

Medicinal plants for women's and children's health in urban and rural areas of Gabon

The harvest of wild and cultivated plants



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Market saleswomen in Oyem, August 5th 2012, picture by Esther van Vliet

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1. Abstract

The majority of the Gabonese population depends on medicinal plants as their primary health care. Due to urbanization and forest degradation, however, wild medicinal plant resources may become depleted especially around urban areas, where the population density is high. Important medicinal plant species may be more difficult to obtain for urban women. Therefore, we checked whether urban women use more cultivated medicinal plants for women's reproductive health and childcare, than rural women. We made an inventory of the medicinal plants by means of 44 individual questionnaires. We collected 194 different species and determined their threat level and endemic status. The plants' vegetation type was determined during harvesting trips and by using literature. No difference was found in the amount of wild and cultivated plants used in urban and rural areas. This result supports that urban women also have easy access to wild medicinal plants. The most frequently cited species in this study did not match the list of vulnerable species. The majority of the medicinal species was growing in disturbed vegetation and are therefore less sensitive to local extinction. A low population density, small domestic trade in herbal medicine and short market chains also contribute to our conclusion that medicinal plants will be available for upcoming generations.

Key words

Conservation, vegetation status, wild plants, cultivation, women's health, childcare

2. Introduction

The rainforests of Africa are threatened by industrial logging, developing infrastructure and slash-and-burn farming (Laurance *et al.*, 2006). Not only do these activities threaten the biodiversity of a country's flora but also the health of billions of people who depend on medicinal plants as their primary health care (Sheldon *et al.*, 1997; Hamilton, 2004). Moreover the trade in medicinal plants also provides work for people from rural areas that often lack a formal education and have few chances for generating an income (Cunningham, 2001). In many indigenous communities in the African rainforests, men have a higher recognition and greater public and social access than women, as set out by local cultural norms (Zelinsky *et al.* 1982 cited in Pfeiffer & Butz, 2005; Iyam, 1996). Hence significantly more men's plant knowledge has been documented by ethnobotanists than women's plant knowledge (Phillips *et al.*, 2002). However the knowledge that women have on medicinal plants used for reproductive health and childcare is sorely needed because gynecological morbidity and infant mortality are among the greatest health issues in developing countries (Horton, 2010; UNICEF, 2011). Ethnobotany has to deal with generational loss of knowledge on traditional medicine due to development and modernization of cultures (Buenz, 2005). For example, urbanization leads to a decline in the diversity and quantity of wild plant resources in trade (Cunningham, 2001). In past decades, Gabon rapidly urbanized, resulting in four out of five inhabitants now living in urban areas (Ben & Pourtier, 2004). Although family ties are strong and often connect people in urban and rural areas (Cunningham, 2001), the knowledge that is still present needs to be documented before it is lost.

Although West-Africa's rainforests suffered from massive loss, as described above, Gabon's landscape remains densely forested. In the early 1970s offshore oil reserves were discovered. Before that time, Gabon depended on logging and manganese extraction. Largely due to the oil reserves, which made Gabon a relatively wealthy country, the vast rainforests of Gabon are for the most part preserved. Since 1998 the production of oil is declining and Gabon is relapsing into the logging business (WWF, n.d.). In 2006 it was estimated that 82% of Gabonese territory is covered with forest (Sosef *et al.*, 2006). In order to preserve the medicinal plant biodiversity and consequently the employment and primary health care for future generations, a more detailed investigation into medicinal plant use and especially women's knowledge is needed. Additionally the vegetation types where medicinal plants occur need to be documented and protected.

Measures to protect Gabonese flora are sorely needed because in rural areas it forms an alternative for formal health care that is often underdeveloped and needs strengthening (Horton, 2010). In 1995 the state announced new regulations to improve health care in Gabon. One item in this program was improving maternal and infantile health. In 2000 Gabon joined the United Nations Millennium Development Goals¹ (UNDP, 2011). Although some progress has been made, maternal and infant mortality currently remain high. It is estimated that the maternal mortality rate for Gabon is 420 per 100,000 live births (UNDP, 2010) and the infant mortality rate is 54 per 1,000 live births (UNICEF, 2011). These high mortality rates do not fit into Gabon's status as one of the most developed countries in Africa (Stads & Obiang Angwe, 2011). In order to improve health care, the management of traditional medicine, especially local adaptation strategies to overharvesting and scarcity, needs to be better understood.

¹ The Millennium Development Goals (MDGs) are a set of 6 objectives adopted by world leaders in 2000 to eradicate extreme poverty by 2015 (UNDP, 2010)

The Gabonese population density is very low, about 5 inhabitants/km² (Ben & Pourtier, 2004). Vast regions outside urban areas are uninhabited (Sosef *et al.*, 2006) and therefore women in rural areas are almost entirely surrounded by forest. Women in these villages have easy access to wild plants unlike urban women that have to cover a larger distance to reach forest. Therefore we expected that urban women more frequently cultivate medicinal plants than rural women.

In order to summarize the importance of research into medicinal plants I quote The World Bank (World Bank, 2001):

'Medicinal plants and knowledge of their use are a thread that links education and knowledge institutions, health and population issues, sustainable development, environmental and cultural issues, gender, and rural, urban and private sector strategies'.

2.1 Aim of this study

The aim of this study is to make an inventory of the origin and management of medicinal plants used for women's reproductive health and childcare by rural and urban Gabonese women and identify species that might suffer from overharvesting. We used the following research questions:

1. Which plants are used for women's reproductive health and childcare by rural and urban women in Gabon?
2. From which vegetation types are these medicinal plants harvested?
 - Which plants are cultivated by rural and urban women?
3. Which medicinal plants are endangered (IUCN- or CITES-listed), (sub)endemic or difficult to find according to the local perception?

Hypothesis: Urban women use more cultivated medicinal plants for women's reproductive health and childcare, than rural women because urban women have less access to wild resources.

In Gabon extensive plant research has been done on areas with high biodiversity and endemic species (Muloko-Ntoutoume *et al.*, 2000) including documentation of medicinal plants. However a study on plants used for women's health and childcare has never been done before. This study is a part of the research project by Dr. T.R. van Andel, called "Plant use of the Motherland: linking West-African and Afro-Caribbean Ethnobotany"². The research group consists of Dr. T.R. van Andel and the PhD researchers A.M. Towns and D. Quiroz. During the separate field work periods, the group was joined by master and bachelor students from various Dutch universities.

2.1.1. Geography of Gabon

Gabon is surrounded by Equatorial Guinea and Cameroon to the north, Congo to the east and the Atlantic Ocean to the west. Gabon is situated at the equator between the latitudes 2°30'N and 3°55'S and is considered Central Africa. Gabon has a surface of 267.667 km² (Ben & Pourtier, 2004). The Congo Basin extends part of Gabon in the west. The population is estimated to be around 1.608.321

² Dr. Tinde van Andel's project, funded by the Netherlands Organisation for Scientific Research (NWO) in 2010, is the first comparative study of ethnobotany in both the African and American continents, supported by fieldwork in Suriname, Ghana, Bénin and Gabon. It is constructed around the central research question: "How African is Afro-Caribbean plant use?" (Andel, 2009) and focuses on the following three components: (1) medicinal plants in trade, (2) plants for African and Afro-Caribbean rituals, and (3) plants used for women's health and child care. For more information turn to: <http://osodresie.wikispaces.com/>

inhabitants (CIA, 2013) and is strongly concentrated in cities and along major roads (Laurance et al., 2006).

It is estimated that Gabon's botanical diversity includes 8.000 plant species of which 20% are endemic (Ben & Pourtier, 2004). The major urban areas on which this study focussed (Libreville and Oyem) are surrounded by degraded primary forest, secondary forest, abandoned fields and cultivated fields. The rural areas lie in the midst of humid primary and secondary forests.

The Transgabonais forms a railroad connection between Libreville and Franceville. Next to that about 12% of all roads are paved in Gabon, taking into account both major roads in Libreville and long distant roads across country. This infrastructure has facilitated the movement from and to cities in the last decades (Trading Economics, 2007).

2.1.2. Climate

Gabon has an equatorial and tropical humid climate. The climate consists of a constant heat, high humidity and high precipitation levels somewhat changing during the seasons. Annual precipitation in Libreville is 2870 mm. Further away from the capital precipitation is lower, between 1400 mm and 1800 mm per year. From June through August rainfall is limited and these months form the major dry season, December through February forms a minor dry season. The remaining months form two rainy seasons (Ben & Pourtier, 2004).

3. Methodology

3.1 Field sites

Interviews were conducted in both urban and rural areas. From mid-July until mid-September we conducted interviews in the capital city of Libreville and its surrounding areas and the north of Gabon. We visited the following departments: Estuaire and Woleu-ntem (Woleu, Ntem and Haut-Ntem).

Due to the project by Dr. T.R. van Andel, the questionnaires were restricted to Bantu speaking communities based on the link between this language group and those ethnicities that were brought to the Guianas for slavery. Consequently the majority of the interviewees were of Fang ethnicity and occasionally Bapunu and Masangu. The participants gave the vernacular plant names in Fang, Bapunu, Masangu, Mpongwè and very seldom in Nzebi or Miene. In order to be able to link the vernacular names with more confidence we stuck to the areas dominated with Fang speakers. In figure 1 the area where inhabitants predominantly speak Fang, is represented in green.



Figure 1. The distribution of Fang speaking communities and other native languages in Gabon. Source: <http://www.uiowa.edu/~africart/toc/countries/Gabon.htm>

Table 1 below lists the cities and villages where this research took place. In this study we considered Oyem and Libreville as urban, the other locations as rural.

Table 1. The cities and villages visited during fieldwork in Gabon.

City/village	Number of inhabitants
Libreville	600.000
Oyem	40.000
Minvoul	4.000
Cocobeach	4.000
Ebomane	2.000
Oveng	<2.000
Akam Essatouk	<2.000

3.2 Data collection

Data was collected by ethnobotanical questionnaires, plant collection and participatory mapping.

3.2.1 Selection of informants

The research team worked according to the Code of Ethics of the International Society of Ethnobiology (ISE, 2006). To guarantee respectful cooperation with local communities, we carefully explained the nature of our research and only conducted interviews after obtaining prior informed oral consent.

As A.M. Towns was first in conducting research in Gabon, I built upon her activities. In the first weeks of her stay in Gabon, she visited medicinal plant markets together with D. Quiroz to familiarize themselves with local experts by means of participant observation and market surveys of commercialized species. Spending time and having informal conversations at the market also helped to build trust necessary for the gathering of sensitive data on plants used in sacred and fertility practices. After A.M. Towns and D. Quiroz identified local experts, they started key informant interviews. This information was used to adjust the semi-structured questionnaires. Most (sales)women were willing to participate in the study, especially in rural areas. Unwillingness to participate usually resulted from uncertainty about the purpose of the study. After explaining that the project was about conducting an ethnomedicinal survey instead of making an inventory of possible new drugs, most women were willing to participate.

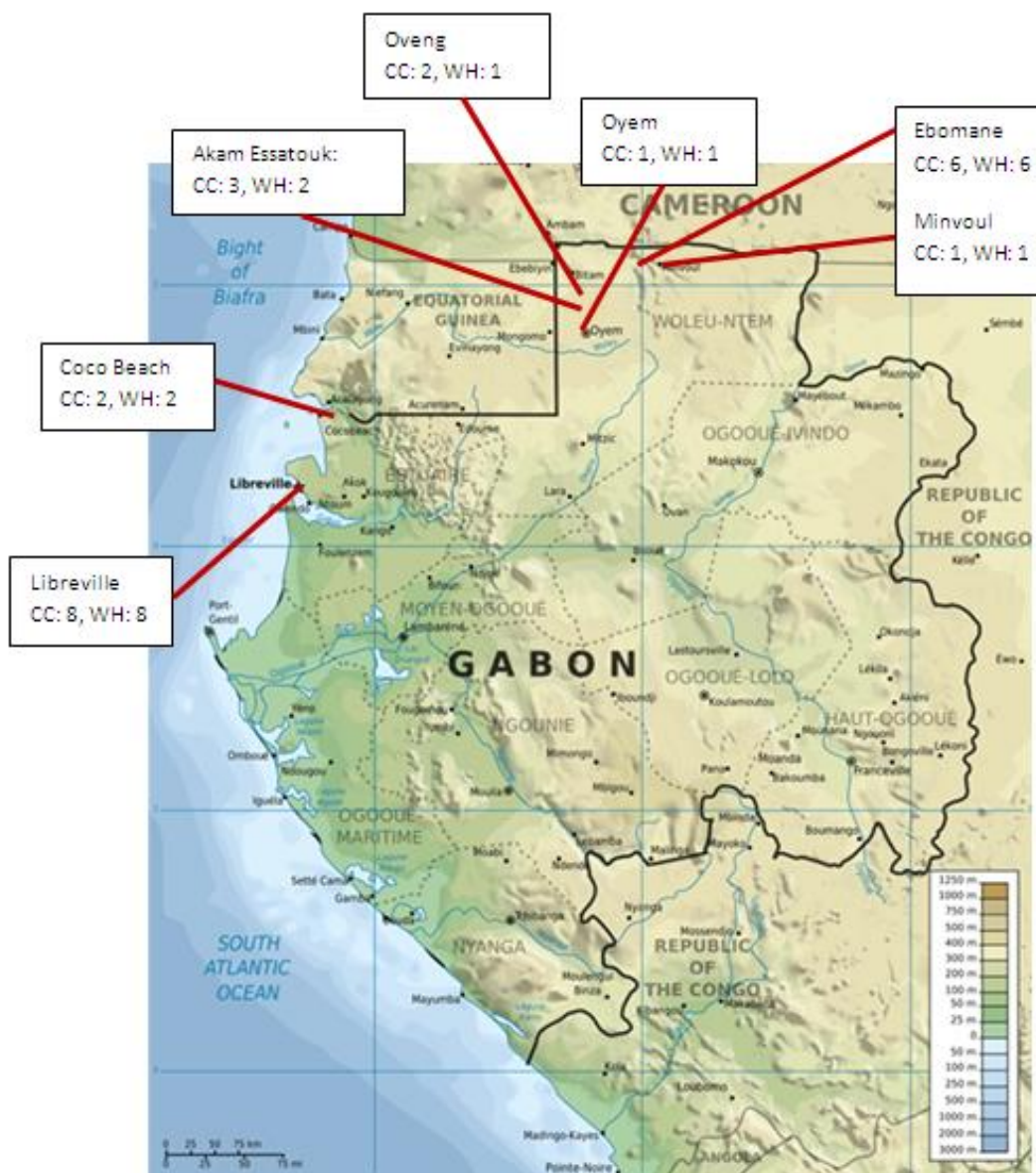


Figure 2. Childcare (CC) and Women's Health (WH) questionnaires map. Adjusted from source: <http://mapsof.net/map/topographic-map-of-gabon-en>

3.2.2 Questionnaires

We interviewed traditional healers, midwives, mothers, plant collectors and market saleswomen. We used two semi-structured questionnaires that have been designed and tested in Bénin, during earlier fieldwork by A.M. Towns. One questionnaire was designed for women's reproductive health and one for childcare. Both questionnaires can be found in appendices 1.1 and 1.2. We adjusted the questionnaires previously used in Bénin to local Gabonese health concepts and concerns. The following two diseases were additions to the childcare questionnaire: worms in the stomach, a disease named 'La Rata' in Fang, and 'fesse rouge'. 'La Rata' was described as a disease characterized by green faeces and a firm and painful belly on the left side. A pediatrician in one of the major hospitals in Libreville said that the symptoms of 'La Rata' are very similar to those of Splenic Sequestration in Sickle Cell disease. The latter is a disease with a high incidence among children with sickle cell anemia between the age of 2 months and 4 years and can lead to blood poisoning. Babies and young children suffer from 'Fesse rouge', an important cultural bound disease. As the French name indicates, it has a lot in common with diaper rash but we could not prove it to be the same disease.

Respondents that took part in the women's health questionnaires mentioned many diseases and physical inconveniences in addition to the previously determined health ailments. But because the participants named many diseases and not one in particular, we did not add any of the extra diseases. Most women felt free to mention all diseases and inconveniences linked to women reproductive health next to the fixed questionnaire.

Questionnaires lasted thirty minutes to two hours. In total we conducted 21 questionnaires on women's reproductive health and 23 on childcare. Out of the total of 44 questionnaires we interviewed 19 participants in urban areas and 25 in rural areas. Figure 2 shows the interview locations and the number of questionnaires per villages or city.

