



Market Profile Analysis of Medicinal Plant Products Trade in Margibi County, Liberia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors contributed to the study conception and design. Manuscript preparation, interpretation, data collation and analysis were performed by author AMW and AOA. All authors have read through and approved the final manuscript.

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ABSTRACT

Medicinal plants play a crucial role in African traditional medicine, particularly in Liberia, where they are used alongside Western medicine. For generations, traditional knowledge about plants utilization has empowered locals to develop a wide range of plant products to address the medical needs of their communities. Over time, this development has led to the emergence of trade in medicinal plants and plant products. The trade of medicinal plant products (MPP) significantly contributes to the local economy by providing income opportunities for many. This study was conducted in Margibi County with aims to profile the trade of MPP, their origins, peak sale times, and the socio-economic characteristics of traders. The research identified key participants in the supply chain as collectors, wholesalers, and retailers. Qualitative data was analyzed using narrative analysis. The study revealed that 34.375% of MPP originates from rural Margibi, 28.125% from

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Montserrado with the rest being from Bong, Grand Bassa, Nimba and Lofa counties. Women are the predominant traders in the MPP trade; representing 78.125% while men represent 21.875%. Businesses along the MPP supply chain earn low profit margins from the sale of these products due to several contributing factors. These factors include limited investment and inadequate record keeping of transactions. The study suggests policy initiatives should be put in place by relevant authorities to formalize the trade, and provide access to financial resources and services which are necessary to improving income levels and creating opportunities for greater investment in the MPP trade.

Keywords: Liberia; Liberia Marketing Association; Margibi; medicinal plant products; medicinal plant trade; profit margin.

1. INTRODUCTION

Throughout history, plants have been crucial in providing medicine for various civilizations. They have been utilized to treat a wide range of illnesses in both animals and humans Tipu et al. (2006); Sannah et al. (2024). Studies have demonstrated a strong connection between human medicine and plant biodiversity Ojha et al. (2020). As Wyk (2015) points out, Africa, including Liberia, has a rich diversity of medicinal plant products (MPP), and traditional medicine is viewed as a complement to Western medicine in Liberia. The extensive variety of plants found in Liberia is deeply intertwined with the cultural heritage of the locals Lebbie et al. (2017). Generations of traditional knowledge have empowered locals to develop a wide range of plant products to address the medical needs of their communities Hwang et al. (2020).

Vasisht et al. (2016) estimated that the global trade in medicinal plant products (MPP) reached a value of US\$33 billion in 2014. In developing countries like Liberia, the trade of medicinal plant products significantly contributes to the local economy by providing income opportunities for many Hwang et al. (2020). This trade is especially important for the rural poor, who often lack alternative income sources (Botha et al. 2004).

Despite the significance of the medicinal plants trade, it is still an area of research that is often overlooked (Van Andel et al. 2012). There is a lack of documented information about the applications and market profile of local trade in such plants in Liberia. There is a need for further research to document the volume of trade; the most commonly traded medicinal plants, and the structure of the supply chain.

Therefore, the study aims to profile the trade of medicinal plant products in key markets in

Margibi County, Liberia, and to examine the socio-economic characteristics of the people involved in these markets. The study will identify the most commonly traded and utilized medicinal plants, along with information about their origins, peak selling times, market value, and the demographics of the market participants, including gender, age group, religion, ethnicity, educational attainment, and citizenship status.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Margibi, Republic of Liberia, and its surrounding areas, covering three major markets. These markets were chosen based on their accessibility and volume of trade and were named according to their general location. The markets included in the study are Duazon Market, Boystown Market, and Kakata Market. Duazon and Boystown Markets are located in Lower Margibi, while Kakata Market is in Upper Margibi. Kakata is situated at 6.53104 latitude and -10.35368 longitude Database (2024), Duazon at 6.2314243 latitude and -10.5915072 longitude Maptons (2024), and Boystown at 6.20545 latitude and -10.54995 longitude Worldplace (2024). These areas have high population density and are significant transit points due to their proximity to the country's capital, Monrovia. The climate in Margibi is mainly equatorial, with a rainy season lasting six months and a dry season lasting six months. According to Global Forest Watch (2024), 85 percent of the area is covered by forest.

