plants without thorns………………..…………………………...……………...……...……42
42	Plants epiphytic………………………..…………………………… *Cuscuta, umbilicus*…..43
	Plants not epiphytic...*Piperaceae, aristol, menisp, Fabaceae, Phytolacaceae*…………...……44
43	Plants with reduced leaves and yellowish skin. Cuscuta campestris.……………………..….…45
	Plants without yellow skin…………………….……………………………...……………..…46
44	Fruit a rattle pod…………………………………………....……..…*Crotalaria karaguensis*
	Fruit no a pod... Piperaceae, aristol, menus, Phytolacaceae………………………………..…key 4
45	Flowers in cymes...,....*Cuscuta campestris*
	Flowers in clusters ....…*Cuscuta kilimanjari*
46	Lamina round weakly toothed ....……………………………………... *Umbilicus botryoides*
	Hairs not prickly...128
48	Plants erect leaves are stalkless…………………………..…………..*Alchemilla argyrophylla*
	Plants repent, leaves stalked……………………….……………...…………………..…49
49	Leaves in rosette………………………………...…………...……...…… ……….…..… 50
	Leaves not in rosette………………...…………………………..……….… *Alchemilla johnstonii*
50	Stipules with green leafy apex……………..……………………………..…. *Alchemilla cryptantha*
	Stipules without green leafy apex……………………………..……………..…………51
51	Leaf lobes pointed, flowers in racemes………………………………….………*Alchemilla gracilipes*
	Leaf lobes not pointed………………………...….…..………...…………..………………52
52	Leaf lobes are obovate……………..……………..................................…*Alchemilla fischeri*
	Leaf lobes not obovate…………………………...…..………..…..…..…*Alchemilla rothii*
53	Leaves succulent and obovate………………………………………........…*Portulaca oleracea*
	Leaves not succulent…………………………………………….…...……………………54
54	Leaves sessile…………………………..……………………..…………………..…..…55
	Leaves peltate…………………….………………………………...……………….…..…56
55	Leaves smell garlic and clasping the stem……………………….……..…..… *Thlaspi alliaceum*

	Leaves do not smell garlic and not stem-clasping ……*Arabis alpina*
56	Leaves rhombic and spikes red…… *Amaranthus hybridus*
	Leaves not rhombic ……57
57	Leaves fleshy, seeds purple turning black …… *Phytolacca octandra*
	Leaves not fleshy ……58
58	Petals pink-purple……59
	Petals different ……61
59	Plants heavily hairy white, petal apex not notched…… *Epilobium hirsutum*
	Plants finely hairy or not hairy, petal apex notched……60
60	Plants, not hair……*Fuchsia regia*
	Plants hairy……62
61	Spur present……78
	Spur absent hairs whitish……77
62	Petals yellow/green……71
	Petals blue or white……63
63	Ovary with five chambers, flowers solitary……*Nicandra physaloides*
	Ovary with two chambers but not five……64
64	Petals white……69
	Petals blue……65
65	Seeds covered with minute spines (sticky)……66
	Seeds not sticky……*Myosotis abyssinica*
66	Cymes in pairs at over right angle……*Cynoglossum lanceolatum*
	Cymes in pairs at less than right-angle ……67
67	Plants with a rosette of leaves……68
	Plants without rosette of leaves……*Cynoglossum coeruleum*
68	Leaves linear elliptic……*Cynoglossum aequinoctiale*
	Leaves lanceolate oblong……*Cynoglossum cheranganiense*
69	Flowers with bracts……70
	Flowers without bracts……*Trichodesma physaloides*
70	Flowers with yellow centre……*Lithospermum afromontanum*
	Flowers without yellow centre……*Petunia species*
71	Flowers greenish……*Withania somnifera*
	Flowers yellow……72
72	Petals free…… *Ludwigia* .73
	Petals at least fused from the base……*Solanum*…74
73	Capsule bamby……*Ludwigia abyssinica*
	Capsule smooth……*Ludwigia jussiaeoides*
74	Stem with several lenticels…… *Solanum nakurense*
	Stem without lenticels……75
75	Fruit a capsule……76
	Fruit berry……*Physalis peruviana*
76	Flowers solitary, bad-smelling……*Datura stramonium*
	Flowers in terminal cymes/panicles……*Nicotiana tabacum*
77	Plants rhizomatous stem reddish……*Epilobium salignum*
	Plants stoloniferous, stem not reddish…… *Epilobium stereophyllum*
78	Stipules present……*Viola eminii*
	Stipules absent……79
	Plants hairy……80
80	Flowers mauve stem with reddish hairs……*Impatiens irvingii*
	Flowers pink, white. Leaves ovate-elliptic……*Impatiens pseudoviola*
81	Leaves are weakly lobed……*Commicarpus pedunculosus*
	Leaves not weakly lobed……*Commicarpus plambagineus*
82	Plants repent……145
	Plants erect or prostrate……83
83	Plants prostrate…Hydrocotyle, Agrocharis……84

Plants erect…86
84 Petals pink… *Hydrocotyle sibthorpioides*
Petals green or different…85
85 Flower heads 5-9 florets… *Hydrocotyle ranuncloides*
Flower heads with over 12 florets… *Hydrocotyle manii*
86 Plants are more or less perennial…87
Plants annual… *Agrocharis incognita, Agrocharis pedunculata*…88
87 Leaves pinnate lobed… *Oenanthe Procumbens*
Leaves circular… *Centella asiatica*
88 Plants basal rosette…89
Plants, not basal rosette…90
89 Leaves pinnately lobed… *Haplosciadium abyssinicum, Agrocharis melacantha*, …92
Leaves not pinnately lobed…91
90 Flowers cream with red centers… *Peucedenum aculeolatum*
Flowers cream without red centers… *Peucedenum kerstenii*
91 Leaves palmately lobed… *Sanicula elata*
Leaves simple, not lobed… *Alepidea peduncularis*
92 Plant trailing… *Agrocharis incognita*
Plants not trailing…93
93 Flowers long stocked… *Agrocharis pedunculata*
Flowers stalkless …94
94 Umbel stalk recurved… *Haplosciandum abyssinicum*
Umbel stalk not recurved… *Agrocharis melacantha*
95 Leaf stalk winged flowers red… *Brilliantaisia madagascariensis*
Leaf stalk, not winged flowers not red…96
96 Cystoliths visible in leaves… *Hypoestis*..105
Cystoliths not visible in leaves…97
97 Capsule with 4 seeds, bracts differ from leaves… *Justicia*…107
Capsule not 4 seeded, bracts similar to leaves…98
98 Stem with six ridges… *Dicliptera*…99
Stem without six ridges…100
99 Flowers pink or purple or white in umbels… *Dicliptera laxata*
Flowers magenta in spikes… *Dicliptera nilotica*
100 Plants with spines at nodes. petals one lipped… *Barleria grandcalyx*
Plants without spines at nodes…101
101 Capsule spindle-shaped… *Isogloss*…102
Capsule not spindle –shaped…103
102 Bracts spoon-shaped with white hairs… *Isoglossa gregorii*
Bracts not spoon-shaped and without white hairs… *Isoglossa subtrobilina*
103 Sepals bristle-like… *Dischoriste clinopoides*
Sepals do not bristle-like…104
104 Herbs woody with white flowers in racemes… *Acanthapole pubescens*
Herbs annual decumbent with red solitary flowers… *Thunbergia alata*
105 Herbs erect… *Hypoestis aristata*
Herbsdecumbent…106
106 Flowers pink… *Hypoestis triflora*
Flowers white to pale mauve… *Hypoestis sp.*
107 Flowers bright yellow subtended by linear-lanceolate leaves… *Justicia flava*
Flowers and leaves different…108
108 Flowers white with red guidelines and wavy margins… *Justicia begonia*
Flowers different and leave margins not wavy…109
109 Leaves subsessile with about 5-9 notches…113
Leaves different…110
110 Leaves linear, flowers purple in upper axils… *Justicia leikipiensis*
Leaves not linear, flowers could be purple or other colour…111

111	Petal lip upper side pale purple…………………………………………… . *Justicia ladanioides*
	Petal lip upper side not pale purple ……………………………………..… ……….………112
112	Flowers white……………………….………………………….…………, ….. *Justicia striata*
	Flowers purple or mauve……………………………………………….….……, *Justicia nyassana*
113	Leaves with about 5 marginal notches.. .... *Justicia unyorensis*
	Leaves without marginal notches…………………….……………….….…*Justicia anagaloides*
114	Petioles hollow…………………………………………… …… ……... ….*Cucurbitaceae.*115
	Petioles not hollow………………….........................… . ..*Rhoicissus tridendata/basella*…121
115	Leaves compound with 2 spines at nodes…………………… …………..*Momordica friesorum*
	Leaves simple without spines……………….……………………….….……….……116
116	Leaf base with pair of glands……………………………….…………. *Lagenaria abyssinica*
	Leaf base without glands…………………………..……..……..… ………………117
117	Fruit with long rough hairs……………………………..………………….……*Peponium vogelii*
	Fruit without long hairs………………….…………………………………………….….118
118	Tendrils more one at each node………………….……………..…………….……*Cucumis ficifolia*
	Tendrils one at each node……………………………………………………………….……119
119	Leaves coarsely toothed………………...………..…………………*Trochomeria macrocarpa*
	Leaves finely toothed……………………………..……………….…………………….…120
120	Leaves very rough to touch…………………………….…………………*Zehneria minutiflora*
	Leaves not rough…...*Zehneria scabra*
121	Leaves compound..*Rhoicissus tridentata*
	Leaves simple…………………..…………………………………….……………….….122
122	Tendrils present ....…*Adenia cissampeloides*
	Tendrils absent……………………..……..………………………………………………123
123	Milk present …..,...*Ipomoea whightii/stictocardia*…125
	Milk absent…………………………………….………….……………………………124
124	leaves present stem brownish………………………………………………………*Basella alba*
	Leaves absent stem yellow…*Cuscuta campestris/kilimanjari*………………………….….126
125	Yellowish hair present……………….……………………..……………*Stictocardia beraviensis*
	Yellowish hairs absent…………………………..…………………………....…*Ipomoea whightii*
126	Flowers in cymes…………………..……………………………………….*Cuscuta campestris*
	Flowers not in cymes…………………………………..…………………*Cuscuta kilimanjari*
127	Leaves lobed…………………….…………………………………….………….129
	Leaves not lobed……………………………………….…………………...……...……..…136
128	Plants not hairy, creeping………………………………………..….……*Ranunculus volkensii*
	Plants hairy, erect……………………………………………….……….… *Ranunculus maltifidus*
129	Fruit one-seeded………………………….…………………………………….………132
	Fruit several seeded…………………….………………………………….………………130
130	Flowers in umbels……………………………..…………………....*Spermannia ricinocarpa*
	Flowers not in umbels……………………………………………..................................131
131	Hairs brownish wholly………………….……...……………………………*Triumfetta tomentosa*
	Hairs, not browny wooly………………………..…………,……………………………….135
132	Leaves heart-shaped………………...……………………………..………...……………134
	Leaves circular……………………………………………………………...………….…133
133	Plants erect…………………………..…………………………….……..*Malva subverticillata*
	Plants trailing,……………………….…………………………...…..……*Malva pervifolia*
134	Leaves broad ovate………………………………...………………...…*Pavonia burchellii*
	Leaves triangular circular………….……………...…………………….…*Pavonia urens*
135	Leaves elliptic to oblong……………………………...................................*Hibiscus aethiopicus*
	Leaves oblong to ovate………………………..*Hibiscus meyeri*
136	Fruits ten or more per carpel…………………………..……………..……..………137
	Fruits less than ten per carpel……………………….………………..…………………138
137	Flowers glossy yellow……………………...…...................................,,..*Abutilon mauritianum*
	Flowers mauve –blue………..,…………...…………….……………….…*Abutilon longicuspe*

138 Leaves rhombic flowers yellow…,………..…………………………….…. …*Sida rhombifolia*
Leaves different………………………………………......…..…..…..…….………….139
139 Leaves linear-lanceolate………………………………………….……….….*Sida schimperiana*
Leaves ovate pentagonal……,…………………………..………..…………..……*Sida ternata*
140 Leaves alternate…………………………………………………..……*Amaranthus hybridus*
Leaves opposite………,…………………………..…………..……..………….…141
141 Flowers in spikes…,………………………………………………..……………..….142
Flowers in cymes……,………………....……………………………………..………143
142 Fruit bend downward along with spike,……….………………………..….*Achyranthes aspera*
Fruit does not bend along stem……………………………………….…*Alternanthera pungens*
143 Inflorescence a terminal golden ball…,……………………..…..……………*Cyanthula unucilata*
Inflorescence not terminal silvery…………………………………….……*Cyanthula cylindrica*

Key one

Ferns and fern allies

1 Ferns epiphytic………………………….…….…………….………………..………..…2
Ferns terrestrial……………………………….……….………….…………..….…………3
2 Micropsporophylls present……………………………..……..…………..*Lycopodium clavatum*
Microsporophyls absent………………………………………………….……..…………4
3 Plants with one veined leaf……………………..…………………….……….……..………16
Plants with multiple veins…………………………..……….………..……………….………17
4 Fronts palmifid……………………….………………….....……….*Crepidomanes melatrichum*
Fronts not palmifid………………………………………………………….………………5
5 Plants hanging……………………..……………………………...………………….…6
Plants not hanging………………………………………..…………..…………………7
6 Fronts narrow lanceolate……………………..*Huperzia decrydioides*
Fronts different……………….…………………………………….......…*Huperzia ophiogloides*
7 Plants with indusium free venation…………………………….…………………….…………8
Plants without indusium free venation……………………………………….……………10
8 Terminal segment present……………………….……………….…………..…*Asplenium sandersonii*
Terminal segment absent……………………………………………………..………………..9
9 Fronts 60-100 cm……………………………………….………………….….…*Asplenium friesiorum*
Fronts about 35 cm ………………………………………………………….…*Asplenium theciferum*
10 Scales fringed……………….………….………………………….……. *Drynaria volkensii*
Scales not fringed or absent ………….…………………...…………..……………………… 11
11 Fronts simple……………………………………………………...…*Lepisorus excavatus*
Fronts pinnatifid……………………………………………………..……………………12
12 Pinnae linear to lanceolate…………………………………...………………*Vittaria volkensii*
Pinnae different…………………………………………………...……………………13
13 Fronts with gloss grey-brown scales…………………….…………………*Melpomene flabelliformis*
Fronts with different scales…………………………………………,……………………14
14 Lamina leathery………………………….…………..…………….…..…,……*Pteridium aquarium*
Lamina not leathery………………..…..*Pleopeltis macrocarpa*
15 Fronts ligulate………………………………………..…………..…………,……..*Sellaginella caffrum*
Fronts not ligulate………………………..………………….…………….*Sellaginella goudotiana*
16 Marginal bristles present…………….…………………………………………....*Polystichum simense*
Marginal bristles absent…………………………..………………………..……………..….18
17 Gemmae on scars …………………………………….……………………....*Tectaria gemmifera*
Gemmae on upper rachis…………………….……………….………………*Asplenium normale*
18 Lamina covered with white powder………….. *Cheilanthes farinosa*
Lamina not covered by white powder…………………………..…..………..……….…19
19 Lamina with dense wooly hairs……………………….………………..…*Cheilanthes inaequalis*

	Lamina devoid of wooly hairs……………………………….……………………….....………20
20	Fresh plants smell wintergreen……………………………………………......*Asplenium protensum*
	Fresh plants do not smell wintergreen…………………………………….………………………..21
21	Plants tree-like with fronts up to 5m ………………………..…………………..……*Cynthia manniana*
	Plants, not tree-like…………………………….…….………………………………….22
22	Plants gregarious………………….……………………….……………………..….………...……23
	Plants not gregarious…………………………….…….………………………………..……24
23	Front margin undulate………………….....……...*Nephrolepis undulata*
	Fronts margin crenulatre…………………………………………………………*Asplenium elliottii*
24	Sori parallel to margin………………..…....……………………………..……*Asplenium monanthes*
	Sori not parallel to margin……………………...……………………………………..…….25
25	Fronts 2m by about 60cm………………………………..………..……..…*Pseudocyclosorus pulcher*
	Fronts smaller in size…………………………………………………….……………….………..…26
26	Stipe coloured red to brown or black or red to straw…………………………….…………….27
	Stipe different,,,,,,,,,,,,,,,,,,,,,,………………………………………………….……..…………32
27	Stipe reddish-brown or black…………Pellaea…………………………………..…… ………28
	Stipe red to straw……Pteris ……………………………………………………….….….………30
28	Fronts ovate to deltoid 3-4 pinnate usually leathery……………………..…..*Pellaea quadripinnata*
	Fronts different …………………………………………………………..………………......29
29	Fronts lanceolate to ovate……………………………………………….…………*Pellaea Viridis*
	Fronts rhomboidal and arrow-shaped…………………………………..…*Pellaea calomelanos*
30	Fronts lanceolate and arching-………………………………………….…….… *Pteris catoptera*
	Fronts different……………………………………………………….……….…..…….……31
31	Margin finely toothed………………………………………………………..…..…..…*Pteris cretica*
	Margin coarsely toothed……………………………………………..……..……*Pteris dendata*
32	Fronts 2-3 pinnate ……………………..……………………………*Asplenium adiantum nigrum*
	Fronts different…………………………...………………...……………………………33
33	Plants with scattered brown scales…………………………………..…*Elaphoglossum spatulatum*
	Plants without scattered brown scales……………………..……………..…….……………..…34
34	Plants woody…………………………………….………………..……*Dryopteris schimperiana*
	Plants, not woody……………………………………………….……………..……………….…35
35	Pinnae elliptic……………………………………………..…...……….……*Osmundia regalis*
	Pinnae different………………………………………………………………....……………36
36	Terminal segment on fronts ……………………………………………………………….…37
	Terminal segment absent………………………….…...……..………………….……………38
37	Stipe and rachis dull green/brown……………………………………………*Asplenium erectum*
	Stipe and rachis different…………………………..……………………………….…..….…39
38	Pinnae blunt to short pointed……………………………………………..*Asplenium inaequilaterale*
	Pinnae different…………………………………………………………...….*Asplenium aethiopicum*
39	Fronts simple……………………………………………….……….……*Elaphoglossum aubertii*
	Fonts pinnate……………………………………………………..pinnatifid...*Nephrolepis undulata*

Key two

Herbs with compound leaves

1	Leaflets much divided and blue-green except Anemone)……..………………….……………,……..18
	Leaflets, not more than once divided and not blue-green…………….….……….…………………..…2
2	Leaflets terminating to a pointed apex (see monocots key)……………..…*Arisaema enneaphyllum*
	Leaflets different…………………………………………………………....…….………………3
3	plants spinny………………………………...…*Crotalaria spinosa*
	Plants not spinny……………… ………… ……………………………………….….…….…4
4	Plants climbers……………………………………………………………………………………5
	Plants, not climbers…………………………………………………………………….…………8
5	Stipules present………………………………………………………… ……….....………6
	Stipules absent………………………………………………………..……*Clematis simensis*

6	Stipules leafy……*Desmodium rependum*
	Stipules not leafy……7
7	Leaves gland-dotted below……*Rhynchosia usambarensis*
	Leaves not gland-dotted……8
8	Leaves paripinnate……*Aeschynomene abyssinica*
	Leaves trifoliate…… *Lablab purpurea*
9	Leaves sheathing……10
	Leaves not sheathing-……11
10	Plants hairy……*Pimpinella hirtella*
	Plants not hairy……*Heraculean abyssinica*
11	Flowers in heads……12
	Flowers not in heads……15
12	Leaflets are pinnately lobed……*Anthemis tigreensis*
	Leaflets not lobed……13
13	Seeds sticky most leaves trifoliate……*Bidens pilosa*
	Seeds not sticky……14
14	Plants with strong smell……*Artemisia afra*
	Plants without strong smell……*Achillea millefolium*
15	Leaves glandular dotted below-……16
	Leaves not gland-dotted below……17
16	Leaflets elliptic……*Eriosema jurionianum*
	Leaflets ovate……*Eriosema montanum*
	Leaflets lanceolate……*Eriosema macrostipulatum*
17	Leaflets sensitive to touch……*Biophytum abyssinica*
	Leaflets not sensitive to touch……19
18	Flowers yellow-green……*Corydalis mildbraedii*
19	Flowers green……*Thalictrum rhynchorcarpum*
	Flowers pink……*Anemone thomasii*
20	Stipules present……22
	Stipule absent……25
21	Petals slightly incurved……*Argyrolobium ramosissimum*
	Petals not incurved……23
22	Sepal tube bell-shaped……*Galenga lindblomii*
	Sepal tube not bell-shaped……24
23	Flowers yellow or orange……*Antopetitia abyssinica*
	Flowers bright pink……*Indingofera brevicalyx*
24	Plants with a bitter taste and odd smell……*Valeriana volkensii*
25	Plants without bitter taste and odd smell……26
	Tendrils present……*Rhynchosia tridentata*
26	Tendrils absent……27
27	Leaves opposite……*Clematis villosa*
	Leaves alternate……28
28	Plants are strictly along waterways fruit cylindrical……*Rorippa nasturtium aquatica*
	Plants not strictly along with water ways, fruit flat ……*Cardamine africana*

Key three

	Herbs with spines
1	Milk present…… Euphorbiaceae…… .8
	Milk absent……2
2	Leaves opposite…. *Dipsacus pinnatifidus...Acanthaceae* ……5
	Leaves alternate……3
3	Plants Basal rosettes with decurrent spinny leaves……*Carduus chamaecephalus*
	Plants with above-gound stem……4

4	Leaves sessile	10
	Leaves peltate	7
5	Cystoliths visible in leaves,	6
	Cystoliths absent	*Dipsacus pinnatifidus*
6	Plants shrub flowers blue	*Acanthus eminens*
	Plants repent herbs spines between leaf stalks	*Barleria grandcalyx*
7	Leaves silvery shiny below flowers yellow	*Berkheya spekeana*
	Leaves not silvery below	9
8	Cyanthal glands crescent-shaped	*Euphorbia schimperiana*
	Cyanthal glands narrowing gradually into incurved horn	*Euphorbia brevicornu*
9	Flowers in heads	11
	Flowers not in heads, but zygomorphic	*Crotalaria spinosa*
10	Heads terminal and axillary	*Cirsium valgare*
	Heads only terminal florets red	11
11	Heads stalkless	*Carduus nyasanus*
	Heads stalked	12
12	Florets red	*Echinops amplexicaulis*
	Florets different (blue or white)	13
13	Stem cobwebby	*Echinops lanatus*
	Stem not cobwebby	14
14	Stem with upper side of leaves with bristles	*Echinops hispidus*
	Stem with upper side of leaves without bristles	*Echinops angustilobus*

KEY FOUR

Woody and semi woody climbers

1	Leaves simple	18
	Leaves compound	2
2	Thorns present	3
	Thorns absent	6
3	Pellucid punctate glands on leaves present	*Toddalia asiatica*
	Pellucid punctate glands on leaves absent	4
4	Leaves whitish below	5
	Leaves not whitish below	12
	Stem covered with sticky stalked glands	*Rubus volkensii*
	Stem without obvious glands	11
6	Stem swelled below ground	*Dioscorea quartiniana*
	Stem not swollen below ground	7
7	Plant sandpapery	*Desmodium rependum*
	Plant not sandpapery	8
8	Dormatia present on leaves	9
	Dormatia absent on leaves	10
9	Leaf base asymmetrical	*Jasminum floribunda*
	Leaf base symmetrical	46
10	Fruit red berry	*Cyphostemma kilimandischarica*
	Fruit a legume	12
11	Leaflets arising from a single point	*Rubus steudneri*
	Leaflets arising not from a common rachis	13
12	Leaves bipinnate	16
	Leaves pinnate	14
13	Stem hairy	*Rubus apetalous*
	Stem glabrous	17
14	Flowers yellow and red streaked	*Rhynchosia kilimandischarica*
	Flowers different	15
15	Leaflets rhombic	*Dolichos sereus*
	Leaflets ovate pointed	*Lablab purpureus*

16	Fruit a samara	*Pterolobium stellatum*
	Fruit a pod	*Caesalpinia decapetala*
17	Petals 4mm or less	*Rubus pinnatus*
	Petals 6-10mm long	*Rubus scheffleri*
18	Milk present	Apocynaceae/Campanulaceae...*48*
	Milk absent	19
19	Leaves opposite	26
	Leaves alternate	27
20	Inflorescence a capitulum on enlarged receptacle	Asteraceae...41
	Inflorescence, not a capitulum on enlarged receptacle	21
21	Leaves alternate	23
	Leaves opposite……………….Lamiaceae/Rubiaeae,Celastraceae	22
22	Recurved prickles present	*Scurtia myrtina*
	Recurved prickles absent	24
23	Branches terminate into bristles	*Asparagus racemosus*
	Branches don’t terminate into bristles	25
24	Leaf veins reddish with long spikes	*Gouania longispicata*
	Leaf veins not reddish without long spikes	29
25	Leaves heart-shaped	*Aristolochia albida*
	Leaves not heart-shaped	26
26	Leaf lamina bulging between veins	*Pentarrhinum golonoides*
	Leaf lamina not bulging between veins	27
27	Stigms with a ring of hairs	*Monotopsis stellarioides*
	Stigma without a ring of hairs	28
28	Flowers solitary	*Canarina abyssinica*
	Flowers in catkins	*Acalypha psylostachya*
29	Hooked remnants of petiole end present	*Clerodendron johnstonii*
	Hooked remnants of petiole end absent	30
30	Seeds winged	*Hyppocratea africana*
	Seeds, not winged	31
31	Leaf apex acuminate	33
	Leaf apex not acuminate	32
32	Flowers yellow	35
	Flowers not yellow	34
33	Climbers hanging down large trees	*Urera hypsalodendron*
	Climbers clambering/scampering	*Rhamnus prinoides*
34	Plants semi-parasitic	36
	Plants not semi-parasitic	37
35	Flowers in fascicles	*Salacia crassifera*
	Flowers in racemes	*Ochna insculpta*
36	Inflorescence in cymes	*Osyris lanceolata*
	Inflorescence in racemes	*Osyridicarpos schimperianus*
37	Carpels star-shaped	*Phytolacca dodecandra*
	Carpals not star-shaped	38
38	Stipules present/caduceus	39
	Stipules absent	45
39	Stinging hairs present	*Tragia brevipes*
	Stinging hairs absent	40
40	Leaves serrate	*Acalypha psylostachya*
	Leaves entire	*Phyllanthus saffrutescens*
41	Stems succulent	42
	Stems not succulent	43
42	Leaves are deeply lobed	*Solanecio angulatus*
	Leaves not lobed	*Senecio hadiensis*
43	Leaves triangular	*Senecio syringifolius*

Leaves not triangular……………………………………………………………………..…………………44

44 Leaves sessile…………………………………………………………..……*Senecio schweinfurthii*

Leaves peltate…………………………………………,*Microglosa densiflora. /Mikaniopsis*…47

45 Flowers violet…………………………………………………………………….……*Solanum terminale*

Flowers pink…………………………………………………………………………...…*Fuchsia regia*

46 Flowers many in terminal corymbs……………………………………………*Jasminum fluminance*

Flowers solitary or few in axillary or terminal cymes………………….…...*Jasminum abyssinicum*

47 Leaves ovate strong woody…………………………………………………….…*Mikaniopsis bambuseti*

Leaves elliptic to round weak woody…………….……………….………………*Microglosa densiflora*

48 Leaves broad ovate to circular…....Marsdenia schimperi//Saba comorensis ……….….…………49

Leaves linear-lanceolate……………..……………………….…………….…*Periploca linearilifolia*

49 Older wood without lenticels...*Saba comorensis*

Older wood with lenticels……………………...*Marsdenia schimperi*

KEY FIVE

Trees Join root key@ 11

1 Leaves compound....................Bignoniaceae, Fabaceae, Hypericaceae, Rutaceae, Sapindaceae, Oleaceae, Araliaceae…………………………………………………………….………...……6

Leaves simple...2

2 Leaves with Parallel venation or scaly or branchless.......... Dracaenaceae, Poaceae, Podocarpaceae, Pinaceae, cypress, casuarina……………………………………………………………….....38

Leaves with net venation...3

3 White milk present...Ficus,. Rauvolfia caffrum, Euphorbia…………………………………..…4

Whitemilk absent……………………………………………………………………….………5

4 Plants spinny……………………………..*Euphorbia obovalifolia*

Plants not spiny...*Rauvolfia, Focus, Lophostemon confertus*……………….…………….…29

5 Leaves opposite...oliniaceae, Rubiaceae, Cornus, loganiacae, Oliniaceae, Myrtaceae, Oleracea, Salicaceae Rhyzophoraceae, Celastraceae...17

Leaves.alternate...Euphorbiaceae,flacourtiaceae,boraginaceae,Canalleceae,olacac,pittosporaceae,proteaceae,malvaceae,sapotaceae,celastraceae,rhamn,cabanaceae,myrsinaceae…………....……45

6 Leaves digitately compound....*Araliaceae, except Polyscias imparipinnate*…………….……….…34

Leaves pinnately compound…,Rutaceae,Sapindaceae,Oleaceae,Meliaceae,Melianthace…………7

7 Rachis winged.... Oleaceae, melianthaceae...8

Rachis not winged..... Bignoniaceae,Fabaceae,hypericaceae,Rutaceae,sapi,ndaceae ,meliaceae, Rosaceae…………………………………………………..……..……………………...….9

8 Leaflets entire..Oleaceae…………………………*Schrebera alata*

Leaflets serrate...melianth Bersama abyss/Hagenia……………………………..………………26

9 Leaves bipinnate...acroc, Albizia, Vachelia……………..……………………….………….……….32

Leaves once pinnate or trifoliate……………………………………………………….…………10

10 Leaves trifoliateVepris nobilis, Allophyllus abysin…………………………………………..….31

Leaves pinnate……………………………………………………………………………….…11

11 Tree having candelabra branching………………………………………….……...*polyscias fulva*

Tree not having candelabra branching………………….…………………………………….…12

12 Pellucid punctuate glands present on leaves…….*Clausena anisata, Hypericum revolutum*………13

Pellucid punctuate glands absent on leaves…………………………………….……………..14

13 Leaves aromatic, alternate leaflets……………………………………………….. *Clausena anisata*

Leaves not aromatic opposite leaflets... *Hypericum revolutum*

14 Flowers white/cream……………………………..……………………………*Ekebergia capensis*

Flowers different……………………………………………………………….……...…..……15

15 Flowers yellow bi-lipped…………………………..……………………………*Markhamia lutea*

Flowers different……………………………………...……………………...…………16

16 Flowers are red and campanulate……………………………………….*Spathodea campanulata*

Flowers petal less………………………………………………………….*Fraxinus pennyslivanica*

17 Stipules present...Oliniacaee, Rubiaceae, Celastraceous (Catha), and Rhyzophoracae……..……18

	Stipules absent..., Ochnaceae, Loganiaceae, Oliniaceae, Myrtaceae Oleaceae, Salicaceae	19
18	Leaves with red midrib peppery taste	*Olinia rochetiana*
	Leaves without red midrib no peppery taste ... *Rubiaceae, Catha, Rhyzophoracae*	44
19	Leaves gland-dotted when held against light...*Myrtaceae, Rutaceae, Monimiaceae*	24
	Leaves not gland-dotted when held against light... *Ochnaceae, Loganiaceae, Monimiaceae, Oleaceae, Ericaceae*	20
20	leaves in threes-4 ... *Loganiaceae*	*Nuxia congesta*
	Leaves in 2 s...*Cornus, Monimiaceae, Oleaceae, Ericaceae*	21
21	Leaves conspicuously mucronate and leathery...ericaceae	*Agauria salicifolia*
	Leaves not conspicuously mucronate and not leathery... *Ochnaceae, Loganiaceae, Oleracea.*	22
22	Leave base asymmetrical... *Ochnaceae*	*Cornus volkensii*
	Leave base symmetrical... *Loganiaceae, Oleracea*	23
23	Leaves serrate..Loganiaceae	*Buddleia Polystachya*
	Leaves entire Oleracea	36
24	Leave iso bilateral	*Callistemon viminalis*
	Leaves dorsoventral	2
25	leave sub opposite flowers cream/green	*Xymalos monospora*
	Leaves strictly opposite	27
	Leaves alternate	*Vepris simplicifolia*
26	Leaves are pubescent	*Hagenia abyssinica*
	Leaves glabrous	*Bersama abyssinica*
27	Leaves amplexicaul	*Syzygium cordatum*
	Leaves petiolate	28
28	Young stem square	*Syzygium guineense*
	Young stem not square	*Eucalyptus* sp.
29	Leaves alternate	*Ficus* sp.
	Leaves opposite	30
30	Milk in all parts	*Rauvolfia caffra*
	Milk only in young parts	*Lophostemon confertus*
31	Pellucid punctate glands present	*Vepris nobilis*
	Pellucid glands absent	*Allophyllus abyssinica*
32	Leaves are large over o.5 m long.Young leaves reddish	*Acrocarpus fraxinifolius*
	Leaves small less than 0, 5 m long young leaves not reddish	33
33	Thorns present	*Vachelia abyssinica*
	Thorns absent	*Albizia sp.*
34	Rachis winged	*Cussonia spicata*
	Rachis not winged	35
35	Leaflet base asymmetrical	*Cussonia holstii*
	Leaflet base symmetrical	*Schefflera volkensii*
36	leaves golden silvery below	*Olea africana*
	Leaves green below	37
37	Petiole less than 15mm long	*Olea capensis ssp wel*witschii
	Petiole over 15 mm up to 40 mm	*Olea hochsteterii ssp welwitschi*i
38	Leaves scaly….Cupressaceae	39
	Leaves not scaly	40
39	Cones bluish	*Juniperus procera*
	Cones brownish	*Cupressus lustanica*
40	Nodes present Poaceae	41
	Nodes absent	*Casuarina equisetifolia*
41	Leaves are less than 15 cm long	*Yuashania alpina*
	Leaves over 25 cm long	*Arundo donax*
42	Nodes absent	43
	Leaves needle-like...pinus	44
43	Leaves are falcate	*Afrocarpus gracillior*
	Leaves straight	*Podocarpus latifolius*