The first seven interviews were recorded digitally to become familiar with the language and documenting the vernacular names. All interviewees were paid 500-2.000 CFA (1-4 US\$) for their time and cooperation. This amount of monetary compensation was suggested by our local colleagues at CENAREST³ and appropriate to local standards. All participants were interviewed in their own environment for example behind their market stand or in their own house. In order to avoid evoking a sense of shame among the interviewees, we did not ask disease related questions personally but posed them in general. Thus all questions started with 'what do women use for ...'

In total, 28 women and one man (because of his extensive knowledge on women's and children's health care) participated in this study. The mean age of the participants was 52,9 years. Almost all the interviewees were self-employed as farmer, harvester, saleswomen at the market, healer or a combination of these professions. On average the participants had 5 children. 85% of the interviewees were Fang, 7.5% Masango and 7.5% Bapunu. Six women did not have any education, ten women had some education or went to church school and the rest went to secondary school and attended school up to different levels.

³ Le Centre National de la Recherche Scientifique et Technologique (CENAREST). For more information turn to: <http://www.cenarestgabon.com/>

3.2.3 Plant collection

Using standard botanical methods, we made 117 vouchers of different species, collected preferably, directly after finishing the questionnaire. When the same species was named in different questionnaires, we did not collect it again, if we were sure that we collected it before. Well known agricultural species that could be identified at the harvesting site were also not collected (e.g. *Zea mays*, *Nicotiana tabacum* and *Elaeis guineensis*). After we finished a questionnaire with a market saleswoman, we purchased previously uncollected plants from her directly or from a colleague's market stall. We also joined (semi) professional extractors in the harvesting process to determine the exact harvest locations, vegetation type and the way of extraction of medicinal plants sold on the market. We recorded the exact harvest locations with a GPS device. To assess the threat status of a plant used as medicine, additional information on occurrence and scarcity of the plants was obtained from the harvesters and our own observations during harvesting trips. We carefully documented the vegetation type from which medicinal plants were harvested. In addition to that we collected documentation of the domestication status, and whether the plant was introduced or (sub)endemic.

Every plant was collected twice in order to deposit one duplicate in the National Herbarium of Gabon 'IPHAMETRA' in Libreville and export the second specimen to the National Herbarium of the Netherlands in Wageningen, now part of Naturalis Biodiversity Center. Information on vegetation type, vernacular names, domestication status was documented during collection and was added to the plant description of the specimen labels.

3.2.4 Plant identification

Although we spent some time identifying our plant collections in the Gabonese herbarium, the major part of the collected plants was brought to the Netherlands to be identified in the herbarium in Wageningen. The plants were identified to species level using 'the Checklist of Gabonese Vascular Plants' by Sosef *et al.* (2006), 'Woody plants species of West Africa' by Hawthorne *et al.* (2006) and 'The Plant Utiles de Gabon' by Raponda-Walker & Sillans (1961). The specimens were compared with herbarium vouchers which in most cases originated from Gabon. During the identification process assistance was provided by botanical specialists at the Wageningen herbarium.

For the major part we could find collected plants linked to a vernacular name and use in literature and the herbarium in Wageningen. Market samples were in general difficult to identify because of the lack of information on the original tree or plant and the natural habitat. However market saleswomen could give many vernacular names in several native languages for plants sold they sold in their stall. Plants that could not be collected but were mentioned in interviews could be identified by means of vernacular name and plant use. Plants that were said to be rare and growing far away we found the most difficult to identify, for in most cases no collection could be made and the vernacular name often did not show up in literature. Therefore we checked the vernacular names of unidentified plants with different Gabonese dialects and foreign languages by using 'Useful plants of west tropical Africa' by Burkill (2004). After the fieldwork in Gabon we checked all collected species in the herbarium in Wageningen. Using 'The Plant List' (2010), we documented the most recent Latin plant names and authors. When species could only be identified by vernacular name and medicinal use, they were often marked with 'CF' because we cannot be sure about the exact species or genus.

Plants named in questionnaires but that could not be identified at family level, we excluded from statistical tests.

3.2.5 Participatory mapping

I conducted three participatory mapping exercises. One participant in Ebomane, see figure 2 (N 2°10', E 12°03') made the first map which included information on her whole village and surroundings. Two market saleswomen from the Mon Bouet Market in Libreville (N 00°24'10", E 009°27'20) both made a map. These maps only show an abstract description of their harvesting sites at Cap Estérias (N 00°34'59", E 009°19'01). I consider the participatory mapping results as an insufficient amount of data to draw any conclusions. However exercise gives an example of the women's harvesting sites and visually depicts how local communities view their environment. I included the maps in this report in appendix 2.



Figure 3. Participatory mapping session in Ebomane

3.3 Data analysis

To assess if (sub)endemic species were among the plants named in the questionnaires, I used the 'Checklist of Gabonese vascular plants' (Sosef *et al.*, 2006). I determined the threat status by means of the IUCN red list (2012). We used the following definitions to classify the domestication status of species:

- Cultivated plants – Seeds that are grown in a garden, plants that are uprooted and replanted in a garden and domesticated plants⁴.
- Wild plants – Plants that sprout and grow independent of human interference.

By employing these definitions while collecting the plant, we determined if a species was wild or cultivated. If we collected a species more than once, we determined all collections as one status; wild or cultivated. It needs to be noted that boundaries between wild and cultivated species were sometimes very small. We referred to literature in cases of uncertainty. Non-collected species were considered cultivated if cultivation in Gabon was clearly stated in literature, if not, the species was considered wild. Finally we considered species cultivated when the individuals in the field were known to be escaped from cultivation.

To classify the vegetation type a more extended system was required. The following classes were used to arrange the harvesting habitats:

- Primary forest – including mangrove forest
- Secondary forest – including heavily disturbed forest
- Secondary shrub land – including forest at village edge and vegetation in and around ponds
- Cultivated field – including species found in and around cultivated fields
- Private yard – including wild species growing on domestic waste

⁴ Plants that sprout and grow only with human interference, so that do not occur as a wild species in Gabon.

We determined the vegetation types by using descriptions made by own observation during fieldwork. When plants named in questionnaires could not be collected, due to distance or scarcity, we referred to literature to classify the vegetation type.

3.4 Statistical analysis

3.4.1 Hypothesis

We calculated the percentage of wild and cultivated species mentioned during interviews. To analyze whether urban women used a higher percentage cultivated species than rural women, a one-way ANOVA was performed according to Dytham (2009) in IBM SPSS (IBM Corp., 2011). Because the percentages of wild and cultivated species add up to 100%, we only included the cultivated species percentages to perform the test.

In order to test if urban women cited cultivated plants more often during the questionnaires than rural women, we counted the number of citations per species per interview. We performed another one-way ANOVA to investigate this hypothesis.

3.4.2. Primary forest species

The aim of this study was next to making an inventory of the origin and management of medicinal plants also to identify species that might suffer from overharvesting. The primary forest species named in this study often have slow maturation rates (B. toxisperma 90-100 years (PROTA4U, 2012)). In comparison with weeds, these species take a much longer time to regrow after logging and are therefore more susceptible for overharvesting. For this reason, when we observed in our database that urban women used slightly more primary forest species than rural women (see table 2), we performed another two one-way ANOVA tests. The first test was conducted to check whether there was a statistical difference in the average number of primary forest species used per questionnaire by urban and rural women. As can be seen in table 2, the average number of primary forest species citations per questionnaire is much higher for urban women than for rural women. Therefore the second test was to check whether there was a statistical difference between these numbers.

Table 2. Overview of the average numbers of primary forest species and citations per questionnaire named by women in urban and rural areas.

	Urban	Rural
Average number of species/questionnaire	0.33	0.27
Average number of citations/questionnaire	1.67	0.81

We verified all datasets used for statistical tests to be normally distributed by means of a Kolmogorov-Smirnov test. If the data was normally distributed ($p > 0.05$) we performed a one-way ANOVA. If not normally distributed, we performed a Kruskal-Wallis test.

4. Results

4.1 Plants used for women's reproductive health and childcare

4.1.1 Medicinal plants, plant parts and preparation

We made 117 vouchers of different species. Respondents named 197 different species, grouped in 160 genera, belonging to 68 families. The most common family found in this study is Fabaceae (21 species), followed by Euphorbiaceae and Malvaceae with 12 species each. The following eight species could be identified in their natural habitat so we did not collect them: *Arachis hypogaea*, *Elaeis guineensis*, *Carica papaya*, *Nicotiana tabacum*, *Terminalia catappa*, *Persea Americana*, *Musa spp.* and *Psidium guajava*. A table with all the named species for women's health and childcare can be found in appendices 3.1 and 3.2.

With 92 citations, the Fabaceae family was named most often, followed by Euphorbiaceae (67 citations) and Malvaceae (47 citations). Table 3 lists the top 10 most frequently cited species and their domestication status. I added a column with the number of interviews to show that species are mentioned more than once in questionnaires, thus women use the species for more than one disease or include it in more than one recipe.

Table 3. Top 10 of most frequently cited species.

	Species	Domestication status	Number of times cited	Number of interviews
1.	<i>Citrus aurantiifolia</i> (Christm.) Swingle	domesticated	39	22
2.	<i>Musa spp.</i>	domesticated	29	17
3.	<i>Capsicum annuum</i> L.	domesticated	27	20
4.	<i>Annickia affinis</i> (Exell) Versteegh & Sosef	wild	25	18
5.	<i>Costus ligularis</i> Baker, <i>C. lucanusianus</i> J.Braun & K.Schum.*	wild	25	18
6.	<i>Harungana madagascariensis</i> Lam. ex Poir.	wild	25	16
7.	<i>Aframomum spp.</i> (AMT 780, 1060, 1088)**	wild	25	17
8.	<i>Elaeis guineensis</i> Jacq.	domesticated	22	19
9.	<i>Manihot esculenta</i> Crantz	domesticated	22	19
10.	<i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll.Arg.	wild	16	13

* Both species were used interchangeably.

** Botanical collections in the Herbarium in Wageningen were often unidentified, therefore we were not able to identify up to species level.

A total of 64 different vernacular names could not be matched up with a scientific name. All collected plants but two could at least be identified to family level.

For every plant named in the questionnaires we noted which plant part was used. See table 4 for an inventory of the plant parts used in curing children's and women's diseases. Leaves and barks have a similar high score while fruits and the whole plant are often used and seeds and roots are only sometimes used. Juice, the heart of a stem and the stem itself are only present in a few recipes. Other parts were flowers, oil, tuber, wood, resin and the cord of a liana.

Table 4. An inventory of the plant parts used for children and the reproductive health of women.

Used part	Number of times cited
Leaves	301
Bark	287
Fruit	85
Whole plant	62
Root	38
Seed	37
Juice	17
Stem	13
Other parts	<6

4.1.2 Other medicines

Not only plants are used as a medicine. Herbal medicinal markets also sell both animal parts and living animals. In the questionnaires animal parts like the tail of a ray, lizards, fireflies or small fishes were often mentioned. As can be seen in figure 4 larger animals like turtles were sold on the market, together with dried chameleons, iguanas and chimpanzee fingers, which all have been attributed a high medicinal value. Next to animal parts, other materials were used for the healing process. For example salt, black coffee, charcoal, eggs, soap, honey, mushrooms, snail's shells, mason bee and termite nests. Crystallized minerals and mixtures of medicinal bark pieces are also used but plants definitely constituted the largest part of non-pharmaceutical medicine.



Figure 4. Living turtle sold on the market in Libreville.

4.1.3 Most commonly treated ailments

In table 5 the diseases with the most citations are shown. In addition to the women's health list, participants also named many kinds of vaginal and womb cleanse often in combination with giving birth.

Table 5. A list of the most commonly cited diseases for women's health and children's health.

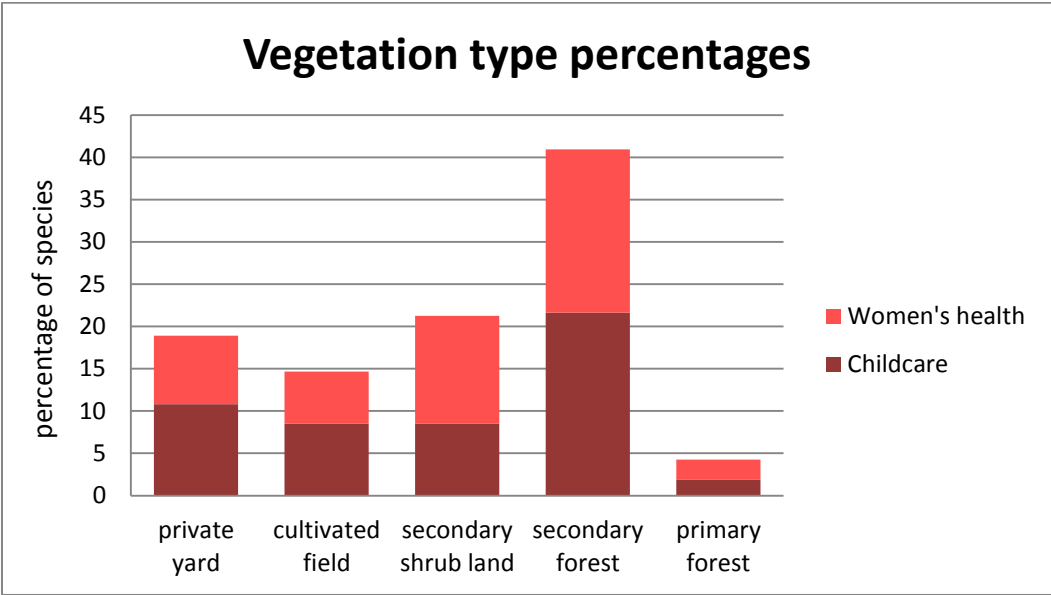
Disease	Number of citations
<u>Women's reproductive health</u>	
Increasing breast milk production	43
Anemia	39
Facilitating childbirth	24
Preserving the health of pregnant women	15
<u>Children's health</u>	
Malaria	66
Diarrhea	43
Closing the fontanel	41
'Fesse rouge'	38

As mentioned in paragraph 3.2.2 participants named many diseases and inconveniences next to those in the women’s health questionnaires, for example pain during pregnancy (‘miniule’) and before delivery, backache in pregnant women (‘mfoes’), swollen feet (‘mobo’) and worms in stomach (‘enna’, ‘amwassi’).

4.2 From which vegetation types are medicinal plants harvested?

4.2.1 Vegetation type

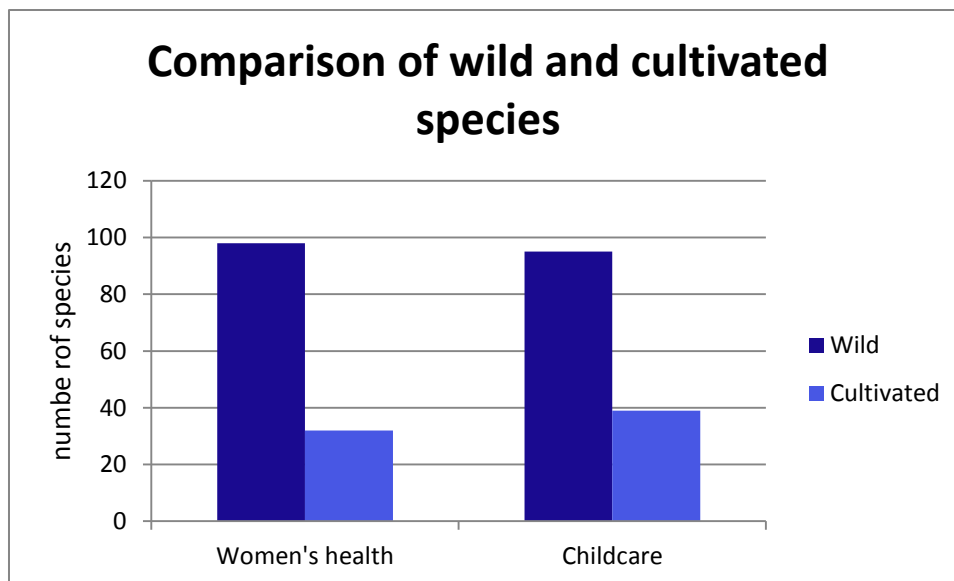
Graph 1 shows the percentages of species per vegetation type of the total amount of species named in this study. Women most frequently found their medicinal plants in secondary forest for both women’s health and childcare.