2.2 Sample Collection and Analyses

For the sample collection and analyses, 32 individuals were identified as sample respondents from a total of 40 medicinal plant sellers in the focus markets, representing 80% of the total population. The sample was chosen

based on the importance of the markets in medicinal plant product sales and their accessibility. The main criterion for sampling was the willingness of the respondents to be interviewed. The sample included key actors in the supply chain (Fig. 1): collectors, wholesalers, and retailers, selected based on their frequency in markets and willingness to participate in interviews.

Data was collected through both informal and structured interviews. Non-structured interviews, known as key informant interviews, were conducted with all actors along the supply chain, while structured interviews were used to collect data from respondents. Data was collected on medicinal plant products, including common use, prices, factors affecting prices, and price trends from collectors to retailers. Narrative analysis was used to analyze qualitative data results.

The research identified collectors as individuals who acquire medicinal plants directly from the source (forest) or who hire others to collect medicinal plant parts. Wholesalers were identified as individuals who buy and sell medicinal plant products to retailers, and retailers were identified as individuals who buy and resell in smaller pieces to consumers. Information about the collectors was obtained through responses from wholesalers about the source

location of the medicinal plants and the prices they were bought at, as well as responses from collectors themselves.

3. RESULTS

3.1 Demographic Results of Medicinal Plants Traders in the Study Area

The demographic results of the respondents within the study area are presented in Table 1. According to the study, 78.125% of the respondents were women, and 21.875% were men. In terms of age distribution, 37.5% of the respondents were above the age of 55, 25% were between 45 and 55 years, 28.125% were between 30 and 45 years, 6.25% were between 18 and 30 years, and 3.125% were below 18 years. It is important to note that all respondents were natural born citizens or indigenous Liberians. Additionally, 43.75% were single, 25% were married, and 31.25% were widows or widowers; none of the respondents were divorced.

The research observed that 68.75% of the respondents described themselves as full-time herbal/medicinal plants vendors, 21.875% as part-time herbal/medicinal plants vendors, and 9.375% as part-time herbal/medicinal plants herbalists, as indicated in Table 2.

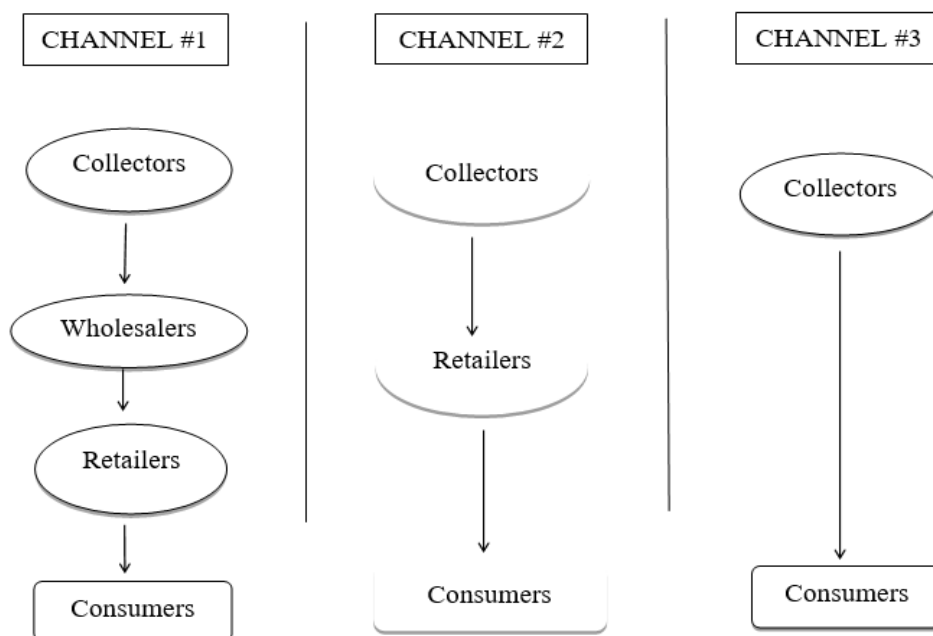


Fig. 1. Marketing channels and actors
Researcher's design (2024)