44	Needles drooping ……………………….……………………….………………….……….………*Pinus patula*
	Needles erect………………………………………………………………………..……..…*Pinus radiata*
45	Leaves entire…………………………………………………………...…………..…………46
	Leaves serrate………………………….……………………………………….…….....………47
46	Plants always trees……...………………………………………………………….....*Galiniera saxifraga*
	Plants trees, shrubs or climbers……………………………………………………..…….*Halleria lucida*
47	Leaves opposite on flowering shoots and alternate on vegetative shoots……….……..*Catha edulis*
	Leaves strictly opposite…………………………………………..…...……*Casipourea malosana*
48	Leaves palminerved………………………………………………………...……*Dombeya torrida*
	Leaves not palminerved…………………………………………..………..…….……./……49
49	Young stem zig zag……………………..……….………………………..…….*Casaeria battisscombei*
	Young stem straight…………………………..………………….…………….…….………50
50	Leaves with serrated margins…………………………………………………………..….…………51
	Leaves with entire margins……………………………………………….……….……………….58
51	Leaf base unequal.Flowers in greenish cymes…………………………………….….*Celtis africana*
	Leaf base equal, Flowers not in greenish cymes………………………………….………………52
52	Leaf margins lightly armed……………………..…………………………………….………53
	Leaf margins not armed………………………….……….………..……….…..…………54
53	Flowers in fascicles…………………………………………………..…*Aningeria adolfi-friedericii*
	Flowers not in fascicles…………………………..……………….………………….………….55
54	Flowers in Heads…………………………………………………...……….………….…….59
	Flowers not in Heads………………………………………………………………..…..….56
55	Plants spinny………………………………………………………………………*Maytenus undata*
	Plants not spinny………..………………………………………………….………………56
56	Midrib reddish……………………………….……………………….……..…*Prunus africana*
	Midrib different……………………………………………………………….………..……. 57
57	Leaves irregularly toothed…………………….……………….............…*Drypetes gerrardii*
	Leaves evenly toothed…………………………..………………………..……………..……*58*
58	Leaves turn opposite on flowering shoots…………………………..……….………….*Catha edulis*
	Leaves remain alternate on flowering shoots……………………….……..…………*Myrsine africana*
59	Stipules present…………………………….………………….……….………….…………….…60
	Stipules absent…………………………………………………………………...………….62
60	Leaves silvery beneath…………………………………….…….…………*Croton megalocarpus*
	Leaves not silvery below……………………………………………………..…………………61
61	Leaves toughly hairy………………………………………….….…..……*Neoboutonia macrocalyx*
	Leaves not toughly hairy,…………………………………………………….,,,,*Croton macrostachys*
62	Leaves densely hairy below……..……………………………………….……*Pittosporum lanatum*
	Leaves not densely below…………………………………………………..…………………63
63	Seeds sticky…………………………………………………….…….…..*Pittosporum viridiflorum*
	Seeds not sticky……………………………………..……………,……………………64
64	Flowers solitary…………………………………………………….………..…*Warburgia ugandensis*
	Flowers in groups……………………….………………………….….……………,………65
65	Leaves bluish green…………………….………………………….…….……*Maytenus senegalensis*
	Leaves not bluish green……………………………………………...……….*Maytenus heterophylla*
66	Friut a capsule……………………………….……………………..………...………*Eucalyptus species*
	Fruit not capsulate……………………………………………………..……………………..….67
67	Flowers brownish in spikes……….………………………………………………….*Myrica salicifolia*
	Flowers not brownish in spikes…………………………………………..………………….68
68	Young leaves bright red……………..………………………………….………….....…*Protea gaguedi*
	Young leaves not red……………………………………………………………………………69
69	Bark deeply fissured…………………………………………..…….………….….*Faurea saligna*
	Bark not deeply fissured but blood red inside…….……………………..……..*Rapanea melanophloeos*

Key six

Asteraceae.with alternate leaves
from the main key @ 15

1	Plants succulent …11
	Plants not succulent…2
2	Plants with thorns…Key 3
	Plants without thorns…3
3	Milk present… Key 11
	Milk absent…4
4	Leaves silvery cobwebby…*Helichrysum* …44
	Leaves, not silvery cobwebby…5
5	Plants with a basal rosette of leaves…6
	Plants without basal rosette of leaves…7
6	Flowers subtended by a scape…9
	Flowers not subtended by a scape…*Haplocarpha ruepelli*
7	Leaves entire…12
	Leaves ser…8
8	Leaves lobed/heads are globular… *Dichrosephala*…17
	Leaves not lobed/heads not globular…10
9	Plants over one mitre height… *Inula manii*
	Plants less than one mitre in height… *Gerbera*… 16
10	Stem winged…*Sphaeranthus suaveolens. Laggera*…13
	Stem not winged…Tolpis capensis. /Stomatanthes …22
11	Plants climber… *Solanecio angulatus*
	Plants erect… *Kleinia species*
12	Gum like secretions on young plants…*Psiadia punctulata*
	Gum like secretions absent on young plants…15
13	Plants near fresh water and repent…*Sphaeranthus suaveolens*
	Plants not near water and are erect…14
14	Flowers in terminal corymbs…*Laggera brevipes*
	Flowers in terminal panicles…*Laggera elevator*
15	Herbs with single stem…*Felicia abyssinica/Conyza schimperi/Nidorella*…19
	Herbs with several stems…*Conyza.Pyrrhopappa/Vernonia brachycalyx*…21
16	Yellow hairs present…*Gerbera piloselloides*
	Yellow hairs absent…*Gerbera/Conyza subscaposa*…18
17	Leaves rhombic ovate and pinnate a times…*Dichrosephala integrifolia*
	Leaves oblanceolate, not pinnate… *Dichrosephala chrisanthemifolia*
18	Flowers green-purple… …*Conyza subscaposa*
	Flowers different…*Gerbera ambigua*
19	Leaves lobed… *Conyza schimperi*
	Leaves not lobed…*Felicia abyssinica/Nidorella*…20
20	Flowers solitary…*Felicia abyssinica*
	Flowers in terminal corymbs…*Nidorella spartioides*
21	Plants erect…*Conyza pyrrhopappa*
	Plants decumbent…*Vernonia brachycalyx*
22	Leaves in rosette oblanceolate…*Tolpis capensis*
	Leaves not in a rosette.Heads white…*Stomatanthes africanus*
23	Leaves linear…31
	Leaves not linear…24
24	Leaves sessile… 32
	Leaves peltate…25
25	Flowers solitary. *Crassocephalum vitellinum/Cotula*…26

	Flowers aggregated………………………………………………………..…..……….……….……	27
26	Leaves lobed, flowers white……………………………………………….…….…………..	*Cotula abyssinica*
	Leaves not lobed flowers not white…………….………………………………………………………	30
27	Plants decumbent succulents……………………….……………………….………….	*Notonia petracea*
	Plants, not decumbent succulents………….……………………………..…………………..……	28
28	Leaves minutely toothed…………………………………….………………………….	*Euryops brownei*
	Leaves not minutely toothed……………………..……………………..…	*Athrixia rosmarinifolia*
29	Leaves circular to triangular, flowers yellow…………………………..……	*Cineraria deltoideaa*
	Leaves not circular to triangular…………………………...……………………………….……………	35
30	Margin serration remote, flowers purple………………………………………	*Centaurea praecox*
	Margin serration not remote, flowers different………… *Conyza*…………………………………..……	37
31	Herbs with woody lower stem…………… *Vernonia*………………………………….…………..………	40
	Herbs without woody lower stem………………………………………………………….……………	32
32	Leaves deeply lobed, flowers pale yellow…………….…………………	*Crassocephalum montuosum*
	Leaves not deeply lobed………………………………………………………………………….………	33
33	Leaves not lobed, decumbent…………………….…….……………….…	*Crassocephalum picridifolium*
	Leaves shallowly lobed, erect……………………………….…………………………………………	34
34	Heads drooping in clusters…………….…….………………………	*Crassocephalum crepidioides*
	Heads not drooping in clusters……….……………………….……………………	*Crassocephalum Rubens*
35	Leaves spoon-shaped…………… *Emilia kivuensis/discifolia*……………...……….……………………	36
	Leaves not spoon-shaped……………………………………….…………	*Crassocephalum vitellinum*
36	Plants Perennial with rootstock…………………………………….………………	*Emilia kivuensis*
	Plants annual without root stock………………….…………………………………..…	*Emilia dicifolia*
37	Leaves in basal rosette…………………….……………………………….………	*Conyza subscaposa*
	Leaves not inbasal rosette…………………………………………...……………………….………	38
38	Flowers bright yellow…………………………………………………….………………	*Conyza newii*
	Flowers not yellow………………………………………………………...…………………	39
39	Flowers in dense terminal corymbs………………………………………………	*Conyza tigrensis*
	Flowers in loose terminal corymbs………………………………………………	*Conyza steudellii*
40	Leaf lobes present……………………….……………………………...………..	*Vernonia auriculifera*
	Leaf lobes absent……………………………..……………………………………………….………	41
41	Flowers bluish……………………………………………………………….………	*Vernonia galamensis*
	Flowers purple or different………………….……………………………..………………………	42
42	Leaves entire……………………………………………………………………	*Vernonia smithiana*
	Leaves serrate……………………………………………………………...………………………	43
43	Heads brown with purple florets………………………………….….……………	*Vernonia purpurea*
	Heads not brown, phyllaries white. pink or purple……………………..……	*Vernonia hymenolepis*
44	Leaves decurrent……………………………………………………	*Helichrysum odorotossimum*
	Leaves not decurrent……………………………………………………………………………………	45
45	Leaves wooly on both surfaces…………………………….…………	*Pseudognaphalium luteo album*
	Leaves not wooly …………………………………………….……………………………..…	46
46	Herbs form a rosette with umbels…………………………..….…….……	*Helichrysum globosum*
	Herbs don't form a rosette with flowers, not in umbels…………………..……………….………	47
47	Stems reddish…………………………………………….……….…………..	*Helichrysum kilimanjari*
	Stem not reddish………………………………………………………………………………………	48
48	Some leaves panduriform……………….……………........…………	*Helichrysum panduratum*
	Some leaves not panduriform…………………………………………………………….…………	49
49	Plants decumbent……………………………………………………...…	*Helichrysum schimperi*
	Plants not decumbent…………………………………………………………...………………	50
50	Capitulum red to white…………………………..……………….……….	*Helichrysum forsaklii*
	Capitulum different………………………………………………………………………………..	51
51	Leaves yellow wooly……………………………………….…………	*Helichrysum foetidum*
	Leaves, not yellow wooly ………………………………………………….…….…………	52
52	Flowers in terminal umbels………………………………………	*Helichrysum formosissimum*
	Flowers in terminal corymbs…………………………......………	*Helichrysum nudiflorum*

KEY SEVEN

Herbs with simple opposite or whorled leaves

sow (simple opposite whorled)

1	Leaves are strictly opposite…………………………………..……………….…………….…..….2
	Leaves mixed opposite and whorled……………………………….…….……………….,…..…5
2	leaf margins serrate, …………………………………………….……………………….…....…3
	Leaf Margin entire, wavy spinny or lobed…………………….………………………………4
3	Stipules present…………………………..…………………*Geraniaceae, Urticaceae*.-…...16
	Stipules absent-v*erbanaceae*, *Onagraceae.Lamiaceae*, *Balsaminaceae*, *Asteraceae*, *Acanthacea*e, *Urticaceae*... 2-s/o/s/xs key 12
4	Stipules present Geraniaceae, Rubiaceae……………………………………..…………..…22
	Stipules absent … Gentianaceae,/Acanthaceae/Melastomataceae/,Crassulaceae, Asteraceae, Nyctaginaceae, Melastomataceae, Caryophyllaceae, Amaranthaceae, Acanthaceae, Hypericaceae ……………………………………………………………..……………33
5	Whorled lvs only per plant…………………………………..……………………………..…6
	Whorled and opposite on same plant……………………..…………..……….………..……11
6	Plants Climber/clambering………………..………………………………………….………7
	Plants diff………………………………..………………………………………………8
7	Leaves heart-shaped with recurved minute prickles…………………………….…….*Rubia cordifolia*
	Leaves oblanceolate……………………………………………………………….….*Gallium aparine*
8	Plants mat-forming…………………………………………………….…......…*Gallium kenyanum*
	Plants, not mat-forming……………………………………………....……….……………9
9	Plants decumbent……………………………………………………….……*Richardia brasiliensis*
	Plants caulescent…………………………………………...………………………10
10	Leaves with dark veins flowers blue/violet…………………………..……*Pentanisia schweinfurthii*
	Leaves without dark veins flowers white/pink………………………………*Pentas pubiflora*
11	Plants with nodes………...………………….…………….………………….……………..…23
	Plants without nodes…………………………………………………………………………...12
12	Plants erect…………………………………..…….……….….…*Agathisanthemum globosum*
	Plants prostrate, decumbent or repent……………………….……………………………13
13	Plants repent………………………………..……………………………….……….………14
	Plants prostrate or decumbent……………………….………………………..……………...15
14	Plants mat-forming with one main tooth on stipular sheath…….……… *Oldenlandia monanthos*
	Plants, not mat-forming; stipular sheath fringed……..…………………..…. *Spermacose pranceae*
15	Leaves sticky and 3 veined strongly bend downward………………...……….*Gallium scioanum*
	Leaves not sticky……………………………………….……...……………………16
16	Flowers unisexual stipular sheath toothed………………………...….*Anthospermum herbaceum*
	Flowers bisexual, stipular sheath fringed……………………….…….….…….*Spermacose* species
17	Leaves palminerved and palmately lobed……………………………….*Geranium arabicum*
	Leaves different…………………………………………………………..………………….18
18	Herb from a rhizome, painful stinging and double toothed……………....……..*Urtica massaica*
	Herb not from a rhizome, not stinging but toothed…………………………….………………19
19	Leaves asymmetrical with wedge-shaped base……………………..…..*Elatostema monticola*
	Leaves symmetrical…………………………………………………….………………20
20	Leaves sessile………………………………………….............…*Spermacose munitiflora*
	Leaves petiolate……………………………………………………..……………………21
21	Leaves trianularovate, inflorescence sessile.stipules transparent………………….*Pilea rivularis*
	Leaves ovate. inflorescence stalked, stipules broadened………………......……*Pilea johnstonii*
22	Leaves pinnately lobed……………………………….………..……*Geranium elemellatum*
	Leaves palmately lobed…………………………………………….…………………….23
23	Flowers white or mauve…………………………….….……......*Geranium aculeolatum*

	Flowers pink, carpel with a shallow network of ridges……………….………*Geranium ocellatum*
24	Plants prostrate……………………………………………….....*Thunbergia paulitschkeana*
	Plants erect…………………………………………..……………………………………25
25	Plants hairy……………………………………………..….*Brilliantaisia madagascariensis*
	Plants smooth………………………………………..…..……………………*Ruellia patula*
26	Flowers capitate……………………………………...………………………………….27
	Flowers different……………*Acanthaceae, Amaranthaceae, Caryophyllaceae, Gentaniaceae, Melastomataceae, Hypericaceae, Nyctaginaceae. Lamiaceae (Nepeta azurea*)……………..…28
27	Plants trailing…………………………………………………………..…*Spilanthes mauritiana*
	Plants erect…………………………………...………..…………*Melanthera pungens*
28	Ovary with nectar disk below, flower solitaryLindernia Serpens. /*Cycnium tenuisectum*…,…29
	Ovary without nectar disk, flower aggregated or solitary……………..……………………29
29	Leaves are pinnately lobed……………………………….………..………*Cycnium tenuisectum*
	Leaves narrow elliptic……………………………………………………………*Lindernia Serpens*

KEY EIGHT

Shrubs

1	Plants with compound leaves……………………………..…………………….....……..……2
	Plants with simple leaves…………………………………..…………………………..…….13
2	Leaves with mango smell when crushed………………………………………………...…...…3
	Leaves without mango smell when crushed…………………………………….………..……4
3	Leave apex is obtuse or emarginate…………………………………………….. *Rhus natalensis*
	Leaf apex acute or rounded……………………………………………..…………..…*Rhus vulgaris*
5	Stem three angled or winged……………………………………….………. *Indingofera homblei*
	Stem not three angled………………………………………………………….……..……………6
6	Leaflets 8-18, asymmetrical and falcate………………….………………*Kotschya recurvifolia*
	Leaflets not asymmetrical or falcate…………………..……..……………*Senna septemtrionalis*
7	Stems spinny…………………………………………………………………......*Rubus apetalous*
	Stem not spinny……………………………………………………………………...………..9
8	Flowers yellow and reddish outside……………..…………………..……*Crotalaria lachnocarpoides*
	Flowers yellow but not reddish outside……………………….…..……...*Crotalaria cleomifolia*
9	Sepals with yellow margins-……………………………………………..….*Phyllanthus fischeri*
	Sepals without yellow margins..…………………………………..……………………….. 10
10	Flowers red…………………………………………………………...….*Tecomaria capensis*
	Flowers not red……………………………………………………………………………..11
11	White stiff hairs present…………………………….……………….*Indingofera longibarbata*
	White stiff hairs absent……………………………………...……………………………12
12	Red multicellular hairs present on all parts except leaflets……………..….*Indingofera mimosoides*
	Red multicellular hairs absent………………………………………..…..*Cassia didymobtrya*
13	Leaves linear…………………………..………………………………………………14
	Leaves laminate……………………………………………………………………………. 17
14	Stipules present……………………………...…………….…………..*Cliffordia nitidula*
	Stipules absent ……………………………………...……………………………………15
15	Flowers in heads leaves in singles…………………………………..…...*Stoebe kilimandscharica*
	Flowers in spikes , leaves in whorls of threes…………………………..…………………… 16
16	Stem is sparsely hairy………………………………………………….…………*Erica arborea*
	Stem hairless………………………………...………...………………*Erica whyteana*
17	Leaves alternate-…………………………………………………...………………………18
	Leaves opposite…………………………………………………..……………………51
18	Leaves serrate…………………………………………………………………………………19
	Leaves entire…………………………………………………………….……………………25
19	Stipules and star hairs present………………………………………………………………20
	Stipules and star hairs absent……………………………………………………………….. 40
20	Flowers in raceme…………………………………………………...………………21

	Flowers solitary	22
21	Leaves are shallowly lobed	*Hibiscus micranthus*
	Leaves not lobed	*Hibiscus vitifolius*
22	Flowers white or purple	*Hibiscus fuscus*
	Flowers yellow	23
23	Flower base maroon	*Hibiscus calyphyllus*
	Flower base not maroon	24
24	Hairs soft	*Hibiscus mauritiana*
	Hairs prickly	*Hibiscus diversifoius*
25	Stem and leaves whitish	28
	Stem and leaves not whitish	26
26	Berries white	*Cestrum aurantiacum*
	Berries not white	27
27	Sepals inflated and persistent on berry	*Withania somnifera*
	Sepals caducous	29
28	Shrubs less than 4 mitres high	*Helichrysum Argyranthemum*
	Shrubs over six mitres high	*Buddleia Polystachya*
29	Flowers pendulous with musk smell	*Datura suaveolens*
	Flowers different	30
30	Milk present	*Euphorbia depauperata*
	Milk absent	32
31	Flowers in umbels	*Solanum aculetissimum*
	Flowers in corymbs	*Solanum aculeastrum*
32	Plants armed	33
	Plants not armed	36
33	Prickles curved	34
	Prickles straight	35
34	Leaves are pinnately lobed	*Solanum anguivi*
	Leaves not lobed	*Solanum incanum*
35	Leaves are occasionally remotely crenulate	*Dovyalis macrocalyx*
	Leaves entire	*Dovyalis abyssinica*
36	Flowers blue	*Solanum mauritianum*
	Flowers not blue	37
37	Flowers in fascicles fruit is a berry	*Discopordium penninervum*
	Flowers not in fascicles	38
38	Young parts hairy	39
	Young parts not hairy	*Ludwigia abyssinica*
39	Leaves in terminal rosette	*Gnidia lamprantha*
	Leaves along the stem	*Indingofera jussiaeoides*
40	Leaves in a rosette	41
	Leaves along stem	42
41	Milk present	*Lobelia gibberoa*
	Milk absent	43
42	Leaves sessile	*Nidorella spartioides*
	Leaves peltate	44
43	Leaves in a basal rosette and a few along stem	*Inula manii*
	Leaves in terminal rosette	,*Solanecio manii*
44	Milk present	*Lobelia arbedarica*
	Milk absent	45
45	Inflorescence a red raceme	*Acalypha volkensii*
	Inflorescence different	47
46	Inflorescence a spike	*Acalypha ornata*
	Inflorescence a raceme	48
47	Flowers solitary	*Rhamnus staddo*

Flowers in head……………………………………..………………..………………….…48
48 Branches lenticellate……………………………….……………………….…*Maesa lanceolata*
Branches not lenticellate………………………………………………….……………………49
49 Flowers yellow………………………………………………………………….….*Conyza newii*
Flowers not yellow……………………………………………………..….….…….…………50
50 Flowers purplish…………………….…………………………………..……*Vernonia lasiopus*
Flowers bluish……………………………………………………………….…*Vernonia galamensis*
51 Leaves spinny…………………………………………………………...….*Acanthus eminens*
Leaves not spinny…………………………………………………...…………….……………52
52 Flowers in umbels……………………………………………………….*Diplophium africanum*
Flowers not in umbels…………………………………………..……..………….………53
53 Leaves with interpetiolar stipules……………………………………………*Pavetta abyssinica*
Leaves without interpetiolar stipules…………………………….…...……………,……54
54 Leaves whorled or opposite……………………………………….…...…*Gnidia lamprantha*
Leaves strictly opposite……………………………………………..…….…….………….55
55 Stilt roots present…………………………………………….…...*Mimulopsis arborescens*
Stilt roots absent…………………………………………………………….……………….56
56 Leaves yellow or striped green……………………………………….……*Duranta variegata*
Leaves not green…………………………………………………..…….……….……….57
57 Plants with mint smell……………………………………………………………………60
Plants without mint smell…………………………………………………..………58
58 Long hairs present on stem……………………………………….….*Epilobium hirsutum*
Long hairs absent on stem…………………………………………….……….…………59
59 Flowers in heads……………………………………….……….…….*Bothriocline fusca*
Flowers not in heads………………….…………………………..……….….…*Leonotis ocifolia*
60 Stem reddish…………………………………………………….......…*Epilobium salignum*
Stem not reddish……………………………………………….....*Epilobium stereophyllum*

KEY NINE
NON-WOODY EPIPHYTES

1 Plants with parallel venation ………………………………….……………..…………2
Plants with net venation………………………………………………………………….3
2 Plants with prostrate stems spreading on substrate leaves leathery…………….….*Stolzia repens*
Plants different…………………………………………………….....……………13
3 Plants are threadlike specifically on Juniperus procera……….…*Arceuthobium juniper-procerae*
Plants different………………………………………………………………………..4
4 Blade circular dimpled opposite notch……………………………..…...*Umbilicus botryioides*
Blade not circular and or not dimpled…………………………..……………………….5
5 Plants Herbs creeping on tree branches or the ground …………………………………..6
Plants shrubs parasitic on trees………………………………………………………..7
6 Leaves Whorled circular to elliptic, creeping………………………...*Peperomia tetraphylla*
Leaves alternate, oblanceolate……………………………………….*Peperomia abyssinica*
7 Leaves opposite……………………………………………..……………………...8
Leaves alternate ……………………………………………………….……... ….11
8 Leaves ovate-shaped petals orange to yellow-reddish inside and rusty...*Phragmathera usuiensis*
Leaves obovate or different……………………………………………...…………9
9 Stems form dense globose masses…………………………………….…*Viscum tuberculum*
Stems without dense globose masses……………………………„.……………………..10
10 Leaves with smooth edges, berry yellow-orange……………………..…………*Viscum fischeri*
Leaves crisped edged berries white or pale green…………..………………..…*Viscum triflorum*
11 Leaves palmately veined…………………………………………….……………………12
Leaves not palmately veined……………………………..……..……….*Oncocalyx fischeri*

12	Leaves heart to arrow-shaped…………….…………………………….….*Plicosepalus sagittifolius*
	Leaves wedge-shaped…………………………………………………..*Plicosepalus curvifolius*
13	Plants with stackless Stout rhizomes 3-5 angled pseudobulbs at intervals……………………… *Bulbophyllum josephii* (Kuntze) Summerh
	Plants with stems or stalked rhizomes…………………….……………………….……….….14
14	Stems short thickened into pseudobulb at the base with 1-several nodes. Leaves in two ranks .Polystachya………………………………………………..…………………….……23
	Stems woody or different………………………………………….....…………………...15
15	Stem thick bamboo-like leaves symmetrical heavily spotted yellow-green flowers with brown. Times terrestrial……………………………………………………………..*Anselia africana*
	Stems woody leaves asymmetrical…………………………………….…………………..…16
16	Flowers with transparent substances Diaphananthe……………………………………………17
	Flowers without transparent substance……………………………………………….....….19
17	Stems hanging leaves curved…………………………………………*Diaphananthe lorilifolia*
	Stems different leaves not curved………………………………………………………..….18
18	Stems covered by old leaf base………………………………………….*Diaphananthe lohrii*
	Stems not covered by old leaf base5-7 yellow flowers……………….…*Diaphananthe montana*
19	Plants in clumps petals shorter than sepals elongated rostellum………………..…*Tridactyle*..20
	Plants different……………………………………………………….…………...………21
20	Raceme with 1-3 flowers…………………...…………………………..….*Tridactyle scollettii*
	Raceme with many flowers…………………………………………………*Tridactyle furcitipes*
21	Leaves succulent or leathery in 2 ranks……………………*Cyrtorchis arcuata.Angraecum*....22
	Leaves not leathery riverine species……………………………………..*Cribbia brachyceras*
22	Leaf Upper surface restricted to narrow groove almost triangular in section apex pointed stem less than 15 cm long…flowers 3-7……………………………………..*Angraecum humile*
	Leaf Upper surface different stem over 15 cm long flowers 1-2……………*Angraecum erectum*
23	Pseudobulb with at least one leaf when flowering…………………………………………..…24
	Pseudobulb without leaves or with more than one leave when flowering……………….……25
24	Leaves less than 10mm wide……………………………………………*Polystachya caesptifica*
	Leaves more than 10mm wide………………………………….……*Polystachya cultriformis*
25	25Stem tapering…………….………….………………………………..……….……..….28
	Stem no tapering……………………………………..………..…………………….,…26
26	Petal lobs under 10 cm………………………….................….*Polystachya campyloglossa*
	Petals over 10cm………………………………………..…………….….………….……27
27	Flowers green…………………………………………….…………….*Polystachya steudneri*
	Flowers white…………………………………………….……………*Polystachya eurychila*
28	Petals pink……………………………………………………………..…*Polystachya confusa*
	Petals yellow-green……………………………………….…….….*Polystachya transvaalensis*
	KEY TEN MONOCOTS
1	Plants tepellate and actinomorphic…………………………………..………….….…………4
	Plants without or with tepals and zygomorphic………………………..……………….…..……2
2	Plants woody over 2.5m tall………………Poaceae……………….…………….……..…….....45
	Plants herbaceous less than 2 m tall………………………………………………….…….….3
3	Herbs perennial, rhizomatous or tubers (false bulb) Ovary inferior, flowers mostly resupinate, pollinia present………………Orchidacea……………………………………………………..52
	Herbs annual/.Ovary superior or inferior, no floral resupination and pollinia……………....….5
4	Leaves in one plane, stamens 3Iridaceae……………………………………………….……31
	Leaves in two planes stamens 6…………………………………………………………….…9
5	Stem with nodes………Commelinaceae, Poaceae…………………………………….….35

	Stem without nodes…………………………………………………………………...……..…	6
6	Stem 3 angled..…………………………………………..……..….. Cyperaceae (key 10 Monocots)	
	Stem not 3 angled……………………………………………………………………….…	7
7	Inflorescence a spadix…………………………..….....	16
	Inflorescence is not a spadix……………………………………………………….……	8
8	Plants growing in water………………………………………………………………..……	43
	Plants growing in grassland glades……………………………………..……………...…	49
9	Corona present, juicy leaves, umbellate flowers……………………..…*Amaryllidaceae*…….....	18
	Corona absent…………………………………………………………………………..…	10
10	Corm with mucilage…Hypoxidaceae/Eriospermaceae……………………………….…..	12
	Corm without mucilage…………………………………………………………….………	11
11	Stamens 6, flowers hanging……………………………………….…….………..*Gloriosa minor*	
	Stamens, not six…………………………………………………………….……………..	15
12	Leaves recurved……………………….…………………………………………….……	14
	Leaves straight………………………………………………………………………….…	13
13	Flowers in pairs…………………….……….…………….……..…*Hypoxis Angustifolia*	
	Flowers not in pairs……………………………………………………….…………*Hypoxis villosa*	
14	Flowers solitary…………………………………..……………..…*Hypoxis kilimandischarica*	
	Flowers in cluster………………………….…*Hypoxis obtusa/Eriospermum abyssinica*…….…	42
15	Perianth campanulate, constricted at base……………………….………….*Kniphofia thomasii*	
	Perianth is not campanulate. not constricted at base……………………….………….…...	17
16	Leaves net veined and digitate palmate………………………………….……….……	20
	Leaves simple, umbellate spathe ……………………………………… *Androcymbium striatum*	
17	Plants glasslike, tepals reduced……………………………………………… *Juncaceae*.....	*50*
	Plants not grasslike, tepals conspicuous…………………………….……………………	19
18	Leaves with spotted sheathing base……………………………..….*Scadoxus multiflorus*	
	Leaves without spotted sheathing base…………………….………………….………..	92
19	Flowers white……………………………………….………………………….………	26
	Flowers not white……………………………...……………………………….…	21
20	Leave apex acuminate……………………………………...………*Arisaema enneaphyllum*	
	Leaves apex not acuminate……………………………….….………*Arisaema mildbraedii*	
21	Branch ends modified into bristles………………………………..…*Asparagus racemosus*	
	Branch ends not modified into bristles……………………………………………..,…	22
22	Leaves tufted…………………………………………………………….….…………	23
	Leaves tufted……………………Hyacinthaceae……………..………………….………	24
23	Flowers with green midrib……………………………………………..……*Albuca abyssinica*	
	Flowers without green midrib……………………………………….……….*Xyris capensis*	
24	Leaves wavy and spotted……………………………………...…….*Scilla hyacinthina*	
	Leaves not wavy or spotted…………………………………………………………….…	25
25	Raceme is more or less open……………………...………………*Ornithogalum gracillimum*	
	Raceme is more or less cylindrical………………………….……….*Ornithogalum tenuiflorum*	
26	Capsule notched at apex, bracts with bristles…….……………………*Anthericum angustifolium*	
	Capsule not notched at apex, bracts without bristles………………..……………….……	27
27	Leaves hairless…………………………...……………………………….……….………	29
	Leaves hairy…………………………………………………………………………………	28
28	Margins wavy………………………………………………..*Chlorophytum blepharophyllum*	
	Margins not wavy……………………………………………….*Chlorophytum subpetiolatum*	
29	Leaves purple-spotted floral stalk zigzag between clusters…..……..…*Chlorophytum cameroonii*	
	Leaves not purple-spotted, floral stalk does not zigzag between clusters…………………,,…	30
30	Capsule spherical with ridges……………………………..……..*Chlorophytum Zanguebaricum*	
	Capsule not spherical and not ridged…………………………...……*Chlorophytum zavattari*	
31	Flowers solitary……………………………………………………………..……………	32
	Flowers in spikes……………………………………………………….……………………	34
32	Flowers pink or mauve with yellow throat……………………….…….…*Hesperantha petitiana*	
	Flowers different…………………………………………………………………….………	33

33	Bracteoles with brown papery margins………….…………..…*Romulea fischeri (Orchidaceae*)
	Bracteoles without brown papery margins……………………………….………*Gladiolus dalenii*
34	Flowers in panicles, blue or purple…………..…………………..………….*Diriema caprifolium*
	Flowers in clusters blue…………………………………………..……….…*Aristea abyssinica*
35	Flowers in 1-2 cymes…………………………Commelinaceae………………..………..…36
	Flowers in spikes……Poaceae……………………………………………………................. 91
36	Flower in spathe.Commelina triangulispatha………../*Commelina.subulata*………………….37
	Flowers not in triangular spathe………………………………………………………..……… 51
37	Flowers blue along waterways……………………………………..…..*Floscopa glomerata*
	Flowers not blue and not along waterways……………………..…….…….………,…….….38
38	Spathe triangular, seedwarted……………………………………*Commelina triangulispatha*
	Spathe not triangular seed not warted………..*Commelina subulata/C.reptans*………...….....39
39	Leaves lanceolate twisted………………………..……………………...*Commelina reptans*
	Leaves not twisted…………………………..…………………..……..…………..…40
40	Leaves in basal rosette……………………………………………………..…*Murdannia simplex*
	Leaves not in basal rosette…………………………………………….…………………41
41	Hairs on sheath margin…………………….……………………...……*Commelina benghalensis*
	Hairs not on Sheath………………………..…..…………….…………*Cyanotis foecunda*
42	Flowers yellow tuberous plants……………………………………...*Eriospermum abyssinica*
	Flowers not yellow plants not tuberous…………………..……………………….………………43
43	Leaves stipulate floating in water……………………………......……*Potamogeton thunbergii*
	Leaves existipulate not floating on water…………………...……………...…………………44
44	Leaves awl-shaped forming dense cushion in peat pools…………………..…..*Eriocaulon volkensii*
	Leaves linear densely tufted……………………..……………………..….*Eriocaulon schimperi*
45	Plants hollow with nodes……………………………………………………….…………46
	Plants solid without nodes……………………..……………………..……………………47
46	Leaves whitish silvery……………………………………...……………….…………*Arundo donax*
	Leaves not whitish silvery……………………………...……………………*Yuashania alpina*
47	Plants branched…………………………………..……………………*Dracaena afromontana*
	Plants not branched…………………………………………………………………….….48
48	Leaves elliptic…………………………………………...……………*Dracaena laxissima*
	Leaves lanceolate………………………………………………………… *Dracaena fragrans*
49	Leaves hairy………………………………………………………..…….*Boophone disticha*
	Leaves hairless…………………………………………………..…….*Eriospermum species*
50	Capsule pointed…………………………………………………….……,.*Juncus oxycarpus*
	Capsule cylindrical………………………………………………………….*Juncus drageanus*
51	Plants rhizomatous or non tuber…………………………………………………..……65
	Plants tuberous……………………………………………………………………………52
52	Flowers bright yellow with 3-6 basal leaves & cylindrical spur……………..*Platycoryne crocea*
	Flowers not bright yellow with different other character combinations…………………..…..…53
53	Flowers greenish-white with 2 stigmatic projection…………………………………..……..…69
	Flowers not greenish and without stigmatic projection………………………….……...…54
54	Flowers with 2 spurs at base or with 2 other extra in dense terminal spikes….Satyrium……...67
	Flowers without 2 spurs and varied inflorescence…………………….…………….………..55
55	Spurs near inner petal margin……………Disperis…………………...…………….…………79
	Spurs not near inner margin or absent…………………….………..…………….……….56
56	Spurs absent……………Lipparis/Disaaconitioides…………………………….……….…..78
	Spurs present……………………………………………………………………...…….57
57	Spurs at the base…………….Holothrix……………………….……………………..…74
	Spurs not at the base…………………………………………...…………………..…59
58	Stigma divided into 6 branches…………….……………………..… *Romulea camerooniana*
	Stigma not divided into 6 branches………………………………………….……………..…61
59	Sepals with twisted lip…………Disa………………………………………..………64
	Sepals without twisted lip……………………………….……………………..……..…61
60	Flowers hooded in terminal racemes. Cynorkis……………………..……………………77