Graph 1. The occurrence percentages per vegetation type of medicinal plant species in the total amount of plant species named during the questionnaires.

4.2.2 Domestication status

The total of 197 plants species named in questionnaires included 149 wild species. As depicted in graph 2 there is a higher diversity of wild plants involved in recipes for women’s health and childcare than cultivated plants.



Graph 2. Domestication status of medicinal plant species used for women's reproductive health and childcare.

4.2.3 Which plants are cultivated by women?

Most women were self-employed as farmer and harvester and cultivated plants themselves in private gardens in the city or their village. During a participatory mapping exercise a market saleswomen mentioned the following species as cultivated in private city gardens: *Terminalia catappa*, *Solanecia angulatus*, *Capsicum annum*, *Citrus aurantiifolia*, *Theobroma cacao*, *Musa spp.*, *Manihot esculenta*, *Solanum tuberosum*, *Solanum anguivi*, *Solanum lycopersicum*, *Arachis hypogea* and *Saccharum officinarum*. Next to that women collected wild herbs and shrubs once or twice a week at the border of the city or further away to sell them on the market the remaining days of the week. Most of these women did not harvest the barks in their stall themselves but bought them from a (usual male) bark harvester.

Women in rural areas almost always collected or cultivated their own medicinal plants. The women collected herbs and shrubs from the wild, while barks from distant parts of the forest were generally collected by men. However, village gardens were shared by female villagers and looked after by the women together. The species they planted were frequently harvested for medicinal purposes and easy to grow.

We found that rural women planted the following species in their garden: *Acmella caulirhiza*, *Ocimum gratissimum*, *Amaryllidaceae sp.* (AMT 869, 1243), *Piper umbellatum*, *Mikania chenopodifolia*, *Psidium guajava*, *Citrus aurantiifolia*, *Capsicum annum*, *Tithonia diversifolia* and *Kalanchoe crenata*. Next to these species, wild species with medicinal value were often not removed but taken care of.

In cultivated fields in rural areas we found wild and cultivated plants growing next to each other: *Passiflora foetida*, *Cucumeropsis mannii*, *Perichasma laetificata*, *Asparagus warneckei*, *Alchornea cordifolia*, *Abelmoschus esculentus*, *Costus sp.* (AMT 817), *Sida acuta*, *Urena lobata*, *Ficus exasperata*, *Amaranthus cruentus*, *Diodella scandens*, *Canna indica* and *Nicotiana tabacum*. Trees and shrubs like *Elaeis guineensis*, *Carica papaya*, *Mangifera indica*, *Tabernanthe iboga*, *Milletia mannii*, *Anonidium mannii*, *Annona muricata* and *Alstonia congolensis* were planted or, in case of spontaneously sprouting species, taken care of by both women and men.

4.3 Which species are (sub)endemic, IUCN- or CITES-listed?

Based on ‘The Checklist of Gabonese Vascular Plants’ by Sosef *et al.* (2006), we found no species in this study that could be labeled as endemic. Only *Baillonella toxisperma* was documented as near endemic to Gabon. We checked the CITES appendices (CITES, 2012) but did not come across any species at risk. Subsequently we applied the Red list, composed by IUCN (2012), to determine the threat status of species cited in this study. None of the cited species was found to be severely endangered, but several species were listed as vulnerable (table 6). We have to note that the Red list lacked several species included in this study.

Table 6. The medicinal plant species cited in this study that are incorporated in the IUCN red list.

Species	Vernacular/trade name	Threat status
<i>Irvingia gabonensis</i>	chocolatier, wild mango	lower risk/near threatened
<i>Brillantaisia lancifolia</i>	ndolo (Fang)	vulnerable
<i>Aucoumea klaineana</i>	okoumé	vulnerable
<i>Baillonella toxisperma</i>	adzap (Fang), moabi	vulnerable

4.4 Statistical analysis

As mentioned in the methodology we tested four hypotheses. To check whether the data was normally distributed, a non-parametric independent samples test was done for all four datasets. In table 7 the results are shown for the first test with the hypothesis: Urban women use a higher percentage of cultivated plant species than rural women. With a p-value of .454 the data is not significant, so the data is not significantly different from normally distributed and the null hypothesis can be retained.

Table 7. The results of the Kolmogorov-Smirnov test used to check whether the data is normally distributed.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of cult_perc is the same across categories of area.	Independent-Samples Kolmogorov-Smirnov Test	.454	Retain the null hypothesis.
2	The distribution of wild_perc is the same across categories of area.	Independent-Samples Kolmogorov-Smirnov Test	.454	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

With test two we checked the following hypothesis: ‘Urban women cited the same number of cultivated species as rural women’. The data was normally distributed ($p=0.655$).

The third (‘Urban women cited the same number of primary forest species as rural women’) and the fourth test (‘Urban women used the same number of primary forest species as rural women’) were both normally distributed (respectively $p=0.912$, $p=1.000$).

4.5 Data analysis

Table 8 shows that our statistical analysis resulted in a mean percentage of 40% for rural cultivated plants and 36% for urban cultivated plants. Table 9 reports that test 1 was not significant ($p=0.343$), thus there was no statistically difference in the percentage of cultivated plants used by rural and urban women. The same conclusion can be drawn for wild plants.

Table 8. The descriptives concerning the one-way ANOVA done on the percentage of cultivated species.

Descriptives

cult_perc

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
urban	19	39,9926	15,84451	3,63498	32,3558	47,6294	11,11	66,67
rural	25	35,8792	12,61030	2,52206	30,6739	41,0845	14,29	60,00
Total	44	37,6555	14,07456	2,12182	33,3764	41,9345	11,11	66,67

Table 9. The results of the one-way ANOVA done on the percentage of cultivated species.

ANOVA

cult_perc

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	182,663	1	182,663	,920	,343
Within Groups	8335,347	42	198,461		
Total	8518,010	43			

The second test revealed that urban women cited an average of 9.16 cultivated species and rural women an average of 7.04 species, but this difference was not significant ($F(df 1,42) = 0.920$, $p=0.198$).

The first one-way ANOVA was performed on the number of primary forest species used by women per questionnaire. The result showed no statistical difference between the number of species used by urban and rural women ($F(df 1,42) = 0.201$, $p=0.656$). However when we conducted an ANOVA on the average number of citations per questionnaire, we found a statistical difference between urban and rural women ($F(df 1,42) = 6.587$, $p=0.014$).

4.6 What plants could be easily collected and what plants were difficult to find?

In table 10 I listed the medicinal plants species that were said to be rare or difficult to find. The women mentioned that many rare plants could be bought on the medicinal plant market in Libreville. Most women also said that relatives living in other villages often harvested plants for them that were not growing in the vicinity of their own village. The biggest part of the herbal pharmacopeia is made up of herbs growing in disturbed areas like gardens and around houses and could therefore easily be found.

4.7 Participatory mapping

I conducted three participatory mapping exercises; one in a rural area (Ebomane) and two in an urban area (Libreville). The urban women went to Cap Estérias once or twice a week by car or bus. They could not give an indication of the vegetation types and exact harvesting locations but gave an enumeration of the plants they collected in Cap Estérias. The woman who was living in a rural area gave a more detailed description of her harvest locations. She indicated up to what distance she collected her own plants and what plants were collected from other villages or by relatives from other villages. Her information about distances gives insight in the daily habits of women in rural areas. Frequently used plants are cultivated between the houses or in small cultivated fields close by the village. She could point the way to large trees, sometimes with a kilometer indication or a specific habitat.

Table 10. A list of medicinal plants species that are difficult to obtain according to the women participating in the questionnaires.

Species	Vernacular name	Reason	Interview location
<i>Aframomum spp.</i>	abodzom	Growing far away	Oveng
<i>Albizia glaberrima CF</i>	sènesak	Growing far away	Ebomane
<i>Annickia affinis</i>	mfo	Growing far away	Oveng
<i>Antrocaryon klaineianum CF</i>	eonkokon	Growing far away	Oveng
<i>Baillonella toxisperma</i>	moabi, adzap	Growing far away	Coco Beach, Ebomane
<i>Barteria fistulosa CF</i>	ensangom	Growing far away	Oveng
<i>Carpolobia alba CF</i>	oenkuta	Growing far away	Oveng
<i>Cola sp.(AMT 874)</i>	abé	Only for sale in Oyem	Oveng
<i>Cylicodiscus gabunensis</i>	edum	Growing far in forest	Coco Beach, Oyem
<i>Guibourtia tessmannii</i>	susuba, tisane de Pygmée	Difficult to find	Libreville
<i>Panda oleosa</i>	afan	Growing far away	Ebomane
<i>Perichasma laetificata CF</i>	enzigi embom	Growing far away	Ebomane
<i>Pterocarpus soyauxii</i>	umbol	Growing far away	Oyem
<i>Ricinodendron heudelotii CF</i>	essessa	Cannot be found in Oveng	Oveng
<i>Spathodea campanulata CF</i>	evuvum	Cannot be found anymore in Ebomane	Ebomane
<i>Trichoscypha sp.</i>	about	Growing far away	Ebomane

The two vernacular names ‘onkoroyo’ and ‘zaka’ could not be identified but were respectively called rare and growing far away.

5. Discussion

5.1 Wild and cultivated species in urban and rural areas

The one way ANOVA showed no statistical difference between the percentages of wild (and cultivated) plants used in urban and rural areas. This result can be explained by means of the accessibility of wild plants. We expected wild plants to be easily obtained in rural areas because most villages are closely surrounded by wild vegetation. However since our results showed no difference in the use of wild plants between rural and urban areas, urban women, including market saleswomen, also have easy access to wild plants. Because of the quantity of paved roads, transportation from and into the city is made easier and people have better access to remote plant resources (Cunningham, 2001). Market saleswomen made weekly visits to the city border or locations further away like Cap Estérias (located at 30 km from Libreville, see image 8) by car or bus. Subsequently it is very easy for women in the city to buy these wild plants on the market. By means of the market we can explain why urban women use the same amount of wild medicinal plants as rural women. However this does not explain why urban women do not significantly cultivate more medicinal plants than rural women.

The findings of this study can be explained by the motives for cultivation that Wiersum *et al.* (2006) found in their study. Among those motives were: avoiding scarcity of a species or medicine and decreasing the distance that needs to be covered to obtain medicinal plants. Because the number of cultivated plants was very low, we can conclude that these motives are not present or not strong enough for Gabonese women in order to cultivate their medicinal plants. One explanation can

be that scarcity is not a problem. There are enough wild medicinal plants to keep up with the city's demand or the same medicinal quality can be found in other plants. For example, for children with measles women named 11 different recipes with 11 different species, usually with 2 or 3 species per recipe. There are different recipes for one disease, so many plants have overlapping medicinal values. A second explanation is that the distance that needs to be covered to obtain medicinal plants is short. Urban women can buy medicinal plants on the market and do not have to go into the forest. If market prices are affordable, women do not take the effort of cultivating these plants because cultivating plants brings along technical constraints like obtaining optimal soil and light conditions, having problems with propagating and a lack of experience (Wiersum *et al.*, 2006). We can conclude

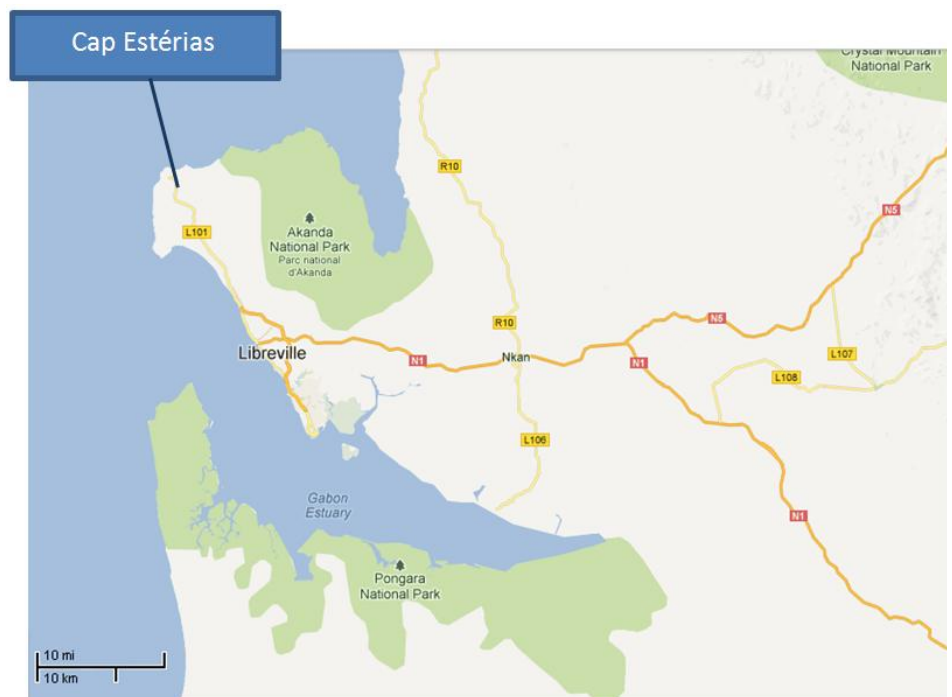


Image 8. The location of Cap Estérias in relation to Libreville. Adjusted from: <http://maps.google.com/maps>

that because of the market, urban women do not have strong motives for cultivation because plants are readily available, there are many overlapping values between species and medicinal plants can be obtained close to home.

Market saleswomen in Libreville mentioned only domesticated species when asked which medicinal species were grown in their garden. Rural women collected wild medicinal plants in the vicinity of their house or at village's edge. In their garden they planted domesticated species next to cultivated and wild species. In many cases wild medicinal species grew spontaneously in the garden and were taken care of. For these women we can conclude that distance is their motive to cultivate their medicinal plants.

From graph 2 it can be concluded that the participants of this study used more wild than cultivated plants. This result corresponds with the global situation that most traditional medicinal plants are collected in the wild (Schippmann *et al.*, 2002). One explanation can be that a cultivated species is in some countries considered less valuable than the same species that is directly obtained from the wild. Although we did not find that this was the case in Gabon, a preference for wild plants can be explained by secondary metabolites. Plants in their natural environment suffer from stress and competition while these factors are diminished in cultivation. Therefore it is likely that cultivated plants have other chemical compositions than their wild variety (Uniyal *et al.*, 2000; Schippmann *et al.*, 2002). Another explanation can be that if wild medicinal plants are affordable and easy to obtain on the market, taking the effort of cultivating plants is not necessary. However some plants do not grow in a garden without human interference and therefore it is not surprising that both urban and rural women cultivate a small amount of medicinal plants.

5.2 Species for concern

Half of the top 10 most cited species consisted of domesticated species that we found abundantly grown by women. Although *Citrus aurantiifolia* suffers from some severe diseases (PROTA4U, 2012), we often found it cultivated in rural areas (PROTA4U, 2012). *Musa spp.* was found in every village we visited. The world production of bananas in 2011 was around 106 million tons (FOA STAT, 2013). Although this number includes various cultivars, the species will not become endangered in the near future. *Capsicum annum* is next to Gabon widely cultivated in Africa (PROTA4U, 2012). *Elaeis guineensis* has a very high genetic differentiation among its natural populations and thus is not likely to become threatened in the wild. Next to that it is extensively cultivated in the tropics for its oil (Hayati *et al.*, 2004). *Manihot esculenta* is one of the most important staple foods in developing countries and is widely cultivated in South America and Africa (Okigbo, 1980). We can conclude that these cultivated species are widely cultivated and thus not likely to become threatened in the future.

Aframomum spp., *Costus ligularis* and *Costus lucanusianus*, three species that are also in the top 10 most frequently used species, we found heavily harvested in the wild. The leaves, fruits and roots of *Aframomum spp.* and the whole plant and the leaves of *C. ligularis* and *C. lucanusianus* are harvested for medicinal purposes. Especially removing roots has great impact on a plant's survival. However both species seem to grow abundantly in areas disturbed by humans. *Harungana madagascariensis* is used in many recipes and harvested in large quantities. Fortunately this is a fast growing pioneer tree in secondary forest that is widespread in tropical Africa. *Alchornea cordifolia* was named 16 times but grows abundantly in secondary shrub land and does not quickly constitute the risk of getting locally extinct. Therefore we have to pay our attention to *Annickia affinis*. In Gabon large

amounts of bark are harvested from this species for the treatment of malaria, anemia and other diseases.