Table 1. Socio-demographic data

Characteristics	Categories	Frequency	Percentage (%)
Gender	Male	7	21.875
	Female	25	78.125
Total		32	100
Age (years)	< 18	1	3.125
	18 – 30	2	6.25
	30 – 45	9	28.125
	45 – 55	8	25
	> 55	12	37.5
Total		32	100
Marital Status	Single	14	43.75
	Married	8	25
	Divorced	0	0
	Widow/Widower	10	31.25
Total		32	100
Nationality	Liberian	32	100
	Others	0	0
Total		32	100
County of Origin	Bomi	3	9.375
	Bong	5	15.625
	Grand Bassa	5	15.625
	Grand Cape Mount	1	3.125
	Grand Kru	1	3.125
	Lofa	10	31.25
	Margibi	3	9.375
	Montserrado	1	3.125
	Nimba	2	6.25
	Rivercess	1	3.125
Total		32	100
Religion	Christianity	32	100
	Islam	0	0
	Other (Specify)	0	0
Total		32	100
Level of Education	Have never been to school	16	50
	Primary School drop out	7	21.875
	Only Primary School Complete	7	21.875
	Current High School Student	1	3.125
	High School Graduate	1	3.125
Total		32	100

Source: Researcher's Survey Questionnaire

3.2 Purchase Demographic Characteristics and Market Profile

The following data pertains to the purchase demographic characteristics of medicinal plant products markets within the study area: - 43.75% of respondents identified women as their primary buyers, 18.75% identified as men, and 37.5% were uncertain about the gender of their primary buyers. - Buyers between the ages of 19 and 25 accounted for 12.5% of respondents, while those between 26 and 35 accounted for 34.375%.

Additionally, 18.75% were between 36-45 years old, 28.125% were between 46-55 years old, and 6.25% were above 55 years old (Table 2).

In terms of involvement with herbal medicine associations: - 43.75% of respondents recognize the existence of herbal medicine associations in Liberia, but they do not belong to any. - 56.25% of respondents believe that herbal medicine associations do not exist in Liberia, indicating that none of the respondents belong to an herbal medicine association (Table 3).

Table 2. Market demographic data

Characteristics	Categories	Frequency	Percentage (%)
Category of herbal medicine career	Full-time herbal medicine practitioner	0	0
	Part-time herbal medicine practitioner	3	9.375
	Full-time herbal product vendor	22	68.75
	Part-time herbal product vendor	7	21.875
Total		32	100
Length of time spent doing the business	Less than two years	2	6.25
	2-5 years	7	21.875
	6-10 years	9	28.125
	Above 10 years	14	43.75
Total		32	100
Business Location	Kakata	14	43.75
	Duazon	8	25
	BoysTown	10	31.25
Total		32	100
Gender Patronage	Men	6	18.75
	Women	14	43.75
	Not sure	12	37.5
Total		32	100
Age Patronage	19 – 25 years	4	12.5
	26 - 35 years	11	34.375
	36 -45 years	6	18.75
	46 – 55 years	9	28.125
	Above 55 years	2	6.25
Total		32	100

Source: Researcher's Survey Questionnaire

Table 3. Business status

Characteristics	Categories	Frequency	Percentage (%)
Attachment to Herbal Medicine Association	Herbal medicine Association does not exist	18	56.25
	Herbal medicine Association exists, but do not belong to any.	14	43.75
	A member of a Herbal Medicine Association	0	0
	Total	32	100
Business/Practice Registration Status	Liberia Marketing Association	19	59.375
	Government	2	6.25
	Not Registered	11	34.375
Total		32	100
Tax Payment Status	Pay taxes to Marketing Association	23	71.875
	Pay taxes to Government	0	0
	Do not pay taxes	9	28.125
Total		32	100

Source: Researcher's Survey Questionnaire

Regarding business registration status: - 59.375 % of respondents' businesses/practices are registered with the Liberia Marketing Association, 6.25% are registered with the Government of Liberia through the Ministry of Health, and 34.375% are not registered with neither (Table 3).