	Flowers not hooded in spikes	62
61	Sepals pink or mauve with spotted throat	*Brachcorythis ovata*
	Sepals orange-yellow throat not spotted	63
62	Leaves with ribbed venation	*Epipactis aafricana*
	Leaves without ribbed venation	*Disa stairsii*
63	Petals curved like a goat's horn, swampy areas	*Disa hircinornis*
	Petals not curved. Grassland	65
64	Reddish spots on petal lip	*Disa erubescens*
	Reddish spot not on petal lip	*Disa fragrans*
65	Flowers hooded	Habenaria…82
	Flowers not hooded	*Roeperocharis bennettiana*
66	Plants with 2 ovate basal leaves that fall off during flowering	68
	Plants with more than 2 leaves	69
67	Spur is longer than 2cm	*Satyrium fimbriatum*
	Spur less than 2 cm long	*Satyrium carsonii*
68	Petals hairy	70
	Petals hairless	71
69	Perianth with papillae hairs	*Satyrium schimperi*
	Perianth without papillae hairs	74
70	Flowers white or greenish-red	*Satyrium coriophoroides*
	Flowers red to orange-brown	*Satyrium sacculatum*
71	Flowers orange-yellow or yellow-green	72
	Flowers pink, mauve, white or pink	73
72	Leaves lanceolate to elliptic	*Satyrium volkensii*
	Leaves ovate	*Satyrium woodii*
73	Flowers deep pink to crimson, plants less than .5 m high in stagnant water	*Satyrium robustum*
	Flowers pink to mauve near running water over 1m tall	*Satyrium crassicaule*
74	Sepal lip entire	*Holothrix puberula*
	Sepal lip 5-7 lobed	*Holothrix pentadactyla*
75	Sepal margin toothed	*Lipparis deistelii*
	Sepal margin entire	76
76	Plants with pseudobulbs	*Lipparis bowkeri*
	Plants with tubers	*Disa aconitioides*
77	Leaves 2-6	*Cynorkis anacamptoides*
	Leaves one	*Cynorkis kassneriana*
78	Leaves lanceolate, flowers mauve	*Disperis reichenbachiana*
	Leaves ovate flowers different	79
79	Flowers yellow to yellowish brown-red	*Disperis pusila*
	Flowers white, mauve or magenta	80
80	Flowers with green tinge	*Disperis antheceros*
	Flowers without green tinge	81
81	Flowers white with rose tinge or entirely magenta	*Disperis dicerochila*
	Flowers white to mauve entirely	*Disperis nemorosa*
82	Leaves 1-2 circular ovate	*Habenaria vaginata*
	Leaves several	83
83	Petals triangular to ovate	*Habenaria bracteosa*
	Petals are asymmetrical to lanceolate	84
84	Petals entire	85
	Petals deeply lobed	86
85	Leaves are ovate to lanceolate plant about 1 m tall	*Habenaria petitiana*
	Leaves lanceolate, plant 0.5 m tall	*Habenaria cavatibrachia*
86	Upper petal lobe is densely hairy with fringed margins	*Habenaria altior*
	Upper petal lobe not densely hairy margins not fringed	87
87	Spur coiled in bracts, flowers with white centers	*Habenaria cirrhata*
	Spur not coiled in bracts, flowers without white centers	88

88	Stigma club-shaped, spur swollen in apical third, fragrant at night……*Habenaria walleri*
	Stigma not club-shaped, apical third of spur not swollen……89
89	Flowers with unpleasant smell……*Habenaria schimperi*
	Flowers without unpleasant smell……90
90	Spur swollen at the end, grass field species……,,,,,..*Habenaria humilior*
	Spur not swollen at the end, swampy species……,,,,,…*Habenaria holubii*
91	Poaceae

KEY ELEVEN

Key-milk herbs

fro the main key @ 6

1	Inflorescence a capitulum……*Sonchus schweinfurthii/Crepis/Lactuca*……24
	Inflorescence different……2
2	Plants Spinny succulents……*Euphorbiaceae*……3
	Plants not spinny……4
3	Leaves entire……*Euphorbia schimperiana*
	Leaves finely toothed……*Euphorbia brevicomu*
4	Leaves opposite……5
	Leaves alternate/rosette……9
5	plant herb Climber/trail toothed leaves…*Canarina abyssinica…/eminii too*…… 29
	Plant suffrutescents….Apocynaceae…… 6
6	Flowers with brown stripes fairly woody climber……*Pentarrhinum golonoides*
	Flowers without brown stripes……7
7	Plants procumbent……*Vinca major*
	Plants prostrate……8
8	Inflorescence…terminal orange-pink flowers……*Margaretta rosea*
	Inflorescence axillary umbelsPachycarpus lineolatus./Gomphocarpus……27
9	Leaves entire……15
	Leaves serrate……10
10	Plants mat-forming with leafless stolons rosette/actinomorphic ……*Wahlenbergia pusila*
	Plants different character combination……11
11	Plants creeping with hairy stem leaf margins thickened……*Wahlenbergia scottii*
	Plants different……12
12	Capsules ten veined wavy leaves……*Wahlenbergia erecta*
	Capsuless not ten veined……13
13	Herbs procumbent cylindrical capsule……*Wahlenbergia silenoides*
	Herbs different……14
14	Capsule five veined decumbent……*Wahlenbergia hirsuta*
	Capsule different……*Wahlenbergia napiformis*
15	Yellowish hairs present……*Ipomoea whightii*
	Yellowish hairs absent……*Ipomoea* sp
16	Stigmas short and surrounded by a ring of hairs anthers fused around style……17
	Stigmas long without hairs……18
17	Inflorescence a raceme……20
	Inflorescence scattered,……21
18	Inflorescence a corymb……*Wahlenbergia capillacea*
	Inflorescence a raceme……24
19	Herbs trailing……*Wahlenberbia krebsii*
	Herbs erect……*Wahlenbergia lobelioides*
20	Plants are ascending /erect……22
	Plants mat-forming and creeping……*Lobelia minutula*
21	Plant a rooting perennial and trailing……*Lobelia Cherenganensis*
	Plants a rhizomatous herb……*Lobelia duriprati*

22	Plants rooting at nodes…………………………………………..…..…*Lobelia inconspicua*
	Plants not rooting at nodes………………………………………………………….……………23
23	Flowers blue………………………………………………….……………*Lobelia neumannii*
	Flowers not blue……………………………………………….…………….……*Lobelia holstii*
24	Leaves in basal rosette…………*Crepis*…………………………….………..…………..…25
	Leaves along stem…………*Sonchus. /Lactuca*…….…………………………,………………26
25	Corymbs grey-green……………………………………………………….…*Crepis rueppellii*
	Corymbs green whitish…………………………………………………….…*Crepis carbonaria*
26	Leaves entire…………………………………………………….…………*Lactuca inermis*
	Leaves serrate……………………………………………………………….……………28
27	Leaves lobed……………………………………….…………………….….*Sonchus aspera*
	Leaves not lobed……………………………………..………..…….*Sonchus schweinfurthii*
28	Fruit covered in purple bristles…………………………………….…*Gomphocarpus fruitcosus*
	Fruit not covered in bristles…………………………………..….…*Pachycarpus lineolatus*
	.
29	

KEY TWELVE

Herbs with simple opposite and serrated leaves

From root key @ (26)-

1	Nodes present……………………………*Acanthaceae...Mimulopsis alpina/M.solmsii*………20
	Nodes absent………………………………………………………………………………….2
2	Capitulum on enlarged receptacle…………………………………………….…Asteraceae.key 13
	Capitulum not on enlarged receptacle or inflorescence not capitulum………………………….3
3	Petiole with spur…………………Balsaminaceae………………………………………….24
	Petiole without spur……………………………………………………………..…………4
4	Flowers actinomorphic…………………………Verbenaceae/Onagraceae…………………..…5
	Flowers zygomorphic…………...………..Scrophloriaceae, Lamiaceae……….………………..…6
5	Young stems squarish…Verbenaceae/Melastomataceae………………………..…..……………26
	Young stem more or less circular………... Onagraceae……………………….……………..….21
6	Petiole broadened, aromatic when crushed, petal 2 lipped………………………….…Lamiaceae..36
	Petiole not broadened, not aromatic, petal not 2 lipped……………….Scrophulariaceae……......7
7	Plants with a basal rosette of leaves……………………...…*Craterostigma species*……………8
	Plants without basal rosette of leaves……………………………………………………,,,,…….9
8	Petals bilobed 2up and 3 down………………………………………………………….……10
	Petals not bilobed 2up and 3 down but with 5 spreading…………………*Hedbergia abyssinica*
9	Flowers white, roots yellow………………………………………….…*Craterostigma hirsutum*
	Flowers mauve blue roots, not yellow...……11
10	Leaves dark green, roots are orange or red…….……………………..…..*Craterostigma pumilum*
	Leaves not dark green, roots red……………………..…………. *Craterostigma plantagineum*
11	Flowers solitary……….……………………………..……….……*Cycnium herzfeldianum*
	Flower aggregated………………………………..……………….…….………..….18
12	Leaves sessile…………*Veronica anagallis-aquatica.* /Buchner…………………...…………13
	Leaves peltate…………………………………………………………..……….........….14
13	Flowers bright crimson………………………………………………………*Striga asiatica*
	Flowers different……………………….……………..………..….…….,,……..…15
14	Leaves ovate, Flowers blue, plants prostrate……………………………..……*Veronica abyssinica*
	Leaves not ovate with different character state combinations……………………..……………16
15	Plants semi-parasitic……………..…………………...………………*Alletra sessiliflora*
	Plants not semi- parasitic…………………………………………….……..……..…17
16	Leaves linear, flowers purple or pink……………………………………..……*Solutia racemosa*
	Leaves laminate, flowers different…………………………………………….……………18
17	Stem with 2 lines of glandular hairs…………….…………………..………*Veronica glandulosa*

	Stem with hairs scattered …… *Buchner scabridula*
18	Flowers mauve…… *Buchner nuttii*
	Flowers blue…… *Veronica anagallis-aquatica*
19	Petals mauve with yellow guidelines & an orange patch on the lower side…. *Mimulopsis alpina*
	Petals pale blue to yellowish with purple guidelines…… *Mimulopsis solmsii*
20	Petals yellowLudwigia……22
	Petals pink purple…… *Epilobium*……23
21	Capsule bumby…… *Lindernia abyssinica*
	Capsule smooth…… *Lindernia jussiaeoides*
22	Stem densely hairy…… *Epilobium hirsutum*
	Stem with minute hairs or hairless……24
23	Leaves wedge shaped…… *Epilobium salignum*
	Leaves rounded…… *Epilobium stereophyllum*
24	Plants hairless…… *Impatiens hochsteterii*
	Plants hairy……26
25	Flowers mauve stem with reddish hairs…… *Impatiens irvingii*
	Flowers pink, white. Leaves ovate-elliptic…… *Impatiens pseudoviola*
26	Basal leaf veins tending to apex…… Melastomataceae……32
	Basal leaf veins not tending ti apex…… *Verbanaceae*……27
27	Stem prickly…… *Verbena bonariensis*
	Stem not prickly……28
28	Leaves sandpapery…… *Lantana and lippia*……29
	Leaves smooth…… 3
29	Leaves serrated…… *Verbena oficinalis*
	Laves entire……30
30	Stem with hooks…… *Clerodendrum johnstonii*
	Stem without hooks…… *Clerodendrum myricoides*
31	Herb from woody rootstock…… *lippia woodii*
	Erect shrublike…… *Lippia kituiensis*
32	Inflorescence in cymes……33
	Inflorescence different……34
33	Flowers pink…… *Antherotoma naudinii*
	Flowers purple…… *Dissotis senegambiensis*
34	Inflorescence paniculate…… *Dssotis canescens*
	Inflorescence of solitary flowers…… *Dissotis speciosa*
35	Bad smell and bitter taste…… *Valeriana volkensii*
	Bad smell and bitter taste absent…… *Verbena officinalis*
36	Plants with basal rosette of leaves…… *Ajuga integrifolia*
	Plants with leaves along the stem……37
37	Plants prostrate with bracts of violet glands…… *Aeollanthus repens*
	Plants erect or decumbent……38
38	Corolla tube with 2 bends……Plectranthus……44
	Corolla tube without 2 bends ……39
39	Stamens held in rolled lower petiole lip…… *Orthosiphon thymiflorus*
	Stamens not held in rolled lower petiole lip ……40
40	Leaves lobed ……Salvia……41
	Leaves not lobed……43
41	Flowers bright red one lobed at the base…… *Salvia coccinea*
	Flowers different……42
42	Leaves oblong…… *Salvia merjamie*
	Leaves ovate…… *Salvia nilotica*
43	Sepals spinny……49
	Sepals not spinny……46
44	Plants decumbent,Flowers purple blue in spikes…… *Plectranthus neochillus*
	Plants erect……45

45	Flowers bright blue with dark bases	*Plectranthus punctatus*
	Flowers purple riverine species	*Plectranthus luteus*
46	Petals white	47
	Petals not white	50
47	Short hairs present	54
	Short hairs absent	48
48	Herb with many prostrate decumbent stems	*Leucas masaiensis*
	Herb with single stem	55
49	Flowers white	*Leucas matinicensis*
	Flowers different	60
50	Sepal tube 10 ribbed	*Leucas glabrata*
	Sepal tube not 10 ribbed	51
51	Hairs cream	*Leucas argentea*
	Hairs not cream or absent	52
52	Leaves elliptic to lanceolate with transparent bracts	*Leucas bracteosus*
	Leaves different	53
53	Leaves oblong	*Leucas oligocephala*
	Leaves ovate	59
54	Hairs glandular	*Scutellaria violescens*
	Hairs not glandular	*Scutellaria scweinfurthii*
55	Flowers with white leaf like bracts	*Platostoma rotundifolium*
	Flowers without white leaf like bracts	56
56	Leaves trianular	*Ocimum lamiilifilium*
	Leaves not triangular	57
57	Flowers pale pink	*Ocimum decumbens*
	Flowers purple	58
58	Leaves peltate	*Clinopodium abyssinica*
	Leaves sessile	*Clinopodium simense*

KEY THIRTEEN

Asteraceae with simple opposite & serrate leaves without stipules.

1	Leaves lobed (Bidens except for *B.biternata*)	10
	Leaves not lobed	2
2	Leaves sessile	9
	Leaves peltate	3
3	Plants prostrate	*Bidens biternata*
	Plants erect	4
4	Flowers mauve or white	*Ageratum conzoides*
	Flowers different	5
5	Plants decumbent (*Melanthera pungens./G.jacksonii*.)	6
	Plants erect	7
6	Leaves glossy, weakly toothed	*Guizotia jacksonii*
	Leaves not glossy leaves well toothed	*Melanthera pungens*
7	Leaves triangular, flowers white cream or pale yellow	*Ageratina adenophora*
	Leaves and flowers different	8
8	Leaves narrow oblong-lanceolate	*Guizotia scabra*
	Leaves different	10
9	Upper leaves lobed at base	*Bidens ternata*
	Upper leaves not lobed at base	*Acmella caulirhiza*
10	Flowers in cymes	*Bidens grantii*
	Flowers in corymbs	*Bidens flagellata*

KEY FOURTEEN

Woody herbs

1	Leaves spinny and succulent…Aloes, Euphorbia engleri	2
	Laves not spinny or succulent	3
2	Exudates white	*Euphorbia engleri*
	Exudates clear	*Aloe cheranganensis*
3	Leaves opposite….*Lamiaceae, Rubiaceae*	4
	Leaves alternate	5
4	Interpetiolar stipules present no aromatic smell….*Rubiaceae*	15
	Interpetiolar stipules absent aromatic smell usually presentLamiaceae, verbanaceae	14
5	Leaves parallel-veined	*Satyrium crassicaule*
	Leaves net veined	6
6	Star hairs present…….*Malvaceae, Tilliaceae*	7
	Star hairs absent……*Clutia. Gnidia kraussiana/Apiac*	8
7	Leaves 3 lobed and variable, stipules small and caducousTriumfetta brachyceras	16
	Leaves not 3 lobed stipules persistent Malvaceae	Go to main key @ 130
8	Leaves compound	10
	Leaves simple	9
9	White exudates	*Clutia abyssinica*
	White exudates absent, *Gnidia kraussiana/Acalypha stahlimanii*	13
10	Leaves sheathing with resin smell…*Apiaceae*	*Plectranthus barbatus*
	Leaves not sheathing with resin smell	11
11	Leaflets in 3 s…*Argyrolobium fischeri, Indingofera trita*	12
	Leaflets 9-12 white hairy beneath	*Tephrosia inturrupta*
12	Hairs white	6…*Indingofera trita*
	Hairs yellowish silky	*Argyrolobium fischeri*
13	Flowers in catkins	*Acalypha stuhlmanii*
	Flowers not in catkin	*Gnidia kraussiana*
14	Strong mint smell from crushed fresh leaves	*Plectranthus barbatus*
	Strong mint smell absent from crushed leaves	*Clerodendron myricoides*
15	Flowers creamish pink	*Pentas schimperiana*
	Flowers creamish white	*Pentas longiflora*

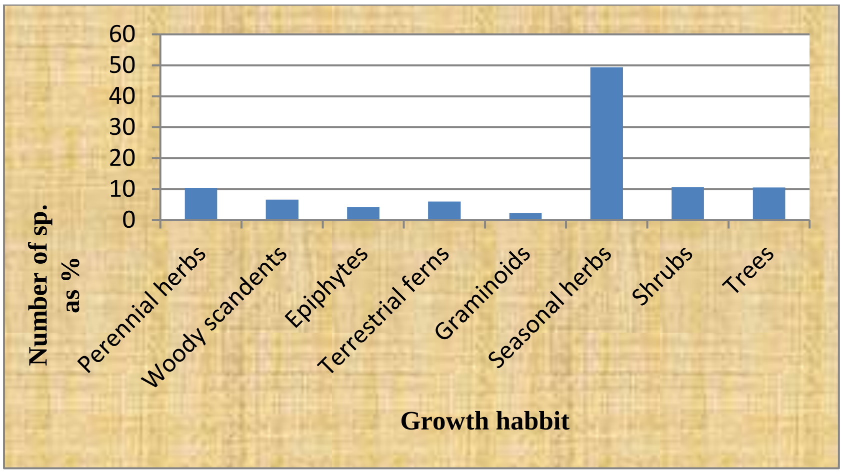

Figure 4.2: Species in blocks as a percentage of all species

4.1.8 Plant growth habits

Most species grow as seasonal herbs (49.4% of all plants) while Woody plants were 29% the rest being perennial epiphytes, graminoids and perennial herbs (Figure 4.6). Some seasonal herbs are epiphytic while others are not (Plate 4.4). Shrubs trees and perennial herbs were close at about 10.5% for each category. Several woody plants were notable (Plate 4.3).

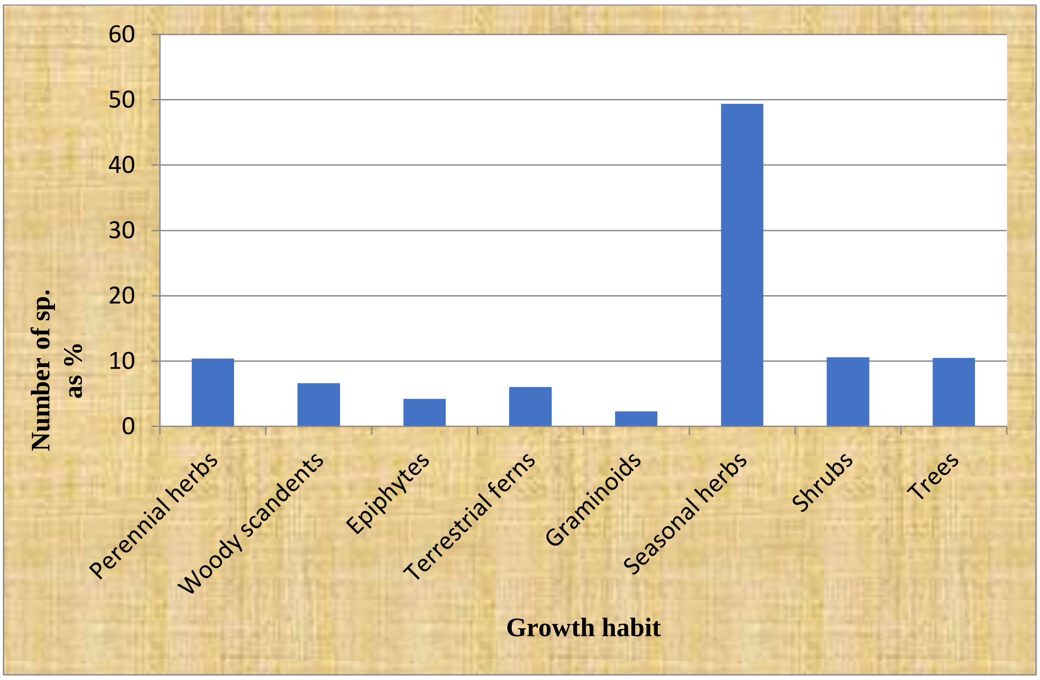

Figure 4.3: Number of species per growth habit as a percentage of total counts in Cherangani forest

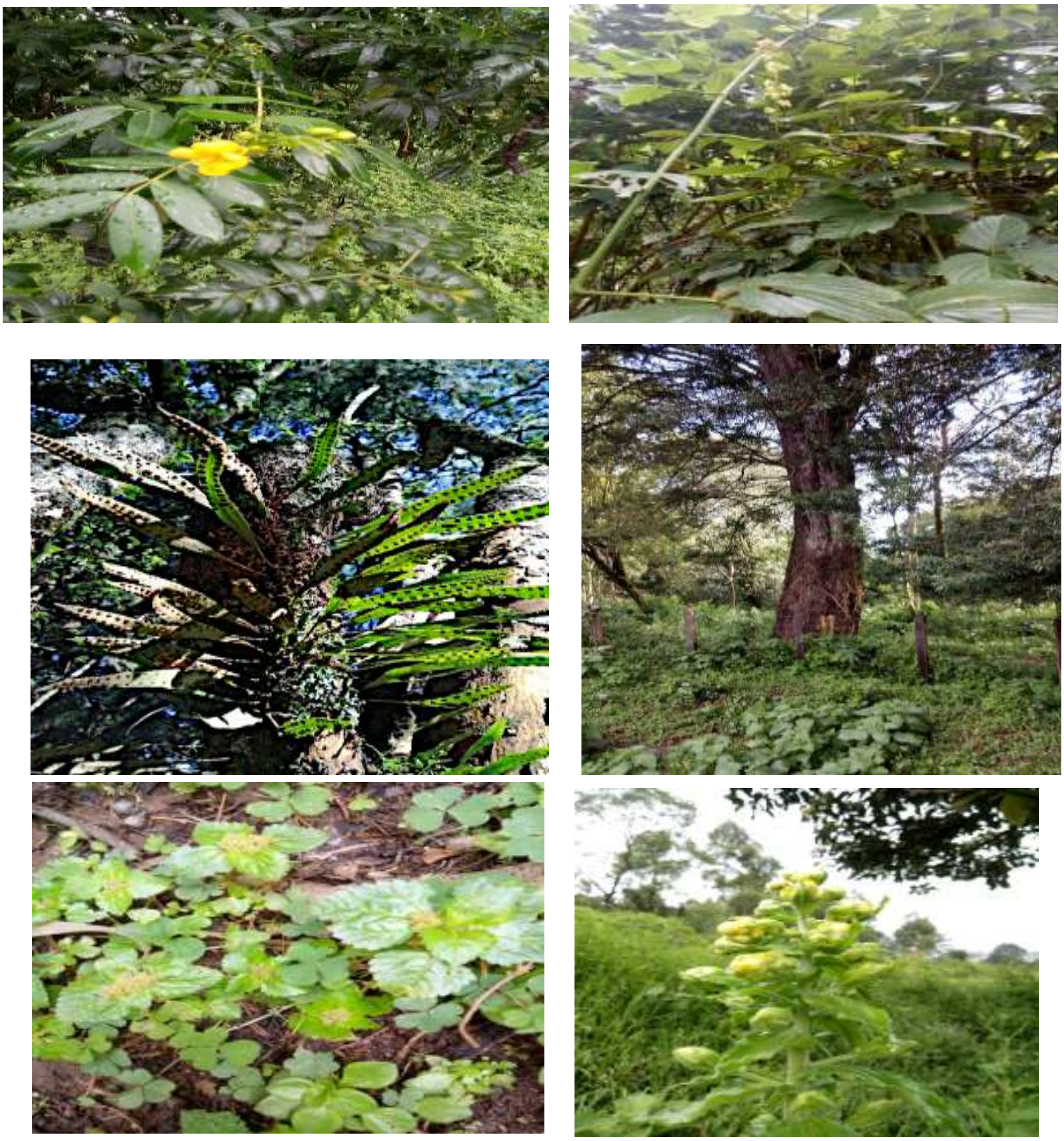

Plate 4.5: Various growth habits of species encountered (clockwise) : *Senna septemtrionalis,* (Shrub) *Gouania longispicata* (Climbers) *Afrocarpus gracillior* (Trees) , *Verbascum brevipedicellatum Lepisorus excavatus*, *Pilea tetraphylla*.

4.1.9 Plant growth habits in Forest blocks

Kipteber block had species in all the eight growth habits (Terrestrial ferns put under herbs) while Toropket has the least number of species per growth habit. The number of tree species ranged from 15 to 31 with exception of Kipteber that had 85 tree species (Fig 4.4). Among the Epiphytes several were orchids and ferns.

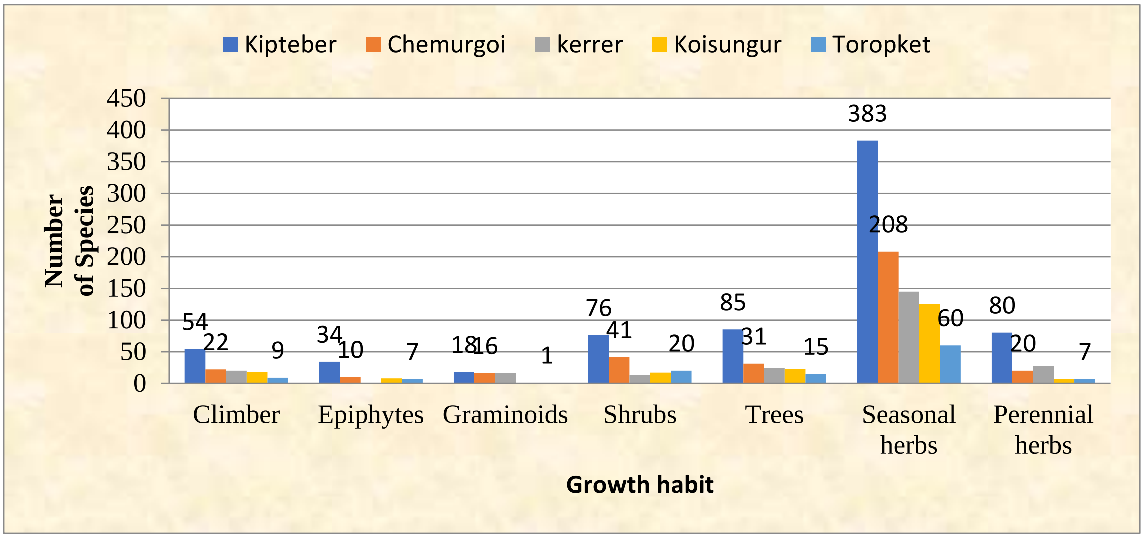

Figure 4.4: Number of species per growth habit in each block

4.1.10 Plantation and other introduced species

Twenty-two species have been deliberately introduced in the Cherangani ecosystem either for commercial purposes or ornamental value. Some of the species are indigenous to Kenya but not the Cherangani ecosystem (Table 4.6).

Table 4.6: Deliberately introduced species in the forest

	Species	Purpose
1	*Pinus radiata* D.Don.	Commercial
2	*Pinus patula* Schiede ex Schidtl. &Cham.	Commercial
3	*Pinus species*	Commercial
4	*Arundo donax* L.	ornamental
5	*Cupressus lustanica* Mill.	Commercial
6	*Acrocarpus fraxinifolius* Am	Ornamental
7	*Eucalyptus species*	Commercial
8	*Fuchsia regia* (Vell). Munz	Ornamental
9	*Melaleuca viminalis* Sol ex. (Gaerth) Bymes	Ornamental
10	*Lophostemon confertus* (R.Br.) Peter G.Wilson	Ornamental
11	*Vinca major* L.	Ornamental

12	*Petunia species*	Ornamental
13	*Fraxinus pennyslivanica* Marshall	Commercial
14	*Markhamia lutea* (Benth K) Schum.	Ornamental
15	*Spathodea campanulata* P.Beauv.	Ornamental
16	*Tecomaria capensis* (Thunb) Lindl	Ornamental
17	*Duranta variegata* L.	Ornamental
18	*Casuarina equisetifolia* L.	Ornamental
19	*Cuphea micropetala* Kunth.	Ornamental
20	*Warburgia ugandensis* Sprague	Ornamental
21	*Harungana madagascariensis* Lam. ex Poir	Ornamental
22	*Camelia sinensis* (L.) Kuntze	Commercial

4.1.11 Biogeography of species

Species associated with disturbed habitats (429 species) and wooded grasslands (363 species.) were the highest in all blocks. This was followed by moist montane species (362 species). Kipteber had twenty species deliberately introduced (local or alien) while Koisungur had one. Other blocks have no deliberately introduced species (Table 4.7).

Table 4.7: Species per biogeographical affinities in each forest block

	Kipteber	Chemurgoi	Kerrer	Koisungur	Toropket
Alpine	21	8	12	7	3
Disturbed forest	180	81	65	64	39
Dry forest	47	29	14	14	10
Forest edge	48	36	17	15	9
Planted	20	0	0	1	0
Wetland	128	40	36	28	12
Wooded grassland	178	95	50	28	12
Moist forest	161	95	40	46	20

4.1.12 Threatened plant species

Thirty-three species are recognized by the IUCN (2021) as threatened (Most of the threatened species are found in Asteraceae and Campanulaceae families (Appendix 4).

4.1.13 Threatened woody plants in Cherangani

Four woody plant species are listed as threatened with only *Osyris lanceolata* listed by IUCN as endangered species (Table 4.8)

Table 4.8: List of Threatened woody plant species

Species	Trade name	IUCN conservation status	Remarks
Olea europea ssp	African Olive	Vulnerable	Endangered in the East African region because of its beautiful wood and medicinal properties.
Polyscias kikuyuensis Summerh	Parasol tree	Vulnerable	The tree is endemic to Kenya but is threatened by habitat loss and overexploitation for timber and medicine.
Prunus africana (Hook.f.) Kalkman	Red stinkwood	Vulnerable	Its heavy timber is prized, straight grained and strong. However, its overexploited medicinal properties as its bark & leaves. The species is protected under Appendix II of CITES.
Osyris lanceolata Hochst. ex A.Rich..	East African sandalwood	Endangered	Overexploited for oil that is valuable in pharmaceutical and cosmetic industry. As such, it is illegal to cut, uproot or export sandalwood

4.1.14 Block specific species

In the five forest blocks assessed, some species appeared in only one of the blocks. The species exhibited local rarity by appearing only in one site of the forest. With exception of Toropket, all blocks possessed one or several species that were specific to them.

Most of these rare species were in Kipteber (Table 4.8). For instance, *Pittosporum lanatum* in Chemurgoi and *Galiniera saxifraga* (Hochst.) Bridson

in Kipteber. *Euphorbia obovalifolia* A. Rich, *Umbilicus botryoides* Hochst. ex A. Rich (Kipteber) and *Pinus radiata* D.Don. (Koisungur) were notable examples (Plate 4.7 & 4.9).

Table 4.9: Block specific species

Forest block	Species
Kipteber	*Calceolaria tripartita* Ruiz & Pav
	Pouteria adolfi-friedericii (Engl.) A.Meeuse
	Galiniera saxifraga (Hochst.) Bridson
	Camelia sinensis (L.) Kuntze
	Cupressus lustanica Mill.
	Euphorbia obovalifolia A. Rich.
	Umbilicus botryoides Hochst. ex A. Rich
Kerrer	*Haplocarpha ruepelli* (Sch.Bip.) Beauverd
	Arceuthobium juniper-procerae Chiov.
	Helychrysum meyeri johanis Engl.
Koisungur	*Cornus volkensii* Harms) Hutch
	Pinus radiata D.Don
Toropket	None
Chemurgoi	*Pittosporum lanatum* Hutch & Bruce
	Peperomia tetraphylla (Forsk.)

A

B

C

D

E

F

G

Plate 4.6: Block specific species

Plate 4.10: (A) *Umbilicus botryoides*, (B) *Peperomia tetraphylla***,** (C) *Pinus radiata* in Koisungur (D) *Euphorbia obovalifolia* A.Rich near Tenden (E) *Cuscuta kilimanjari* (F) *Alletra sessiliflora* in Kipteber (G) Craterostigma pumilum in Kerrer

4.1.15 Species protected under CITES

Thirty-five species of vascular plants identified were found to be protected under CITES regulations. The orchids are predominantly terrestrial herbs with few epiphytes (Table 4.10). Apart from *Prunus africana* (Rosaaceae), *Aloe cheranganiensis* (Xanthohoeaceae) and *Osyris lanceolata* (Santalaceae), the rest were in Orchidaceae.