Figure 8. Bark of *Annickia Affinis* is harvested in high quantities.
Picture by Lieke Guinée

Annickia affinis, another wild species, was cited 25 times in this study, in most cases as a cure for malaria. Even now malaria is a major threat for pregnant women and children under the age of five in the tropics. Because malaria medication is expensive and unaffordable for many people (Nolé *et al.*, 2011), herbal medicine is extensively used in treatments. As in Cameroon, Gabonese people find an effective alternative for western medicine in *A. affinis*. Many saleswomen on the market in Libreville sold large pieces of the bark of *A. affinis* in high quantities. The individuals that are harvested for its bark are growing in old secondary and primary forest. During a harvesting trip we attended in this study, we came across a very unsustainable way of bark harvesting of *A. affinis*, see figure 8. Although this species is not red-listed by the IUCN, the multiplicity in use in and outside of Gabon and the beneficial effects in the treatment of malaria may result in a decline in the population and bring *A. affinis* at risk.

Baillonella toxisperma is an example of a species that is already at risk. It was mentioned two times in the questionnaires, at different villages, and said to be difficult to find. Eight interviewees named this species in a questionnaire for various diseases. Since 2008 IUCN considers *B. toxisperma* as vulnerable (IUCN red list, 2012). The tree only grows in humid primary forest and is heavily exploited for its timber. Some measurements have already been taken, for example the minimum exploitation diameter is fixed at 70 cm in Gabon, 80 cm in Congo and 100 cm in Cameroon. But in Cameroon this means that 90% of trees above 100 cm in diameter are harvested. Cameroon exported 16.000 m³ of processed wood while Gabon processed even more, around 54.000 m³ (PROTA4U, 2012). Planting may be a solution to regenerate healthy numbers of *B. toxisperma*. But this is a long term solution because marketable trees, with a diameter at breast height (dbh) of ≥ 100 cm, take about 150 years to attain this size (Doucet *et al.*, 2009). More research is needed to create a short term solution.

The interviewees named the threatened species listed in table 6 once or several times. *Brillantaisia lancifolia* was only mentioned once but the whole plant was harvested. *Irvingia gabonensis* was named three times for the bark, leaves and fruit. Although this use does not seem too destructive, during fieldwork we saw women harvest large amounts of fruits. In figure 9 the yield harvested by a local woman can be seen. Our concern goes to *Aucoumea klaineana* or Okoumé. This species was only named three times during interviews for the fabrication of indigenous torches. These torches

were used during (healing) ceremonies, so were indirectly used as a medicine. Because we saw these torches in many places we assumed it is an important object for the Gabonese population. Okoumé was also mentioned to be used as a disinfectant. In 2000 Gabon produced over 4 million m³ timber. Okoumé made up the biggest part with 72% (Medzegue *et al.*, 2007). Okoumé is the main commercial timber tree in Gabon (Muloko-Ntoutoume *et al.*, 2000). In 2004 the timber production has decreased to 1.6 million m³, but most of this was still Okoumé (Medzegue *et al.*, 2007). Although this species is a near endemic in Gabon (Sosef *et al.*, 2006), it seems currently not threatened but may become scarce in the future (Laurance *et al.*, 2006) because its genetic resources are depleting as a result of a limited distribution of its natural populations. Furthermore Okoumé encounters fragmentation and a lack of regeneration (Muloko-Ntoutoume *et al.*, 2000). Sustainable management in Okoumé plantations can release the pressure of natural populations (Medzegue *et al.*, 2007).

We found that urban women cited more medicinal primary forest species than rural women. This result is remarkable because rural women live surrounded by (primary) forest and were therefore expected to use more primary forest species. We can explain this result in the same way as we did in paragraph 5.1, by means of the market. Urban women can easily buy the primary forest species on the market because market saleswomen can collect the plants in the wild. Rural women usually have less access to transportation than urban women. These women have to walk, often far into the forest to collect the plants for their own health care. It would be interesting to see if the use of primary forest species in urban areas is a developing trend because if this is the case, primary forests around cities may become threatened. *Annickia affinis*, *Baillonella toxisperma* and *Aucoumea klaineana* are all primary forest species and need more research to investigate if a sustainable logging management can be created.



Figure 9. *Irvingia gabonensis* yield in Oveng.

5.3 Vegetation types

The majority of the plants mentioned in the questionnaires are harvested from secondary forest. However, many species can be found in private yards, secondary shrub land or near cultivated fields. These results are consistent with the conclusions of Dijk & Wiersum (1999) that plantations and other anthropogenic vegetation types are a good habitat for many non-timber forest products (NTFPs) including medicinal plants. They also stated that this brings along the advantage that the collection of these NTFPs could be easily combined with livelihood practices. It is not surprising that we saw women use medicinal plants that predominantly originated from disturbed areas and secondary forest. In 1976, Levin found that annual plants nearly have twice as much alkaloids for their defense as perennials. Voeks (1996) suggested that weeds, secondary forest species and

perhaps even cultivated species may contain bioactive compounds. In comparison with primary forest species, these species are more likely to be potential useful medicinal plants.

Less than 5% of the medicinal plant species named in this study was collected in primary forest. In spite of this low number, this harvest can be very destructive. Mostly bark is collected from primary forest species, such as *Piptadeniastrum africanum*. Although this species grows widespread throughout West and Central Africa and can be found in different forest types, it may become threatened in the future. *P. africanum* is an upcoming commercial timber species and the bark is used for numerous medicinal purposes, which may lead to a decrease in genetic variability. This species' growth rate under different ecological situations needs to be further investigated in order to be able to develop an appropriate sustainable management (PROTA4U, 2012).

People are willing to travel into primary forest to collect their medicinal species. We can assume that there is no proper alternative for primary forest species that is easier to collect. Medicinal plant species that take some time to collect, are not practical if one is sick, so in general people prefer close by growing species (Stepp & Moerman, 2001). The collection of bark in primary forest also means that harvesters have access to this type of distant forest and can collect large amounts of bark. We can expect then that not only the species that were named in the questionnaires are taken from the forest but also additional species. Because we sometimes classified species by literature, species that also occur in other forest types may not be included in the 5% mentioned above. So the amount of species collected in primary forest may be higher.

Women used mostly leaves and bark for their medicinal value. *A. affinis*, *B. toxisperma* and *A. klaineana* are harvested for their bark in large quantities. Harvesting of the bark can be very destructive, especially in cases of ring barking and overharvesting, death may be inescapable (Cunningham, 1993). Harvesting leaves, seeds and fruits do not seem to form a direct risk for the survival of a species however its reproductivity can be affected by intensive pruning (Gaoue & Ticktin, 2007; Andel & Havinga, 2008). Harvesting of the roots or the whole plant is usually restricted to small shrubs and herbs. Although in general this kind of harvesting kills an individual, it concerns mostly weeds and thus does not necessarily constitute a risk for abundance the species.

5.4 Species cultivated by women

With the results from this study we have an idea of the plants used by women for their reproductive health and childcare. As mentioned in the introduction especially men's knowledge has been documented in the past. For conservation purposes, many species would be left out without the inclusion of women's knowledge on medicinal plants for women and children.

Plant species that are often used for medicinal purposes need to be readily available. Therefore frequently used species that allow themselves for cultivation, we found often cultivated close to home, like crops and weeds. Because of this and the numerous citations of these species in the interviews, we can assume that the plants found in women's gardens are their most important species. This knowledge is helpful for health care and conservation organizations. Health care initiatives can focus on the diseases that are being treated with these species, because those are probably the most important and frequently occurring diseases. Conservation organizations can focus on species that are important but cannot be cultivated or are not under cultivation yet, like *Annickia affinis*, *Baillonella toxisperma* and *Aucoumea klaineana*.

5.5 Limitations

5.5.1 Plant collection

Most plants named in the questionnaires could be collected or matched up with the collection made by colleagues in the research team. 45 species could not be collected but could be identified by means of the vernacular name and the medicinal use. 64 different vernacular names could not be collected and not be identified. Often due to the long distance that needed to be covered to reach the plants habitat, collecting the species was not possible. If a species was collected with leaves and/or flowers, we could often be sure about the genus and species level and medicinal value could be linked from literature (Raponda-Walker & Sillans, 1961). Although the book by Raponda-Walker and Sillans was originally published in 1961, many vernacular names and uses corresponded. Plants collected at the markets in Libreville were often difficult to identify because these plants were partly or completely dried and most of the times without fertile plant parts. If possible these species were collected again in the wild. The medicinal barks that we bought on the market were difficult to identify because the smell was quickly lost through other medicinal plants in the market stall and the pieces that were sold were often very small.

The following reasons could be the underlying problem for the non-identification of both collected and not collected plants:

- Vernacular names were wrongly understood or documented.
- Vernacular names were not yet documented in literature.
- The use of a species was not mentioned in literature. Matching vernacular names was not enough assurance to identify a species.
- Identification was not possible since the vouchers contained insufficient identifiable parts.

This study lasted ten weeks and therefore detailed data on season variability and geographic differences have not been taking into account. With a more extensive time management, the study could also have covered the medicinal plants use habitats of more ethnicities in Gabon.

5.5.2 Vegetation types

The vegetation type was determined by our own observation during collection trips. The habitat of plants was sometimes varying by area. Wild plants growing in a village garden were also found in secondary forest and shrub land near another village. Thus it was difficult to place a species into one of the five classes of the classification system used in this study. We chose the vegetation type where the species occurred most abundantly; however when vegetation types were heavily overlapping, we used the literature for final determination.

The same problem was encountered with classifying wild and cultivated species. The boundary between these two domains was often very small. For example women took wild plants from the forest and planted them in their garden. These wild plants would not grow in their garden without human interference. Another example is that we found many plants growing in a cultivated field that sprouted there spontaneously and were subsequently taken care of by farmers. In short the classification of wild and cultivated species was sometimes difficult and therefore literature was often consulted.

In the villages most women cultivated and collected their medicinal plants themselves. Gardens and harvesting places were shown after finishing the questionnaire. But because market saleswomen either worked all day on the market or collected fresh plants in the forest, there was no time to visit private city gardens.

5.5.3 Questionnaires

Especially the older participants sometimes only spoke Fang while the questionnaires were formulated in French. We then needed local translators during the questionnaires and this brings along an inevitably bias to the results (Newing, 2009). In addition the questionnaires, especially the childcare questionnaire, took a long time. Most housewives continued to do their household work, while market saleswomen got irritated when the questionnaire took longer than expected, because they did not want to stop talking to customers and helping them.

We came across some women with lack of trust in our research goal. Some market women thought we had the intention of stealing their medicinal plant knowledge to make an inventory of new lucrative drugs. Most of the times we gained trust after explaining our research goal in other words. Only a few women did not agree in participating in the study.

5.5.4 Sensitive topics

In practice the childcare questionnaire contained no or almost no sensitive questions. The women's health questionnaire on the other hand provoked timidity or discomforted the interviewee. Although almost all women were familiar with the disease terminology, topics such as abortion and sexually transmitted infections (STIs) but particularly HIV and AIDS lead to no response or an evasive answer. Topics like these still seem to be taboo in Gabon. Most women stated that the best option was going to the hospital. Vaginal steam baths and other vaginal cleansing methods, however almost never elicited a sense of shame.

Most interviews were conducted with women in the presence of family members what may have played a part in not answering sensitive questions. However sensitive topics sometimes were widely discussed in front of children and this seemed to serve as a form of sex education.

5.6 Participatory mapping

Although the amount of information from the three participatory mapping exercises is insufficient to draw any conclusions from it, it gives an idea of the harvesting sites and the distances that the women are willing or have to bridge.

The local perception is very useful in mapping vulnerable species or species that are becoming scarce (Cunningham, 2001). Species that need to be collected far away in the forest or by relatives in other villages may be getting scarce. Next to that women in both urban and rural areas will continue collecting plants in secondary and primary forests because their health and income depend on it. Although species are not threatened now, they may become scarce as species are collected for several years. From the rural map the following species were said to be growing far away or could not be found anymore: *Aframomum spp.* (AMT 780) ('adzom ebaja', 'ndong'), *Panda oleosa* ('afan'), *Baillonella toxisperma* ('adzap'), *Spathodea campanulata* CF ('evuvum') and *Trichoscypha sp.* Collection habits need to be monitored to keep insight in harvesting trends.

5.7 Research impact

We brought (near) threatened species into the light by means of the IUCN red list and additionally by taking a look at the medicinal plant use habits of women in urban and rural areas. Overexploitation of locally important species is indicated in this study to provide information to local and regional nature conservation organizations and consequently secure herbal health care for upcoming generations. However sustainable management for several species needs to be further investigated in upcoming studies.

Next to preserving endangered plant species, we wanted to conserve the knowledge on medicinal plant use. We documented recipes, vernacular names and diseases. This knowledge can be used to instruct local health organizations and for educational purposes. Moreover in this way a part of the centuries-old knowledge that may disappear due to urbanization and restricted knowledge transfer to new generations, is now captured and secured.

The insights provided by this study can be used by local, national and international health care organizations throughout Gabon. Major diseases for women and children, and especially culturally bound conditions such as 'La Rata', 'fesse rouge' and vaginal cleaning practices can be brought into focus and disease control and health educational programs can be set up or improved.

5.8 Contributions to Gabonese health care

In the childcare questionnaire a cure for malaria was by far most frequently named ailment. This implies the severity of this disease for children. Diarrhea was ranked second, not surprisingly for it is dangerous especially for very young children and is reflected in international mortality statistics (WHO, 2012). Although 'fesse rouge' does not seem life threatening it was frequently cited as a common health concern by mothers. This may be because the disease is easy to treat and many different plant species can be used as a remedy. The fourth disease that is most cited is closing of the fontanelles in young children. It is thought that if the fontanelles do not close in time, the head will keep on growing or evil spirits may take possession of the child's mind. The perception that this condition is a major health concern for young children is remarkable because biomedical health care does not view closing of the fontanelles as an especially risky condition for infants. It is through ethnobotany, the discussion of plants and their uses, that the differences in local and biomedical perceptions and priorities of health care are made known.

In the women's reproductive health questionnaires increasing a mother's breast milk production was the most cited. The need for this increase of breast milk may be a result of shared breast feeding. Ramharter *et al.* (2004) found that 40% of the lactating mothers in Gabon also nurse children other than their own. However this did not come up as an explanation of the necessity of increased breast milk production in the questionnaires. The disease that was second most cited was anemia. In questionnaires it was told that mainly pregnant women suffer from anemia because they have to share their blood with their unborn child. Because maternal and infant mortality rates are still high (WHO, 2012), it was not unexpected that many plants are used for facilitating childbirth and preserving the health of pregnant women. However 'ovules', folded leaves sometimes containing plant extract, were also cited many times as a use for all kinds of cleanses, mostly to purify the vagina after menstruation, after childbirth and before or after sex.

5.9 Implications for the Gabonese population

While women in rural areas usually did not know a cure for diseases such as fibroids, cysts, HIV and STIs, market women advised their customers to the hospital for the treatment of these diseases. For those people among the population who depend on herbal medicine exclusively, these diseases will remain difficult to cure.

Women in rural areas collected their plants themselves. Market saleswomen in Libreville bought their barks from a commercial harvester. At the most one middleman was paid so overall market chains were short in the North of Gabon. Libreville has one relatively large herbal plant market with approximately 30 stalls divided between two market areas. In Oyem we found one market woman selling medicinal barks. Domestic trade in medicinal plants in the north of Gabon is small, what may contribute to a sustainable extraction of medicinal plants.

Apart from a few species that may become scarce in the future, most medicinal plants used for women's reproductive health and childcare are growing abundantly in secondary shrub land and forest or are being cultivated in gardens. Furthermore species can be easily collected from the wild, both in rural and urban areas and many species are overlapping in medicinal purposes. Therefore most women will not quickly lack medicine for their health and their children's.

6. Conclusion

In this study we made an inventory of medicinal plants used by Gabonese women for their reproductive health and childcare in rural and urban areas. Respondents named 194 different species, grouped in 160 genera, belonging to 68 families. We expected urban women to use more cultivated species than rural women, because of the larger distance they have to cover to harvest medicinal plants. However distance does seem easy to bridge. Urban women both cited and used the same percentage of wild and cultivated plant species as rural women. People start cultivating plants when natural populations are declining, prices and demand remain high and no natural or synthetic substitute is available (Cunningham, 2001; Schippmann et al., 2002). We can conclude that the number of cultivated species is low because of the market where medicinal plants are affordable, easy to access and/or are available in a large variety.