Tax payment: - 71.875% of respondents do not remit business tax to the government but pay daily fees to the Marketing Association. - 28.125% do not pay any tax to the government or a fee to the marketing association (Table 3).

Other findings: - 75% of respondents experience significant trade in medicinal plant species and

products over weekends, 9.375% during weekdays, and 15.625% were not sure. - 25% of respondents experienced the best sales during the rainy season, 15.625% during the dry season, and 59.375% were unable to identify the best sales season (Table 4). The study also revealed that MPP commercial actors mainly use a strategy resulting from bunches to improve their profit (Fig. 2). The size of a "bunch" of plant organs varies significantly according to the type of actor (collector, wholesaler, or retailer). The results further show that collectors and wholesalers sell in 25kg rice bag size, while retailers acquire the medicinal plant products in bulk (25kg rice bag size or large bunches) and sell in smaller bunches (Table 5).

Table 4. Best times for sales

Categories	Frequency	Percentage (%)
Rainy Season	8	25
Dry Season	5	15.625
Not Sure	19	59.375
Total	32	100
Week Days	3	9.375
Weekends	24	75
Not Sure	5	15.625
Total	32	100

Source: Researcher's Survey Questionnaire



a. Monkey apple root



b. Borr



c. Yellow back



d. Yellow root

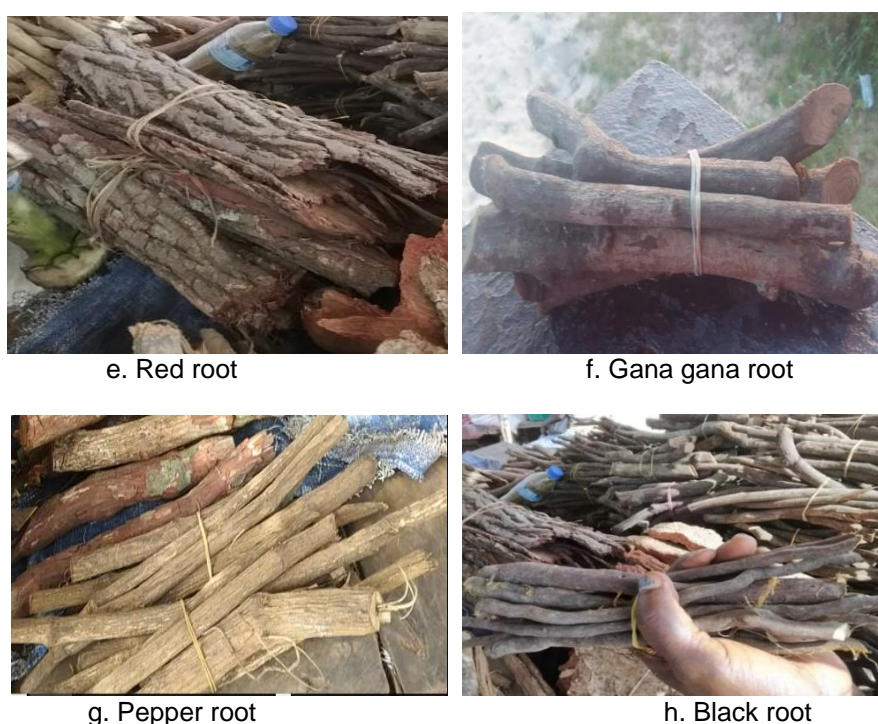


Fig. 2. Samples of medicinal plant products on sale at the study area

Table 5. Modes/methods of packaging

Actor (s)	Mode/Method of Packaging	Count	Probability (%)
Collector	Tie Bunch	1	3.125
	500 ml bottle, 350ml bottle, and Tie Bunch	1	3.125
	500 ml bottle and Tie Brunch	3	9.375
	25kg bag size	1	3.125
	1 liter bottle, 350ml bottle, and Tie Bunch	1	3.125
Wholesaler	Tie Bunch	1	3.125
	25kg bag size	5	15.625
Retailer	Tie Bunch	15	46.875
	Tie Bunch and 500ml Bottle	2	6.25
	Tie Bunch and 3*6 plastic bag	2	6.25
Total		32	100