Table 4.10: Species protected under cites regulations

Families	Species	Growth habit
Orchidaceae	*Angraecum humile* Summerh.	Epiphyte
	Bulbophyllum josephii (Kuntze) Summerh.	Epiphyte
	Cyrtorchis arcuata (Lindley) Schltr	Epiphyte
	Diaphananthe rohrii (Reichb.f.) Summerh.	Epiphyte
	Disa acontoides Sond	Terrestrial herb
	Disa erubescens Rendle	Terrestrial herb
	Disa fragrans Schiltr	Terrestrial herb
	Disa stairsii Kraenzl.	Terrestrial herb
	Disperis antheceros Rendle.	Terrestrial herb
	Disperis dicerochila Summerh.	Terrestrial herb
	Disperis nemorosa Rendle	Terrestrial herb
	Disperis pusila Verdc.	Terrestrial herb
	Disperis reichenbachiana Rechb.f	Terrestrial herb
	Epipactis africana Rendle	Terrestrial herb
	Habenaria cavatibrachia Summerh.	Terrestrial herb
	Habenaria cirrhata Lindley (Reichb).f.	Terrestrial herb
	Habenaria holubii Rolfe	Terrestrial herb
	Habenaria humilior Reichb.f.	Terrestrial herb
	Habenaria petitiana A.Rich. Dur.&Schinz	Terrestrial herb
	Habenaria schimperiana A.Rich.	Terrestrial herb

	Habenaria vaginata A.Rich.	Terrestrial herb
	Habenaria walleri Reichb.f.	Terrestrial herb
	Holothrix pentadactyla (Summerh.)Summerh	Terrestrial herb
	Platycoryne crocea (Reichb f.) Rolfe	Terrestrial herb
	Polystachya steudneri Reichb.f.	Epiphyte
	Roeperocharis bennettiana Reech	Terrestrial herb
	Satyrium carsonii Rolfe	Terrestrial herb
	Satyrium coriophoides (A.Rich)D.D	Terrestrial herb
	Satyrium fimbriatum Summerh.	Terrestrial herb
	Satyrium robustum Schltr.	Terrestrial herb
	Satyrium schimperiana A.Rich	Terrestrial herb
	Tridactyle scottellii (rendlee) Schltr.	Epiphyte
Rosaceae	*Prunus africana* (Hook.f.) Kalkm	Terrestrial herb
Santalaceae	*Osyris lanceolata* Hochst. & Steudel	Wood epiphyte
Xanthohoeaceae	*Aloe cheranganiensis S.*Carter & Brandham	Perennial suffrutescent

4.1.16 Endemic plant species

From the list of Endemic plant species in Kenya, ten plant species were recorded as occurring in Cherangani forest mostly from the family *Asteraceae* as shown in Table 4.10.

Table 4.11: List of Kenya Endemic plant species in Cherangani forest.

Family	Species	Growth Habit
		West Mount Kenya -
Moraceae	*Dorstenia afromontana* R.E. Fr.	Perennial Herb
Boraginaceae	*Cynoglossum cheranganiense* Verdc.	Annual Herb
		Marakwet /Karamoja-
Orobanchaceae	*Buchnera scabridula* E.A. Bruce	Annual herb
Acanthaceae	*Justicia leikpiensis* S. Moore	Annual Herb
Asteraceae	*Senecio hedbergii* C. Jeffrey	Shrub
Asteraceae	*Senecio plantagineoides* C. Jeffrey	k3 & k5 Herb
Asteraceae	*Senecio snowdenii* Hutch	Shrub
Asteraceae	*Carduus schimperi* Sch. Bip.	Herb
Asteraceae	*Dendrosenecio cheranganiensis* (Cotton & Blakelock) E.B.Knox subsp. *cheranganiensis*	

4.2 Forest structure

The forest vertical structures are generalized into 14 categories with native softwoods occupying almost all blocks (Appendix IV). Key reference points used to undertake supervised classification of the study area are shown in Table 4.12.

Table 4.12: Main vertical forest structures and sample reference points

Plot No	Block	GPS Coordinates	Altitude (M) a.s.l	Physiognomic description	Canopy height (M)
20	Chemurgoi	1.01337335.3804	2539.78	*Hagenia-Dombeya-Maesa-Pittosporum*	*Hagenia-Dombeya*-30 *Pittos*-20
31	Chemurgoi	0.97834435.41767	2727.52	*Olea hochsteteri-Maytenus*	*Olea*-30 *Mytenus*-20

32	kerrer	1.14977235.42217	2826.09	*Olea-Podacarpus-Juniperus-Nuxia*	*Olea-Podo*-35 *Junip*-35*Nuxia-25*
43	kerrer	1.1489635.42661	2901.22	*Glade*	*Mixed grasses & rushes*
2	Kipteber	1.11233 35.23636	2109.85	*Prunus-Pouteria*	*Prunus/Pout*-35
3	Kipteber	1.03932735.3318	2260.06	*Syzygium-Cestrum-Makaranga*	*Syzy*-30 *Makar*-40.*Cestr*-35
5	Kipteber	1.04966 35.32653	2273.59	*Euphorbia-Syzygium-Nuxia-Cestrum*	*Euph*-35
9	Kipteber	1.04507835.32513	2305.08	*Tea plantation Camelia sinensis*	*Camelia*-1
15	Kipteber	1.08953335.33785	2442.04	*Podocarpus-Syzygium-Hagenia*	*All species*-35
17	Kip-teber	1.09916235.33701	2494.59	*Olinia-Makaranga-Nuxia*	*Olinia*-30, *Makar*-40
6	Kipteber	1.04966335.32656	2276.46	*Euphorbia-Syzygium-Nuxia-Cestrum*	
8	Kip-teber	1.04702235.32582	2298.1	*Cypress plantation*	
48	Kois-ungur	1.10385835.42306	2925.45	*Pinus radiata*	
49	Kois-ungur	1.03971 35.42728	2942.85	*Hagenia-Rapanea-Juniperus*	
24	Toro-opket	1.00498235.42662	2676.11	*Podocarpus dominated*	
17	Tor-opket	1.00575735.42696	2686.44	*Podocarpus-Olea-Hagenia*	*Podo/Olea*-30 *Hagenia-35*
40	Kerrer	1.03760335.4244	2896.26	*Juniperus dominated*	40

4.2.1 Distribution of forest structure

The supervised classification map is shown in Figure 4.5. The composition of respective forest structures is presented in Fig 4.6. Most of the forest is dominated by Podocarps, junipers and *Hagenia* accounting for over 80% of the total area of the forest. The indigenous softwoods are arguably the main and characteristic species of the forest. The glades, tea belt and plantations account for less than 4%. The rest which constitutes native hardwood species are about 15%.

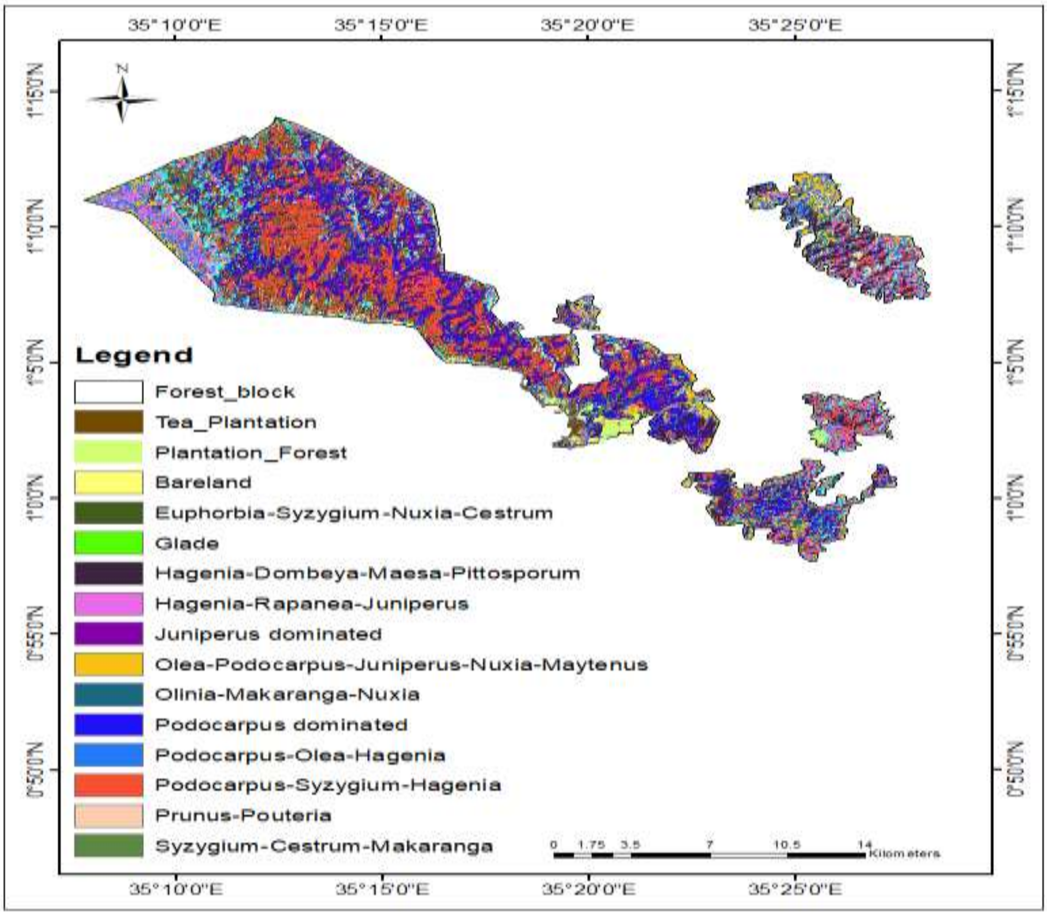

Figure 4.5 : Map of vertical forest structure distribution of Cherangani forest station (Author, 2020).

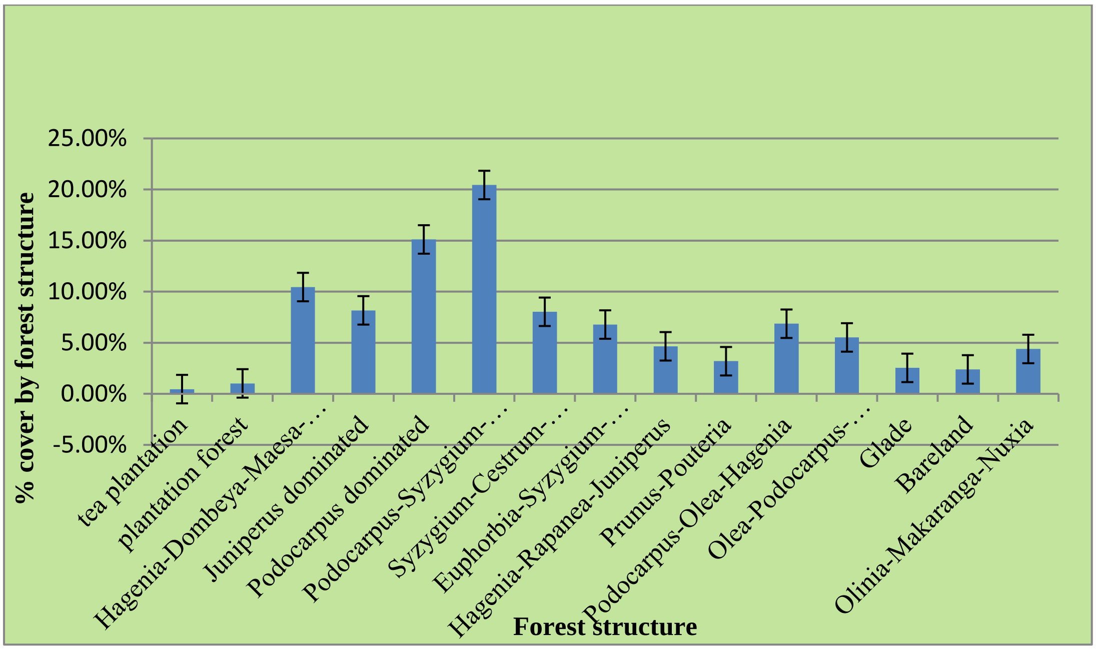

Figure 4.6: Distribution of forest physiognomies as % in Cherangani forest

4.2.2 Common Forest structures

Some of the common forest structures are as shown in Plate 4.7 to 4.9.

Plate 4.7: Kipteber glade adjacent to three storey forests. Source: Author, 2020

Upper canopy *Makaranga kilimandscharica* and *Hagenia abyssinica*. Middle storey of *Afrocarpus gracillior* and lower storey of mixed herbs shrubs and saplings

Plate 4.8: Mature scattered *Juniperus procera* in Kerrer
Source: Author, 2020

Plate 4.9: Giant Juniperus procera (E.A. Pencil cedar (with Afrocarpus middle storey in Chamgaa area. Source: Author, 2020

4.2.3 Characteristic species on the forest floor and open spaces

Most areas in the forest are dominated by *Plectranthus kamerunensis* and *Hypoestis* species. with exception of Kerrer that features *Haplocarpha* and *Lobelia* species (Table 4.13).

Table 4.13: Common species on the forest floor and open spaces

Block	Species
Kipteber	*Plectranthus kamerunensis*
	Hypoestis forskaolii
Chemurgoi	*Plectranthus kamerunensis*
Koisungur	*Hypoestis* species.
Kerrer	*Lobelia arberdarica, Haplocarpha ruepellii*
Toropket	*Pteris cretica*, Hypoestis forskaolii

Plate 4.10: *Pteris cretica*, *Plectranthus kamerunensis* and *Lobelia arberdarica*

Source: Author, 2020)

4.2.4 Plant species density

By density, Kerrer has the highest at 110.2 species/km^2 while Kipteber had the lowest species density at 5.8 species/km^2 (Figure 4.7)

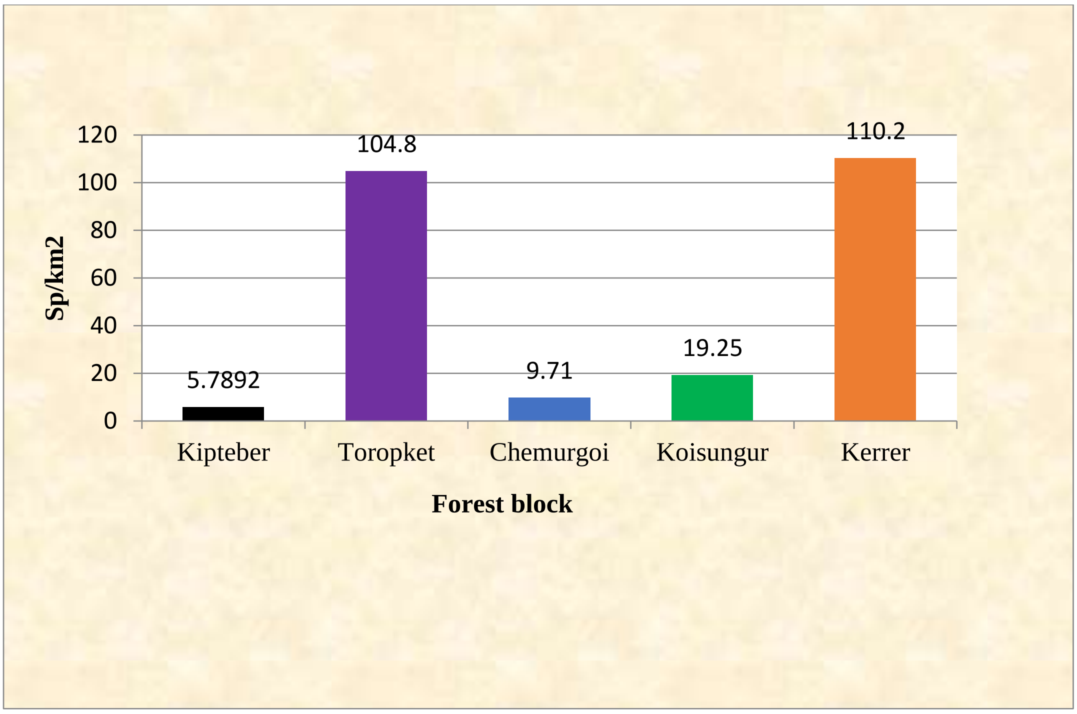

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Figure 4.7: Density of species (species/km^2) in each block

4.2.5. Diversity between forest blocks (Beta diversity)

Diversity between forest blocks was assessed in terms similarity of species present and absent.

4.2.5.1 Sorensen's Similarity Index

Sørensen's similarity index has been expressed as a percentage. The figures depicted similarity of species between two blocks or sites with numbers ranging from 0% for no similarity to 100% where all species in both blocks were the same. Koisungur and Kerrer had the highest level of *species* similarity (73. 97%). The least similarity is between Kipteber and Toropket (33.33%) (Table 4.14).

Table 4.14 : Sorensens's Similarity Index (SI) Matrix of blocks

	Kipteber	Chemurgoi	Kerrer	Koisungur	Toropket
Kipteber	**0**	61.90476	37.07865	35.67568	33.33333
Chemurgoi	61.90476	**0**	61.22449	57.14286	36.17021
Kerrer	37.07865	61.22449	**0**	73.9726	38.70968
Koisungur	35.67568	57.14286	73.9726	**0**	34.78261
Toropket	33.33333	54.83871	38.70968	34.78261	**0**

4.3 Ethnobotany of Cherangani forest

An assessment and documentation of economically important plants of Cherangani forest was carried out among the residents of the study area who included the Marakwets and in part the Pokots based on the selected respondents.

4.3.1 Key respondents

100 respondents comprising 67.0% males and 33.0% females filled the questionnaires (Appendix V). The majority were from Kapcherop and Tenden Villages. In terms of dialect, Marakwets constituted 67.0% of the respondents while Pokot were the least. 7.8 % of the respondents were aged between 30 and 40 years while those between 41-51 years comprised only 10%. Based on occupation 93% of the respondents were farmers while the students comprised only 2% (Fig. 4.8).

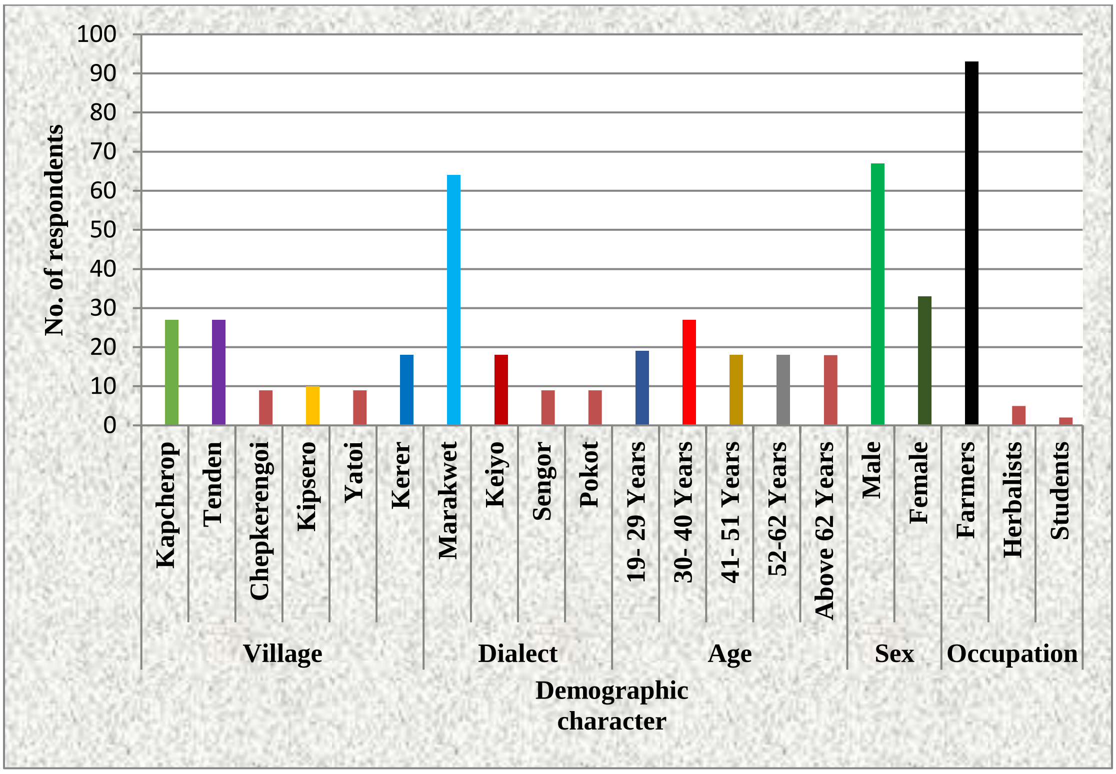

Figure 4.8: Demographic characteristics of Respondents

4.3.2 Economically important species

Forty-three species have been mentioned as having various uses among the community members. 29 Species have at least one medicinal value while other species are useful for timber, firewood, other cultural and ritualistic significance. In addition, some species like *Stephania abyssinica* (Dillon&A. Rich) Walp are known to cause health problems to livestock and humans (Appendix VI).

4.3.3 Benefits of the forest plant Species to the local people

Fuelwood was mentioned most by respondents (91) followed by medicine mentioned by 88 respondents. Only one person mentioned sand harvesting (Figure 4.9). Among the main uses.

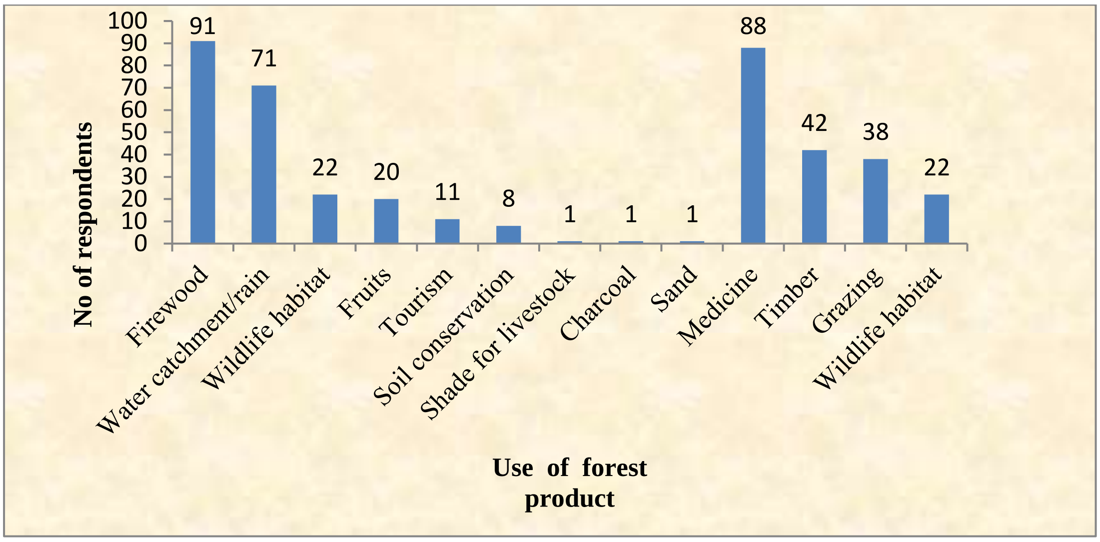

Figure 4.9: Breakdown of forest benefits by number of respondents

4.3.4 Major benefits derived from the forest per village

Tenden village was leading in number of respondents who mentioned medicine (27), fuelwood (21). While Kapcherop led in timber. The two villages tied on source of water at 15 respondents (Fig 4.10).

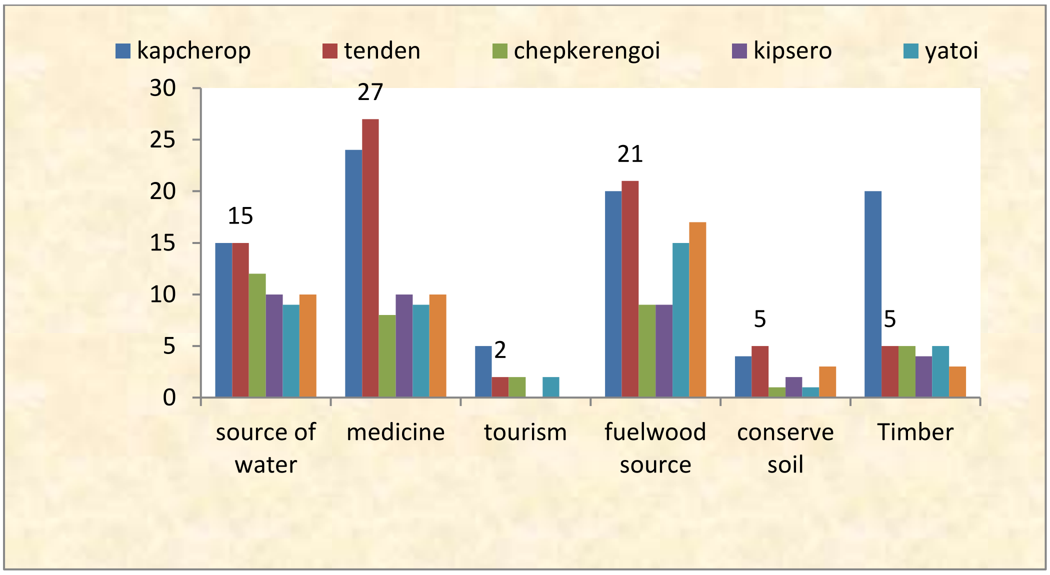

Figure 4.10: Comparison of major uses derived from the forest per Villages

A


B

Plate 4.11: A native Doctor displaying herbal medicinal products during a market day in Kapcherop (A). A debarked medicinal tree *Rapanea melanophloeos* (B).

4.3.5 Species use and Reported use values

Afrocarpus falcatus has the highest use and reported use value of one and five respectively. *Bambusa valgaris* had the least species use value and reported use value of 0.1 and 0.5 respectively (Figure 4.11).

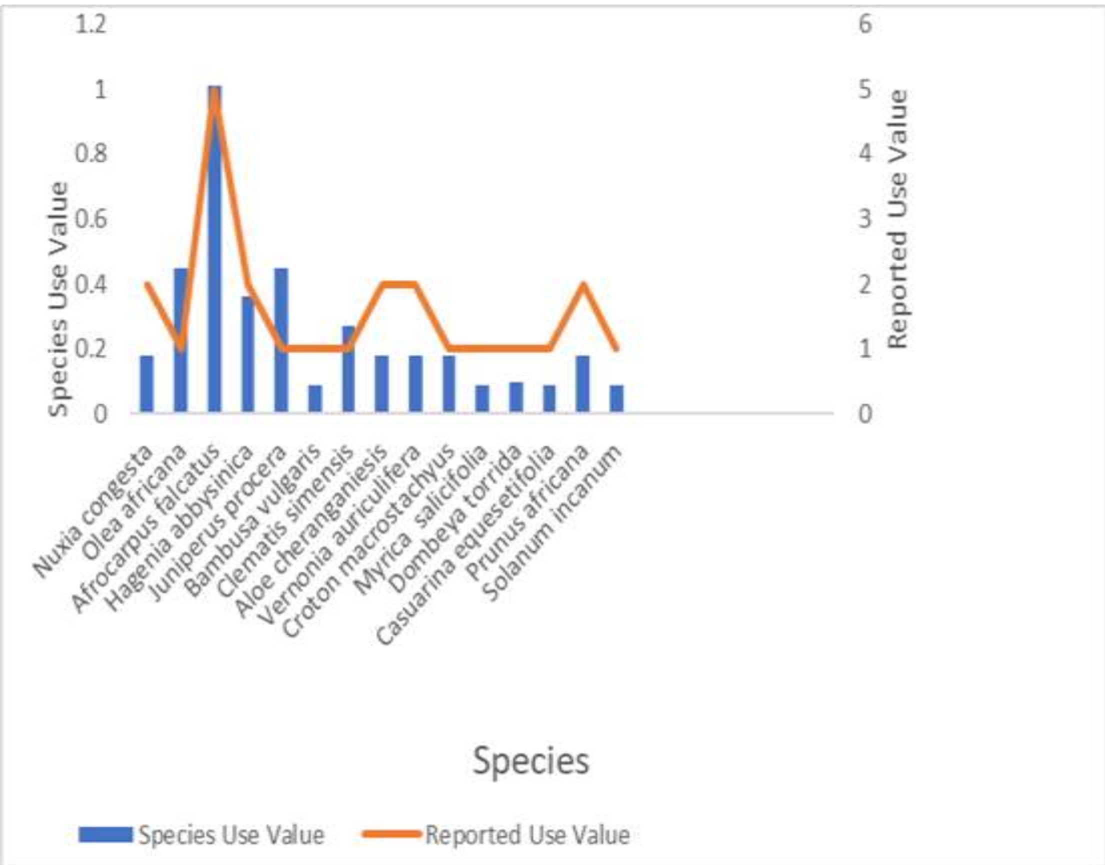

Figure 4.11: Species use and reported use value

4.3.6 Selected species with high informant factor

Twelve species. had an informant consensus factor of over 0.5 for various uses with *Dombeya torrida, Pittosporum lanatum* Hutch & Bruce, *Vernonia auriculifera, Afrocarpus gracillior, Saba comorensis, Podocarpus latifolius* recording ICF of between 0.9 and 1. On various uses values, *Solanum incanum, Faurea saligna* and O*lea africana* recorded above 0.5 but below 0.8 ICF. Most of these species have medicinal uses (Table 4.15).

Table 4.15: Species with highest informant consensus factor (ICF)

Species		Local name	Uses & consensus factor
1	*Solanum incanum*	Jemorkimnerkeny	Toothache7/18, chicken disease 9/18, stomach.
2	*Dombeya torrida*	Borowa	Ropes, soil conservation 11/18, timber, ulcers.
3	*Faurea saligna*	Maiyokwa/Sirite	Stimulant in tea 6/13 firewood, timber, posts.
4	*Olea africana*	Yemit	Firewood 27/47, stomach, posts
5	*Pittosporum lanatum*	Chemnosa	Anti-acid 9/10, malaria.
6	*Afrocarpus gracillior*	Benet	Timber, allergy, skin rushes 61/firewood, stomach.
7	*Podocarpus latifolius*	Serti/Sosaite	Raise water table 18/22, timber.
8	*Saba comorensis*	Ochon	Chest pain 2/2.
9	*Schefflera volkensii*	Tingwa/Tinwot	Allergy, head 14/16, stomach.
10	*Vangueria apiculata*	Komorwo	Fruits 20/20.
11	*Vernonia auriculifera* Hiern	Tobongwa	Malaria, predict rainfall 9/19.
12	*Yuashania alpina*	Tegaat	Raise water table 10/11.
13	*Clematis simensis*	Bisangwa	Headache 27/27.

4.4 Challenges affecting the survival of the forest

All respondents indicated that there were challenges that affected the survival of the forest which included majorly illegal logging (35 %) and charcoal burning (32%.) A

Few respondents mentioned that the forest was affected by forest fires (8%) from arsonists and encroachment (4%) and plant diseases (5%). (See Fig 4.12).

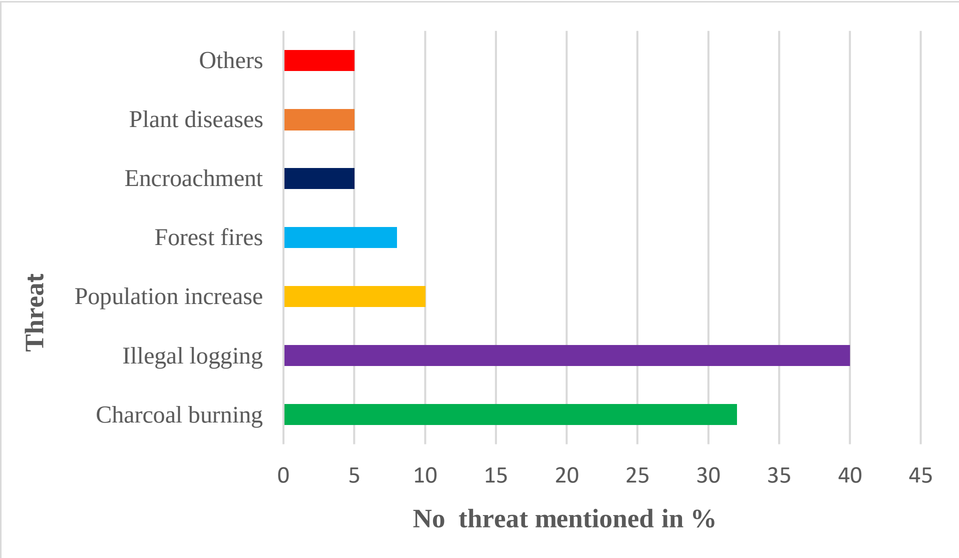

Figure 4.12: Challenges of forest management

(a) **(b)** **(c)**

Plate 4.12 (a) Impounded posts (b), concealed posts using ferns (c), local chief inspects timber poaching site in Kipteber forest

(Author, 2020)

A B

C

Plate 4.13: Further examples of indicators leading to deforestation in Cherangani forest including, illegal houses (A), fences (B) & (C).

Source: (Author, 2020)

4.4.1 Overexploited species

The tree species that received the highest number of mentions by respondents for being the most exploited included, *Afrocarpus falcatus (*35), *Hagenia abyssinica,* (20), *Olea africana* (15) and *Juniperus procera* (14) (Fig. 4.3).

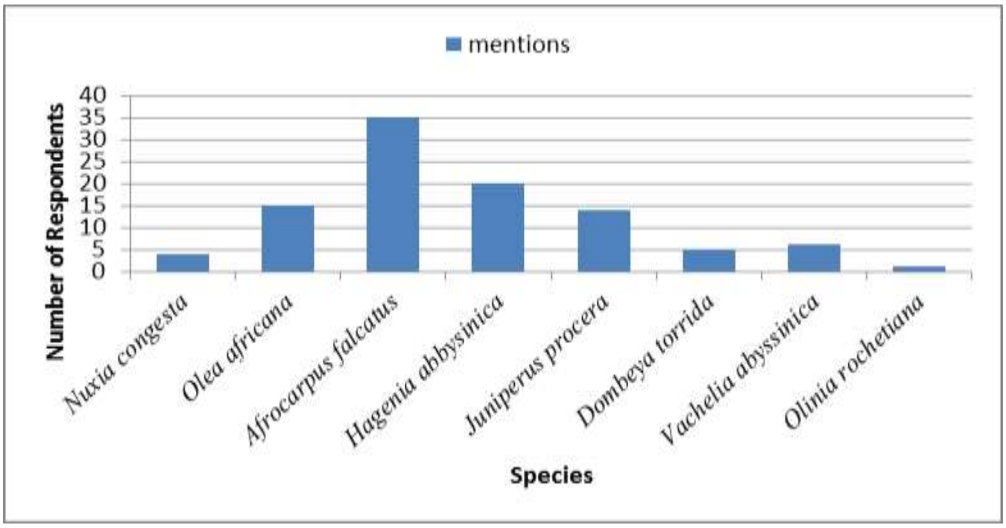

Fig 4.13: Most threatened tree species. Source: Author, 2020

Plate 4.14: *Afrocarpus gracillior* tree and fruiting branch of *Podocarpus latifolius* (Note different colours as the fruit matures).