The top 10 most frequently cited species consisted of five wild and five cultivated plants. The five wild plants in the top 10 do not seem endangered except for *Annickia affinis*. Because malaria medication is expensive, *A. affinis* is used extensively in Gabon. Large amounts of bark are harvested to meet the demand and therefore this species may be at risk. Because many people depend on this species for the treatment of malaria, the conservation of this species should be of the highest concern.

Most of the medicinal plant species mentioned in our study could be found in secondary forest. However, the larger part of the species, including cultivated ones, grew in areas with high human interference. These abundantly growing species will not be threatened easily. Therefore the sustainability of a major part of the medicinal plants used by women in Gabon is not at risk. Less than 5% of the plants were collected in primary forest. One of the primary forest species, *B. toxisperma* was identified as difficult to find in two questionnaires. By means of the IUCN red list we found that *B. toxisperma* and *Aucoumea klaineana* (Okoumé) are vulnerable species. In addition these species are the most important commercial timber tree species in Gabon. When Gabon is relapsing into the logging business, *A. affinis*, *B. toxisperma* and *A. klaineana* need attention, because these species are very important for the export and the primary health care of the Gabonese population. Further research is needed to create a sustainable logging management for these species.

Malaria and diarrhea are still life threatening diseases for young children in Gabon (WHO, 2012). Next to these diseases, 'fesse rouge' and closing of the fontanels were named many times in the questionnaires. For women's reproductive health increasing breast milk production and anemia was named most often. However many recipes were used for vaginal cleanses and facilitating childbirth. Health care organizations need to focus on this set of diseases in order to reduce gynecological morbidity and infant mortality.

Our results support that Gabon's botanical biodiversity does not seem at risk of declining due to plant harvesting for women's and children's health. Because of overlapping medicinal values in species, a low population density, short market chains and the use of disturbance species, we expect medicinal plants to be available for upcoming generations. Consequently medicinal plants will still provide many jobs in the future.

The importance of traditional herbal medicine should not be underestimated just like local perception on scarcity cannot be overlooked in conservation programs.

7. Acknowledgements

I would like to thank the Alberta Mennega Foundation, the FONA foundation, Jo Kolk studiefonds and the K.F. Hein Foundation for their financial support. Their contribution has been of great value for this study. I also want to thank the botanical specialists at the herbarium in Wageningen, who assisted us in the identification process. Finally I want to thank Lieke Guinée, Britt Boogmans and Diana Quiroz for the pleasant teamwork in Gabon and especially Alexandra Towns and Tinde van Andel for their excellent supervision and knowledge.

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9. Appendices

Appendix 1.1 Women's health questionnaire

The results from the free listing, will be incorporated in the research by A.M. Towns.

Questionnaire pour la santé des femmes

Le numéro : La date:

L'endroit: Les coordonnées

Information sur le répondeur:

1. Nom : 2. Age:.....
3. Lieu de naissance:..... 4. Lieu de résidence:.....
5. Langue(s): 6. Religion:.....
7. Occupation:..... 8. Education:.....
9. Combien d'enfants:.....

Free-listing

1.1 – Quelles sont les plantes (3) que vous connaissez que les femmes utilisent pour la sante?

2.1 – Quelles sont les (3) maladies le plus souffrant pour les femmes?

Les plantes pour maladies spécifiques

3.1 - Est-ce que les femmes utilisent les plantes pour l'anémie (manque de sang)?

3.2 - Quelles (3) plantes vous connaissez que les femmes utilisent pour ça⁵?

3.3 – Qu'est-ce qui cause cette maladie chez les femmes?

4.1 – Est-ce que les femmes utilisent les plantes pour l'hypertension ?

4.2 - Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

4.3 – Qu'est-ce qui cause cette maladie chez les femmes?

⁵ (1) nom local(s), (2) partie du plant, (3) sa préparation, (4) son administration

5.1 - Est-ce que les femmes utilisent les plantes pour « faire les ovules » ?

5.2 - Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

5.3 – Quand est qu’une femme doit « faire les ovules »?

5.4 - Et les plantes pour « la perte blanche » ?

5.5 – Et les plantes pour serrer le vagin (comme une vierge)?

6.1 – Est-ce que les femmes utilisent les plantes contre les maladies sexuellement transmissibles?

6.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ses maladies?

6.3 – Et contre le SIDA ?

7.1 – Est-ce que les femmes utilisent les plantes pour la circoncision au Gabon?

7.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

8.1 - Est-ce que les femmes utilisent les plantes pour les règles douloureuses?

8.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

8.3 – Et les plantes pour trouver ses règles ?

8.4 – Et les plantes pour autre complication de règles ?

9.1 Est-ce que les femmes utilisent les plantes pour le fibrome et la kyste ?

9.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

9.3 - Qu’est-ce qui cause cette maladie chez les femmes?

10.1 - Est-ce que les femmes utilisent les plantes pour la contraception (pour ne pas tomber enceinte)?

10.2 - Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

11.1 - Est-ce que les femmes utilisent les plantes pour la stérilité (celle qui n’arrive pas à tomber enceinte d’avoir un enfant)?

11.2 - Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

11.3 – Pourquoi il y a des femmes qui ne tombent pas enceinte?

12.1 – Est-ce que les femmes enceintes utilisent les plantes?

12.2 - Quelles (3) plantes vous connaissez que les femmes enceintes utilisent?

12.3 – C'est dans quelle période de grossesses que les femmes utilisent les plantes?

12.4 – Et plantes que les femmes enceintes mangent pour la bonne santé?

13.1 – Est-ce que les femmes utilisent les plantes pour faciliter l'accouchement?

13.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

13.4 – Et les plantes pour faire sortir le placenta ?

13.5 – Et les plantes pour arrêter le sang après l'accouchement ou une fausse couche?

13.3 – Et les plantes contre des infections après l'accouchement?

14.1 – Est-ce que les femmes utilisent les plantes pour augmenter la sécrétion lactée?

14.2 – Quelles (3) plantes vous connaissez que les femmes utilisent pour ça?

15.1 – Y a-t-il des situations dans lesquelles les femmes préfèrent utiliser les plantes que de se rendre chez les médecines ou chez les féticheurs?

15.1a – Dans quelles situations et pourquoi?

15.2 – Y a-t-il des situations dont les médecines sont mieux que les autres?

15.2a – Dans quelles situations et pourquoi?

15.3 – Y a-t-il des situations dont les féticheurs sont mieux que les autres?

15.3a- Dans quelles situations et pourquoi ?

15.4- Est-ce que les médecins vous parlent sur la médecine traditionnel (des plantes)?

16.1 – Est-ce que j'ai oublié une maladie ou un traitement très importante pour la sante des femmes?

Appendix 1.2 Childcare questionnaire

Questionnaire pour la santé des enfants

Le numéro : La date:

L'endroit: Les coordonnées

Information sur le répondeur:

1. Nom : 2. Age:.....
3. Lieu de naissance:..... 4. Lieu de résidence:.....
5. Langue(s): 6. Religion:.....
7. Occupation:..... 8. Education:.....
9. Combien d'enfants:.....

Free-Listing

1.1 – Quelle sont les (3) plantes que vous connaissez qui sont utilisées pour la santé des enfants?

2.1 – Quelle sont les (3) maladies le plus souffrant pour les enfants?

Les plantes pour maladies spécifiques

3.1- Est-ce qu'on utilise les plantes pour la diarrhée des enfants?

3.2 - Quelles (3) plantes vous connaissez pour ça⁶?

3.3 – Qu'est-ce qui cause la diarrhée?

4.1 - Il-y-a-t 'il des plantes qu'on utilise pour le lavage intestinale (ventre) des enfants?

4.2 – Quelles (3) plantes vous connaissez pour ça?

4.3 – Pourquoi on fait ce lavage pour les enfants?

(la promotion de santé, le traitement, la constipation)

4.4 - Et les plantes pour le premier caca de l'enfant ?

4.5 – Ils 'ont les mêmes plantes pour le colique ?

⁶ (1) nom(s), (2) partie du plant, (3) sa préparation, (4) son administration

5.1 - Est-ce qu'on utilise les plantes contre le paludisme des enfants?

5.2 - Quelles (3) plantes vous connaissez pour ça?

5.3 – Qu'est-ce qui cause le paludisme?

6.1 - Est-ce qu'on utilise les plantes contre les problèmes respiratoires des enfants?

6.2 - Quelles (3) plantes vous connaissez pour ça?

6.3 – Qu'est-ce qui cause l'asthme?

6.4 – Qu'est-ce qui cause la toux?

7.1 - Est-ce qu'on utilise les plantes pour la rougeole?

7.2 - Quelles (3) plantes vous connaissez pour ça?

8.1 – Il-y-a-t' il des plantes qu'on utilise pour la sante de la nouveau-né?

8.2 – Quelles (3) plantes vous connaissez pour ça?

8.3 - Et les plantes (3) pour sécher le cordon?

9.1 – Est-ce qu'on utilise les plantes pour fortifier l'enfant qui est dans le ventre (un enfant qui ne pas encore née)?

9.2 - Quelles (3) plantes vous connaissez qu'on utilise pour lui?

9.3 - Et pour les enfants qui restent petit (maigre)?

9.4 – Qu'est-ce qui cause l'amaigrissement d'enfants?

10.1 – Est-ce qu'on utilise les plantes pour la sortie des premières dents de l'enfant?

10.2 - Quelles (3) plantes vous connaissez pour ça?

11.1. - Est-ce qu'on utilise les plantes pour la circoncision du garçon?

11.2 – Quelles (3) plantes vous connaissez pour la circoncision du garçon?

12.1 - Est-ce qu'on utilise les plantes pour fermer les fontanelles des enfants?

12.2 - Quelles (3) plantes vous connaissez pour ça?

12.3 – Pourquoi c'est important pour les fermer ?

13.1 – Y-a-t' il des plantes (3) qu'on utilise pour les enfants pour leur permettre de marcher rapidement?

13.2- Quelles (3) plantes vous connaissez pour ça?

13.3 – Pourquoi les enfants doivent marcher rapidement?

14.1 - Est-ce qu'on utilise les plantes pour « rougeur de fesse » ?

14.2 - Quelles (3) plantes vous connaissez pour ça?

14.3 - C'est quoi, « rougeur de fesse »?

15.1 - Est-ce qu'on utilise les plantes pour « _____ » ?

15.2 - Quelles (3) plantes vous connaissez pour ça?

15.3 - C'est quoi, « _____ »?

16.1 – Est-ce qu'on utilise les plantes pour la crise des enfants?

16.2 – Quelles (3) plantes vous connaissez pour ça?

16.3 – Qu'est-ce qui cause la crise?

17.1- Il-y-a-t 'il des plantes qu'on utilise pour protéger les enfants contre la sorcellerie?

17.2- Quelles (3) plantes vous connaissez pour ça?

17.3 – Si on n'utilise pas cette protection pour l'enfant, qu'est-ce qui va lui arriver?

18.1 – Y a-t-il des situations pour enfants pour lesquelles on préfère utiliser les plantes que de se rendre chez les médecins ou chez les féticheurs?

18.1a – Pour quelles maladies et pourquoi?

18.2 – Y a-t-il des situations dont les médecins sont mieux que les autres?

18.2a – Pour quelles maladies et pourquoi

18.3 – Y a-t-il des situations dont les féticheurs sont mieux que les autres?

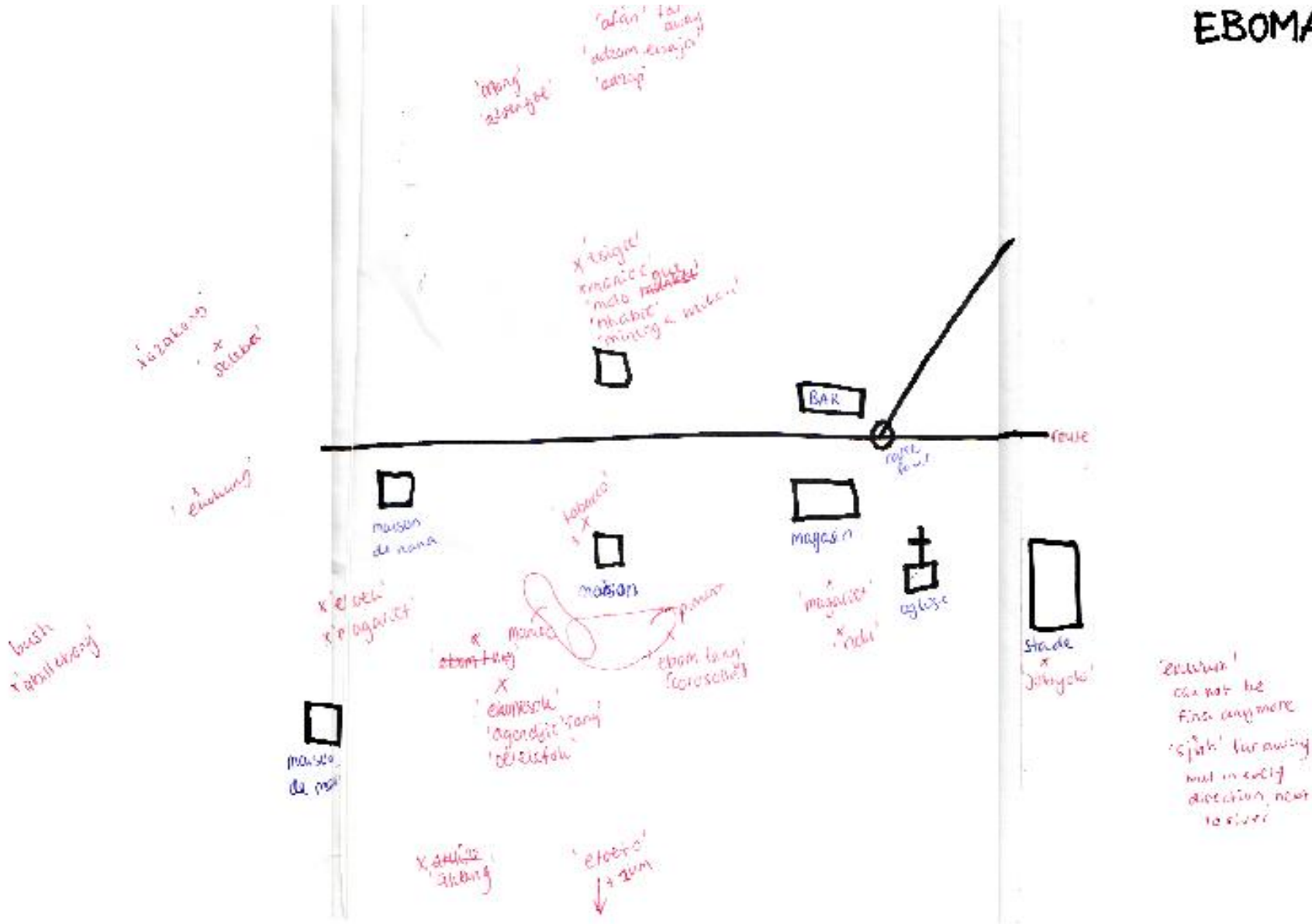
18.3a- Pour quelles situations et pourquoi?