3.3 Availability of Medicinal Plant Products

Each seller within the market sells at least three different medicinal plant species and parts within their stall. The medicinal plant species and parts purchased are commonly used to treat endemic diseases such as malaria, typhoid, and yellow jaundice (Table 6). Medicinal plant products (Fig. 2) produced from plant parts are sold directly on the market and are used to treat ailments endemic to communities within and around the study area, including hydrocele, hemorrhoid, and African signs (Table 7).

3.4 Medicinal Plants Source location

Table 8 shows the source location from which the respondents purchase the medicinal plant products they sell. The table shows that medicinal plants products merchants within the study area source the medicinal plants from mainly six (6) counties in Liberia namely Margibi (Host County), Bong, Grand Bassa, Montserrado, Nimba and Lofa. 34.375% of the respondents source the medicinal plants from Margibi, 15.625% from Bong, 15.625% from Grand Bassa, 28.125% from Montserrado, 3.125% from Nimba and 3.125% from Lofa.

4. DISCUSSION

4.1 Role of Women in the Medicinal Plants Trade

The initial data presented revealed demographic information about the study respondents, indicating that there are more female MPP traders than male traders. This finding aligns with a study conducted in the Eastern Cape Province by Mcata and Qapeshu (2019), which also found a majority of female respondents. However, studies in Malawi, Tanzania, and South Africa have shown that there are more male medicinal plant traders compared to females (Botha et al. (2004); Meke et al. (2017); Posthouwer et al. (2018); Rasethe et al. (2019).

The predominance of female medicinal plant traders in the focus markets is not unique to this trade. Studies in Liberia have indicated that women are the dominant traders in the informal sector Dolo (2021), which can be explained by the fact that many low-income women in Liberia are single mothers and must serve as the primary breadwinners for their families (Moran 2019; Aning and Edu-Afful 2013). Engaging in informal sector trade is a crucial means for these women to earn income and support their families Dolo (2021). Low-income women explore various opportunities to earn a living, including venturing into profitable business opportunities.

4.2 Medicinal Plants Source Location and Availability

The locations of the three key focus market areas, Kakata market in the northern part of Margibi (also known as upper Margibi) and both Duazon and Boystown market areas being in the southern part of Margibi (also known as lower Margibi), are uniquely placed; as such, the source location of various medicinal plant products sold in those markets varies accordingly. Traders in the Kakata market area are much closer to Bong, Nimba, and Lofa counties. This close proximity to these central and northern counties of Liberia grants them easy access to medicinal plant suppliers/traders from those counties. The Kakata market area is also seen as a major transit route to Monrovia. Thus, medicinal plant product traders from those central and northern counties that supplies to Monrovia usually make stops in Kakata market area to supply medicinal plant product traders (Table 9).

On the other hand, medicinal plant traders in Duazon and Boystown market areas are in close proximity to one of Liberia's major markets in Montserrado County, known as the Redlight markets. This close proximity gives medicinal plants product traders from Duazon and

Table 6. Medicinal plants and their usage in the area

Vernacular/common name	Usage	Parts used
Bum Bum	Treats typhoid and malaria	Root
Gana Gana root	Treats malaria, fever, and sexual weakness	Root
Yellow root	Treats ulcer, typhoid, and yellow jaundice	Root and bark
Monkey apple	Treats Eczema	Root
Red root	Treats diabetes	Root
Man root	Treats sexual weakness	Root
Black root	Treats jaundice	Root
Bassa root	Treats sore	Root
Pepper root	Treats hookworm	Root
Quinny	Treats Malaria and fever	Leaf
Yablu	Treats yellow jaundice and malaria	Root
Moringa root	Treats Malaria	Root
Rusty plum	Treats rectal bleeding	Back
Sechor	Treats infectious diseases	Back
Cinema back	Treats high blood pressure	back
Borr	Treats stomach ulcer	Back
Bush Atayea	Treats baby sickness	Leaf