Source: (Author, 2020)

4.4.2 Detrimental plant species in the forest and the effects associated with them

Most respondents thought poisoning of livestock and people together with displacement of other species were the main effects of invasive species (Table 4.16). The most detrimental plant in the forest is *Cestrum aurantiacum* that displaces other plants and is poisonous to livestock if ingested (Plate 4.14).

Table 4.16: List of detrimental plant species in the forest

Species	Effect reported	Mentions
Cestrum aurantiacum	Displace other species. Poisonous to livestock	35
Croton macrostachys	Displace other species	19
Datura stramonium	Poisonous to people and livestock, stains milk	6
Tirkaan (Not seen)	Bitter, wound animal throat	12
Cheptimoo (Not seen)	Cause livestock to swell if eaten in grass	14
Stephania abyssinica (Dillon&A.Rich) Walp	Suppress other plants	9
Prunus africana (Hook.f.) Kalkm	Poison livestock	6

Plate 4.15: Highly invasive *Cestrum aurantiacum*

Plate 4.16: *Stephania abyssinica* (Dillon & A.Rich) Walp in young cypress plantation (Source Author, 2020)

4.4.3 Efforts by the community to protect the forest.

Most of the respondents mentioned community forest associations (36 %) and use of informants 31% as the current efforts in salvaging the forest (Fig 4.14).

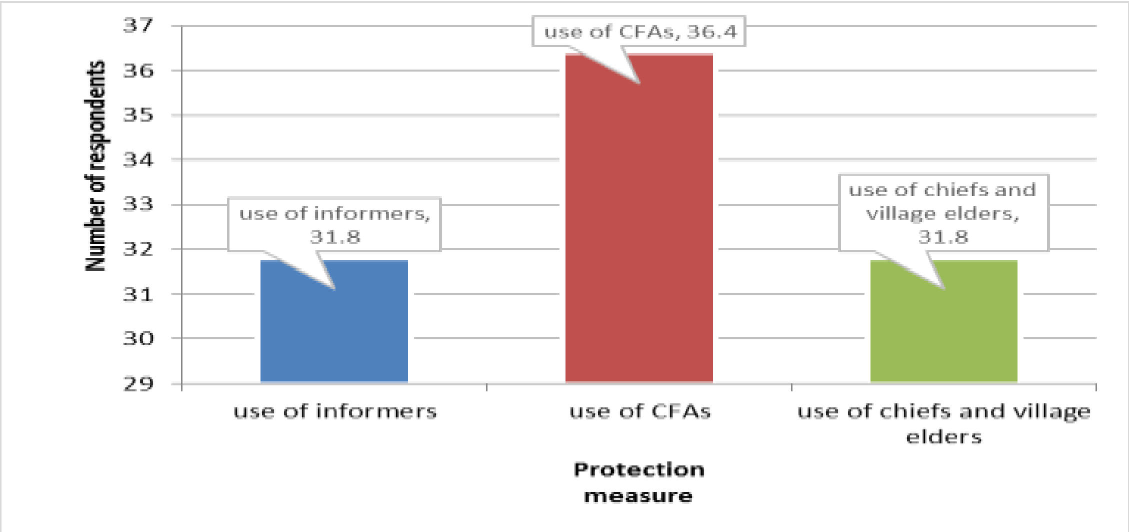

Figure 4.14: Current efforts by the community to protect the forest

4.4.4 Remedial measures for the forest degradation

Respondents stated that the best way to manage the forest was by providing basic education to the local community who reside around the forest (31 %), employing more rangers to arrest the culprits (26%), using chiefs and village elders to identify culprits (20.1%) as well as providing free tree seedlings (11.3%) to farmers to plant on their parcels of land to reduce dependency on the government forest resources (Figure 4.15; Plate 4.19, 4.20).

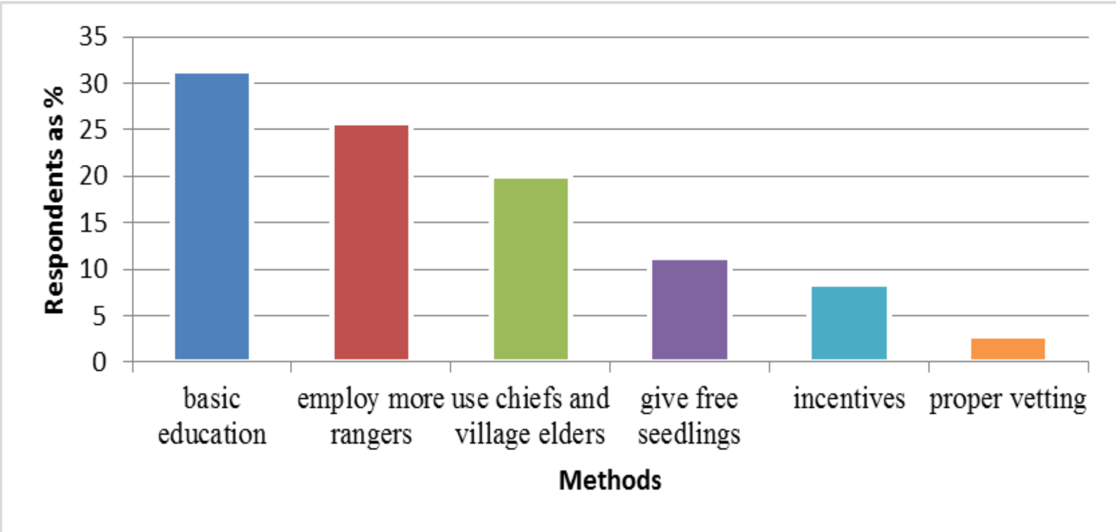

Figure 4.15: Methods recommended by the respondents on how to protect the forest

Plate 4.17: Forest ranger with the arrested culprit, (Author, 2020)

Plate 4.18: Locals attend sensitization meeting (Author, 2020**)**

Plate 4.19: Scouts assisting in putting off forest fire in Chamgaa forest

(Author, 2020)

Plate 4.20: Tea belt on the periphery of Kipteber forest - (Source - Author, 2020)

CHAPTER FIVE

DISCUSSION

5.1 Taxonomy and diversity of species

A summary of major plant groups depicted those Eudicots and monocot were the primary categories comprising 93.4% of all species. This is a common and obvious occurrence as it affected the composition of species in most major studies (Govaerts et al., 2021). The annotated checklist that was developed captured several details regarding species. For the first time now, it was possible to trace the 815 species to the exact forest blocks where they grew within the forest. This is crucial because, in the future, people interested in locating species on the checklist can narrow their searches to specific blocks.

One of the most remarkable findings of this study was the data on number and diversity of species. The record presented in this study is of species that accounts for the country's 12.3 % and 56.4% of all native plant species and families respectively. It is also clear that most of the species are native to the ecosystem. The data on studied plant groups based on relative representations demonstrates that the flora of Cherangani is rich in taxa at various ranks between family and species. This substantiates previous findings by (Fikadu et al., 2014; Zhou 2018). A comparison with recent studies confirms that this forest is sixth countrywide in plant species richness (Quentin, 2005; Fischer et al., 2010; Zhou et al., 2018; Watuma et a*l*., 2022). The current study found much higher values for species compared to those reported by Musila et al., (2011) and Kibet (2016). This can be attributed to the sampling methods used, seasonality of some species, or sampling bias (Groom & Whild, 2017). A similar study by Mbuni et al., (2019), recorded 1296 species from the larger Cherangani. Partial failure to address synonymy bias can be implicated for this result. However, the large number of species puts Cherangani forest on priority list for conservation.

The ten largest families comprise of 399 species or 49 % of all species identified. This leaves 406 species in 118 families. This study found out that Asteraceae (11.2%), Orchidaceae (8.2%) and Fabaceae (6.1%) were the richest families in terms of species. The study provided additional support for the major and most authoritative studies in the World like IPNI, (2022) and Plants of the World online (POWO.*science. Kew.Org*). In contrast, a few studies introduce Poaceae in the list of the first three largest families (Ayanaw Abunie & Dalle, 2018; Zhou et al., 2017). These latter study's findings may have been influenced by too small sample size. By knowing a family, one can tell the characters of many more genera and species (Gastauer & Meira Neto, 2017). Hence, knowing the family will significantly reduce efforts in science and subsequently assist conservationists and researchers.

From the study on family composition, the high presence of some taxa like Asteraceae and Solanaceae which are generally associated with disturbed fertile grounds (weeds) implies that the ecosystem can be easily revegetated. In addition, as annuals, species of such families provide supplementary diet for insects, birds and other wildlife that form an integral part of the forest food chain. In such circumstances, they sustain pollinators of tree species that normally flower after long periods. Further, orchids and ferns are associated with moist, well conserved ecosystems. Therefore, their presence is an indication of a well-protected forest. On the other hand, in case of species extinction for a given taxon with many species, some of its members take over and ensure continuity of the ecosystem's parallel and cyclic configuration processes (Giorgini et al., 2015). Therefore, species appearing in low numbers per family need special protection for ecosystem functions.

Several species found in the study area did not appear in previous databases for Cherangani. The most conspicuous species in this study, was *Calceolaria tripartita* reported for the first time as a new record in Cherangani, Kenya and probably East Africa. A cross check in key regional and local databases (including the East Africa Herbarium) did not find the species. The genus *Calceolaria* formally in Scrophulariaceae is now in the family Calceolariaceae with 11 genera. The family and most species are native to Peru and Mexico with about 271 species (Christenhusz & Byng, 2016). It is composed of herbs and shrubs up to 4m tall with opposite leaves and usually yellow flowers. *Calceolaria* L (1770: 286) with 23 synonyms, has always been regarded as a distinct genus although its relationships remained unresolved until recently (Puppo, 2014). The species was cited in Kapcherop town on the periphery of the tea plantation. The species is a seasonal herb up to 22 cm tall with tripartite lobed leaves and yellow flowers and is planted as an ornamental but at times it is an escapee from cultivation. However, it not clear how the species reached Kenya hence has remained unknown raising concerns on the safety of our conserved areas from alien species some of which can be detrimental.

Based on the tallies by Zhou et al., (2017), the addition of *Calceolaria tripartita* increases the number of exotic species, genera and families in Kenya by one from 588, 302 and 62 respectively. However, it should be noted that Zhou’s review is based on FTEA Published between 1948-2012, hence excludes families described thereafter and even some species that were still part of groups already published in Fascicles. This means that their tallies are not currently accurate. With botanical expeditions going on continuously, studies to identify and describe new species are in motion.

In Cherangani tree nursery, *Northoscordum borbonicum* and *Petunia* species were noted. The species do not appear in all the local databases reviewed. The former, also known as onion grass or wild onion, does not tolerate grass competition and is not known for any commercial value in Cherangani. A study in Cherangani (Mbuni et al., (2019) reported *Allium neapalitanum* Cirillo, a species with similar looks (probably a misidentification). The species is an herb associated with upland grassland, 1500–2500 m and having many reference specimen vouchers. This further confirmes that indeed several other species remain undescribed and hence more plant collection expeditions.

Within the identified taxa, 23 have changed names within the last fifteen years. Most of these changes result from new research and judgments about the taxonomy of plants. While some are nomenclatural, a variety of factors contribute to the extent of changes. Plant taxonomists continue to discover plants species and reclassify and rename those already known (Nicolson et al., 2017). This has been accelerated by use of new molecular phylogenetic techniques that provide new data that clarifies taxonomy, especially at the level of the genus and above, resulting in changes in the circumscription of genera. Therefore, this finding reinforces the conventional understanding about scientific name changes.

Among the identified species, were fifty exotics that accounted for 8.5% of the total population in 22 families and 44 genera. Asteraceae and Solanaceae were among the top families with exotic species maybe due to their easy adaptability, a high number of seeds and several methods of dispersal. Most of these species are foods for birds that are eventually dispersed on disturbed forest boundaries. Among these species, were common weeds. Some previous studies had documented less than 6% as exotics (Ngumbau et al., 2020). Other studies had confirmed that although exotics promote regeneration, they deter species recruitment leading to less productive functional units (Van & Wilson, 2017). Considering that most of these species are from America and South Asia, their transportation could be linked to trade goods. Hence, there need to secure our forest margins against their infiltration. The presence of highly invasive *Cestrum aurantiacum* in all blocks except Kerrer should alarm botanical inventory. In addition, managers need to prioritize conducting a risk assessment of key invasive species in the Cherangani ecosystem.

The various growth habits of species identified in the entire study area and blocks occur in proportions that conform or conflict with past surveys. Within the categorized eight growth forms, almost 50% of them are seasonal herbs. These are like findings by Mbuni et al., (2019). Conversely, Giorgini et al., (2015), recorded herbs at less than 40% of the entire species composition. This is linked to the study site from dry regions that at most times have few non perennial plants. In general, most studies within tropical forests show that herbs constitute 18-44% of all flora (Aigbokhan, 2014; Fikadu,et al.,2014). Therefore, the high percentage of herbs in the current study implies the availability of optimum conditions that supports growth, usually associated with tropical forests (Gurmessa et al., (2012). Similarly, these could be due to large open areas with enough light in forest areas to support fast growth which has a reflection on past management.

The distribution of species in different growth forms per block gives the impression that species per growth form is roughly related to block area with very minor exceptions

(Ayanaw Abunie & Dalle, 2018). This suggests that blocks maybe subjected to similar management practices because disturbance regimes or factors of growth in all blocks are similar (Holtmeier & Broll, 2018). More importantly and expected, large areas have more species than small ones (Sainge et al., 2019). However, it is not clear at this point if the same growth habits were represented by species with similar requirements, or its vegetation interaction is perturbed by human activities like encroachment. Previous land-use and forest management have been shown to influence the development of plant species richness and evenness (Tenzin & Hasenauer, 2016). Evidently, human-induced disturbances can have a strong influence on plant species composition. In this perspective, the conclusion by Althof (2005) that high species richness is not always a suitable measure of forest quality, but the proportion of climax species typical for the Forest is a better indicator.

The higher number of epiphytes and perennial herbs present in Kipteber demonstrates that it is comparatively better conserved than the rest of the forest. Even though these findings differ from Zhu et al., (2015), they are consistent with those of Plas et al., (2018). The inconsistence could have arisen from variations in the ecological requirement of species at both study sites. This is due to the vascular epiphytes and some herbs being sensitive to changes in their microclimatic conditions and those caused by forest disturbance (Barthlott et al., 2015). Such plant groups occur only in primary forest sites and are useful bioindicators that determine the degree of disturbance (Plas et al., 2018). Considering that epiphytes are an integral component of Afromontane forests they contribute considerably to enhancement of biodiversity. By their adaptations to arboreal lifestyles, they increase canopy diversity, enable many animals to colonize the treetops, thereby increasing plant biomass, water storage, and nutrient recycling (Del Toro & Ribbons, 2019). This implies that some functions of the forest have slackened, and weeds could be taking over the forest (Makokha, 2018). Therefore, this requires urgent measures to reverse the trend and enhance their conservation.

There are several alternative explanations for the high percentage of non-perennial species in the forest, firstly, the linear shape of the forest blocks is partially responsible for exposing most of the forest to disturbance from expanding farms (Van & Wilson, 2017). Secondly, the conditions for dispersal and seedling recruitment for species dispersed by wind become more conducive (Ayanaw Abunie & Dalle, 2018). Thirdly, small forest blocks have a greater edge to area ratio and are therefore intrinsically more prone to effects of plants and animals from adjacent habitats dominated by humans (Sharma & Kant, 2014). This implies that the forest edges exposed to open habitats can severely modify local microclimatic conditions to favour non-perennial plants (Isajev et al., 2018). Several other studies that did not segregate forests into blocks still recorded species in biogeographical proportions like in the present study (Kibet, 2016). Seasonal herbs are mostly opportunistic species that take advantage of disturbed sites. Therefore, to counter their aggression, Rita et al., (2017) suggested low-density grazing or manual removal to initiate secondary succession.

Epiphytes and terrestrial ferns registered 34 and 49 species accounting for 4.2% and 6% respectively of the entire species population. Mbuni et al., (2019) found nearly the same figure (3.55%) of epiphytes. However, some elaborate studies have concluded that due to the high precipitation and relative humidity, epiphytes and terrestrial ferns are usually the most frequent life forms beside trees (Boehmer 2011). It can therefore be suggested that the current results could imply that several epiphytes have not been registered (some are located far in tree crowns), or the forest composition has been compromised by disturbance regimes not explored in this study. Despite this scenario, it should be noted that woody epiphytes in this study have been recorded under woody plants, this could affect the final percentage of epiphytes. Despite all these arguments, this study's findings together with previous local ones demonstrate that in general, there is a decline in fern and orchid families that constitute most epiphytes (Zhou et al., 2017). This calls for further investigations to establish whether the decline is due to disturbance, climate change, or otherwise.

5.1.2 Identification key

This study developed the first single access identification key for vascular plants of Cherangani. Additionally, this is the first regional checklist to be developed in Kenya covering vascular plant species in all taxa. unlike in traditional dichotomous keys often starting with difficult Latin terms (Dale & Greenway & Dale, 1961), this single access key involves making complex dichotomous decisions at some couplets and this improves on the number of available character state combinations leading to an adequate diagnosis of diverse and closely resembling species (Sauquet & Magallón, 2018). This key resembles that of Agnew (2013) and Dharani (2013) and is remarkably simplified compared to the ones in the Fascicles of FTEA which requires one to know at least the family of the species before using it. Other keys are purely dichotomous and pertain to comparatively fewer species (Dharani, 2002; Christine et al., 2011). Unlike previous keys, the current key is useful for identifying all species in all families and all growth forms. The current key has some limitations but possess several merits too. For instance, keys have been known to contain many inconsistencies and sometimes just plain mistakes and require terminologies (Kokwaro, 1994). Plants vary a lot in the wild (Sauquet & Magallón, 2018) making it difficult to take all of the variations into account including evolutionary lineages. However extensive use of hypertext to link to images, glossaries, and illustrations and other support material improves species identification (Yanikoglu et al., 2014). This relieves the users from the burden of presenting all specimens to experts or registered Herbaria.

5.1.3 Species of conservation significance

Among the plant species in the study area, 22 of them had been deliberately introduced with some specific for industrial purposes. Fifteen of these species did not appear in all records of previous studies on Cherangani forest. This confirms the doubt that the region has not been exhaustively investigated. In reference to the commercial tree species, most of them were in the Kipteber block near the Forest Office (Kapcherop) with exception of one old plantation of *Pinus radiata* in Koisungur block. The plantations in Kapcherop are mainly *Cupressus lusitanica* with few *Pinus patula*. In addition, the forest is buffered by a tea belt that provides a lasting solution to encroachment. The plantations have attracted sawmilling activities around Kapcherop which is close to the source of materials (Cherangani Hills Strategic Ecosystem Plan 2014). This is like Kakamega (Althof, 2005) and at the foot of Mt. Kenya, where a large area of the original forest was replaced by plantations of *Pinus patula*, *Cupressus lusitanica*, and *Eucalyptus* species for timber (Bussman, 2006). The presence of *Cannabis sativa* in clear-felled areas may be attributed the seeds dispersal by loggers in the forest who probably used it for smoking.

From the eight species biogeographical affinities defined, it creates the impression that disturbed, woodland and montane species are the primary occupants of the forest. This being a montane forest, the high presence of disturbed ecosystem affiliated species indicates activities that amount to forest disturbance. In addition, this relates to the nature of land use dominated by nearby farms. The presence of woodland species could have culminated from the impacts of climate change (Mezgebe & Mezgebe, 2019) . In addition, it is clear from the results that larger and less disturbed forest blocks exhibit more forest edge species. The existence of such species is indicative of species composition not simply being a mixture of communities but instead, edges have their typical species (Aggemyr et al., 2018). Thus, edges are acknowledged as a separate habitat type. In the alpine zone, only 2.8 % of species were similar to Chaturvedi & Raghubanshi, (2014). Therefore, from the major biogeographical affinities registered, managers of the forest should be alarmed by the impacts of climate change and disturbance and implement urgent remedial measures**.**

Four species in the current checklist appear on the IUCN list of threatened species (IUCN,2021). Only *Osyris lanceolata* (Hochst & Steudel) is endangered according to the publisher's definition. Socio-economic benefits associated with the species can be blamed for contributing to its over-exploitation (Mutisya et al., 2019). Other species include *Olea africana* and *Prunus africana* (Hook.f.) Kalkm that are listed as vulnerable. Endangered species are under threat of becoming critically endangered as their populations are under pressure from overexploitation or habitat loss. Vulnerable species are those at risk of becoming endangered if the predisposing factors of threat are not checked for such species to be protected. It is important for mapping their habitats with a view of enhanced protection.

In addition to the characteristic species common in montane habitats recorded in the past and present studies, some species exhibited local rarity. i.e., they were only reported in particular blocks. For instance, *Arceuthobium* Juniperi-*procerae* Chiov. (Juniperus dwarf mistletoe) was present only in Kerrer block same to *Haplocarpha ruepelli*. (Sch.Bip) P Beauv. High altitudes (over 2900m a. s. l) seemed crucial in determining this species' habitats. In Kipteber block, *Galiniera saxifraga* (Hochst.) Bridson appears along a roadside in the forest adjacent to Kipteber hill. Another species, *Euphorbia obovalifolia* A. Rich was fast colonising the forest. This is due to its easy vegetative reproduction, together with tough spines that repulse grazers and lack of immediate economic value.

The presence of a mature stand of *Pinus radiata* in Koisungur that has never been reported before confirms that the forest has not been well investigated before. Similarly, *Umbilicus botryoides* Hochst. ex A. Rich. was noted growing epiphytical only once on *Schefflera volkensii* within forest station compound. Other rarely spotted species were *Peperomia tetraphylla* (Forsk.) and *Cuscuta kilimanjari* Oliv which is hosted mainly by *Hypoestis* species. This observation is important because people interested in these species can narrow their searches to blocks and not the entire forest. This calls for mapping and recognition of such uncommon species.

The study registered 35 Species as protected under CITES regulations This accounted for 10.7% and 0.1% of all CITES-listed species in the country and Africa respectively (IUCN, 2021). Of these, with exception of only 3 species, the rest were orchids and despite having many ferns in the forest, none appeared on the CITES list. This signifies the importance of the orchid family in conservation. Considering that this region is not very well protected, vulnerable species are under additional threat, for example, *Dendrosenecio cheranganiensis* (Cotton & Blakelock) E.B. Knox (not reported in the present study) had been previously reported to be endemic in this forest (Kibet, 2016; Mbuni et al., 2019). This is because habitat loss has led to such species becoming highly threatened hence classified as a vulnerable species (IUCN, 2021). Therefore, there is a need for these areas to be designated as nature reserves for monitoring species under high risk of extinction.

5.2 Forest structure

The false colour composite generated in this study, gives a rough impression of the distribution of major vertical forest structures. Although the colours appear to mark the boundaries of structures, on the ground structures are not marked (Are intergraded/continuum). This is because the structures are only based on a sample of points used in the classification of a satellite image. From the image analysis, it is evident that *Podocarpus* species appears in most structures that occupy high percentages of the total forest area together with *Hagenia*, *Syzygium* and *Juniperus.and* the forest is almost defined. On the other hand, the tea belt (0.5% of total area) protects the forest from encroachment appears only on the western part of Kipteber block (most predisposed to human interference). Similarly, industrial plantations of timber species (1.02%) appear near Kapcherop where they have attracted sawmilling. However, based on these findings alone, it is not possible to prescribe selective exploitation, therefore information on densities and diameter at breast height of timber species should be sought in future studies.

From the fourteen major forest structures discerned Multi-layered Forest (ground, middle and upper) was reported in *Podocarpus-Juniperus-Hagenia* forests. Some studies (Khan et al., 2015), attribute this formation to competition and coexistence of vegetation. This is crucial because such structured natural forests exhibit comparative superiority in terms of stocking levels and variability for seedlings, vitality, resistance to pests and environmental factors (Hitimana et al., 2019). In this regard they act as surrogate measurements of good forest health. Similar studies have been reported in Kakamega and Nandi forests (Girma et al., 2014; Melly et al., 2020). Findings in the current study about variations in forest structure can be linked to commercial logging activities and other anthropogenic disturbances (Pimm et al., 2014). For instance, habitat fragmentation is a major cause of biodiversity erosion in tropical forests (Whitehurst et al.,2013; Bohn & Hutch, 2017). This reinforces the conclusion of a recent study that long-term dynamics in tropical forests are prone to large-scale disturbance-recovery cycles, that resemble those driving temperate forests (Vlam et al., 2017). Such activities need to be regulated to save the forest.

Most Afromontane characteristic species were found in all blocks. For example, Kerrer and Koisungur blocks were characterized by *Juniperus procera* in mature stands. Further, all the blocks were characterized by *Afrocarpus gracillior, Prunus africana, Podocarpus latifolius, Hagenia abyssinica, Syzygium guineense* and *Juniperus procera.* Most plots in Kerrer, Koisungur, and Chemurgoi recorded *Juniperus procera* more than other species. Other species recorded were *Rapanea melanophloeos, Nuxia congesta,* and *Maytenus undata.* Fikadu et al., (2014) consented that these are the typical Afromontane species. Along forest edges, *Makaranga kilimandscharica* and *Neoboutonia macrocalyx* recorded are indicative of disturbance and characteristic of a secondary forest formation. Some findings in Afromontane have noted *Tabernaemontana stapfiana* and *Croton megalocarpus* as key species (Admassu et al., 2016). Therefore, it can be authoritatively remarked that the study area is dominated by characteristic species of Afromontane forests. In conclusion, the presented knowledge on forest structure can guide forest managers to plan for different forest blocks based on species requirements.

After assessing the five blocks in terms of woody species similarity ("between-habitat"),it was noted that some pairs of blocks had higher numbers of common species than between others. A comparative analysis using the Sorensen – index gave an average similarity of 47.93%. This implies that blocks are floristically unconnected by a margin of 52.07%. The dissimilarity could largely arise from different levels of disturbance, size and distance from each other evolving to discrete populations or vegetation due to separations (Sauquet & Magallón, 2018). By comparison, Toropket had the least number of species in common with all other blocks. On the other hand, the highest similarity was recorded between Kerrer and Koisungur at 73.97%. This can be attributed to their proximity as they share most factors that influence species composition. In addition, it can be postulated that they share some growth factors (soils, temperature, etc) that support similar plants. The overall implication of differences in species composition is that each block has a significant number of peculiar species that should be regarded during re-vegetation exercises.

On the densities and number of species in the study area and respective blocks presented, Kipteber block possessed 91.6% of all species. This can be linked to the vast area of the block (64 % of the entire forest). Furthermore, it has the highest altitudinal range (2400m -3242m a.s.l.) In addition, it has diverse habitats and its proximity to the forest office enhanced protection. Other blocks had relatively lower numbers of species which is still commensurate with respective areas but had higher species densities than Kipteber. The overall species density of 4.03 species/km^2 reported in the study area was higher than the national average of 0.01209 sp/ km^2 (Zhou et al., 2017). This implies that the study area is richer by 333.3 times than the national average,hence reinforcing the need for conservation efforts.

5.3 Economically important plant species

The respondents who were interviewed were mainly male farmers who spoke Marakwet dialect. Although males exceeded females as respondents, this should not be construed in any way to imply that men had more information on the uses of plants than women.

The low number of female informants was attributed to the fact that some of the women selected for the survey declined to be interviewed. The designation of farmers included all people excluding students and practicing herbalists. Further, some respondents were not willing to expound on their occupational engagements, so they ended up being categorized as farmers. Most informants were between 40-45 years because at that age they were enabled to grant both interviews and field visits where necessary.

The results of the present study provided information about popular uses of plants by locals that included timber, firewood, water and several medicinal uses as mentioned by most respondents. Over one half of all informants thought that water, medicine and fuelwood were key products from the forest Kapcherop reported most mentions for timber probably because of sawmilling businesses around the block. In all the villages sampled, majority of respondents admitted that herbal medicine is a key product from the forest, Water was mentioned equally as locals associated the forest with rains experienced throughout the year. The name Kapcherop means "a place of rain". The study findings demonstrated that knowledge and usage of plants among peoples in Cherangani is still a major part of their life and culture. Therefore it can be widely acknowledged that households rely on untamed natural resources to help meet daily needs and to provide a safety net in times of need (Hudson, 2015: Antonelli et al., 2020). Subsequently, to avoid overdependence on the forest, locals should be trained on agroforestry practices to meet some of their needs (Bala et al., 2020).

Further analysis of the mentioned species showed that among the 43 economically important plant species identified, 29 species were associated with at least one medicinal use. Herbs are commonly used by locals routinely which concurs with Some, (2014). The current findings confirms that herbal medicine is a respected economic and cultural practice among the locals. For instance, during market days, herbalists join other traders to display and sell their products. This supports the perception that plants play a key role in the healthcare system of the locals (Bruschi et al., 2014). Some of the ailments treated included stomachache, headache, malaria, skin rashes and animal diseases. These ailments have been managed using species previously reported in Kigen et al., (2017).The extensive use of herbal medicine has been notable amongst the people who live in remote areas with limited access to modern healthcare facilities which concurs with Islam *e*t al., (2014). In this regard, to protect the forest, herbalists should be trained on sustainable harvesting and conservation of medicinal plant species.

Twelve species had an informant consensus factor (ICF) of over 0.5 for various uses. There were several species that had high informant consensus factors of between 0.9 and 1. As the ICF tends to one, the higher the number of respondents interviewed on that species agreed on a particular use. This calls for further investigations into claims raised in current and previous studies with similar findings where almost all respondents had consensus on certain species uses. *Afrocarpus falcatus* was the most important species in the community. In other studies forest resources were useful for medicine, religious significance and as ornamentals (Getahun, 2017). Unlike in the present study, previous local studies had not documented the use of *Faurea saligna*. Elsewhere, the species had a multitude of uses. For better use of this species, claims by the local people should be validated with a view of domestication.

5.4 Disturbance regimes affecting the forest

Local people expressed concerns about several species under varying levels of threats. The most threatened species mentioned was *Afrocarpus gracillior*. Although, this is contrary to IUCN Red List of Threatened Species (https://www.iucnredlist.org:) The species are the most useful and exploited among the local people. Other species that were most threatened included in this study are *Juniperus procera*, *Podocarpus latifolius, Hagenia abyssinica* and *Olea africana*. This calls for improved regeneration and protection of such species.

Some of the indicators of anthropogenic activities mentioned included illegal logging (35.4%), charcoal burning (32.3%), settlement and cultivation inside the forests (4%). Many of these illegal activities were captured in various parts of the forest. These activities pose a great threat to the survival of disturbance-sensitive plant species. This makes the forest eminently interesting for timber poachers (Isajev et al., 2018). Very few respondents agreed that encroachment was a primary factor of diminishing forests. This was due to the fact that most of the respondents were culprits of encroachment of which they were not ready to admit. Previous studies agreed that poaching (Isajev et al., 2018), Firewood collection (Bruschi et al., 2014), Charcoal, production, encroachment (Phongoudome et al., 2013). Increasing human population and politics (Antonelli et al., 2020) were the primary causes of forest degradation. These activities can change the character of an ecosystem (FAO, 2022; Ayanaw Abunie & Dalle, 2018). Therefore, these practices should be addressed permanently to save the forest.

In this study, six unwanted species were reported. The fact that invasive species were not mentioned as a threat to the forest explains the low level of concern and knowledge the locals have about them. However, *Cestrum aurantiacum* a highly destructive species to the ecosystem was noted in all blocks except the far end Kerrer. Introduced in Kenya in 1921 (Makokha, 2018), it has been cited in all previous studies in Cherangani except Mabberley (1963). This implies it may have been introduced in Cherangani after that period. Cases of livestock poisoning have been reported by more than half of the respondents interviewed on detrimental (invasive) species. Similar species not reported by respondents but cited in the field included *Solanum mauritianum S*cop, *Euphorbia obovalifolia* A. Rich and *Prunus africana* (Hook.f.) Kalkm having been reported to be detrimental to livestock. However past studies elsewhere strongly disagree (Islam et al., 2014).This may indicate lack of knowledge and documentation on the species. An understanding of such species is important to avoid casualities.

Most of the respondents stated that locals have participated in conservation through CFAS, scouts and local informers. This is similar to Reyes-García, (2010). Employment of more rangers, use of local leaders and basic education were suggested as the best options to save the forest from further destruction. This finding has several similarities with other studies (Hamraz et al., 2017). The presence of tea belts around the forest was not mentioned by any respondents though it has been successfully employed here. However, in contrast, other findings concur that the best way to ensure the survival and sustainable utilization of overexploited species is domestication (Bruschi et al., 2014). For instance, Murad et al., (2013) found that the cultivation of medicinal plants is a means of combining biodiversity conservation, protection of endangered species and poverty alleviation. All these measures if implemented can help alleviate, the present pressure on the forest.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

1. The findings of the current study validate Cherangani forest as a floristically significant area (815 species) with a high diversity of plants including threatened and endemic plant species. The forest is among the six leading forests countrywide in species richness. This meets the threshold for important plant areas. The annotated checklist and identification keys for plant species in the study ecosystem were realized.

2. The forest is predominantly *Podocarpus-Hagenia-Juniperus* which defines most of its 14 vertical structures identified.
3. The local people depend to a large extent on the forest for their livelihood particularly for Medicine, building material, water and fuelwood.
4. Encroachment, Charcoal burning and tree poaching are the main causes of forest destruction. The forest too has invasive species dominated by *Cestrum aurantiacum* and other unwanted species that threaten to interfere with an ecological framework of the forest livelihood of dependants and their livestock. Local people think that local leaders, rangers, education and provision of free seedlings should be employed to curb forest loss.

6.2 Recommendations

1. The few remaining areas of intact native forests should be prioritized for conservation regardless of their size and connectivity. If diversity is conserved within these fragments, the short-term effects of landscape-scale change may be minimized. They may then be reversed if long-term restoration initiatives can be implemented. In addition to domestication, threatened species like *Osyris*, *Prunus*

africana (Hook.f.) Kalkm and *Olea africana* should be mapped for enhanced protection.

2. The key species linked to the definition of identified forest structures should be prioritized for protection from overexploitation and emphasized in reafforestation activities.
3. The rich ethnobotanical information of the local people can form basis of bioprospecting and therefore should be well documented understood and recognized.
4. Even though the extent and magnitude of identified threats were not measured, there is a need to control the ongoing illegal activities through strict policing and surveillance. Alternative means of livelihood e.g., beekeeping should be promoted to reduce over-dependence on forest resources.