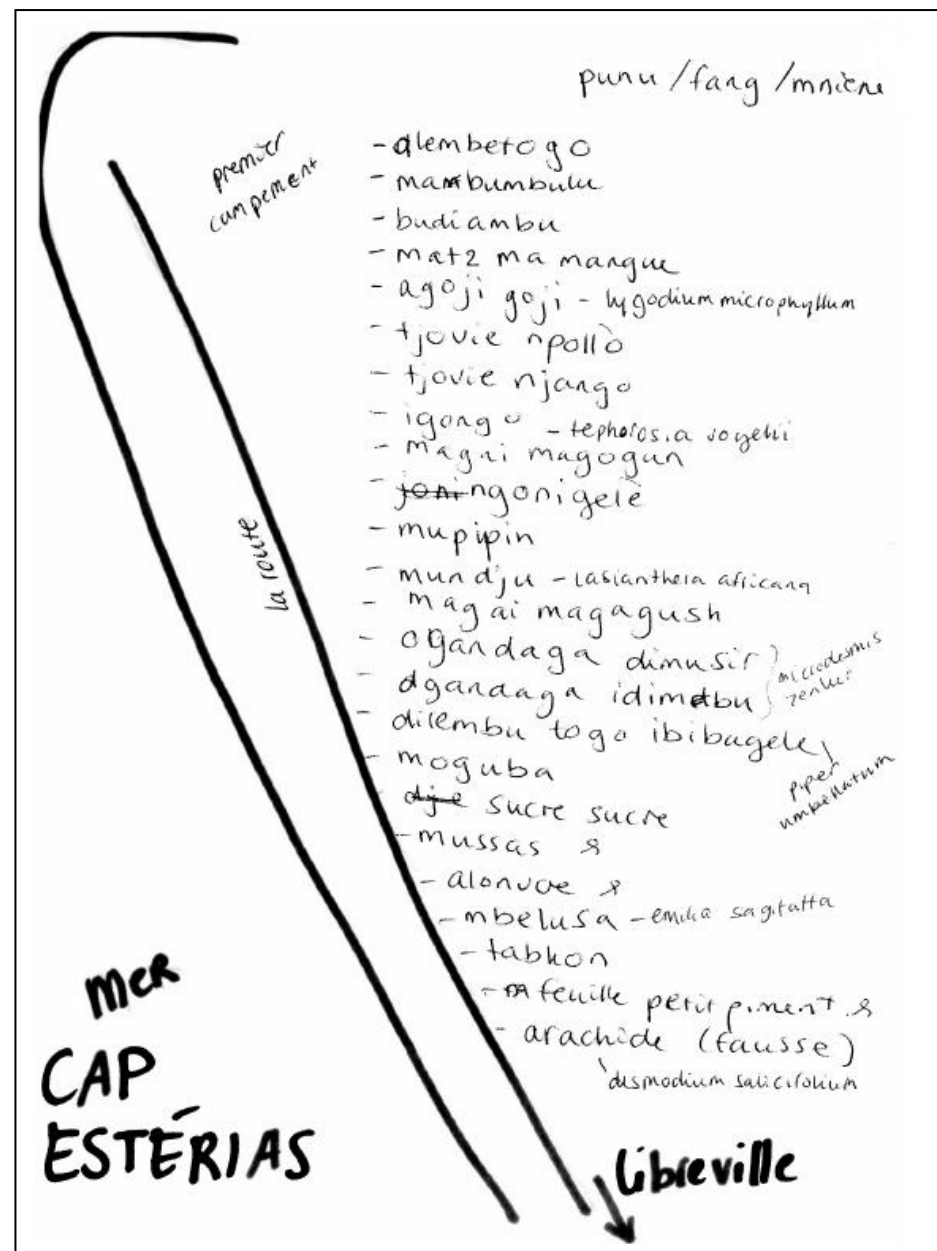
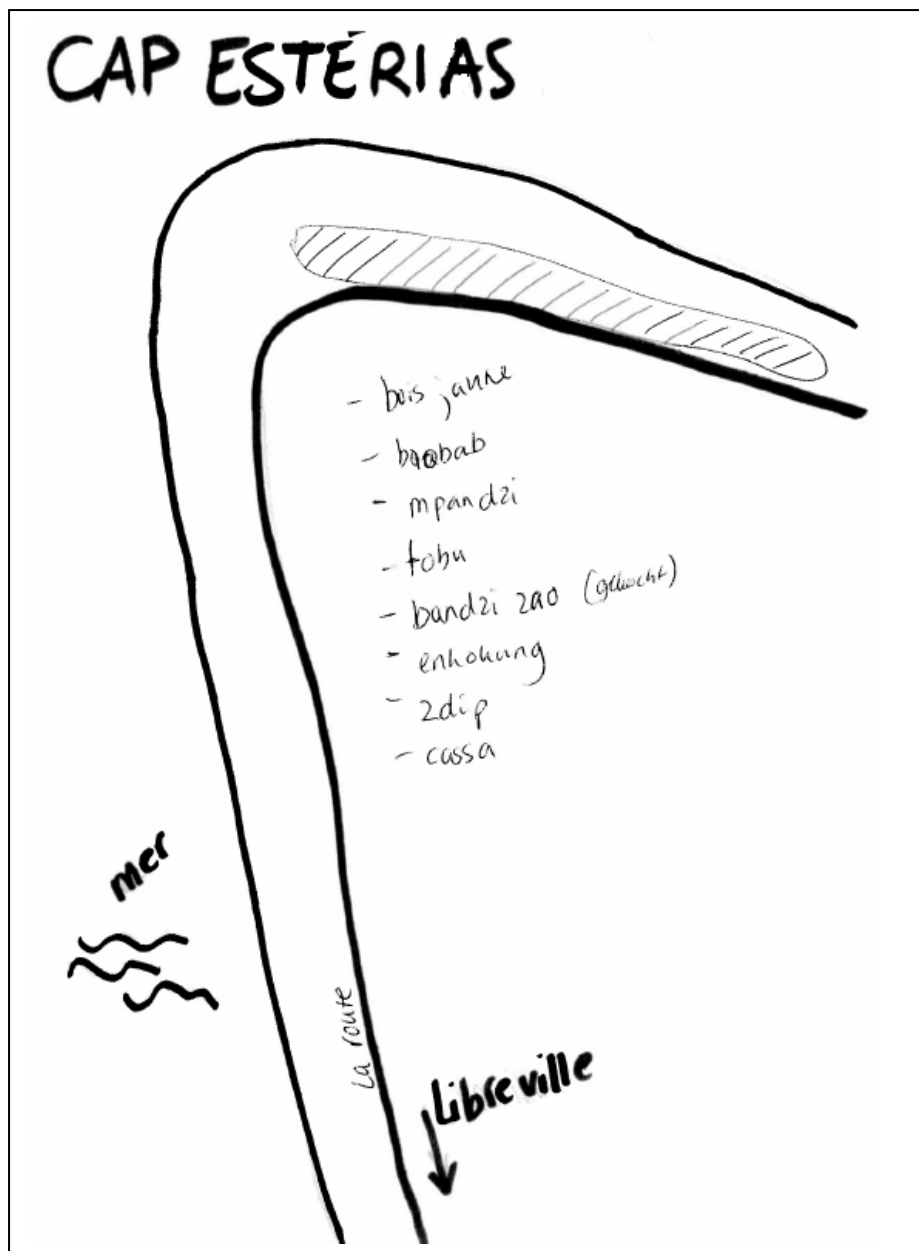
19.1 – Est-ce que j'ai oublié une maladie ou un traitement très importante pour la sante de les enfants?

Appendix 2. Participatory mapping exercises

Map made of the village Ebomane, 18th of August 2012

EBOMANE





Appendix 3.1 Table with medicinal plant species used for childcare

Family	Botanical name	Collection number	Vernacular name	Therapeutic use	Used part	Wild/ Cultivat ed/ Domesti cated	Growth form	Vegetation type				
								Private yard	Cultivated field	Secondary shrub land	Secondary forest	Primary forest
ACAN	<i>Acanthus montanus</i> (Nees) T.Anderson		ndu (Fang)	Cough	leaves	wild	shrub				x	
	<i>Brillantaisia lancifolia</i> Lindau	AMT 1252	ndolo (Fang)	Asthma	whole plant	wild	herb				x	
ACHA	<i>Camptostylus mannii</i> (Oliv.) Gilg	AMT 852	ebubun (Fang)	CBD bad lungs after birth	leaves	wild	tree				x	
AGAV	<i>Dracaena fragrans</i> (L.) Ker Gawl.	AMT 1235	alen-okpo (Fang)	Walk facilitator	bark	wild	shrub		x			
AMARA	<i>Cyathula prostrata</i> (L.) Blume	AMT 831, 893	kolok (Fang) oborbe grande feuille	Fontanels	leaves, flower	wild	herb	x				
AMARY	<i>sp.</i>	AMT 869, 1243	molo mundju (Fang)	Walk facilitator	leaves	cult	herb	x				
ANAC	<i>Antrocaryon klaineanum</i> Pierre	AMT 767, 1204	angokon	Fontanels	bark	wild	tree				x	
	<i>Mangifera indica</i> L.	AMT 839	endok (Fang)	Malaria	leaves	dom	tree	x				
ANNO	<i>Annickia affinis</i> (Exell) Versteegh & Sosef	AMT 1099	nfo (Fang), bois jaune, mukoka	Malaria	bark	wild	tree				x	
	<i>Annona muricata</i> L.	AMT 871	corosollier	Respiratory problems	leaves	dom	tree	x				
	<i>Anonidium mannii</i> (Oliv.) Engl. & Diels	AMT 957	ebom (Fang)	Health unborn child	bark	cult	tree	x				
	<i>Cleistopholis spec.</i> CF		avum (Fang)	Health unborn child		wild	tree			x		
	<i>Xylopia aethiopica</i> (Dunal) A.Rich.		bikwin (Fang)	Circumcision healing	fruit	wild	tree			x		
APOC	<i>Alstonia boonei</i> De Wild.	AMT 855	ekouk (Fang)	Malaria, worms in abdomen, asthma, la Rata	bark	wild	tree				x	
	<i>Picalima nitida</i> (Stapf) T.Durand & H.Durand	AMT 1250	ebam (Fang)	Malaria, la Rata	bark	wild	tree				x	

APOC	<i>Rauvolfia mannii</i> Stapf	AMT 1075	obaton (Fang)	Malaria		wild	shrub				x	
	<i>Tabernanthe iboga</i> Baill.		bois sacré	Pregnancy: avoid malaria, fetus strengthener, against sorcery	root	cult	shrub					
ARAC	<i>Colocasia esculenta</i> (L.) Schott		taro (Musangu)	La Rata	bark	cult	shrub		x			
AREC	<i>Elaeis guineensis</i> Jacq.		esong, onbonmiban (Fang), huile de palme	Fontanels, measles, rash, fetus strengthener, intestinal washing, la Rata, belly button, circumcision healing	seed, heart stem, nut	dom	tree	x				
ASPA	<i>Asparagus warneckeii</i> (Engl.) Hutch.	AMT 864, 1230	mincoga mikou (Fang)	Fontanels	root	wild	climber		x			
BIGN	<i>Spathodea campanulata</i> P.Beauv. CF		evuvum (Fang)	Cough	leaves	cult	tree	x				
BURS	<i>Aucoumea klaineana</i> Pierre	AMT 823		Against sorcery	bark, resin	wild	tree				x	
CANN	<i>Canna indica</i> L.	AMT 1061, 1233	ekwanzo (Fang)	Malaria	leaves	wild	herb				x	
CARI	<i>Carica papaya</i> L.		papaya	Malaria	leaves	dom	tree	x				
COMB	<i>Terminalia catappa</i> L.		huile d'almande	Fesse rouge	oil from seed	dom	tree	x				
COMP	<i>Acmella caulirhiza</i> Delile	AMT 759, 856	andongsie (Fang)	Fontanels	leaves	cult	herb	x				
	<i>Ageratum conyzoides</i> (L.) L.	AMT 1054	mambi matap (bapunu), ikukwey (Fang)	Diarrhea, CBD ebam	leaves	wild	herb			x		
	<i>Emilia coccinea</i> (Sims) G.Don	AMT 825, 1247	alovou, fub (Fang)	Measles, umbilical cord, walk facilitator, new born washing	leaves, whole plant	wild	herb			x		
	<i>Ethulia conyzoides</i> L.f. CF		matzimama	CBD: miloen	leaves	wild	herb				x	
	<i>Laggera alata</i> (D.Don) Sch.Bip. ex Oliv. CF		susuba, tabac de pygmée	Stop bleeding after delivery, fesse rouge	leaves	wild	herb			x		
	<i>Solanecio angulatus</i> (Vahl) C.Jeffrey		budiambu	Crise	leaves	wild	shrub				x	
	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	AMT 862	margarit	Measles, fesse rouge, rougeole, la Rata, malaria, intestinal washing	Leaves, flower, whole plant	wild	shrub		x			

COMP	<i>Vernonia amygdalina</i> Delile	AMT 807, 887, 1070	zomayo, yoloyolo, bikambilar (Fang)	Measles, intestinal washing, chicken pox, colic, tootache, malaria, worms in abdomen	leaves, bark	cult	shrub			x		
	<i>Vernonia conferta</i> Benth.	AMT 1071, 1201	abankak, abanga (Fang)	Diarrhea	bark	wild	tree				x	
CONV	<i>Ipomoea mauritiana</i> Jacq.	AMT 1218		fontanels	root	wild	vine				x	
COST	<i>Costus spp.</i>		myen (Fang), feuille de canne sauvage	Measles, chicken pox, diarrhea, CBD bad lungs after birth, fesse rouge, la Rata, fontanels, asthma, malaria	leaves, sap, whole plant, stem	wild	shrub				x	
CRAS	<i>Kalanchoe crenata</i> (Andrews) Haw.	AMT 758	ivivuma (Fang), Majujuga, jejoujuga (Bapunu)	Cold, cough, umbilical cord, ear disorders	leaves	dom	herb	x				
CUCU	<i>Cogniauxia podolaena</i> Baill.	AMT 1229		La Rata	root	cult	climbing herb			x		
	<i>Cucumeropsis mannii</i> Naudin	AMT 854	concombre traditionnelle	Diarrhea, walk facilitator	seed, stem	dom	climbing herb		x			
	<i>Momordica charantia</i> L.	AMT 678	mabubulu	Diarrhea, intestinal washing, colic, rougeole, meconium wash, crise, health newborn	leaves	cult	climbing herb		x			
	<i>Momordica foetida</i> Schumach. CF		eyenzum (Fang)	Stomachache with green poo	whole plant	cult	climbing herb		x			
	<i>sp.</i>		ekoangon (fang)	Walk facilitator	seed	cult	climbing herb		x			
	<i>Telfairia pedata</i> (Sm. ex Sims) Hook. CF		ayuzum (Fang)	Colic, meconium wash	leaves	wild	liana					x
CYPE	<i>Scleria boivinii</i> Steud.		kengitsie (Bapunu)	Umbilical cord	leaves	wild	herb				x	
DILL	<i>Tetracera sp.</i>		nzrnzu (Fang)	Health unborn child	wood	wild	liana				x	
DIOS	<i>Dioscorea bulbifera</i> L.	AMT 1207	bibuma abang (Fang)	Malaria	tuber	wild	vine				x	
	<i>Disoscorea sp.</i>		yam blanche	La Rata		wild	vine				x	

EUPH	<i>Acalypha paniculata</i> Miq.	AMT 844	oekoenkoenkoe n (Fang)	CBD onkoe abijel		wild	shrub			x		
	<i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll.Arg.	AMT 827, 838, 870, 1062	nkabie, unusum abui (Fang)	Malaria, fesse rouge, toothache	leaves	wild	herb			x		
	<i>Alchornea floribunda</i> Müll.Arg.	AMT 1057	alan-bwikili (Fang)	Intestinal washing, umbilical cord	root, leaves	wild	herb				x	
	<i>Croton oligandrus</i> Pierre ex Hutch. CF		obumba	La Rata		wild	tree				x	
	<i>Macaranga spinosa</i> Müll.Arg.	AMT 1064	avel-assass, lasass (Fang)	Malaria, meconium wash, walk facilitator	bark, leaves	wild	tree				x	
	<i>Manihot esculenta</i> Crantz	AMT 890	menza, pwem (Fang), manioc	Measles, chicken pox, rougeole, intestinal washing, health unborn child	leaves, root	dom	shrub		x			
	<i>Phyllanthus sp.</i>	AMT 1245	kanguh (Fang)	Flu, diarrhea	whole plant	wild	shrub				x	
	<i>Ricinodendron heudelotii</i> (Baill.) Heckel CF		essessa (Fang)	Health unborn child	leaves	wild	tree				x	
HYPE	<i>Harungana madagascariensis</i> Lam. ex Poir.	AMT 778	atuin (Fang)	Circumcision healing, diarrhea, fesse rouge, la Rata, measles, respiratory problems	bark, leaves	wild	tree				x	
IRVI	<i>Irvingia gabonensis</i> (Aubry-Lecomte ex O'Rorke) Baill.	AMT 1017	muebe (Bapunu), chocolatier, wild mango	Health unborn child, fever	bark, leaves	wild	tree			x		
LAMI	<i>Clerodendron sp.</i>	AMT 851	bejim elok (Fang), reine des herbes	CBD bad lungs due to sorcery, fontanel, CBD onkoe simple	leaves	wild				x		
	<i>Ocimum americanum</i> L.	AMT 1142	ocim (Fang)	Earache	whole plant	cult	herb	x				
	<i>Ocimum gratissimum</i> L.	AMT 1143	messup, massep (Fang)	Cough, umbilical cord, intestinal washing, diarrhea	leaves	cult	herb	x				
	<i>Ocimum sp.</i>		dziandzie, petit zianzi (Bapunu)	CDB: miloen, malaria, walk facilitator, cough, intestinal washing	leaves	cult	herb			x		
	<i>Persea americana</i> Mill.	AMT 1078	afia	Toothache	bark	cult	tree	x				
LECY	<i>Petersianthus macrocarpus</i> (P.Beauv.) Liben	AMT 1220	abing (Fang)	CBD asok	bark	wild	tree				x	