Source: Researcher's Survey

Table 7. Traditional herbal product usage

Medicinal Product	Usage
Gowa medicine	Treats Gowa (African sign)
Typhoid medicine	Treats typhoid
Hydrocele medicine	Treats hydrocele
Menstrual Sickness Medicine	Treats menstrual cramps and pains
Pile medicine	Treats haemorrhoids (Pile)
Fertility Medicine	Treats infertility
Yellow Jaundice Medicine	Treats yellow jaundice

Source: Researcher's Survey

Table 8. Medicinal plants source location data

Locality (Counties)	Frequency	Percentage (%)
Margibi	11	34.375
Bong	5	15.625
Grand Bassa	5	15.625
Montserrado	9	28.125
Nimba	1	3.125
Lofa	1	3.125
Total	32	100

Source: Researcher's Survey

Table 9. Medicinal plant product source location comparison

Source Location	Selling Market Area			Total
	Kakata	Duazon	Boystown	
Bong	3	0	1	4
Grand Bassa	1	2	2	5
Lofa	1	0	0	1
Margibi	7	1	3	11
Montserrado	1	5	4	10
Nimba	1	0	0	1
Grand Total	14	8	10	32

Boystown market areas easy access to medicinal plants products along with other non-medicinal plant product in the Redlight market. Furthermore, due to some traders' ethnic link to nearby Grand Bassa County, they source the medicinal plant product from Grand Bassa (Table 9). Grand Bassa County borders Margibi's southeastern regions.

4.3 Marketing Channels and Actors

The study revealed that the supply of medicinal plants follows three main channels. The first channel involves collectors, wholesalers, retailers, and consumers. Within the Kakata market area, all three actors operate directly within the market, while in Duazon and Boystown market areas, retailers purchase from wholesalers outside the study area. The second channel involves collectors, retailers, and consumers, with the absence of wholesalers. In this channel, collectors gather medicinal plants from the forests, bring them to the general market, and sell directly to the retailers who then sell to the final consumers. The third and final channel involves only two actors: the collectors and the consumers. Collectors gather the medicinal plants and sell them directly to the consumers. This channel represents the shortest supply chain.

4.4 Average Sale and Profitability

The market for medicinal plant products (MPP) in the study area serves as a substitute for modern medicine. Businesses along the supply chain earn low profit margins from the sale of these products due to several contributing factors. One reason for the low margins is the limited investment in the market. The majority of traders in this market are low-income earners who rely on it for sustenance. Similar to most small and medium-sized enterprises (SMEs), MPP traders struggle due to inadequate funding [Nitetcu (2015). They often find it challenging to secure the necessary capital for business expansion.

Furthermore, in the study area, MPP sales are not the only activity of traders. Most MPP traders diversify their operations by selling other products in an attempt to earn a livable wage due to the difficulty in achieving sustainable sales. Some traders also face challenges meeting their daily sales targets due to the business climate.

Additionally, most actors in the study area, particularly retailers, do not keep transaction records. This lack of record-keeping can be attributed to low literacy levels and the informal nature of the trade. The absence of records hinders the actors' ability to expand and become more profitable. According to Atah and Bessong Atah and Bessong (2018), effective record-keeping is essential for the success of any business operation. Thus, the lack of records contributes to the low profit margins of retailers and other actors Ali et al. (2015).

However, some wholesalers along the supply chain generate revenue by supplying medicinal plants to beverage companies involved in producing herbal drinks. This serves as a significant portion of their income.