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APPENDICES

Appendix I: Annotated checklist of vascular plants found in Cherangani forest

KEY FOR THE ANNOTATED CHECKLIST

K-	Kipteber block	FN	Fern	WG	Wooded grassland
C	Chemurgoi block	WL	Wetland	HB	Seasonal herb
E	Kerrer block	PL	Planted	PH	Perennial herb
O	Koisungur block	TR	Tree	TN	Tree nursery
T	Toropket block	MF	Moist forest	SG	Sedge
BG	Biogeographical affinity	DF	Dry forest	AL	Alpine zone
GF	Growth form	HE	Herb/Epiphyte	GL	Rashes
FE	Forest edge	DM	disturbed montane	GR	Grass
CR	Climber	0	Species absent	1	Species present

	aaaa	K	C	E	O	T	BG	GF		Reference
		Seedless Vascular Plants (Ferns and fern allies)								
		Small leaves with only a single unbranched vein								
	Lycopodiaceae									
1	*Lycopodium clavatum* L.	1	1	1	1	0	FE	FN		Mabberley & McCall 42 (EA).
	Huperziaceae									
1	*(Huperzia dacrydioides* Baker) Pic.serm.	1	0	0	0	0	WL	FN		
1	*Huperzia ophioglossoides* (Lam.)	1	0	0	0	0	WL	FN		
	Cyatheacae									
2	Cyathea manniana Hook.	1	0	0	0	0	WL	FN		Voucher: Mabberley 19 (EA).
	Tectariaceae									
2f-	*Tectaria gemmifera* (Fee*)* Alston	1	0	0	0	0	MF	FN		Tweedie 2702 (EA).
	Selaginellaceae									
3	*Selaginella goudotiana* Spring	1	0	0	0	0	MF	FN		……….
3	*Selaginella caffrorum (*Milde*)* Hieron	1	0	0	0	0	RK	FN		…….
	Pteridaceae									
7f	*Cheilanthes calomelanos* (Sw) Link.	1	0	0	0	1	WL		FN	
7f	*Cheilanthes farinosa* Forssk Kaulf	1	1	0	0	0	WL	FN		SAJIT 004834 (EA)
7f	*Cheilanthes hirta* Sw.	1	0	0	0	0	WL		FN	
7f	*Cheilanthes inaequalis* Kunze	1	0	0	0	0	WL		FN	
7f	*Cheilanthes multifida (*Sw) Sw	1	0	0	0	0	WL		FN	
7f	*Pellaea calomelanos* (Sw.) Link	1	0	0	0	1	WL		FN	
7f	*Pellaea quadripinnata* (Forssk). Prantl.	1	0	0	0	0	WL	FN		SAJIT 007091 (EA,

7f	*Pellaea viridis* (Forssk.) Prantl	1	0	0	0	1	WL		FN	
7f	*Pteridium aquilinum* (L.) Kuhn	1	0	0	0	0	WL		FN	
7f	*Pteridium aquilinum* (L.) Kuhn	1	0	0	0	0	WL		FN	
7f	*Pteris catoptera* Kunze.	1	1	1	1	1	WL		FN	
7f	*Pteris cretica* L.	1	1	1	1	1	WL	F N		Thulin 56 (EA).
7f	*Pteris dendata* Forsk.	1	0	0	0	0	WL	F N		FOKP 1871 (EA)
7f	*Vittaria volkensii* Hieron	1	0	0	0	0	WL		FN	
	Aspleniaceae									
8f	*Asplenium adiantum-nigrum* L	1	0	0	0	0	WL		FN	
8f	*Asplenium aethiopicum* (Burm. f.) Bech.	1	0	0	0	0	WL		FN	
8f	*Asplenium elliottii* C.H Wright	1	0	0	0	0	WL		FN	
8f	*Asplenium erect*	1	0	0	0	0	WL		FN	
8f	*Asplenium friesiorum* C.Chr.	1	0	0	0	0	WL	F N		FOKP 1122 (EA)
8f	*Asplenium inaequilate*	1	0	0	0	0	WL		FN	
8f	*Asplenium monathes* L.	1	0	0	0	0	WL	F N		FOKP 1078 (EA,
8f	*Asplenium normale* D.Don	1	0	0	0	0	WL		FN	
8f	*Asplenium protensum* Schrad.	1	0	0	0	0	WL	F N		Gilbert & Mesfin 6675
8f	*Asplenium sandersonii* Hook.	1	0	0	0	0	WL		FN	
8f	*Asplenium tenuifolium* D,don	1	0	0	0	0	WL	F N		Mbuni 642 (EA),
	Dryopterdaceae									
10f	*Doryopteris concolor* (Langsd. & Fisch.)	1	0	0	0	0	WL		FN	
10f	*Dryopteris schimperiana* (A.Braun)	1	0	0	0	0	WL	F N		Tweedie 2844 (EA).
10f	*Elaphoglossum aubertii* (Desv)T.Moore	1	0	0	0	0	WL		FN	
10f	*Elaphoglossum spatulatum (*Bory) Brack	1	0	0	0	0	WL		FN	
10f	*Polystichum simense* (Hieron.)C.Chr.	1	0	0	0	0	WL	F N		Tweedie 2702 (EA).
	Polypodiaceae									
12f	*Drynaria volkensii* Hieron.	1	0	0	0	0	WL	F N		Tweedie 2799 (EA).
12f	*Lepisorus excavates* (Bory ex Willd.) Ching	1	1	1	1	1	WL	F N		Thulin & Tidigs 99 (EA),
12f	*Melpomene flabelliformis* (Poir.)	1	0	0	0	0	WL		FN	

12f	*Pleopeltis macrocarpa* (Wild.)Kaulf.	1	0	0	0	0	WL	FN		Faden & Evans 69/258
	Thelypteridaceae									
f	*Christella sp.*	1	0	0	0	0	WL		FN	
f	*Pneumatopteris unita* (Kunze) Holttum	1	0	0	0	0	WL		FN	
f	*Pseudocylosorus pulcher* (Wild.) Holttum	1	0	0	0	0	WL		FN	
f	*Amauropelta oppositiformis* (C.Chr) Holttum	1	0	0	0	0	WL		FN	
	Hymenophyllaceae									
f	*Crepidomanes melanotrichum* (SCHLTD)	1	0	0	0	0	WL	F		
f	*Nephrolepis undulata* (Sw.) J.Sm	1	0	0	0	0	WL	F		
	Adianthaceae									
f	*Chenopodium procerum [*Hochst. ex] Moq	1	0	0	0	0	WL	F		
	Osmundaceae									
f	*Osmunda regalis* L.	1	0	0	0	0	WL	F		
	SEED PLANTS									
	Naked seeds									
	Pinaceae									
2g	*pinus patula* Schldl. et Cham	1	0	0	0	0	PL		TR	
2g	*Pinus radiata* D.don.	1	0	0	1	0	PL		TR	
2g	*Pinus sp.*	1	0	0	0	0	PL		TR	
	Podocarpaceae									
13	*Afrocarpus gracillior* Mirb.	1	1	1	1	1	MF	TR		Makokha 00 (NAI)
13	*Podocarpus latifolius* . (Thunb.) R.Br. ex Mirb.	1	1	1	1	1	MF	TR		Mbuni 592 & 611 (EA).
	Cupressaceae									
14	*Juniperus procera Endl.*	1	1	1	1	1	DF	TR		Malombe & Mlangeni 931 (EA).
14	*Cupressus lustanica* Mill	1	0	0	0	0	PL		TR	

	Cased seeds									
					a					
	Piperaceae-1									
1	*Peperomia abyssinica* Miq.	1	1	0	0	0	MF	HE		FOKP 10989 (EA,
1	*Peperonia tetraphylla* (Forsk.)	1	1	0	0	0	MF	ET		Hepper & Field 5034 (EA)
	Monimiaceae-2									
2	*Xymalos monospora* (Harv.) Warb.	1	0	0	0	0	MF	TR		Dale 912 (EA),
	Araceae									
19	*Arisaema enneaphyllum* A.Rich.	1	0	0	0	0	FE	HB		SAJIT 004859 (EA,
19	*Culcasia falicifolia* Engl.	1	0	0	0	0	WL	HB		FOKP 737 & 1304 (EA,
19	*Arisaema mildbraedi* Engl.	1	0	0	0	0	MF	HB		SAJIT 006909 (EA,
	Potamogetonaceae									
20	*Potamogeton thunbergii* Cham & Schlechtd	1	0	0	0	0	WL		HB	
	Dioscoreaceae									
21	*Dioscorea quartiniana* A.Rich	1	0	0	1	0	MF	CR		SAJIT 005067 (EA,
	Colchicaceae									
22	*Androcymbium striatum* A. Rich	1	0	0	0	0	WL		HB	
22	*Gloriosa superba* Rendle	1	0	0	0	0	WL	HB		Mbuni 215 & 694 (EA).
	Xyridaceae									
23	*Xyris capensis* Thunb.	1	0	0	0	0	DM		HB	
	Labellum present									
	Orchidaceae									
	Aerangis thomsonii (Rolfe) Schiltr.	1	1	0	0	0	MF	ET		FOKP 11634 (EA),
24	*Angraecopsis gracillima* (Rolfe) Summerh	1	1	0	0	0	MF	ET		

24	*Angraecum erectum* Summerh.	1		1	0	0	0	MF	ET		
24	*Angraecum humile* summerh.	1		0	0	0	0	MF		HB	
24	*Bolusiella tridifolia* (Rolfe) Schltr.	1		1	0	0	0	MF	ET		
24	*Brachycorithis kalbreyeri* Reichb.f	1		1	0	0	0	MF	ET		
24	*Brachycorithis ovata Lindley*	1		1	0	0	0	MF		HB	
24	*Bulbophyllum josephii* (Kuntze) Summerh.	1		0	0	0	0	MF		HB	
24	*Cribbia brachyceras* (Summerh) Senghas	1		1	0	0	0	MF	ET		
24	*Cynorkis anacamptoides* Kraenzl.	1		1	0	0	0	MF	ET		Dale 3444 (EA)
24	*Cynorkis kassneriana* Kraenzl.	1		1	0	0	0	MF	H B		Kirk 9418 (EA)
24	*Cyrtorchis arcuata* (Lindley*)* Schltr	1		0	0	0	0	MF		HB	
24	*Diaphananthe montana* (piers)	1		1	0	0	0	MF	ET		Stewart 1010 (EA).
24	*Diaphananthe rohrii* (Reichb.f.) Summerh	1		0	0	0	0	MF		HB	
24	*Diaphnanthe lorifolia* Summerh	1		1	0	0	0	MF	ET		
24	*Disa acontoides* Sond	1		0	0	0	0	MF	H B		Webster 9036 (EA).
24	*Disa erubescens* Rendle	1		0	0	0	0	MF	H B		Blake 2128 (EA).
24	*Disa fragrans* Schiltr	1		0	0	0	0	MF		HB	
24	*Disa hircinornis* Reichb.f.	1		1	0	0	0	MF	H B		Dale 3446 (EA).
24	*Disa stairsii* Kraenzl.	1		1	0	0	0	MF	H B		Dale 3267 (EA)
24	*Disperis antheceros* Rendle.	1		1	0	0	0	MF		HB	
24	*Disperis dicerochila* Summerh.	1		0	0	0	0	MF		HB	
24	*Disperis nemorosa* Rendle	1		0	0	0	0	MF	H B		Dale 34431 (EA).
24	*Disperis reichenbachiana* Rechb.f	1		0	0	0	0	MF		HB	
24	*Epipactis africana* Rendle	1		0	0	0	0	MF	H B		Mabberley 221 (EA).
24	*Habenaria altior* Rendle	1		1	0	0	0	MF	H B		Dale 3447 (EA).
24	*Habenaria bracteosa* A.Rich.	1		1	0	0	0	MF		HB	
24	*Habenaria cavatibrachia* Summerh.	1		0	0	0	0	MF		HB	
24	*Habenaria cirrhata Lindley (* Reichb).f	1		0	0	0	0	MF	H B		Linday 157 (EA).

24	*Habenaria holubii* Rolfe	1	0	0	0	0	WL	H B		Blake 2127 (EA).
24	*Habenaria humilior* Reichb.f.	1	0	0	0	0	MF		HB	
24	*Habenaria petitiana* A.Rich Dur.&Schinz	1	0	0	0	0	MF		HB	
24	*Habenaria schimperiana* A.Rich.	1	0	0	0	0	MF		HB	
24	*Habenaria vaginata* A.Rich.	1	0	0	0	0	MF		HB	
24	*Habenaria walleri* Reichb.f	1	0	0	0	0	MF	H B		Webster 9027 (EA).
24	*Holothrix pentadactyla* (Summerh.)Summerh	1	0	0	0	0	MF	H B		Stewart 1005 (EA).
24	*Holothrix puberula* Rendle.	1	1	0	0	0	MF	ET		
	Lipparis bowkeri Harv.	1	1	0	0	0	MF	ET		
24	Lipparis deistelii Schltr.	1	1	0	0	0	MF	ET		
24	*Oeceoclades saundersiana* (Rechb.f.) Garay and Taylor.	1	1	0	0	0	MF		HB	
24	*Orobanche minor* Smith	1	1	0	0	0	MF		HB	
24										
	*Platycoryne crocea (*Reichb .f) Rolfe	1	0	0	0	0	MF		HB	
24	*Anselia Africana* Lindl	0	1	0	0	0	MF	H B		Webster 9023 (EA).
24	*Disperis pusila* Verdc.	1	0	0	0	0	WG		HB	
24	*Polystachya bicarinata* Rendle.	1	1	0	0	0	MF	ET		Van Someren 8650 (EA).
24	*Polystachya bicarnata* Rendle.	1	1	0	0	0	DF	H B		Webster 1981 & 9030 (EA).
24	*Polystachya caesptifica* Kraezl.	1	1	0	0	0	MF	ET		
24	*Polystachya campyloglossa* Rolfe Bella Summerh	1	1	0	0	0	MF	ET		FOKP 11263 (EA)
24	*Polystachya confusa* rolbe	1	1	0	0	0	MF	ET		
24	*Polystachya cultriformis (*Thou) Spreng.	1	1	0	0	0	MF	ET		
24	*Polystachya eurychila* summerh.	1	1	0	1	0	MF	ET		Kirk & Irwin 50 (EA).
24	*Polystachya steudneri* Reichb.f.	1	0	0	1	0	MF		HB	
24	*Polystachya transvaalensis* Schltr.	1	1	0	1	0	MF	ET		
24	*Polystichum volkensii* (Hieron.)C.Chr.	1	1	0	0	0	MF		HB	
24	*Roeperocharis bennettiana* Reech	1	0	0	0	0	WL	H B		Dale 3445 (EA).

24	*Romulea camerooniana* Bak.	1	1	0	0	0	MF		HB	
24	*Satyrium carsonii* Rolfe	1	0	0	0	0	WG	HB		Napier 2126 (EA),
24	*Satyrium coriophoides* (A.Rich)D.D	1	0	0	0	0	WG	HB		Tweedie 1589 (EA).
24	*Satyrium crassicaule* Rendle	1	1	0	0	0	WL	HB		Webster 9034 (EA).
24	*Satyrium fimbriatum* Summerh.	1	0	0	0	0	WG	HB		Lucas 163 (EA).
24	*Satyrium robustum* Schltr.	1	0	0	0	0	MF		HB	
24	*Satyrium sacculatum* (Rendle.)Rolfe	1	1	0	0	0	MF		HB	
24	*Satyrium schimperiana* A.Rich	1	0	0	0	0	MF		HB	
24	*Satyrium volkensii* Schltr.	1	1	0	0	0	MF		HB	
24	*Satyrium woodii* Schltr.	1	1	0	0	0	MF		HB	
24	*Stolzia repens* (Rolfe) Summerh	1	1	0	0	0	WL	ET		FOKP 1094 (EA).
24	*Tridactyle furcisitipes* summerh.	1	1	0	0	0	MF	ET		Beentje 3055 (EA).
24	*tridactyle scottellii* (rendlee) Schltr.	1	1	0	0	0	MF	ET		Beentje 3050 (EA).
	Hypoxidaceae									
25	*Hypoxis angustifolia* L.	1	0	0	0	0	WG	HB		Napier 1907 (EA),
25	*Hypoxis kilimanjarica* Bak.	1	0	0	0	0	WG	HB		Thulin & Tidigs 201 (EA).
25	*Hypoxis obtusa Burch*	1	0	0	0	0	WG	HB		Agnew 10484 (EA),
25	*Hypoxis villosa* L.F.	1	0	0	0	0	WG		HB	
	Icacinaceae									
26	*Apodytes dymidiata* Arn.	1	0	0	0	0	MF		TR	
	Iridaceae									
26	*Aristea abyssinica* Pax	1	1	0	0	0	WL	HB		Blake 3108 (EA).
26	*Androcybium stratum* A.Rich.	1	1	0	0	0	WG		HB	
26	*Dierama cupliflorum* Klatt	1	1	0	0	0	WG	HB		Thulin & Tidings 207 (EA).
26	*Gladiolus dalenii* Van Geel	1	1	0	0	0	WG	HB		Maas 4690 (EA).
26	*Hesperantha petitiana* (A.Rich.)Bak	1	1	0	0	0	WG	HB		Thulin & Tidings 216 (EA).
26	*Romulea fischeri* Pax	1	1	0	0	0	WG		HB	

	Xanthorrhoeaceae									
27	*Aloe cheranganiensis* S.Carter &*Brandham*	cites	1	1	0	0	DF	PH		Brandham 1727 (EA).
27	*Aloe myriacantha* (Haw)	1	0	0	0	0	DF		PH	
	Asphodelaceae									
	Kniphofia thomsonii Bak.	0	0	1	0	0	WL	HB		Lucas 212 (EA).
	Amaryllidaceae									
28	*Scadoxus multiflorus* (Martyn) Raf.	1	1	1	0	0	MF		HB	
28	*Boophone disticha* Herb.	1	0	0	0	0	WG		HB	
28	*Nothoscordum bobornicum* Kunth.	1	0	0	0	0	TN	HB		Makokha 00 (NAI)
	Asparagaceae									
29	*Albuca abyssinica* Murr.	1	0	0	0	0	MF		HB	
29	*Anthericum angustifolium* A.Rich	1	0	0	0	0	MF	HB		Blake 1896 (EA).
29	*Asparagus racemosus* Willd.	1	1	1	1	1	MF	CR		Mus 114 (EA).
29	*Chlorophytum blepharophylum* Bak.	1	1	0	0	0	WG		HB	
29	*Chlorophytum cameronii* (Bak.) Nordal	1	1	0	0	0	WG	HB		Symes 36 (EA).
29	*Chlorophytum subpetiolatum* Bak. Kativu	1	1	0	0	0	WG		HB	
29	*Chlorophytum zanguebaricum* (Bak.)	1	1	0	0	0	WG		HB	
29	*Chlorophytum zavattari (Cuf.)* Nordal	1	1	0	0	0	WG		HB	
29-	*Dracaena afromontana* Mildbr.	1	1	1	1	0	MF	TL		Oteke 97 (EA).
29-	*Dracaena ellenbeckiana* Engl.	1	0	0	0	0	DM	TL		SAJIT 005050 (EA,
29-	*Dracaena fragrans* (L.)Ker *Gawl.*	1	0	0	0	0	DM	TL		
29-	*Dracaena steudneri* Engl.	1	1	1	1	0	DM	TL		
	.Eriospermaceae									
	Eriospermum abyssinicum Bak	1	0	0	0	0	WL		HB	
29-										
	Hyacinthaceae									
29-	*Ornithogalum gracillimum* R.E Fries	1	0	0	0	0	WL	HB		SAJIT 005076 (EA,
29-	*Ornithogalum tenuifolium* Delaroche	1	0	0	0	0	WL		HB	

29-	*Scilla hyacinthina* (Roth.) Alston	1	0	0	0	0	WL		HB	
	Commelinaceae									
30	*Commelina reptans* L.	1	1	1	1	1	DM		HB	
30	*Commelina subulata* Roth.	1	1	1	1	1	DM		HB	
30	*Commelina triangulispatha* Mildbr	1	1	1	1	1	DM	HB		Tweedie 4083 (EA),
30	*Cyanotis foecunda* Hassk.	1	0	0	0	0	DM		HB	
30	*Floscopa glomerata (***Schult.f.)** Hassk.	1	0	0	0	0	WL	HB		Webster 8995 (EA).
30	*Murdannia simplex* (Vahl) Brenan	1	0	0	0	0	DM		HB	
	Eriocaulaceae									
31	*Eriocaulon schimperi* Engl.	1	1	1	1	0	AL	HB		Rauh 678 (EA).
31	*Eriocaulon volkensii* Engl.	1	1	1	1	0	DM		HB	
	Juncaceae									
32	*Junccus dregeanus* Kunth	1	0	0	0	0	WG	Gl		Bogdan 4991 (EA).
32	*Juncus oxycarpus* Kunth.	1	0	0	0	0	WG	Gl		Verdcourt 2435 (EA)
	Cyperaceae									
33	*Carex johnstonii* Boek	1	1	1	0	0	WG	SG		Thulin & Tidigs 48 (EA).
33	*Carex peregrina* Link	1	1	1	0	0	WG	SG		Thulin & Tidigs 112 (EA).
33	*Cyperus platycaulis* Bak.	1	1	1	0	0	WG	SG		Smith, Beentje & Muasya 208 (EA),
33	*Cyperus niveus* Retz	1	1	1	0	0	WG	SG		
33	*Cyperus tomaiophyllus* (K.Schum)C.B.Clarke	1	1	1	0	0	WG	SG		
33	*Kyllinga nervosa* Steud.	1	1	1	0	0	WG	SG		
33	*kyllinga odorata* Vahl	1	1	1	0	0	WG	SG		Bogdan 5002 (EA).
33	*kyllinga pulchella kunth*	1	1	1	0	0	WG	SG		Smith *et al*. 190 (EA).
33	*Kyllinga sp.*	1	1	1	0	0	WG	SG		
33	*Scleria clathrata* A.Rich.	1	1	1	0	0	WG		HB	
	Poaceae									
34	*Oplesminus hirtellus* (L.) P Beav.	1	1	1	1	1	WG		GR	

34	*Agrostis quinqueseta (*Steud.) Hochst.	1	1	1	1	1	WG		GR	
34	*Aira caryophyllea* L.	1	1	1	1	1	WG		GR	
34	*Andropogon amethystinus* Steud.	1	1	1	1	1	WG		GR	
34	*Andropogon chinensis (Nees)* Merr.	1	1	1	1	1	WG		GR	
34	*Andropogon schirensis H*ochst.	1	1	1	1	1	WG		GR	
34	*Anthephora nigritana* Stapf & C.E. Hubb.	1	1	1	1	1	WG		GR	
34	*Anthoxanthum nivale* K. Schum.	1	0							
34	*Arundo donax* L.	1	0	0	0	0	PL		TR	
34	*Oreosyce africana* Hook.f.	1	0	0	0	1	DM	HB		Bogdan 4952 (EA).
34	*Yuashania alpina* K.Schum.) W.C.Lin	1	0	0	0	0	MF		TR	
	Papervaraceae									
35	*Corydalis mildbraedii F*edde	1	1	1	1	0	WL		HB	
	Aristolochiaceae									
36-	*Aristolachia albida* Duchartre	1	0	0	0	0	WL		PH	
	Menispermaceae									
36	*Cissampelos pareira* L.	1	0	0	0		DM	CR		Mbuni 593 & 604 (EA).
36	*Stephania abyssinica* (Dillon&A.Rich) Walp.	1	1	1	1	1	DM	CR		Hollis B2812
	Kalanchoaceae									
41-	*Kalanchoe densiflora Rolfe*	1	1	1	1	1	WG		HB	
	Ranunculaceae									
38	*Clematis villosa* DC	1	0	0	0	0	DM	HB		Webster 8710 (EA).
38	*Anemone thomsonii* Oliv.	1	0	0	0	1	WL	PH		Ivens 1254 (EA).
38	*Clematis brachiata* Thunb.	1	0	0	0	1	DF	CR		Ivens 1254 (EA).
38	*Clematis simensis* Fres	1	1	1	1	1	DF	CR		Mabberley *et al*. 227 (EA).
38	*Delphinium macrocentron* Oliv.	1	0	0	0	0	DM	HB		Mabberley 235 (EA).
38	*Rununculus multifidus* Forsk.	1	1	0	1	1	DM	PH		Thulin *et al*. 78 (EA).
38	*Rununculus oreophytus* Del.	1	0	0	0	1	DM	PH		Trelawny 4385 (EA).

38	*Rununculus volkensii* Engl.	1	0	0	0	1	DM	PH		Knox 3382 (EA).
38	*Thalictrum rhynchorcarpum* Dillon & A .Rich	1	0	0	0	1	AL	HB		Mabberley & McCall 188 (EA).
	Proteaceae									
39	*Faurea saligna* Harv.	1	0	0	0	0	MF	TR		Buch 178 (EA).
39	*Protea gaguedi* J.F Gmel.	0	1	0	0	0	MF	TR		Napper 1504 (EA).
	Gunneraceae									
40	*Gunnera perpensa* L.	1	0	0	0	0	AL	HB		Tweedie 3014 (EA).
	Crassulaceae									
41	*Crassula alata* (Viv) Berger	1	0	1	0	0	DM	HB		Maas 6348 (EA).
41	*Crassula alba* Forsk	1	0	1	0	0	DM	HB		Dale 3271 (EA).
41	*Crassula alsinoides (Hook.f) Engl.*	1	0	1	0	0	DM	HB		Mabberley 572 (EA).
41	*Crassula granvikii* Mildbr	1	0	1	0	0	AL	HB		Thulin 204 (EA).
41	*Crassula schimperi Fisch & Mey*	1	0	1	0	0	DM	PH		SAJIT 004833 (EA).
41	*Kalanchoe cretica* (Andrews) Haw.	1	1	1	1	1	WG	HB		Symes 279 (EA).
41	*Kalanchoe densiflora* Rolfe	1	1	1	1	1	WG	HB		Rauh 683 (EA).
41	*Polygala sphenoptera* Fres.	1	0	0	0	0	DM		HB	
41	*Sedum meyeri-johannis* Engl.	1	0	0	0	0	DM	HB		SAJIT 006824 (EA,
41	*Sedum ruwenoriense* Bak.f.	1	1	1	1	0	DM	HB		Mabberley & McCall 230 (EA),
41	*Umbilicus botryioides* Hochst. ex A. Rich.	1	0	0	0	0	DM	ET		SAJIT 004850 (EA).
	Haloragaceae									
42	*Laurembergia tetrandra* (Schott) Kanitz	1	0	0	0	0	WL	HB		FOKP 10923 (EA,
	Vitaceae									
43	*Cyphostemma cyphopetalum* (Fresen.) Desc. ex Wild & R.B.Drumm	1	0	0	0	0	DM	HB		Symes 334 (EA).
43	*Cyphostemma kilimandischaricum*	1	0	0	0	0	DM		CR	

	(Gilg) Desc. ex Wild & R.B.Drumm									
43	*Rhoicissus tridentata* (L.f.) Wild & R.B.Drumm	1	0	0	0	0	DM		HB	
	Fabaceae									
45	*Aeschynomene abyssinica* (A.Rich.) Vatke	1	1	0	0	0	DM		HB	
45	*Acrocarpus fraxinifolius* Am	1	0	0	0	0	PL		TR	
45	*Albizia gummifera* (JF Gmel.)C.A SM	1	0	0	0	0	DF		TR	
45	*Antopetitia abyssinica* A. Rich	1	0	0	0	0	MF		HB	
45	*Argyrolobium fischeri* Taub.	1	0	0	0	0	DM		WH	
45	*Argyrolobium ramosissimum* Bak.	1	0	0	0	0	DM		HB	
45	*Caesalpinia decapetala* (Roth) Alston	1	0	0	0	0	FE	C R		FOKP 1297 (EA,
45	*Cassia didymobotrya* (Fresen.) Irvin & Barneby	1	1	0	0	0	WL	SB		
45	*Chamaecrista falcinella (*Oliv.)	1	0	0	0	0	DM	SB		
45	*Crotolaria cleomifolia* Bak.	1	0	0	0	0	WG		SH	
45	*Crotolaria cylindrica* A.Rich.	1	0	0	0	0	WG		SH	
45	*Crotolaria karagwensis* Taub	1	0	0	0	0	WG		HB	
45	*Crotolaria lachnocarpoides* Engl.	1	0	0	0	0	WG	SB		FOKP 11573 (EA,
45	*Crotolaria mauensis* Bak.f	1	0	0	0	0	WG		SH	
45	*Crotolaria quartiniana* A.Rich.	1	0	0	0	0	WG		SH	
45	*Crotolaria spinosa* Benth.	1	0	0	0	0	WG		HB	
45	*Crotolaria vallicola* Bak.f.	1	0	0	0	0	WG		HB	
45	*Desmodium repandum* (Vahl) DC.	1	0	0	0	0	WG		CR	
45	*Dolichos sericeus* E.Mey.	1	0	0	0	0	WG	C R		Tweedie 2959 (EA).
45	*Eriosema jurionianum* Stan & De Craene	1	0	0	0	0	WG		SH	
45	*Eriosema macrostipulum* Bak.f	1	0	0	0	0	WG	H B		Symes 61 (EA).
45	*Eriosema montanum* Bak.f.	1	0	0	0	0	WG		SH	
45	*Fraxinus pennyslvanica* Marshall	1	0	0	0	0	WG		TR	
45	*Galenga lindblomii* (Harms) Gillett	1	0	0	0	0	WG	H B		Gillett 18423 (EA).