LEGU	<i>Albizia glaberrima</i> (Schum. & Thonn.) Benth. CF		sènesak (Fang)	Health unborn child, umbilical cord	bark	wild	tree				x	
	<i>Albizia sp.</i>	AMT 876, 1228	vovo-esak (Fang)	Diarrhea	whole plant	wild	tree			x		
	<i>Arachis hypogaea</i> L.		eba-owun (Fang)	Fontanels	seed	dom	shrub		x			
	<i>Cylicodiscus gabunensis</i> Harms	AMT 915, 950	edum (Fang)	Worms in abdomen, malaria, diarrhea, health newborn	bark	wild	tree				x	
	<i>Desmodium adscendens</i> (Sw.) DC.	AMT 833	obomèsin (Fang) oborbe petit feuille,	Fontanels	leaves	wild	herb				x	
	<i>Detarium microcarpum</i> Guill. & Perr.		enouk (Fang)	Pregnancy: avoid malaria		wild	tree			x		
	<i>Distemonanthus benthamianus</i> Baill.	AMT 756	eyem, movengi (Fang)	Newborn bath, strength unborn child, fontanels	bark	wild	tree				x	
	<i>Erythrina mildbraedii</i> Harms CF	AMT 881	esok (Fang)	Against sorcery	bark	wild	tree		x			
	<i>Guibourtia tessmannii</i> (Harms) J.Leonard	AMT 764	oveng (Fang)	Against soercery, newborn bath	bark, resin	wild	tree				x	
	<i>Millettia gagnepainiana</i> Dunn		fe-enziee (fang)	Umbilical cord	bark	wild	liana				x	
	<i>Millettia mannii</i> Baker		vinekwey (Fang) ecorce de la Peyrie, diperie	Intestinal washing, health newborn, meconium wash	bark	wild	liana		x			
	<i>Pentaclethra eetveldeana</i> De Wild. & T.Durand CF		tzi (Fang)	Colic, intestinal washing	bark	wild	tree				x	
	<i>Pentaclethra macrophylla</i> Benth.	AMT 834, 1077	ebenje, nzesé (Fang), mupandzi (musangu)	La Rata, asthma, stomach ache with green faeces, CBD asok	bark, wood	wild	tree				x	
	<i>Phaseolus vulgaris</i> L.		haricot	Rougeole	leaves	dom	climbing herb		x			
	<i>Piptadeniastrum africanum</i> (Hook.f.) Brenan	AMT 816a, 1219	miso-miso, tum (Fang)	La Rata, stomache ache with green faeces, CBD asok	bark	wild	tree					x
	<i>Pterocarpus soyauxii</i> Taub.	AMT 1203, 880	umbey, esi (Fang) kaolin rouge	Measles, chicken poc, circumcision healing, diarrhea	bark, wood	wild	tree				x	
	<i>Senna alata</i> (L.) Roxb.	AMT 1210	dowlontou (Fang)	Diarrhea, blisters, CBD asok	leaves	cult	shrub				x	
	<i>Senna occidentalis</i> (L.) Link	AMT 1055	besi (Fang)	La Rata	whole plant	wild	shrub				x	

LOGA	<i>Anthocleista nobilis</i> G.Don	AMT 765	ajinebe (Fang)	Diarrhea, CBD onkoe abijel	bark	wild	tree			x		
LYGO	<i>Lygodium microphyllum</i> (Cav.) R. Br.		nzalanu (Fang)	Diarrhea	leaves	wild	climbing fern				x	
MALV	<i>Ceiba pentandra</i> (L.) Gaertn. CF	AMT 882	guna (Musangu)	La Rata, asthma	bark	wild	tree			x		
	<i>Cola sp.</i>	AMT 874	abe (Fang), cola rouge/indigene, ecorce de lisop	Circumcision healing, cough, fetus strengthener, fontanels	bark, seed	wild	tree				x	
	<i>Gossypium barbadense</i> L.		cotton	Asthma	leaves	dom	shrub		x			
	<i>Hibiscus acetosella</i> Welw. ex Hiern	AMT 885	esang (Fang)	Fesse rouge	flower	cult	shrub		x			
	<i>Hibiscus sp.</i>		osail (Fang)	Fontanels	leaves	cult	Shrub	x				
MARA	<i>sp.</i> CF		zin-unkun (Fang)	Meconium wash, walk facilitator	root, whole plant	wild	shrub				x	
MENI	<i>Perichasma laetificata</i> Miers	AMT 810, 832, 886	tsigie, enzigi embon (Fang)	Diarrhea, intestinal washing	leaves, stem	wild	climber		x			
MORA	<i>Ficus exasperata</i> Vahl	AMT 848, 1239	ako (Fang)	Umbilical cord, fetus strengthener, cough	bark	wild	tree		x			
	<i>Ficus mucoso</i> Welw. ex Ficalho	AMT 826	engokom, ekoko (Fang)	Meconium wash, colic, fontanels, walk facilitator, health unborn child	leaves, bark, stem	wild	tree				x	
	<i>Musanga cecropioides</i> R.Br. ex Tedlie		asung (Fang)	Meconium wash, walk facilitator, cold, CBD ebam, fesse rouge	bark	wild	tree				x	
MUSA	<i>Musa spp.</i>		angive, atoran, elat-onton-ekon, adjuvèh, kanwa (Fang)	Malaria, diarrhea, fesse rouge, umbilical cord, fontanels, la Rata, cough, fetus strengthener, injuries, crise, CBD toufement, worms in abdomen	leaves, root, fruit, whole tree	dom	tree		x			
MYRTA	<i>Psidium guajava</i> L.		guave	Diarrhea	leaves	dom	shrub	x				
NYMP	<i>Nymphaea lotus</i> L.		otoeto (Fang)	Respiratory problems	leaves	wild	herb			x		
PAND	<i>Panda oleosa</i> Pierre		afan (Fang)	Intestinal washing	bark	wild	tree					x
	<i>Barteria fistulosa</i> Mast. CF	AMT 837,	nsabre (Fang)	Walk facilitator	bark	wild	tree					x

		1066										
PASS	<i>Passiflora foetida</i> L.	AMT 849	matuka makari (Bapunu)	Health newborn, diarrhea	leaves	wild	climbing herb			x		
PIPE	<i>Piper umbellatum</i> L.	AMT 761, 877, 1246	abomanzan (Fang)	Circumcision healing, hemorrhoids in children		cult	shrub			x		
PLAN	<i>Scoparia dulcis</i> L.	AMT 830	mnserè (Fang)	Worms in abdomen	leaves	wild	herb	x				
POA	<i>Bambusa vulgaris</i> Schrad.		muguisa	Fesse rouge	bark	wild	shrub				x	
	<i>Cymbopogon citratus</i> (DC.) Stapf		tisane	Malaria	leaves	dom	herb		x			
	<i>Pennisetum glaucum</i> (L.) R.Br. CF		wunzuku (Bapunu)	Health unborn child	leaves	cult	shrub		x			
	<i>Saccharum officinarum</i> L.	AMT 829	enkok (Fang) canne à sucre	Flu, asthma, meconium wash, malaria	stem, sap	dom	herb	x				
	<i>Zea mays</i> subsp. mays			Rougeole	ear	dom	shrub		x			
POLY	<i>Carpolobia alba</i> G.Don	AMT 779, 1056, 1255	onong, kara, nkota (Fang)	Umbilical cord, cough, fetus strengthener, circumcision healing, injuries, la Rata, respiratory problems, malaria	root, bark, leaves	wild	shrub				x	
RHAM	<i>Maesopsis eminii</i> Engl.	AMT 879	enkangalle (Fang)	Stomache ache with green faeces, la Rata, malaria, cough, fesse rouge,	bark	wild	tree				x	
RUBI	<i>Diodella scandens</i> (Sw.) Bacigalupo & E.L.Cabral	AMT 886, 1234	oyemze (Fang)	Cough, toothache	leaves	wild	herb		x			
	<i>Fleroya ledermannii</i> (K.Krause) Y.F.Deng	AMT 879	afobozam (Fang)	Respiratory problems	bark	wild	tree				x	
	<i>Leptactina mannii</i> subsp. arnoldiana (De Wild.) Neuba ex Figueiredo	AMT 814	ewas wasakulu (Fang) bois des os	Growth of a lean child	bark, leaves	wild	tree					x
	<i>Morinda lucida</i> Benth.	AMT 858, 1213	akeng, akong (Fang)	Intestinal washing, la Rata, malaria,	bark	wild	tree				x	
	<i>Psydrax palma</i> (K.Schum.) Bridson		colera (Fang)	Fontanels		wild	tree				x	
RUTA	<i>Citrus aurantifolia</i> (Christm.) Swingle	AMT 1059	Alas (Fang), citron	Malaria, health newborn, measles, rougeole, fesse rouge, la Rata, asthma,	fruit, bark, sap, leaves, root	dom	shrub	x				

				chicken pox, diarrhea, cough								
RUTA	<i>Citrus sp.</i>		Canne acid	newborn intestinal washing,		dom	shrub	x				
	<i>Zanthoxylum heitzii</i> (Aubrév. & Pellegr.) P.G.Waterman CF		olom (Fang)	Asthma	bark	wild	tree				x	
SAPO	<i>Baillonella toxisperma</i> Pierre	AMT 745	azap (Fang)	Circumcision healing	bark	wild	tree					x
SIMA	<i>Quassia africana</i> (Baill.) Baill.	AMT 763, 895	izien iral (musanga)	Malaria	root	wild	shrub				x	
SOLA	<i>Capsicum annum</i> L.	AMT 806	okam (Fang) piment, piment indigene	Diarrhea, intestinal washing, circumcision healing, fesse rouge, fontanel, meconium wash, colic, la Rata, respiratory problems	fruit, leaves, seed	dom	shrub	x				
	<i>Nicotiana tabacum</i> L.		taba en feuilles, tabacco	Fesse rouge, health unborn child,	leaves	dom	shrub	x				
THOM	<i>Sp.</i>	AMT 1253	umbazal (Fang)	Fetus strengthener	root	wild	shrub				x	
URTI	<i>Laportea aestuans</i> (L.) Chew	AMT 1244	tak-akun (Fang)	Health child with premature birth	whole plant	wild	herb	x				
	<i>Myrianthus arboreus</i> P.Beauv.	AMT 853, 1073	enkokung (Fang)	Malaria, diarrhea	Leaves, whole plant	wild	tree			x		
	<i>Myrianthus serratus</i> (Trécul) Benth.	AMT 1251	afulum (Fang)	Newborn bath	whole plant	wild	tree				x	
VITA	<i>Cissus aralioides</i> (Welw. ex Baker) Planch.	AMT 860, 867	ngun-ele (Fang)	Fontanel, fesse rouge	leaves	wild	climbing herb			x		
ZING	<i>Aframomum spp.</i>	AMT 780, 1060, 1088, 1089	adzom ebaja, obadzom, ondodo, ndong, bisom (Fang) petit piment	Umbilical cord, la Rata, malaria, fontanel, circumcision healing, flu, measles, meconium wash, intestinal washing, respiratory problems, health unborn child, CBD asok	fruit	wild	shrub				x	

Key appendix 3.1

Fontanel: closing the fontanel in very young children

CBD ebam: first stage of La Rata, if not treated, La Rata will develop

CBD miloen: cold feet and hands, while the body is hot

CBD asok: child's belly expands

CBD onkoe abijel: respiratory problems caused by bad water during delivery

CBD onkoe simple: respiratory problems caused by sorcery

CBD toufement: child doesn't want to do anything, no eating or drinking, crying, is going to die

Note: Most plants are part of a recipe.

Appendix 3.2 Table with medicinal plant species used for women's reproductive health

Family	Botanical name	Collection number	Vernacular name	Therapeutic use	Used part	Wild/cult	Growth form	Vegetation type				
								Private yard	Cultivated field	Secondary shrub land	Secondary forest	Primary forest
ACAN	<i>Brillantaisia owariensis</i> P.Beauv.		alemбетorro (Musangu)	Vaginal cleanse	leaves	wild	herb			x		
	<i>Justicia secunda</i> Vahl	AMT 805	lormatjie (Fang)	Anemia	leaves	wild	herb			x		
ACHA	<i>Camptostylus mannii</i> (Oliv.) Gilg	AMT 852	miamongon (Fang)	Vaginal cleanse	bark	wild	tree				x	
AMARA	<i>Amaranthus cruentus</i> L.	AMT 1240	folon (Fang)	Contraception	whole plant	do	herb		x			
AMARY	<i>sp.</i>	AMT 869, 1243	molo ngu (Fang)	Health of unborn child	tuber	cult	herb	x				
ANAC	<i>Antrocaryon klaineianum</i> Pierre	AMT 767, 1204	angokon, osokon, ndungu (Fang)	Womb cleanse after delivery, female infertility, backache, anemia, vaginal tightening	bark	wild	tree				x	
	<i>Mangifera indica</i> L.	AMT 839	andok-fang (Fang)	Infection after delivery, stomachache, menstruation painful	leaves	dom	tree	x				
	<i>Pseudospondias longifolia</i> Engl.	AMT 1081	ofoss (Fang)	Stomachache, anemia	bark	wild	tree				x	
	<i>Trichoscypha sp.</i>		about (Fang)	Womb cleanse after delivery	bark	wild	tree					x
ANNO	<i>Annickia affinis</i> (Exell) Versteegh & Sosef	AMT 1099	mubanga (Fang) bois jaune	Patique jaune, STI's, anemia, maintaining first child's health, hypertension	bark	wild	tree				x	
	<i>Annona muricata</i> L.	AMT 871	ebom fang (Fang)	Health pregnant women	bark	dom	tree	x				
	<i>Annona senegalensis</i> Pers. CF		racine senegalais	Hypertension	root	wild	tree			x		
	<i>Anonidium mannii</i> (Oliv.) Engl. & Diels	AMT 957	ebom (Fang)	Protect fetus, health pregnant women, pregnancy: purge	bark	cult	tree	x				

APOC	<i>Alstonia boonei</i> De Wild.	AMT 855	ekouk (Fang)	Increase breast milk production, worms in abdomen	bark	wild	tree				x	
	<i>Landolphia owariensis</i> P.Beauv. CF		pondzie	Increase breast milk production, anemia, contraception	leaves	wild	liana				x	
	<i>Periploca nigrescens</i> Afzel.		alarminson (Fang)	Faire les ovules	leaves	wild	climber				x	
	<i>Picalima nitida</i> (Stapf) T.Durand & H.Durand	AMT 1250	ebam, unsa-gom (Fang) dioendu	Malaria, fibroids, cysts, hypertension	bark	wild	tree				x	
	<i>Secamone afzelii</i> (Roem. & Schult.) K.Schum.	AMT 1221	akalakala (Fang)	Itching groin	whole plant	wild	liana				x	
	<i>Tabernanthe iboga</i> Baill.		bois sacré	Anemia AS type, hypertension, contraception	root	cult	shrub	x				
ARA	<i>Pistia stratiotes</i> L. CF		angoun (Fang)	Female infertility	whole plant	wild	herb			x		
AREC	<i>Elaeis guineensis</i> Jacq.		esong (Fang)	Increase breast milk production, afterbirth, female infertility	seed, heart stem, nut	dom	tree	x				
	<i>sp.</i>			Afterbirth, post-partum hemorrhage	leaves, twigs	wild					x	
ASPA	<i>Asparagus warneckei</i> (Engl.) Hutch.	AMT 864, 1230	mincoga mikou (Fang)	White vaginal excretion, menstruation: painful	leaves, whole plant	wild	climber		x			
ASPL	<i>Asplenium africanum</i> Desv. CF		ayan (Fang)	Health pregnant women	whole plant	wild	fern				x	
BURS	<i>Santiria trimera</i> (Oliv.) Aubrév. CF		atounou (Fang)	CBD zchaw	bark	wild	tree				x	
CANN	<i>Canna indica</i> L.	AMT 1061, 1233	ekonzok (Fang)	headache	leaves	wild	herb				x	
CARI	<i>Carica papaya</i> L.		papaya	STI's, increase breast milk production	root, fruit	dom	tree	x				
COMB	<i>Combretum aphanopetalum</i> Engl. & Diels	AMT 866	otoulofuk (Fang)	Faire les ovules, vaginal tightening, painful hip	leaves	wild	shrub			x		
COMP	<i>Ageratum conyzoides</i> (L.) L.	AMT 1054	botu (Fang)	Vaginal cleanse	leaves	wild	herb			x		
	<i>Emilia coccinea</i> (Sims) G.Don	AMT 825, 1247	alovou (Fang)	Menstruation: black	leaves	wild	herb			x		
	<i>Ethulia conyzoides</i> L.f. CF		matze ma mang	Infections after delivery	leaves	wild	herb				x	