45	*Hylodesmum repandum (*Vahl) H. Ohashi & R.R. Mill	1	0	0	0	0	WG	H B		FOKP 11525 (EA,
45	*Indigofera astragalina DC.*	1	0	0	0	1	WG	H B		Tweedie 2894 (EA).
45	*Indigofera brevicalyx* Bak.	1	0	0	0	1	WG		HB	
45	*Indigofera homblei* Bak.f & Martin	1	0	0	0	1	WG	SB		
45	*Indigofera longibarbata* Engl.	1	0	0	0	1	WG	SB		
45	*Indigofera mimosoides* Bak	1	0	0	0	1	WG	SB		
45	*Indigofera subargentea* De Wild	1	0	0	0	0	WG		HB	
45	*Indigofera trita* L.f.	1	0	0	0	0	WG	W H		FOKP 1288 (EA)
45	*Kotschya recurvifolia (*Taub.) F.White	1	0	0	0	0	WG	SB		
45	*Lablab purpureus* (L) Sweet.	1	0	0	0	0	WG		CR	
45	*Pterolobium stellatum* (Forssk.) Brenan	1	0	0	0	0	FE		CR	
45	*Rhynchosia kilimandischarica* Harms.	1	0	0	0	0	WG		CR	
45	*Rhynchosia usambarensis* Taub	1	0	0	0	0	WG		CR	
45	*Senna septemtrionalis* (Viv.) H.S. Irwin & Barneby	1	1	0	1	0	WG	SB		FOKP 1903 (EA,
45	*Tephrosia interrupta* Engl.	1	0	0	0	0	WG	W H		Thulin 120 (EA).
45	*Trifolium burchelianum* Ser.	1	1	0	0	0	MF	H B		Bogdan 4966 (EA).
45	*Trifolium cheranganiense* Gilett	1	1	0	0	0	WG	H B		Rawlins 2 (EA).
45	*Trifolium cryptopodium* A.Rich.	1	0	0	0	0	WG	H B		Bogdan 4968 (EA).
45	*Trifolium multinerve* A.Rich.	1	1	0	0	0	WG		HB	
45	*Trifolium polystachyum* Fres.	1	1	0	0	0	FE	H B		Symes 637 (EA).
45	*Trifolium rueppellianum* Fres.	1	1	0	0	0	WG	H B		Strange 140 (EA).
45	*Trifolium semipilosum* Fres	1	1	0	0	0	WG		HB	
45	*Trifolium simense* Fres.	1	1	0	0	0	WG	H B		Knight 56 (EA).
45	*Trifolium usambarense* Taub.	1	1	0	0	0	WG	H B		SAJIT Z0074
45	*Vacheliia abyssinica* Benth.	1	0	0	0	0	DF		TR	
45	*Zornia setosa* Bak.f.	1	0	0	0	0	DM		HB	
	Stipules									
	Rosaceae									
47	*Alchemila fischeri* Engl.	1	1	1	1	1	MF	SB		

47	*Alchemila rothii* Oliv.	1	1	1	0	1	MF	HB		Knox 3404 (EA).
47	*Alchemilla argyrophylla* Oliv.	1	0	0	0	1	MF	SB		
47	*Alchemilla cryptantha* A.Rich.		1	1	1	0	MF	HB		Napier 1978 (EA),
47	*Alchemilla gracilipes* (Engl*)* Engl	1	1	1	1	1	MF	HB		Verdcourt 2426 (EA).
47	*Alchemilla johnstonii* Oliv.	1	1	1	0	0	ALL	HB		Knox 3385 (EA).
47	*Cliffortia nitidula* RE & TCE Fries	1	0	0	0	1	AL	SB		
47	*Hagenia abyssinica* (Bruce)J.F Gmel	1	1	1	1	1	MF	TR		SAJIT 004854 (EA,
47	*Prunus africana* (Hook.f)Kalkman	TC	0	0	0	0	MF	TR		SAJIT 006869 (EA,
47	*Rubus apetalus* Poir	1	0	0	0	1	FE	CR		FOKP 1060
47	*Rubus pinnatus* Wild.	1	0	0	0	0	MF	CR		Tweedie 4086 (EA).
47	*Rubus scheffleri* Engl.	1	0	0	0	0	FE		CR	
47	*Rubus steudneri* Scheinf.	1	1	0	0	0	FE	CR		Tweedie 4086 (EA).
47	*Rubus volkensii* Engl.	1	0	0	0	0	AL		S/S	
	Rhamnaceae									
48	*Gouania longispicata* Engl.	1	1	0	0	0	FE	CR		FOKP 1098 (EA,
50	*Celtis africana* Burn.f.	1	0	0	0	0	MF		TR	
48	*Rhamnus prinoides* L 'Herit	1	1	1	0	0	DF	TR		Mbuni 046 (EA).
48	*Rhamnus staddo* A.Rich	1	0	0	0	1	DF	SB		
48	*Scurtia myrtina (*Burm.f.) Kurz	1	0	0	0	0	DF	SC		
	Cannabaceae									
50	*Trema orientalis* (L) BI.	1	0	0	0	0	MF		TR	
	Moraceae									
51	*Ficus sp.*	1	0	0	0	0	DM		TR	
	Urticaceae									
52	*Elastostema monticola* Hook.f	1	0	0	0	0	DM		HB	
52	*Girardina bullosa* (Steud.) Wedd.	1	0	0	0	0	WL		HB	
52	*Laportea alatipes* Hook.f	1	0	0	0	0	WL		HB	
52	*Laportea ovalifolia* (Schumach. & Thonn.) Chew.	1	1	1	1	0	WL		HB	
52	*Pilea johnstonii* Oliv.	1	1	1	1	0	WL		HB	
52	*Pilea rivularis* Wedd	1	0	0	0	0	WL		HB	

52	*Urera hypselodendron (A.Rich.)* Wedd.	1	1	0	1	1	WL		CR
52	*Urtica masaica Mildbr.*	1	0	0	0	0	FE		HB
	Cucurbitaceae								
53	*Cucumis ficifolius* A.Rich	1	0	0	0	0	WG	SB	
53	*Lagenaria abyssinica* (*Hook .f) C.Jeffrey*	1	0	0	0	0	WG		HB
53	*Momordica friesorum* (Harms.) C.Jeffrey	1	0	0	0	0	WG		HB
41	*Peponium vogelii* (Hook. f.) Engl...	1	0	0	0	0	WG		CR
53	*Trochomeria macrocarpa* (Sond) Hook .f	1	0	0	0	0	WG		HB
53	*Zehneria minutiflora* (Cogn.) C.Jeffrey	1	0	0	0	0	WG		CR
53	*Zehneria scabra* (L.f.) Sond.	1	0	0	0	0	WG		CR
	Celastraceae								
55	*Catha eduls* (Vahl) Forssk. ex Endl.	1	0	0	0	0	MF		TR
55	*Maytenus heterophylla* (Eckl. & Zeyh.) Robson	1	0	0	0	0	MF		TR
55	*Maytenus senegalensis* (Lam.)Exell	1	0	0	0	0	MF		TR
55	*Maytenus undata* (Thumb.)Blakelock	1	1	0	0	0	MF		TR
55	*Camellia sinensis (*L.) Kuntze	1	0	0	0	0			
55	*Salacia ceracifera* Welw. ex Oliv	1	0	0	0	0	MF		CR
	Hippocrateaceae								
55-	*Hyppocratea africana* (*Willd.) Loes*	1	0	0	0	0	DM		CR
	Oxalidaceae								
56	*Biophytum abyssinica* A.Rich.	1	0	0	0	0	DM		HB
56	*Oxalis acuminata* Schltdl. & Cham	1	1	1	1	1	DM		HB
56	*Oxalis latifolia* H.B & K.	1	1	1	1	1	DM		HB
	Rhizophoraceae								
57	*Cassipourea malosana* (Bak.)Alston	1	0	0	0	0	DM		TR
	Euphorbiaceae								
	Acalypha fruitcosa Forsk.							SB	
59	*Acalypha ornata* A.Rich	1	1	1	1	0	MF	SB	

59	*Acalypha psylostachya* Hochst.	1	1	1	1	0	FE		CR	
59	*Acalypha stuhlmanii* Pax	1	1	1	1	0	DM		HB	
59	*Acalypha volkensii* Pax	1	0	0	0	0	WG	SB		FOKP 11407 (EA,
58	*Clutia abyssinica* Jaub.& Spach	1	0	0	0	0	DF		WH	
59	*Coccinia adoensis* (A.Rich) Cogn.	1	1	1	1	0	DM		HB	
59	*Croton macrostachys* Del.	1	1	1	1	0	DM	TR		Birch 61 & 169 (EA).
59	*Drypetes gerrardii* Hutch.	1	0	0	0	0	DM		TR	
59	*Erythroccoca species*	1	0	0	0	0	DM	SB		
59	*Euphorbia brevicomu* Pax	1	1	1	1	0	DF	HB		Mabberley & McCall 254 (EA).
59	*Euphorbia depauperata* A.Rich	1	0	0	0	0	WG	SB		Thulin & Tidigs 224 (EA).
59	*Euphorbia engleri* pax	1	0	0	0	0	DM	WH		FOKP 1807 (EA,
59	*Euphorbia obovalifolia* A.Rich	1	1							
59	*Euphorbia schimperiana* Scheele	1	1	1	1	0	DF		HB	
59	*Macaranga kilimandischarica* Pax	1	0	0	0	0	DM	TR		Buch 175 (EA).
59	*Neoboutonia macrocalyx* Pax	1	1	1	1	0	WL	TR		Tweedie 4118 (EA).
59	*Phyllanthus saffrutescens* Pax	1	1	1	1	0	DM		CR	
59	*Phyllanthus boehmii* Pax	1	0	0	0	0	DM	SB		
59	*Phyllanthus fischeri* Pax	1	1	1	1	0	DM	SB		
59	*Phyllanthus niruroides* Muell.Ang	1	1	1	1	0	DM		HB	
59	*Tragia brevipes* pax	1	1	1	1	0	DM		CR	
	Ochnaceae									
60	*Ochna insculpta* Sleumer	1	1	0	0	0	DM	SC		Carter & Stannard 70 (EA).
	Passifloraceae									
62	*Adenia cissampeloides* (Planch. ex Hook.) Harms	1	0	0	0		MF		CR	
	Salicaceae									
63	*Agauria salicifolia* (Lam.) Oliv	1	0	0	0	0	MF		TR	
63	*Dovyalis abyssinica* (A.Rich.) Warb.	1	0	0	0	0	FE	SB		

63	*Dovyalis macrocalyx* (Oliv.) Warb.	1	1	0	1	1	DF	SB	
	Violaceae								
	Viola eminii (Engl.) R.E.Fr.	1	0	0	0	0	DM		HB
	Linaceae								
64	*Linum volkensii* Engl.	1	1	0	0	0	DM		HB
	Hypericaceae								
66	*Gnidia glauca* (Fresen) Gilg	0	0	0	1	0	DM	SB	
66	*Gnidia kraussiana* Meisn	1	0	0	1	0	MF	SB	
66	*Harugana madagascariensis* Lam. ex Poir.	1	0	0	0	0			
66	*Hypericum lalandii* Choisy	0	0	0	1	0	DM		HB
66	*Hypericum peplidifolium* A.Rich	0	0	0	1	0	AL		HB
66	*Hypericum revolutum Vahl*	1	0	0	1	0	MF		TR
	Geraniaceae								
67	*Geranium aculeolatum* Oliv.	1	1	1	1	0	MF		PH
67	*Geranium arabicum* Forsk.	1	1	1	1	0	DM		HB
67	*Geranium arabicum* Forsk.	1	1	1	1	0	MF		HB
67	*Geranium elamellatum* Kokwaro	1	1	1	1	0	FE		PH
67	*Geranium ocellatum* Cambess.	1	1	1	1	0	WL		HB
	Bersamaceae								
68	*Bersama abyssinica* Fres.	1	1	1	1	0	DM		Tree
	Onagraceae								
71	*Epilobium hirsutum* L.	1	0	0	0	0	WG		HB
71	*Epilobium salignum* Hausskn	1	0	0	0	0	WG		HB
71	*Epilobium stereophyllum* Fres	1	0	0	0	0	WG		HB
71	*Fuchsia regia* (Vell.) Munz	1	0	0	0	0	PL		HB
71	*Ludwigia abyssinica* A.Rich	1	0	0	0	0	WL		HB
71	*Ludwigia jussiaeoides* Desr.	1	0	0	0	0	MF		HB

	Myrtaceae									
72	*syzygium cordatum* Krauss	1	1	1	1	0	MF		TR	
72	*Melaleuca viminalis (Sol. ex Gaertn.) Byrne*	1	0	0	0	0	PLL		TR	
72	*Eucalyptus saligna* Smith.	1	0	0	0	0	PLL		TR	
72	*Lophostemon confertus* .(R.Br.) Peter G.Wilson & J.T.Waterh	1	0	0	0	0	PLL		HB	
72	*Syzygium guineense* (Willd.)DC.	1	1	1	1	1	MF		TR	
	Melastomataceae									
73	*Antherotoma naudinii* Hook.f.	1	1	1	0	0	WG		HB	
73	*Dissotis canescens* (Graham) Hook.f.	1	1	0	0	0	WG		HB	
73	*Dissotis senegambiensis* (Guill.&Perr.0Triana	1	1	0	0	0	WG		HB	
73	*Dissotis speciosa* Taub.	1	1	0	0	0	WG		HB	
	Penaeaceae									
74	*Olinia rochetiana* A.Juss.	1	0	0	0	0	Moist forest		TR	

Resinous trees/shrubs. Leaves alternate often trifoliolate or pinnately compound, Some simple

	Anacardiaceae									
	Rhus vulgaris Meikle	1	1	1	1	0	DF	SB		
76	*Searsia natalensis (*Bernh. ex C. Krauss) F.A. Barkley	1	1	1	0	0	FE			Mbuni 172 (EA).
	Sapindaceae									
77	*Allophyllus abyssinica* (Hochst.) Radk.	1	0	0	0	0	MF	T R		SAJIT 006927 (EA,
	Rutaceae									
78	*Toddalia asiatica* (L.) Lam	1	1	1	1	1	FE		CR	
78	*Clausena anisata* (Wild.) Benth.	1	0	0	0	0	MF		TR	
78	*Vepris nobilis* (Delile) Mziray	1	1	1	1	1	MF	T R		Kokwaro 3096
78	*Vepris simplicifolia* (Engl.) Verd	1	1	1	1	0	MF	T R		FOKP 1872 (EA,
	Meliaceae									
79	*Turraea abyssinica* A.Rich	1	0	0	0	0	DM	ST		

79	*Ekebergia capensis* Sperm.	1	1	0	0	0	DF		TR	
	Malvaceae									
80-	*Triumfetta rhomboidea* Jacq.	1	0	0	0	0	DM	SH		Symes 215 (EA).
80-	*Triumfetta brachyceras* K.Schum	1	0	0	0	0	FE	WH		Hepper & Field 4983 (EA).
80	*Abutilon longicuspe* A .Rich	1	1	0	0	0	MF	SB		SAJIT 004752 (EA,
80	*Abutilon mauritianum* (Jacq) Medic.	1	1	0	0	0	WL	SB		Lindsay 2 (EA).
80	*Dombeya torrida* J.F Gmel	1	1	1	1	1	MF	TR		Lind *et al*. 5080 (EA).
80	*Hibiscus aethiopicus* L.	1	1	0	0	0	WG	SF		
80	*Hibiscus calyphyllus* Cav.	1	1	0	0	0	WG	SB		
80	*Hibiscus diversifolius* Jacq.	1	1	0	0	0	DF	SB		Brodhurst –Hill 8765 (EA).
80	*Hibiscus fuscus* Garcke	1	1	0	0	0	WG	SB		Symes 72 (EA).
80	*Hibiscus meyeri* Harv	1	1	0	0	0	DF		HB	
80	*Hibiscus micranthus* A.Rich	1	1	0	0	0	DF	SB		Webster 8763 (EA).
80	*Hibiscus vitifolius* L.	1	1	0	0	0	FE	SB		
80	*Malva parvifolia* L.	1	0	0	0	0	WG		WH	
80	*Malva verticilata* L.	1	1	0	0	0	FE	HB		Thulin & Tidings 241 (EA)
80	*Pavonia burchellii* (DC.)R.A Dyer	1	1	0	0	1	DF	SB		.Symes 65 (EA).
80	*Pavonia urens* Cav.	1	1	0	0	0	WL	SB		Kerfoot 8771 (EA).
80	*Sida rhombifolia* L.	1	1	0	0	0	WG	SF		Agnew *et al*. 10275 (EA).
80	*Sida schimperiana* A.Rich.	1	1	0	0	0	WG	SF		
80	*Sida ternata* L.f,	1	1	0	0	0	AL	HB		Symes 100 (EA).
80	*Sparmannia ricinocarpa* (Eckl & Zeyh.) Kuntze	1	1	0	0	0	FE	SF		FOKP 11711 (EA,
80	*Triumfetta brachyceras* K.Schum	1	1	0	0	0	FE	SB		Hepper & Field 4983 (EA).
80	*Triumfetta tomentosa* Boj.	1	1	0	0	0	FE	SB		
	Thymelaeaceae									
81	*Gnidia kraussiana* Meisn	0	0	1	1	0	MF	SF		
81	*Gnidia lamprantha* Gilg.	0	0	1	1	0	MF	SB		
81	*Struthiola thomsonii* Oliv.	1	0	0	1	0	DF	SB		

	Brassicaceae									
86	*Arabis alpina* L.	1	0	0	0	0	WL		HB	
86	*Cardamine africana* L.	1	0	0	0	0	AL		HB	
86	*Rorippa nasturtum-aquaticum* (L) Hayek	1	0	0	0	0	WL		HB	
86	*Thlaspi alliaceum* L.	1	0	0	0	0	AL		HB	
	Viscaceae									
87-	*Arceuthobium juniperi-procerae* chiov	0	0	0	1	0	WL	ET		
87-	*Viscum tubercululatum* A. Rich	1	0	0	0	0	DM	ET		
87-	*Viscum schimperi* Engl.	1	0	0	0	0	DM	ET		
87-	*Viscum triflorum* DC.	1	0	0	0	0	DM	ET		
	Santalaceae									
87	*Osyridicarpos schimperianus* (.Rich)	1	0	0	0	0	MF	ET		
24	*Osyris lanceolata* Hochst. & Steudel.	1	1	0	0	0	MF	ET		SAJIT 004835 (EA,
	Loranthaceae									
88	*Oncocalyx fischeri* (Engl.)	1	1	0	0	0	MF			
88	*Phragmathera usuiensis* (Oliv.)M.Gilbert	1	1	0	0	0	MF	ET		
88	*Plicosepalus curvifolius (*Oliv.) Van Tiegh.	1	1	0	0	0	MF	ET		
88	*Plicosepalus sagittifolius* (Engl.)Danser	1	1	0	0	0	MF	ET		
								ET		
	Polygonaceae									
90	*Fragopyrum esculentum* Moench	1	0	0	0	0	DM		HB	
90	*Harpagocarpus snowdenii* Hutch& Dandy	1	1	1	1	0	MF		HB	
90	*Perscaria lapathifolia* (L) Gray.	1	0	0	0	0	DM		HB	
90	*Polygonum senegalense* Meisn.	1	0	0	0	0	WL		HB	
90	*Rumex steudelii* A.Rich	1	0	0	0	0	DM		HB	
	Caryophyllaceae									
91	*Cerastium afromontanum* T.C.E. Fries & Weimark	1	0	0	0	0	DM		HB	
91	*Silene burchellii* DC.	1	0	0	0	0	DM		HB	
91	*Silene gallica* L.	1	0	0	0	0	DM		HB	
91	*Stellaria media* (L.) Vill.	1	0	0	0	0	DM		HB	
	Amaranthaceae									

92	*Alternanthera pungens* Kunth.	1	0	0	0	0	DM		HB	
92	*Amaranthus hybridus* L.	1	0	0	0	0	DM		HB	
92	*Achyranthes aspera* L.	1	0	0	0	0	FE		HB	
92	*Cyanthula uncinulata* (Schrad.) Schinz	1	1	1	1	0	DM		HB	
92	*Cyathula cylindrica* Moq.	1	1	1	1	1	DM		HB	
	Phytolaccaceae									
93	*Phytolacca octandra* L.	1	1	1	1	0	DM	H B		SAJIT 004776,
93	*Phytolacca dodecandra* L 'Herit.	1	1	1	1	1	FE	C R		FOKP 969
	Nyctaginaceae									
94	*Boerhavia plumbaginea* Cav.	1	1	1	1	0	DM	H B		FOKP 1250 (EA,
94	*Commicarpus pedunculosus* (A.Rich (Cuf.	1	0	0	0	0	DM		HB	
94	*Commicarpus plumbagineus* (Cav.) Standl.	1	0	0	0	0	WL		HB	
	Basellaceae									
96	*Basella alba* L.	1	1	1	1	0	FE	C R		FOKP 982
	Cornaceae									
99	*Cornus volkensii* Harms	0	0	0	1	0	DM	T R		FOKP 1058,
	Balsaminaceae									
100	*Impatiens hochstetteri* Warb.	1	1	1	1	0	DF		HB	
100	*Impatiens irvingii* Hook.f.	1	1	1	1	0	MF	H B		Webster 8738 (EA).
100	*Impatiens pseudoviola* Gilg.	1	1	1	1	0	WL	H B		Hughes 1 (EA).
100	*Impatiens sodenii* Engl. & Warb.	1	1	1	1	0	WL	H B		SAJIT 004733 (EA,
	Sapotaceae									
101	*Aningeria adolfi-friedricii* (Engl.)Robyns&Gilb	1	0	0	0	0	MF	T R		Colby H134 (EA).
	Primulaceae									
103	*Maesa lanceolata* Forssk.	1	1	0	0	1	DF	SB		SAJIT 004770
103	*Myrsine africana L.*	1	1	0	1	0	MF	T R		Lind & Agnew 5160 (EA).
103	*Rapanea melanophloeos* (L.)Mez	1	0	0	0	0	MF	T R		Knight 87 (EA).

	Ericaceae								
104	*Erica whyteana* Britten	1	1	1	1	0	WL	SB	Bogdan 4999 (EA).
104	*Agarista salicifolia* A.Rich	1	0	0	0	0	WG	TR	Friis & Hansen 2513 (EA),
	Rubiaceae								
	Interpetiolar stipules								
105	*Agathisanthemum globosum A.*Rich Brem	1	1	1	1	0	DM	HB	Lewis 5987 (EA),
105	*Anthospermum herbaceum* L.f	1	1	1	1	1	DM	HB	Symes 211 (EA).
105	*Anthospermum usambarense* K. Schum	1	0	0	0	1	DM	SB	Thulin &Tidigs 251 (EA).
105	*Coffea eugenioides* S.Moore…?	1	0	0	0	0	WG	TR	Thomas 232 (EA).
105	*Galiniera saxifraga* (Hochst.)Bridson	1	0	0	0	0	MF	TR	SAJIT 005072
105	*Galium aparine auctt.Afr***.**	1	1	0	0	1	WG	HB	AJIT 006856 (EA,
105	*Galium aparinoides* Forsk.	1	1	1	1	1	FE	HB	FOKP 11404 (EA,
105	*Galium kenyanum* Verdc	1	1	1	1	1	AL	HB	Mabberley 51 (EA).
105	*Galium ruwenzoriense (*Cortesi) Chiov.	1	1	1	1	1	FE	HB	Knox 3387 (EA),
105	*Galium scioanum* Chiov.	1	0	0	0	0	MF	HB	Tweedie 2699 (EA).
105	*Keetia guienzii* (Sond.) Bridson	1	0	0	0	0	DF	SC	Friis & Hansen 2545 (EA).
105	*Mitracarpus scaber Zucc.*	1	0	0	0	0	DM	HB	SAJIT Z0008
105	*Oldenlandia monathos* (A.Rich.)Hiern	1	0	0	0	0	DM	HB	SAJIT 006820 (EA,
105	*Pavetta abyssinica* Fres	1	0	0	0	0	DM	SB	SAJIT 005069 (EA,
105	*Pentanisia schweinfurthii* Hiern	1	1	0	0	0	DM	HB	Symes 278 (EA).
105	*Pentas decora S.Moore.*	1	1	0	0	0	DM	WH	Lucas 200 (EA).
105	*Pentas lanceolata* (Forssk.) Deflers	1	1	1	1	1	DM	WH	Lind 5093 (EA).
105	*Pentas longiflor*a Oliv.	1	0	0	0	0	DM	WH	FOKP 1095,
105	*Pentas pubiflora* S.More	1	0	0	0	1	DM	HB	FOKP 11290 (EA,
105	*Pentas schimperiana* (A.Rich.) Vatke	1	0	0	0	0	DM	WH	Gardener 2852 (EA).

105	*Psychotria kirkii* Hiern	1	0	0	0	0	MF	SB		FOKP 11298
105	*Richardia brasiliensis* Gomes	1	0	0	0	1	WG	HB		FOKP 11489 (EA,
105	*Rubia cordifoliav* L	1	1	1	1	1	DF	HB		Mungai 84 & 128 (EA).
	Spermacose minutifora (K .Schum) Verdc.	1	0	0	0	1	WG	HB		Napier 1973 (EA).
105	*Spermacose princeae K.* Schum	1	0	0	0	0	FE	HB		SAJIT 006926 (EA,
105	*Vangueria apiculaa (Verdc.) Lantz*	1	0	0	0	0	DF	TR		SAJIT 004742
	Gentianaceae									
106	*Anagalis pumila* Sw.	1	1	1	1	0	WL		HB	
106	*Anagalis serpens* DC.	1	1	1	1	0	WL		HB	
106	*Lysmachia ruhmeriana* Vatke.	1	1	1	1	0	WL		PH	
106	*Sebaea brachyphylla* Griseb	0	1	1	1	0	WL		HB	
106	*Sebaea leiostyla Gilg*	1	1	1	1	0	WL		HB	
106	*Swertia crassiuscula* Gilg	1	1	1	1	0	WL	HB		Dale 3263 & 3264 (EA).
106	*Swertia eminii* Engl.	1	1	1	1	0	WL		HB	
106	*Swertia kilimandischarica* Engl.	1	1	1	1	0	WL	HB		Lucas 169 (EA),
106	*Swertia tetrandra* Hochst.	1	1	1	1	0	WL	HB		005101 (EA,
106	*Swertia usambarensis* Engl.	1	1	1	1	0	WG		HB	
	Apocynaceae									
108	*Marsdenia schimperi* Decne.	1	1	1	0	0	FE		HB	
108	*Gomphocarpus fruitcosus* (L.) Ait.f	1	0	0	0	0	WG	WH		Hepper 5056 (EA).
108	*Margaretta rosea* Oliv.	1	0	0	0	0	DF		CR	
108	*Pachycarpus lineolatus* (Decne.) Bullock	1	0	0	0	0	DF		CR	
108	*Pentarrhinum gonoloboides* (Schltr.)	1	0	0	0	0	DF		CR	
108	*Periploca linearilifolia* Dill&A.Rich	1	1	1	1	1	DF	CR		Fattan 13876 (EA).
108	*Rauvolfia caffra* Sond	1	1	1	1	0	MF		TR	
108	*Saba comorensis* (DC.)	1	0	0	0	0	MF	CR		Mabberley & McCall 98 (EA).
109	*Tabernaemontana stapfiana* Britten	1	0	0	0	0	MF	TR		FOKP 1112,
108	*Vinca major* L.	1	0	0	0	0	PL		HB	

	Boraginaceae									
109	*Cynoglossum aequinoctiale* T.C.E Fries	1	0	0	0	0	MF		HB	
109	*Cynoglossum cheranganiense Verrdc.*	1	0	0	0	0	MF		HB	
109	*Cynoglossum coeruleum* A.DC	1	0	0	0	0	MF		HB	
109	*Cynoglossum lanceolatum* Forsk.	1	0	0	0	0	MF		HB	
109	*Ehretia* cymose (Thonn)	1	0	0	0	0	MF		HB	
109	*Lithospermum afromontanum* Weim.	1	0	0	0	0	MF		HB	
109	*Myosotis abyssinica* Boiss & Reut.	1	0	0	0	0	MF		HB	
109	*Trichodesma physaloides* (Fenzl) A.DC.	0	1	0	0	0	WG		HB	
	Cuscutaceae									
110	*Cuscuta campestris* Yunck	1	0	0	0	0	DM		Herb	
110	*Cuscuta kilimanjari* Oliv.	1	1	0	0	0	DM	He rb		SAJIT 006901 (EA,
	Convolvulaceae									
	Milky climbers, Convolute flowers									
110	*Dicondra repens* J.R & G Forst.	1	1	1	1	1	DM		HB	
110	*Ipomea wightii (Wall.)* Choicy	0	0	0	0	0	DM		HB	
110	*Ipomoea tenuirostris* Choicy	1	0	0	0	0	WG	C R		Tweedie 3115 (EA).
110	*Ipomoea wightii* (Wall.) Choisy	1	0	0	0	0	WG		CR	
110	*Stictocardia beraviensis* (Vatke)Hall.f	1	0	0	0	0	WG	C R		Honore 3451 (EA).
	Solanaceae									
111	*Cestrum aurantiacum* L	1	1	0	1	1	DM	SB		FOKP 1020 (EA,
111	*Datura stramonium* L.	1	1	1	1	1	DM		HB	
111	*Datura suaveolens* Hook.	1	0	0	0	1	DM		HB	
111	*Discopodium penninervum* Hochst.	0	0	0	1	0	AL	SB		FOKP 1891 (EA,
111	*Nicandra physaloides* L. Gaertn.	1	0	0	0	0	DM		HB	
111	*Nicotiana tobacum* L.	1	0	0	0	0	DM		HB	
111	*Petunia species*	1	0	0	0	0	PL		HB	
111	*Physalis peruviana* L.	1	0	0	0	0	WG	H B		Mabberley & McCall 108 (EA).
111	*Solanum aculeastrum* Dunal	1	0	0	0	1	WG	SB		Symes 635 (EA).

111	*Solanum aculetissimum* Jacq.	1	0	0	0	1	DM	SB		
111	*solanum anguivi* Lam	1	1	1	1	1	DF	SB		
111	*Solanum incanum* L.	1	1	1	1	1	DM	SB		
111	*Solanum mauritianum* Scop.	1	1	1	1	1	FE	SB		
111	*Solanum nakurense* C.H Wright	1	0	0	0	0	WG		SH	
111	*Solanum sessilistellatum* Bitter	1	0	0	0	0	DF	S H		Jackson 2424 (EA).
111	*Solanum terminale* Forssk.	0	1	0	0	0	MF		HB	
111	*Withania somnifera* (L.) Dunal	1	0	0	0	0	DF		PH	
	Oleaceae									
112	*Jasminum abyssinicum* DC.	1	1	1	1	0	DF		CR	
112	*Jasminum floribundum* Fresen.	1	1	1	1	0	DF		CR	
112	*Jasminum fluminense* Vell.	1	0	0	0	0	DF	C R		SAJIT 006807 (EA,
112	*Olea africana L.*	1	1	0	0	0	MF	T R		Lind 5088 (EA).
112	*Olea capensis ssp. hochstetteri* (Baker)	1	1	0	0	1	MF		TR	
112	*Olea capensis ssp.welwitschii (*Knobl.)& P.S Green	1	0	0	0	0	MF		TR	
112	*Schrebera alata* (Hochst.) Welw.	1	1	1	1	0	MF		TR	
	Fraxinus pennyslivanica Marshal*l*	1	0	0	0	0	PL		TR	
	Plantaginaceae									
113	*Plantago lanceolata* L.	1	1	1	1	1	WL	H B		Tweedie 2806 (EA).
113	*Plantago palmata* Hook.f.	1	1	1	1	1	WL	H B		Pudwa 67 (EA).
114	*Veronica anagallis-aquatica* L.	1	0	0	0	0	WL		CR	
114	*Veronica abyssinica Fres.*	1	0	0	0	1	WL		HB	
114	*Veronica glandulosa* Benth.	1	0	0	0	1	WL		HB	
	Linderniaceae									
114	*Lindernia serpens* Philcox	1	0	0	0	1	DM		HB	
114	*craterostigma hirsutum* S.Moore	0	0	1	0	0	WL		HB	
114	*Craterostigma plantagineum* Hochst	1	0	1	0	0	WL		HB	
114	*Craterostigma pumilum* Hochst	1	0	1	0	0	WL		HB	

	Pedeliaceae									
117	*Sesamum calycinum* Welw.	1	0	0	0	0	DM		HB	
117	*Sesamum species.*	1	0	0	0		DM		CR	
	Lamiaceae									
	Mint smell, Opposite leaves									
118	*Achyrospermum schimperi* (Hochst. ex Briq.) Perkins (Briq.) Perkins	1	1	0	0	0	WL	SB		FOKP 11311 (EA),
118	*Ajuga integrifolia* Buch-Ham.	1	1	1	1	1	DM		HB	
118	*Clerodendron johnstonii* Oliv.	1	1	1	0	0				SAJIT 004723,
118	*Clinopodium abyssinica* (Benth.)Kuntze	1	1	0	0	0	WL	SB		
118	*Clinopodium simense* (Benth.)Kuntze	1	1	0	0	0	DM		HB	
118	*Fuerstia africana* T.C.E.Fr.	1	1	0	0	0	WG		WH	
118	*Leonotis nepetifolia* (L.)R.Br	1	1	0	0	0	WG	W H		SAJIT 004845 (EA,
118	*Leonotis ocymifolia* (Burm.f.) *Iwarsson* (N.L.Burm.)Iwarsson	1	1	0	0	0	MF	H B		FOKP 942 & 11311
118	*leucas argentea* Guerke	1	1	0	0	1	DM		HB	
118	*Leucas bracteosus* Guerke	1	1	0	0	0	DM		HB	
118	*Leucas calostachys* Oliv	1	1	0	0	0	DM		HB	
118	*Leucas glabrata* (Vahl) R.Br	1	1	0	0	0	DM		HB	
118	*Leucas martinicensis* (Jacq) Ait.f.	1	1	0	0	0	DM		HB	
118	*Leucas masaiensis* Oliv.	1	1	0	0	0	DM		HB	
118	*Leucas oligocephala* Hook.f	1	1	0	0	0	DM		HB	
118	*Micromeria imbricata* (Forsk) C.hr.	1	1	0	0	0	DF	W H		FOKP 11546
118	*Nepeta azurea* benth.	1	1	0	0	1	WG	SB		Mabberley & McCall 248 (EA).
118	*Ocimum decumbens* Guerke	1	1	0	0	0	WG		WH	
118	*Ocimum kilimandischarica* Guerke	1	1	0	0	0	WG		WH	
118	*Ocimum lamiifolium* Benth.	1	1	0	0	0	WG		WH	
118	*Pimpinella hirtella* A.Rich	1	1	0	0	0	WL		HB	
118	*Platostoma rotundifolium* (Briq.) A.J. Paton	1	1	0	0	0	WL	H B		OKP 1222 (EA,

118	*Plectranthus alpinus* (Vatke)Ryding	1	1	0	0	0	WG		Shrub	
118	*Plectranthus autranii* (Briq.) Erhardt, Götz & Seybold	1	1	0	0	0	WG	SB		
118	*Plectranthus barbatus* Engl.	1	1	0	1	0	DM	W H		Symes 655 (EA).
118	*Plectranthus bojeri* (Benth.) Hedge	1	1	0	0	0	WG		WH	
118	*Plectranthus kamerunensis* Guerke	1	1	1	1	1	WG		HB	
118	*Plectranthus luteus* Gurke	1	0	0	0	0	WG		HB	
118	*Plectranthus neochillus* (Schltr.) Codd	0	0	0	1	0	WG		HB	
118	*Plectranthus ornatus* Codd	1	1	0	0	1	WG	SB		
118	*Plectranthus punctatus* (L.f)	1	0	0	0	0	WL	H B		FOKP 1132 (EA,
118	*Plectranth*us *sylvestris* (Gürke) A.J.Paton & Phillipson	1	1	0	0	0	DM	SB		
118	*Plectranthus tetradenifolius* A.J .Paton	1	1	0	0	0	DM		DB	
118	*Pycnostachys meyeri Guerke.*	1	1	1	0	0	DM	W H		FOKP 11274,
118	*Salvia cocinnea* Buchoz Ex eti.	1	0	0	0	0	MF		HB	
118	*Salvia leucantha* Cav	1	0	0	0	0	PL			
118	*Salvia merjamie* Forsk	1	1	0	0	1	WL	P H		Lucas 167 (EA).
118	*Salvia nilotica* Jacq.	1	1	0	0	0	WG	H B		Webster 8978 (EA).
118	*Scutellaria schweinfurthii* Briq	1	1	0	0	0	WG	H B		Symes 33 (EA).
118	*Scutellaria violascens* Guerke	1	1	0	0	0	WL	H B		Chater 1932 (EA).
118	*Tetradenia urticifolia* (Bak.) Philipson	1	1	0	0	0	DF		SH	
118	*Tinnea aethiopica* Hook.f.	1	1	0	0	0	WG	SB		Lucas 160 (EA).
	Orobanchaceae									
119	*Alletra sessiliflora* (Vahl) ,Kuntze	1	1	0	0	0	DF	H B		Bogdan 5302 (EA).
114	*Buchinera nuttii* Skan	1	0	0	0	0	DM		HB	
114	*Buchinera scabridula* E.A Bruce	1	0	0	0	0	DM		HB	
114	*Buddleia polystachya* Fres.	1	0	0	0	0	MF	SB		FOKP 965,
114	*Casaeria battiscombei* R.E Fries	1	0	0	0	1	MF		TR	
114	*Cycnium herzfeldianum* (Vatke) Engl.	1	0	1	0	0	DM		HB	

114	*Cycnium tenuisectum* (Stand) O.J.Hansen	1	0	1	0	0	DM	H B		SAJIT 007119 (EA,
114	*Selago thomasii* Rolfe.	1	0	0	0	1	DM		HB	
114	*Sopubia ramosa* (Hochst.) Hochst	1	0	0	0	1	DM	H B		Gardner 3724 (EA).
114	*Striga asiatica* (L.) Ktze.	1	0	0	0	1	DM		HB	
114	*Verbascum brevipedicellatum* (engl.) Huber.	1	0	0	0	0	DM	T R		Thulin & Tidigs 44 (EA).
115										
116										
117										
118										
119										
120										
120	*Utricularia prehensilis* E.Mey	1	1	0	0	0	D M		WH	
	Herbs,funicled seed stock, simple opposite exstipulate leaves									
	Acanthapale pubescens C.B Clarke	1	1	1	1	0	FE		HB	
	Acanthaceae									
	Cystoliths visible									
121	*Acanthus eminens* C.B Clarke	1	1	0	0	0	DF	S/ H		FOKP 1002 (EA,
121	*Barleria grandcalyx* .Lindau	1	1	0	0	0	FE	H B		Symes 35 (EA).
121	*Brilliantaisia madagascariensis* Lindau	1	1	1	1	0	FE	H B		Verdcourt 1656
121	*Dicliptera laxata* C.B.CL.	1	1	0	0	0	FE		HB	
121	*Dicliptera nilotica* C.B.CL.	1	1	1	1	0	FE		HB	
121	*Dyscoriste clinopodioides* Mildr.	1	1	0	0	0	FE		HB	
121	*Hypoestis aristata* (Vahl) Roem & Schultes	1	1	1	1	1	FE		HB	
121	*Hypoestis forskahlii (Vahl)R.Br.*	1	1	1	1	1	FE	H B		FOKP 932,
121	*Isoglossa gregori* (S.Moore) Lindau	1	1	0	0	0	FE		HB	
121	*Isoglossa subtrobilina* C.B.CL.	1	1	0	0	0	FE	H B		FOKP 948
121	*Justicia anagalloides (*Nees)T.Anders	1	1	0	0	0	FE		HB	
121	*Justicia flava* Vahl	1	1	0	0	0	FE	H B		Perdue & Kibuwa 9423
121	*Justicia ladanioides* Lam.	1	1	0	0	0	W G	H B		Geesteranus 6375 (EA).
121	*Justicia leikipiensis* S. Moore	1	1	0	0	1	W G	H B		Mainwaring 18 (EA).
121	*Justicia nyassana* Lindau	1	1	0	0	0	FE		HB	
121	*Justicia striata (*Kl.) Bullock	1	1	0	0	0	FE		HB	
121	*Justicia unyorensis* S. Moore	1	1	0	0	0	FE	H B		Malombe *et al*. 1324