COMP	<i>Laggera alata</i> (D.Don) Sch.Bip. ex Oliv. CF		susuba, tabac de pygmée	Stop bleeding after delivery	leaves	wild	herb			x		
	<i>Mikania chenopodiifolia</i> Willd.	AMT 1242	madamoiselle	Health pregnant women	whole plant	cult	shrub	x				
	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	AMT 862	margarit	Hypertension	leaves	wild	shrub		x			
COST	<i>Costus spp.</i>		musuku, myen (Fang)	Anemia, menstruation: painful, vaginal cleanse, increase breast milk production, pregnancy: avoid problems, fibroids, cysts	Leaves, whole plant	wild	shrub				x	
CUCU	<i>Cucumeropsis mannii</i> Naudin	AMT 854	concombre traditionnelle	Increase women's fertility, female infertility	seed, fruit	dom	climbing herb		x			
	<i>Momordica charantia</i> L.	AMT 678	mabubulu	Contraception	leaves	cult	climbing herb		x			
	<i>sp.</i>		lon-duh (fang)	Afterbirth	fruit	cult	climbing herb		x			
DILL	<i>Tetracera sp.</i>		nzrnzu (Fang)	Health pregnant women	wood	wild	liana				x	
EUPH	<i>Acalypha paniculata</i> Miq.	AMT 844	oekoenkoenakoe n (Fang)	Health pregnant women, facilitate delivery	leaves	wild	shrub			x		
	<i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll.Arg.	AMT 827, 838, 870, 1062	nkabie, abdj (Fang)	White vaginal excretion, anemia, faire les ovules, STI's, vaginal cleanse	leaves	wild	herb			x		
	<i>Macaranga spinosa</i> Müll.Arg.	AMT 1064	asass (Fang)	Menstruation: heavy, encourage child to move in belly, pregnancy: avoid problems	bark, leaves	wild	tree				x	
	<i>Manihot esculenta</i> Crantz	AMT 890	mandza (Fang), manioc	Increase breast milk production, health pregnant women, facilitate delivery, post-partum hemorrhage	leaves, tuber	dom	shrub		x			
	<i>Phyllanthus sp.</i>	AMT 1245	kang-uh (Fang)	Vaginal cleanse	whole plant	wild	shrub				x	
	<i>Plagiostyles africana</i> (Müll.Arg.) Prain		ele-esula (Fang)	Menstruation: painful, post-partum infections	bark	wild	tree				x	
	<i>Tetrorchidium didymostemon</i> (Baill.) Pax & K.Hoffm.	AMT 875, 1202	zili, awoup (Fang)	Female infertility, increase breast milk production, menstruation painful, post-partum infections	bark, liana	wild	tree				x	

FLAG	<i>Flagellaria guineensis</i> Schumach. CF		enganisang (Fang)	Post-partum hemorrhage	leaves	wild	climber				x	
HUA	<i>Afrostryax</i> sp. CF		mujumbu	Post-partum infections, female infertility	bark	wild	tree				x	
HYPE	<i>Harungana madagascariensis</i> Lam. ex Poir.	AMT 778	atuin, azom, musassa (Fang)	Infections after delivery, menstruation painful, post-partum infections, pregnancy: avoid problems	bark, leaves	wild	tree				x	
IRVI	<i>Irvingia gabonensis</i> (Aubry-Lecomte ex O'Rorke) Baill.	AMT 1017	wild mango	Increase breast milk production	fruit	wild	tree			x		
LAMI	<i>Clerodendrum formicarum</i> Gürke	AMT 1236		Pregnancy: stomach ache	whole plant	wild	shrub		X			
	<i>Clerodendron</i> sp.		ebabejen (Fang),	Health pregnant women		wild				X		
	<i>Ocimum gratissimum</i> L.	AMT 1072, 1143	Messup, mante(Fang)	Increase breast milk production, malaria in pregnant women	leaves	cult	herb	x				
	<i>Ocimum</i> sp.		dziandzi (Bapunu)	Vaginal cleanse, worms, malaria, increase breast milk production, cough, fibroids	leaves	cult	herb			x		
LAUR	<i>Persea americana</i> Mill.	AMT 1078	avocado	Vaginal cleanse, hypertension	leaves	cult	tree	x				
LECY	<i>Petersianthus macrocarpus</i> (P.Beauv.) Liben	AMT 1220	abing (Fang)	Back pain in pregnant women, anemia, faire les ovules, health pregnant women	bark, leaves	wild	tree				x	
LEGU	<i>Albizia</i> sp.	AMT 876, 1228	evovule sak (Fang)	Faire les ovules, cysts, stomach ache	whole plant, leaves	wild	tree			x		
	<i>Cylicodiscus gabunensis</i> Harms		edum (Fang)	Health pregnant women, worm in abdomen	bark	wild	tree				x	
	<i>Desmodium adscendens</i> (Sw.) DC.		obumen zeny (Fang)	Female fertility	leaves	wild	herb				x	
	<i>Distemonanthus benthamianus</i> Baill.		eyen (Fang)	Health pregnant women	bark	wild	tree				x	
	<i>Erythrina droogmansiana</i> De Wild. & T.Durand		esok (Fang)	Anti-poison	bark	wild	tree		x			
	<i>Guibourtia tessmannii</i> (Harms) J.Leonard	AMT 764	oveng, Kevasingo, obaka madjabie (Fang)	Hypertension	bark	wild	tree				x	

LEGU	<i>Inga edulis</i> Mart.			Fibroids, cysts	seed	dom	tree	x				
	<i>Pentaclethra macrophylla</i> Benth.	AMT 1077	ebey (Fang), mupandzi (musangu)	Vaginal cleanse, health pregnant women, facilitate delivery, pregnancy: stomach ache	bark	wild	tree				x	
	<i>Piptadeniastrum africanum</i> (Hook.f.) Brenan	AMT 816a, 1219	miso-miso, tum, nlouey (Fang)	CBD mfoes, female infertility	bark, leaves	wild	tree					x
	<i>Pterocarpus soyauxii</i> Taub.	AMT 880, 1203	umbel (Fang)	Anemia, increase breast milk production	bark	wild	tree				x	
	<i>Senna alata</i> (L.) Roxb.		abahorkon (Fang)	Patique jeunisse	leaves	cult	shrub				x	
	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.		tsélé (Musangu)	Helath pregnant women, increase breast milk production	fruit	wild	tree				x	
LOGA	<i>Anthocleista sp.</i> CF	AMT 765	ayindo (Fang)	Diabetes, hypertension	bark	wild	tree			x		
MALV	<i>Abelmoschus esculentus</i> (L.) Moench	AMT 845	etetam, gomboe (Fang)	Facilitate delivery	leaves	wild	herb		x			
	<i>Abutilon mauritianum</i> (Jacq.) Medik.		odongi	Facilitate delivery		wild	shrub			x		
	<i>Ceiba pentandra</i> (L.) Gaertn.	AMT 882	baobab (Fang)	anemia	bark	wild	tree			x		
	<i>Cola nitida</i> (Vent.) Schott & Endl.		ngwam (Fang) kolatier	CBD les urines, health pregnant women, facilitate delivery	bark, seed	dom	tree				x	
	<i>Cola spp.</i>		abu (Fang), kola	Anemia, facilitate delivery	bark, leaves seed	wild	tree				x	
	<i>Hibiscus sp.</i>		lesseile (Fang)	Anemia, white vaginal excretion	flower, leaves	cult	shrub	x				
	<i>Sida acuta</i> Burm.f.	AMT 828, 1237, 1254	ezisum (Fang)	Health pregnant women, facilitate delivery, CBD les urines, worms in women's stomach	leaves, whole plant	wild	herb		x			
	<i>Theobroma cacao</i> L.	AMT 872, 1205	kaku, red cacao, cacaowey, salebe	Hypertension, anemia, womb cleanse after delivery	bark, leaves	dom	tree	x				
	<i>Urena lobata</i> L.	AMT 1238	okon (Fang)	Post-partum hemorrhage	leaves	wild	shrub		x			
MARA	<i>Halopegia azurea</i> (K.Schum.) K.Schum.			Back pain in pregnant women	leaves	wild	herb				x	

MELAS	<i>Heterotis rotundifolia</i> (Sm.) Jacq.-Fél.	AMT 1248	ekaso (Fang)	Vaginal cleanse, STI prevention	whole plant	wild	herb			x		
	<i>Tristemma hirtum</i> P. Beauv. CF		masessa	vaginal cleanse, white vaginal excretion, vagina tightener	leaves	wild	herb					x
	<i>Tristemma littorale</i> Benth.	AMT 861, 873	Abillebong (Fang)	Vaginal cleanse	leaves	wild	herb				X	
	<i>Tristemma mauritianum</i> J.F. Gmel.	AMT 1084		Stomach ache	leaves	wild	herb				X	
MENI	<i>Dioscoreophyllum volkensii</i> Engl.	AMT 1249	tziga (Fang)	Post-partum hemorrhage	whole plant	wild	climber				x	
	<i>Perichasma laetificata</i> Miers		enzigue (Fang)	Health pregnant women	root	wild	climber		x			
MORA	<i>Ficus exasperata</i> Vahl	AMT 848, 1239	ako (Fang)	Pregnancy: stomach ache, facilitate delivery	bark	wild	tree		x			
	<i>Ficus mucuso</i> Welw. ex Ficalho	AMT 826	ekoko (Fang)	Anemia, health pregnant women, back ache	leaves, bark, stem	wild	tree				x	
	<i>Ficus thonningii</i> Blume CF		eto, atak (Fang)	Prevent miscarriage, female infertility, increase breast milk production	bark	wild	tree			x		
	<i>Milicia excelsa</i> (Welw.) C.C.Berg	AMT 835, 836	abang (Fang)	Increase breast milk production	leaves, bark	wild	tree			x		
	<i>Treculia erinacea</i> A.Chev.		dzip (Fang)	Female infertility, anemia	bark	wild	tree					x
MUSA	<i>Musa spp.</i>		umbolokon, ngaka (Fang)	Anemia, menstruation: cleanse, worms in abdomen, faire les ovules, back ache, facilitate delivery, menstruation: painful, increase breast milk production, afterbirth	leaves, fruit, bark, stem	dom	tree		x			
MYRI	<i>Scyphocephalum ochocoa</i> Warb. CF		sogo (Fang)	Menstruation: painful	bark	wild	tree				x	
	<i>Psidium guajava</i> L.		guabe	Vaginal cleanse	leaves	dom	shrub	x				
NYMP	<i>Nymphaea lotus</i> L.		otoeto (Fang)	Faire les ovules	leaves	wild	herb			x		
PASS	<i>Passiflora foetida</i> L.	AMT 849	ejeszum (Fang)	Worms in abdomen, female sterility	stem, leaves	cult	climbing herb		x			
PIPE	<i>Piper umbellatum</i> L.	AMT 761	abong medzang	Female infertility,	whole plant,	cult	shrub			x		

			(Fang)	hemorrhoids, faire les ovules, afterbirth, health pregnant women	leaves							
POA	<i>Cymbopogon sp.</i>		citronelle	Malaria	leaves	cult	herb		x			
	<i>Saccharum officinarum</i> L.	AMT 829	nkok (Fang) canne sucre	Menstruation: painful, black, fibroids, cysts	stem, sap, whole plant	dom	herb	x				
POLY	<i>Carpolobia alba</i> G.Don		onong (Fang)	Facilitate delivery	root	wild	tree					x
PUTR	<i>Drypetes sp.</i>	AMT 878	esop (Fang)	Faire les ovules	bark	wild	tree				x	
RHAM	<i>Maesopsis eminii</i> Engl.	AMT 879	enkalle (Fang)	Female infertility	bark	wild	tree				x	
RUBI	<i>Fleroya ledermannii</i> (K.Krause) Y.F.Deng	AMT 897	tobu (Musangu)	Menstruation: heavy, female sterility, contraception	bark	wild	tree				x	
	<i>Geophila obvallata</i> Didr.	AMT 1092		Maintaining health firstborn	whole plant	wild	herb				x	
	<i>Morinda lucida</i> Benth.	AMT 1213	akong (Fang)	Intestinal washing, pregnancy: avoid problems, hypertension	bark	wild	tree				x	
RUTA	<i>Citrus aurantifolia</i> (Christm.) Swingle	AMT 1059	citron	Malaria in pregnant women	fruit	dom	shrub	x				
SAPO	<i>Baillonella toxisperma</i> Pierre	AMT 745	adzjap, moabi, azala (Fang)	Menstruation: heavy, afterbirth, womb cleanse after delivery, worms in abdomen, post-partum infections, vaginal cleanse	bark	wild	tree					x
SELI	<i>Selaginella myosurus</i> Alston	AMT 1063	zelan (Fang)	Pregnancy: protect against sorcery	whole plant	wild	fern				x	
SIMA	<i>Quassia africana</i> (Baill.) Baill.	AMT 763	icindural (Bapunu)	Diabetes, hypertension	root	wild	shrub				x	
SOLA	<i>Capsicum annuum</i> L.	AMT 806	undodo (Fang) petit piment, green piment	Vaginal cleanse, worms, post-partum infections, facilitate delivery, womb cleanse after delivery, hemorrhoids, stomach ache, back ache	fruit, leaves, seed	dom	shrub	x				
	<i>Nicotiana tabacum</i> L.		taba	CBD zchaw, protect fetus	leaves	dom	shrub	x				

SOLA	<i>Solanum anguivi</i> Lam.		petit aubergine amère	Increase breast milk production, stop bleeding after delivery	fruit	cult	herb			x		
	<i>Solanum lycopersicum</i> Lam		tomato	Anemia	fruit	dom	herb		x			
URTI	<i>Laportea aestuans</i> (L.) Chew		terakun (Fang)	Facilitate delivery	whole plant	wild	herb	x				
	<i>Myrianthus arboreus</i> P.Beauv.	AMT 853	ekokum (Fang)	Post-partum infections	bark	wild	tree			x		
	<i>Myrianthus serratus</i> (Trécul) Benth.	AMT 762	afulum (Fang)	Good luck	leaves	wild	tree				x	
VERB	<i>Lippia abyssinica</i> (Otto & A.Dietr.) Cufod.		mututu	Health pregnant women, increase breast milk production, stop bleeding after delivery	leaves	wild	herb			x		
	<i>Lippia multiflora</i> Moldenke CF		liwaji (Bateke)	Increase breast milk production	leaves	wild	herb			x		
	<i>Lippia rugosa</i> A.Chev.	AMT 760	afing (Fang)	Breastmilk: increase production	leaves	wild	herb			x		
	<i>Lippia sp.</i>			Postpartum hemorrhage	Leaves	wild	herb			x		
VITA	<i>Cissus aralioides</i> (Welw. ex Baker) Planch.	AMT 867	agondjie (Fang)	Menstruation: heavy	leaves	wild	liana			x		
ZING	<i>Aframomum spp.</i>	AMT 1088	azum, ndong, obadzom, bison (Fang)	Stomach ache, Menstruation: heavy, stomach ache before delivery, maintaining first born's health, health pregnant women	root, fruit, leaves	wild	shrub				x	

Key appendix 3.2

Patique jaune/jeunisse - disease that gives people yellow eyes

Faire les ovules - folded leaves sometimes containing plant extract

CBD zchaw – it is a disease but the origin is unknown, probably fibroids or cysts

CBD mfoes – backache

CBD les urines – STI named “monyo-oh”, (peeing) stomach

Note: Most plants are part of a recipe.