121	*Makharmia lutea* (Benth.) K.Schum	1	0	0	0	0	PL L	T R		Makokha 000 (NAI)
122	*mimulopsis alpina* Chiov	1	0	0	0	0	M F		HB	
121	*Mimulopsis arborescens* C.B.CL.	1	0	0	0	0	M F	S B		Cock 009
121	*Mimulopsis solmmsii* Schweinf.	1	0	0	0	0	M F	S B		Tweedie 3229 (EA)
121	*Spathodea campanulata* P.Beauv.	1	0	0	0	0	PL L	T R		Makokha 000 (NAI)
122	*Tecomaria capensis*	1	0	0	0	0	PL L	S B		Makokha 000 (NAI)
122	*Thunbergia alata* Sims	1	1	0	0	0	DF		HB	
121	*Thunbergia paulitschkeana* Beck	1	1	0	0	0	M F	H B		Hepper 5024 (EA).
	Verbenaceae									
123	*Clerodendrum johnstonii* Oliv.	1	1	0	0	0	M F	S C		
123	*Duranta variegata* L	1	0	0	0	0	PL	S B		
123										
123	*Lantana trifolia* L.	1	1	0	0	0	D M	SF		
123	*Lippia grandifolia* A.Rich	1	1	0	0	0	FE	SF		
123	*Lippia kituiensis* Vatke.	1	1	0	0	0	DF	SF		
123	*Lippia woodii Moldenke*	1	1	1	0	0	W G	SF		
123	*Rotheca myricoides* (Hochst*.)*Steane & Mabb.	1	1	0	0	0	W G	S B		
123	*Verbena bonariensis*	1	0	0	0	0	W G	H B		FOKP 1282
123	*Verbena officinalis* L.	1	0	0	0	0	FE		HB	
	Milky herbs									
	Campanulaceae									
125	*Canarina abyssinica* Engl*.*	1	1	1	0	0	W L		CR	
125	*Lobelia aberdarica* R.E.&T.C.E.Fries	1	0	1	0	0	W L	S B		Townsend 2387 (EA).
125	*Lobelia cherenganiensis* Thulin	1	0	1	0	0	AL		PH	
125	*Lobelia duriprati* T.C.E Fries	1	0	1	0	0	M F	P H		Thulin & Tidigs 220 (EA).
125	*Lobelia gibberoa* Hemsl.	1	0	1	0	0	W L	S B		
125	*Lobelia holsti* Engl.	1	0	1	0	0	D M		HB	
125	*Lobelia inconspicua* A.Rich.	1	0	1	0	0	D M		HB	
125	*Lobelia minutula* Engl.	1	0	1	0	0	M F		HB	
125	*Lobelia neumannii* T.C.E. Fries	1	0	1	0	0	M F		HB	
125	*Monopsis stellarioides* (Presl) *Urb.*	1	0	1	0	0	W G	C R		Mbuni 276 (EA),

125	*Wahlanbergia capillacea* (L.f) A.D.C	1	0	1	0	0	AL		HB	
125	*Wahlanbergia krebsii* Cham	1	0	1	0	0	WG		HB	
125	*Wahlanbergia napiformis* (A.DC.)Thulin	1	0	1	0	0	WG		HB	
125	*Wahlanbergia pusila A*.Rich.	1	0	1	0	0	AL		HB	
125	*Wahlanbergia silenoides* A.Rich	1	0	1	0	0	WG	HB		Tweedie 3020 (EA).
	Wahlangergia lobelioides (L.f) *A.DC.*	1	0	1	0	0	DF		HB	
	*Wahlenbergia erecta (*Roem & Schultes}	1	0	1	0	0	WL		HB	
125	*Wahlenbergia hirsuta (*edgew)	1	0	1	0	0	WL		HB	
125	*Wahlenbergia species scottii Thulin*	1	0	1	0	0	WG		HB	
	Dipsacaceae									
126-	*Scabiosa columbaria* L.	1	0	0	0	0	DM		HB	
126-	*Valeriana volkensii* Engl.	1	0	0	0	0	FE		HB	
126-	*Dipsacus pinnatifidus* A.Rich	1	0	1	0	0	WL		HB	
126-	*Cephalaria pungens* Szabo	1	0	0	0	0	WG		HB	
	Herbs, flowers in heads									
	Asteraceae									
126	*Achillea millefolium* L.	1	0	0	0	0	WG		HB	
126	*Acmella caulirhiza* Del.	1	1	1	1	0	WG		HB	
126	*Ageratina adenophora* (Spreng.) R.M King & H Robins	1	1	1	1	1	FE	HB		FORK 1806
126	*Ageratum conzoides* L.	1	1	1	1	1	DM	HB		FOKP 11495 (EA),
126	*Anthemis tigreensis* A.Rich	1	1	1	1	1	AL	HB		Thulin 203 (EA).
126	*Atemisia afra* Wild	1	0	0	0	0	DM		WH	
126	*Athirixia rosmarinifolius* (Sch.) Bip	1	1	1	1	0	DM	HB		Tweedie 3904 (EA).
126	*Berkheya spekeana* Oliv.	1	1	0	0	1	WG	HB		Symes 157 (EA).
126	*Bidens biternata* (Lour) Merr & Sheriff	1	1	1	1	0	DM		HB	
126	*Bidens flagellata (*Sherff) Mesfin	1	1	1	1	0	DM		HB	
126	*Bidens grantii (*Oliv). Sheriff	1	1	1	1	0	DM		HB	
126	*Bidens pilosa* L.	1	1	1	1	1	DM	HB		FOKP 11434 (EA),
126	*Bidens ternata* Chiov.Sheriff	1	1	1	1	1	DM		HB	

126	*Bothriocline fusca* (S.Moore) M.Gilbert	1	0	0	0	0	DM	SB		FOKP 11377 (EA,
126	*Bothriocline ugandensis* (S.Moore) M.Gilbert	1	0	0	0	0	MF	SB		
126	*Cardus chamaecephalus* (Vatke)Oliv.&Hiern	1	0	1		0	WG		HB	
126	*Carduus nyassanus* (S.Moore)R.E.Fries	1	0	0	0	0	WG		HB	
126	*Centaurea praecox* Oliv & Hiern	0	1	1	1	0	WG		HB	
126	*Cinenaria deltoides* Sond.	1	1	1	1	0	DM		HB	
126	*Cirsium valgare (*Savi) Ten.	1	1	0	0	1	DM		HB	
126	*Conyza bonariensis* (L.)&Cronq.	1	1	1	1	1	DM		HB	
126	*Conyza newii* Oliv&Hiern	1	1	1	1	1	DF		HB	
126	*Conyza pyrrhopappa* A.Rich.	1	1	1	1	0	DM		HB	
126	*Conyza shimperi* A.Rich	1	1	1	1	0	DM		HB	
126	*Conyza steudelii* A.Rich	1	1	1	1	0	DM		HB	
126	*Conyza stricta* Wild	1	1	1	1	0	DM		HB	
126	*Conyza subscaposa* O.Hoffm.	1	1	1	1	0	DM		HB	
126	*Conyza tigrensis Oliv.& Hiern*	1	1	1	1	0	DM		HB	
126	*Crassocephalum crepidioides (*Benth).S Moore	1	1	1	1	0	DM		HB	
126	*Crassocephalum montuosum* S.Moore	1	1	1	1	0	DM		HB	
126	*Crassocephalum rubens* S.Moore	1	1	1	1	0	DM		HB	
126	*Crassocephalum vitellinum (*Benth.)S.Moore	1	1	1	1	0	DM		HB	
126	*Crepiis rueppellii* Sch.Bip	1	1	1	1	1	WG		HB	
126	*Crepis carbonaria* Sch. Bip	1	1	1	1	0	WG		HB	
126	*Dichrocephala chrysanthemifolia* DC.	0	0	0	1	0	WG	HB		FOKP 111406 (EA,
126	*Dichrocephala integrifolia O.Kuntze*	1	1	1	1	1	WG		HB	
126	*Echinops amplexcaulis* Oliv.	1	0	0	0	0	WG	HB		Napper 1501 (EA).
126	*Echinops angustilobus S.Moore*	1	0	0	0	0	WG	HB		Townsend 2376 (EA)
126	*Echinops hispidus Fresen*	1	0	0	0	0	WG		HB	
126	*Echinops lanatus C.Jeffrey & Mesfin*	1	0	0	0	0	WG		HB	
126	*Emilia discifolia (*Oliv)C.Jeffrey	1	1	1	1	1	DM		HB	
126	*Emillia kivuensis (*Muschl.)C.Jeffrey	1	1	1	1	1	WG		HB	
126	*Euryops brownei* S.Moore	1	1	1	1	0	WG		HB	

126	*Euryops chrysanthemoides (*DC.) B.Nord.	1	1	1	1	0	WG		HB	
126	*Felicia abyssinica* A.Rich.	1	1	1	1	0	WG		HB	
126	*Galinsonga parviflora* Cav.	1	1	1	1	1	WG		HB	
126	*Gerbera ambigua* Sch. Bip	1	1	1	1	0	WG		HB	
126	*Gerbera piloselloides* (L)	1	1	1	1	0	WG	HB		SAJIT 005106 (EA,
126	*Guizotia jacksonii* (S.Moore) .Baagoe	1	1	1	1	0	DM		HB	
126	*Guizotia scabra (Vis.) Chiov.*	1	1	1	1	0	DM		HB	
126	*Haplocarpha ruepellii* (Sch.Bip) P Beauv.	0	0	1	0	0	MF	HB		SAJIT 005123 (EA,
126	*Helichrisum foetidum* (L.) Moench.	1	1	1	1	0	DM		HB	
126	*Helichrysum argyrathum* O.Hoffm	1	0	0	0	0	WL	HB		FOKP 996,
126	*Helichrysum formossissimum* (Sch.Bip.) A.Rich.	1	0	1	0	0	AL	SB		
126	*Helichrysum forskahlii* (J.F.Gmel*)* Hiliard & Burtt	1	1	1	1	0	WG		HB	
126	*Helichrysum globosum* Sch.Bip.	1	1	1	1	0	DM		HB	
126	*Helichrysum kilimanjari* Oliv.	1	1	1	1	0	DM		HB	
126	*helichrysum nudifolium* (L) .Lesa	1	1	1	1	0	WG		HB	
126	*Helichrysum panduratum O.Hoffm.*	1	1	1	1	0	WG		HB	
126	*Helichrysum schimperi* (Sch.Bip) Moeser	1	1	1	1	0	WG		HB	
126	*Helichyrysum odoratissimum* (L.) Less Helicrysum meyeri johanis Engl.	0	0	0	0	1	WG	HB		Thulin & Tidigs 254 (EA).
126	*Inula manii* (Hook .f) Oliv. & Hiern	1	1	0	0	0	WG	HB		Tweedie 4184 (EA).
126	*Kleinia species*	1	0	0	0	0	WG		HB	
126	*Lactuca inermis* Forsk.	1	1	1	1	0	DM		HB	
126	*Laggera brevipes* Oliv.& Hiern	1	0	0	0	1	DM		HB	
126	*Laggera eliator* R.E Fries	1	0	0	0	1	MF	HB		Mabberley 483 (EA).
126	*Melanthera pungens* Oliv.& Hiern	1	0	0	0	0	WG	HB		Napier 1929 (EA,
126	*Microglossa densiflora* Hook.f	1	1	1	0	1	WG	CR		Agnew *et al.* 10462 (EA
126	*Mikaniopsis bambuseti* (R.E Fries)	1	1	1	1	0	MF	CR		Townsend 2393 (EA)
126	*Nidorela spartioides (*O.Hoffm.) Cronq.	1	0	0	0	0	WG	HB		Napier 1920 (EA).
126	*Notonia petraea* R.E. Fries	1	0	0	0	0	WG		HB	
126	*Pseudognaphalium luteo-album* (L.) Hiliard& Burtt	1	1	0	0	0	WG	HB		Thulin & Tidigs 115 (EA).

126	*Psiadia punctulata (*DC) Vatke	1	0	0	0	0	DF	HB		FOKP 11465 (EA,
126	*Senecio hadiensis* Forsk.	1	1	1	1	0	MF		CR	
126	*Senecio schweinfurthii* O.Hoffm.	1	1	1	1	0	MF		CR	
126	*Senecio syringifolia* O.Hoffm.	1	1	1	1	0	MF		CR	
126	*Solanecio angulatus (*Vahl)C.Jeffrey	1	1	0	0	0	MF		CR	
126	*Senecio rhammatophyllus Mattif.*	1	1	0	0	0		SB		FOKP 1110,
	*Solanecio manii (*Hook.) C.Jeffrey						MF			
126	*Sonchus asper* (L.) Hill)	1	1	1	1	0	DM		HB	
126	*Sonchus schweinfurthii* Oliv & Hiern	1	1	1	1	1	DM	CR		Thulin & Tidigs 69 (EA).
126	*Sphaeranthus suaveolens (*Forsk) DC	1	0	0	0	0	WL	HB		FOKP 1729,
126	*Spilanthes mauritiana (*Pers.) DC.	1	1	1	1	1	DM	HB		Hedberg 79 (EA).
126	Stoebe *kilimandischarica*.O.Hoffm.	1	1	1	0	0	ALL	SB		FOKP 11317 (EA,
126	*stomatanthes africanus* (Olive & Hiern)R.M King	1	0	0	0	0	DM	HB		Symes 282 (EA).
126	*Tagetes minuta* L.	1	1	1	0	1	DM		HB	
126	*Tolpis capensis (*L.) Sch. Bip.	1	0	0	0	0	DM		HB	
126	*Vernonia auraculifera* Hiern	1	1	1	1	1	DM	TR		FOKP 959 (EA,
126	*Vernonia galamensis (*Cass.) Less	1	0	0	0	0	DM	SB		SAJIT 006896 (EA,
126	*Vernonia holstii* O. Hoffm.	1	0	0	0	1	DM		HB	
126	*Vernonia hymenolepis* A.Rich.	1	0	0	0	1	DM		HB	
126	*Vernonia lasiopus* O.Hoffm	1	1	1	1	1	DM	SB		Symes 261 (EA).
126	*Vernonia purporea* Sch.Bip	1	0	0	0	0	DM	SB		
126	*Vernonia syringifolia* O.Hoffm.	1	1	0	0	0	DM	HB		Webster 8897 (EA).
	Caprifoliaceae									
127	*Scabiosa columbaria* L.	1	0	1	0	0	MF		HB	
127	*Valeriana volkensii* Engl.	1	0	1	0	0	WL	HB		Mabberley McCall 231 (EA).
	Pittosporaceae									
128	*Pittosporum viridiflorum Sims*	1	0	0	0	0	DM	TR		FOKP 11570 (EA)?

128	*Pittosporarum lanatum* Hutch & Bruce	0	1	0	0	0	MF	TR		Dale 672 (EA).
	Araliaceae Palmately digitate leaves									
129	*Cussonia arborea* Hochst. ex A.Rich.						WG	TR		Napier 1980 (EA).
129	*Cussonia holstii* Engl.	1	1	1	0	0	MF		TR	
129	*Cussonia spicata* Thumb.	1	1	1	0	1	MF	TR		1026 (EA,
129	*Polycias fulva* (Hiern)Harms	1	1	1	0	1	MF	TR		SAJIT Z0034 (EA,
129	*Schefflera volkensii* (A.Rich.) Harms	1	1	1	1	0	MF	TR		FOKP 1007,
	Apiaceae Sheathing leaves with hollow petiole									
	Oenanthe procumbens (H.Wolf) *Norman*	1	1	0	1	0	AL	HB		Thulin &Tidigs 234 (EA).
130	*Sanicula elata* D.Don	0	1	0	1	0	AL	HB		FOKP 1083,
130	*Agrocharis incognita* Norman	0	1	0	1	0	MF		HB	
130	*Agrocharis pedunculata* Bak.	0	0	0	1	0	MF	WH		Napier 1922 (EA).
130	*Agrochoris melacantha* Hochst.	0	0	0	1	0	MF	WH		Voucher: Thulin & Tidings 126 (EA).
130	*Alepidea pedunclaris* A.Rich	1	1	0	1	0	MF	HB		Napper 1503 (EA).
130	*Centella asiatica (*L.) Urb.	1	1	1	1	1	WG		HB	
130	*Criptotaenia africana* (Hook.f) *DC.*	1	0	0	1	0	WG		WH	
130	*Diplolophium africanum* Turcz	0	0	0	1	0	WG	SB		Kokwaro 2535 (EA).
130	*Haplosciadium abyssinicum* Hochst	1	1	0	1	0	DF	HB		Thulin & Tidigs 152 (EA).
130	*Heracleum abyssinicum* Boiss	1	0	0	1	0	MF		WH	
130	*Hydrocotyle manii* Hook.f.	1	1	0	1	0	MF	HB		Mabberley & McCall 301 (EA).
130	*Hydrocotyle ranuncloides* L.f.	1	1	0	1	1	MF	HB		Tweedie 2584 (EA).
130	*Hydrocotyle sibthorpioides* Lam	1	1	0	1	0	MF		HB	
130	*Peucedanum elgonense* H.Wolf	0	0	1	1	0	AL	WH		SAJIT 004797 (EA,
130	*Peucedemum linderi* Norman	0	0	1	1	0	WL		WH	

130	*Peucedenum aculeolatum* Engl.	0	1	1	1	0	MF		HB	
130	*Peucedenum kerstenii Engl.*	0	1	1	1	0	WL		HB	
130	*Pimpinella hirtella* A.Rich	1	1	0	1	0	WL		HB	
130	*Torilis arvensis (Huds.)*Link	1	1	0	1	0	DF	HB		Bogdan 5001 (EA).

	Casuarinaceae							
f	*Casuarina equisetifolia* L	1	0	0	0	0	PL	TR
	Lythraceae							
	Cuphea micropetala Kunth							
f		1	0	0	0	0	DM	HB
	Portulacaceae							
	Portulaca oleracea L.	1	1	0	0	1	DM	HB
f								
	Ericaceae							
	Erica arborea L	1	0	1	0	0	MF	TR
f								
	Arecaceae							
f	*Phoenix reclinate* Jacq	1	1	0	0	0	MF	TL
	Olacaceae							
	Strombosia scheffleri Engl.	1	0	0	0	0	MF	TR
f								
	canellaceae							
	Warburgia ugandensis Sprague	1	0	0	0	0	PL	TR

Appendix II: List of exotic species with the country of origin

	Family	**Species**	**Origin**
1	Apocynaceae	*Gomphocarpus physocarpus E.Mey*	N. America
2	Asteraceae	*Ageratum conzoides* L.	
3	Asteraceae	*Athrixia rosmarinifolia* (Sch.)Bip	
4	Asteraceae	*Conyza bonariensis* (L.) &Cronq.	N. America
5	Asteraceae	*Guizotia scabra* (Vis.) Chiov.	
7	Asteraceae	*Sonchus schweinfurthii*	
8	Asteraceae	*Sonchus asper* (L.) Hill	
9	Asteraceae	*Tagetes minuta* L.	Europe
10	Asteraceae	*Ageratina adenophora* (Spreng.)	S. America
11	Asteraceae	*Emilia discifolia* (Oliv) C.Jeffrey	
12	Asteraceae	*Achillea millefolium* L.	America
13	Asteraceae	*Galinsoga parviflora* Cav.	
14	Bignoniaceae	*Tecomaria capensis* (Thunb)Spach	
15	Calceolariaceae	*Calceolaria tripartita* Ruiz & Pav	
16	Cuscutaceae	*Cuscuta campestris* Yunck	
17	Casuarinaceae	*Casuarina equisetifolia*	
18	Cupressaceae	*Cupressus lusitanica* Lindl.	N.America
19	Euphorbiaceae	*Euphorbia hirta* Sw.	N.America
20	Fabaceae	*Acrocarpus fraxinifolius* Am	
21	Fabaceae	*Cassia didymobotrya* (Fresen.) Irvin & Barneby	
22	Fabaceae	*Senna septemtrionalis* (Viv.) H.S. Irwin & Barneby	C.America
23	Fabaceae	*Caesalpinia decapetala* (Roth) Alston	India
24	Amaryllidaceae	*Nothoscordum bobonicum* Kunth.	
25	Lamiaceae	*Plectranthus barbatus* Engl.	S.Africa
26	Lamiaceae	*Salvia leucantha* Cav.	
27	Lythraceae	*Cuphea micropetala* Kunth.	
28	Myrtaceae	*Callistemon viminallis* Sol ex. (Gaerth) Bymes	Australia
29	Myrtaceae	*Eucalyptus saligna* Smith	Australia
30	Myrtaceae	*Lophostemon confertus. (R.Br.)* Peter G.Wilson & J.T.Waterh	
31	Oleaceae	*Fraxinus pennyslivanica* Marshall	
32	Onagraceae	*Fuchsia regia* (Vell). Munz	
33	Oxalidaceae	*Oxalis acuminata* Schltdl. & Cham	
34	Oxalidaceae	*Oxalis latifolia* H.B & K.	
35	Phytolaccaceae	*Phytolacca octandra* L.	
36	Pinaceae	*Pinus radiata* D. Don	
37	Pinaceae	*Pinus species*	
38	Pinaceae	*Pinus patula* Schiede ex Schidtl &Cham	Mexico
39	Portulacaceae	*Portulaca oleracea* L.	
40	Solanaceae	*Solanum aculetissimum* Jacq.	
41	Solanaceae	*Cestrum aurantiacum* L	Guatemala
42	Solanaceae	*Datura stramonium* L.	

43	Solanaceae	*Brugmansia suaveolens* (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl	Mexico
44	Solanaceae	*Nicandra physaloides* L. Gaertn.	
45	solanaceae	*Petunia* species	
46	Solanaceae	*Physalis peruviana* L.	
47	Solanaceae	*Solanum aculeastrum* Dunal	
48	Solanaceae	*Solanum mauritianum* Scop.	
49	Verbenaceae	*Duranta variegata* L	
50	Verbanaceae	*Verbena bonariensis* L	
51	Celastraceae	*Camelia sinensis* (L.) Kuntze	

Appendix III: List of threatened plant species in Cherangani Forest station

Family	Species
Apiaceae	*Peucedanum aculealatum* Engl.
Asteraceae	*Ethulia vernonioides*
Asteraceae	*Gutenbergia rueppellii*
Asteraceae	*Senecio pseudosubsessilis*
Asteraceae	*Helichrysum meyeri-johannis*
Asteraceae	*Guizotia jacksonii* (S.Moore) Baagoe
Asteraceae	*Senecio rhammatophyllus* Mattif.
Vitaceae	*Cyphostemma cyphopetalum* (Fresen.) Desc. ex Wild & R.B.Drumm
Rubiaceae	*Galium kenyanum* Verdc
Rubiaceae	*Spermacoce minutiflora* (K. Schum.) Verdc.
Poaceae	*Calamagrostis hedbergii* Melderis
Euphorbiaceae	*Euphorbia brevicornu* Pax
Hypericaceae	*Hypericum kiboense* Oliv.
Malvaceae	*Abutilon mauritianum* (Jacq.) Medik
Ranunculaceae	*Delphinium macrocentrum Oliv.*
Campanulaceae	*Wahlenbergia scottii* Thulin
Campanulaceae	*Lobelia duriprati* T.C.E. Fr.,
Campanulaceae	*Lobelia cheranganiensis* Thulin
Campanulaceae	*Lobelia aberdarica* R.E. Fr. & T.C.E. Fr
Campanulaceae	*Lobelia deckenii* (Asch.) Hemsl.
Orchidaceae	*Polystachya bella* Summerh
Orchidaceae	*Diaphananthe montana* (Piers) P.J. Cribb & J. Stewart
Orchidaceae	*Habenaria altior* Rendle
Fabaceae	*Galega lindblomii* (Harms) J.B. Gillett
Fabaceae	*Trifolium cheranganiense* J.B. Gillett
Boraginaceae	Cynoglossum cheranganiense Verdc.
Rosaceae	*Rubus scheffleri* Engl.
Balsaminaceae	*Impatiens pseudoviola* Gilg
Balsaminaceae	*Impatiens tinctoria* A. Rich.
Balsaminaceae	*Impatiens meruensis* Gilg,
Orchidaceae	*Impatiens hoehnelii* T.C.E. Fr.,

Appendix IV: Key Forest structures

Physiognomy & key species	Block	Remarks
Exotic softwoods *Pinus patula*	Kipteber Koisungur	Cypress and pines near Kapcherop centre (20-35m tall) with one plantation of Pinus radiata in Koisungur established in 1972 (55-65m tall).
Cupressus lustanica		
Pinus radiata		
Makaranga-Syzygium	Kipteber	Found in areas bordering plantations extending to Chinese water intake and slightly beyond. Upper storey 40m tall of *Makaranga*. Middle storey of *Neoboutonia*. At 25 m
Makaranga kilimandscharica		
Syzygium guineense		
Neoboutonia macrocalyx		
Cestrum aurantiacum		
Olinia rochetiana		
Nuxia congesta		
Afrocarpus gracillior		
Prunus Africana		
Pouteria adolfi friedericii *Hagenia abyssinica* *Plectranthus kamerunensis*		
	Kipteber	Areas of Yatoi extending to Tenden.*Euphorbia obovalifolia* is the most conspicuous species standing at 35 m tall.
Euphorbia-Syzygium		
Euphorbia obovalifolia		
Vernonia auriculifera		
Cestrum aurantiacum		
Dombeya torrida		
Allophyllus abyssinicus		
Olea maytenus		
Olea hochsteterii		

Maytenus undata		
Prunus Africana		
	Chemurgoi Koisungur Kerrer Toropket	
Podocarpus –Juniperus-Hagenia		Semi pure stands of *juniperus procera* are common at very high altitudes trees are covered by threads of A*ceuthobium juniper procerae* (Kerrer). In some cases, regeneration is evident with healthy forests exhibiting ground layer of herbs, middle layer of shrubs and young trees and upper canopy of mature trees.
Juniperus procera		
Podocarpus latifolius		
Hypericum revolutum		
Rapanea melanophloeos		
Hagenia abyssinica		
Cornus volkensii *Dombeya torrida*		
Hypoestis		
Plectranthus kamerunensis		
Tea belt *Camelia sinensis*	Kipteber	The tea belt managed by Nyayo tea zones extends from Yatoi through Kapcherop to Kamoi area. The bushes are maintained at 1m in height.
Graminoids (Glade) *Juncus oxycarpus* *Eriocaulon schimperi* *Carex johnstonii* *Kilinga aodorata* *Oplesminus hirtellus*	Kipteber Chemurgoi Kerrer Toropket Koisungur	A mixture of grasses, sedges and *Juncus* form fields frequented by grazers.
Hagenia-Pittosporum-Podocarpus		
Olinia-Makaranga-Nuxia		
Prunus –Pouteria		
Juniperus dominated		
Podocarpus dominated		
Hagenia –Rapanea-Juniperus		

Appendix V: Sample of questionnaire administered to respondents

CHERANGANI FOREST ETHNODATA

NAME OF RESPONDENT...

VILLAGE/LOCATION..

DIALECT...

OCCUPATION...

TEL.NUMBER..

AGE...

SEX..

DATE...

1	What is the name of the forest?....
2	Who owns the forest?
3	Do these forests have any benefit to local people?
3b	What are these benefits?

<table>
<tr><td>3c</td><td>From which plant species do you derive these benefits?
<table>
<tr><td>Species...</td><td>how
used</td><td>preparation</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>4</td><td>Any other plant species you know?</td></tr>
</table>

4b	If yes. Their uses.
5	Do you know this species? (Interviewer reads names of species. From pre Prepared list of scientific local names)
5	Is it useful too?
5b	How (For each species)

6	Do we have unwanted plants in the forest?
6b	What are they?
6c	What are the effects associated with them?
7	Are there challenges facing survival of this forest?
7b	If yes, what are they?

7c	What do you think can be done to forestall these challenges?
8	Do we have species that once existed but are no longer available in the forest? .
8b	What are their names

9	Do we have species threatened by over exploitation ?.
9b	Their names
	Is the government doing enough to protect this forest?
	If no what should the govt do?
10	Are there local efforts to protect this forest.
11	What is your opinion on the best way to manage the forest?
12	Is this forest a worthy investment by owner or the land can be put to a better use?
12b	Like what?

Request for field visit to the forest with respondents to identify plants

Take Photographs and specimens for authentication purposes.

Additional information for number 3,4,5,6 can be obtained if field visit is granted

is added.

Appendix VI: Species of economic importance as mentioned by respondents

S/n	Family	Scientific name	Local name	Uses	Voucher No
1	Fabaceae	*Vachellia sp*	2	Typhoid	Makokha 0005
2	Xanthohoeaceae	*Aloe cheranganiensis*	18	Stomach, malaria	Makokha 0010
3	Scrophulariaceae	*Buddleja Polystachya*	Musereti/Choruet 15	Stomach,typhoid,allergy,chest pain, common cold	Makokha 0001
4	Fabaceae	*Cassia didymobotrya*	13	Typoid,skin, Allergy, head, stomach.	Makokha 0006
5	Casuarinaceae	*Casuarina equisetifolia*	9	Soil conservation	Makokha 0011
6	Solanaceae	*Cestrum aurantiacum*	Isaya	Suppress other Plants. kills livestock 35/35	Makokha0 007
7	Ranunculaceae	*Clematis simensis*	Bisangwa	Head 27/27	Makokha 0002
8	Euphorbiaceae	*Clutia abyssinica*	Kioswa/ Sitaboin	Allergy	Makokha0008
10	Euphorbiaceae	*Croton macrostachys*	Tobowasa	Typhoid,timber	Makokha0012
11	Cupressaceae	*Cupressus lustanica*	Tarakwa	Timber	
12	Araliaceae	*Cusonia spicata*	Jeleikta	Typhoid, Malaria, Stomach	Makokha
13	Solanaceae	*Datura stramonium*	Chesambo	Stain milk, poisonous	
14	Malvaceae	*Dombeya torrida*	Borowa	Ropes, Soil cosrvation 11/18,timber, ulcers	Makokha

15	Meliaceae	*Ekebergia capensis*	Kerbut	shade	Makokha
16	Proteacea	*Faurea saligna*	Maiyokwa/ Sirite	stimulant in tea 6/13 firewood, timber,posts,STD	Makokha)
17	Moraceae	*Ficus natalensis*	Sitotwet	timber	Makokha
18	Rosaceae	*Hagenia abyssinica*	Seweruwa	timber, malaria,stomach, posts	Makokha
19	Cupressaceae	*Juniperus procera*	Tarakwet/ Torokwa	timber, posts,firewood,skin,malaria, stomach, animal stomach	Makokha
20	Myrsinaceae	*Maesa lanceolata*	Mborio/Tuyunwa	stomach	Makokha
21	Primulaceae	*Rapanea melanophlooeos*	Sitotwet	stomach	Makokha
22	Stilbaceae	*Nuxia congesta*	Chorua	typhoid, stomach, chest	Makokha
23	Oleaceae	*Olea africana*	Yemit	firewood 27/47,stomach,posts	Makokha
24	Apocynaceae	*Periploca linearitifolia*	inendet	identify gifts, stomach	Makokha
25	Pittosporaceae	*Pittosporum lanatum*	Chemnosa	Anti acid 9/10, malaria	Makokha
26	Solanaceae	*Afrocarpus gracillior*	Benet	Timbr,allergy and skin rushes 61/firewood, stomach	Makokha
27	Podocarpaceae	*Podocarpus latifolius*	Serti/sosaite	raise water table 18/22,timber	Makokha
28	Araliaceae	*Polyscias fulva*	Auoun	timber	Makokha
29	Sapotaceae	*Pouteria adolfifriedericii*	Muna/Kipworbet	timber	Makokha
30	Rosaceae	*Prunus africana*	Tendwet	Timber, ulcers, stomach.	Makokha)
31	Rhamnaceae	*Rhamnus prinoides*	Kosisit/Kipser	stomach, medicine	Makokha
32	Apocynaceae	*Saba comorensis*	Ochon	chest pain 2/2	Makokha
33	Araliaceae	*Schefflera volkensii*	Tingwa/ Tinwot	allergy,head 14/16,stomach	Makokha
34	Solanaceae	*Solanum incanum* L.	Jemorki-mnerkeny	toothache7/18,chicken disease 9/18,	Makokha

				stomach	
35	Myrtaceae	*Syzygium guineense* (Willd.)DC	Lemaiyua	timber, fruits, firewood, raise water table, post	Makokha
36		*Stephania abyssinica* (Dillon&A.Rich) Walp	Tabarar	invasive,poisonous,stomach	Makokha
37	Unknown	*unknown*	Cheptimoo	Kill livestock	Makokha
38	Unknown	*unknown*	Tirkaan	Kill livestock	Makokha
39	Urticaceae	*Urera hypselodendron*	Kipsotet	Stomach	Makokha
40	Rubiaceae	*Vangueria apiculata (Verdc.) Lantz*	Komorwo	fruits 20/20	Makokha
41	Rutaceae	*Vepris nobilis* (Delile) Mziray	Kuriot/ Lugumwa	timber,allergy,stomach	Makokha
42	Asteraceae	*Vernonia auriculifera* Hiern	Torogogwa	Malaria, predict rainfall 9/19	Makokha
43	Poaceae	*Yushania alpine*	Terga/ Tegaat	Raise water table 10/11	Makokha

Appendix VII: Similarity Report

University of Eldoret

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Department	Type here...
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Similarity	14%
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Submission Date	2023-10-02 15:38:12

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