5. CONCLUSION

The research indicates that there is significant potential for the MPP trade to be highly profitable. However, the current level of trade in MPP is low. There is a possibility for the trade of medicinal plants to expand sustainably and provide employment opportunities, ultimately helping to alleviate poverty in the study area. To achieve this, various measures need to be implemented to increase trade and incomes from medicinal plants. Policy initiatives should be put in place by relevant authorities to formalize the trade, and access to financial resources and services will be necessary to enhance income levels and create opportunities for greater investment in the MPP trade.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as QuillBot Paraphraser and Grammarly Free AI Writing Assistant have been used during writing or editing of this manuscript. The Author acknowledges the use of AI tools in paraphrasing some aspects of the research in order to provide better understanding.

Details of the AI usage are given below:

1. Name: QuillBot
Version: Online Version
Model: QuillBot Paraphraser
Source: Learneo, Inc.
Prompt: Paraphrase
2. Name: Grammarly
Version: Online Version
Model: Grammarly Free AI Writing Assistant
Source: Grammarly Inc.
Prompt: Grammar Checker, Paraphrase, Rewording

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Ali, F., Harrington, S., & Kennedy, S. (2015). Diagnostic radiology in Liberia: A country report. *Journal of Global Radiology*. <https://doi.org/10.7191/jgr.2015.1020>
- Aning, K., & Edu-Afful, F. (2013). Unintended impacts and the gendered consequences of peacekeeping economies in Liberia. *International Peacekeeping*, 20(1), 17-32. <https://doi.org/10.1080/13533312.2013.761828>
- Atah, C. A., & Bessong, E. B. (2018). Impact of record keeping for sustainability of small scale business operators for national economy. *Nigerian Journal of Business Education (NIGJBED)*, 5(1), 102-114.
- Botha, J., Witkowski, E. T. F., & Shackleton, C. M. (2004). Market profiles and trade in medicinal plants in the Lowveld, South Africa. *Environmental Conservation*, 31(1), 38-46. <https://doi.org/10.1017/S0376892904001067>
- Database. Earth. (2024). GPS coordinates of Kakata, Margibi County, Liberia [Blog post]. Available at <https://database.earth/countries/liberia/regions/margibi-county/cities/kakata>
- Dolo, A. B. (2021). An examination of the role female traders play in the Liberian economy. *Noble International Journal of Economics and Financial Research*, 6(2), 44-55. <https://doi.org/10.51550/nijefr.62.44.55>
- Global Forest Watch. (2024). Explore forest atlas. Global Forest Watch. Available at <https://www.globalforestwatch.org/dashboards/country/LBR/9/>
- Hwang, J. H., Cho, H. J., Im, H. B., Jung, Y. S., Choi, S. J., & Han, D. (2020). Complementary and alternative medicine use among outpatients during the 2015 MERS outbreak in South Korea: A cross-sectional study. *BMC Complementary Medicine and Therapies*, 20, 147. <https://doi.org/10.1186/s12906-020-02945-0>
- Lebbie, A., Kouame, F., & Kouassi, E. (2017). Specialization in ethnomedicinal plant knowledge among herbalists in the forest region of Rivercess County, Liberia. *Academic Journals*. <https://doi.org/10.5897/JMPR2017.6329>
- Maptons. (2024). Duazon on the map of Liberia [Blog post]. Available at <https://pk.maptons.com/3467406>
- Mcata, & Qapeshu. (2019). Profitability of indigenous medicinal plants market (IMPM) in improving household income and food security. *Repository*. Available at <https://hdl.handle.net/20.500.11910.15380>
- Meke, G., Mumba, R., Bwanali, R., & Williams, V. (2017). The trade and marketing of traditional medicines in southern and central Malawi. *International Journal of Sustainable Development and World Ecology*, 73-87. <https://doi.org/10.1080/13504509.2016.1171261>
- Moran, M. (2019). Life without choice: How do mothers with children living in direct provision in Ireland feel about their limited role as family food providers?

- Technological University Dublin.
<https://doi.org/10.21427/ozjb-y894>
- Nitetcu, D. C. (2015). A new beginning for SMEs development. *Theoretical and Applied Economics*, 3, 39-52.
- Ojha, S. N., Tiwari, D., Anand, A., & Sundriyal, R. C. (2020). Ethnomedicinal knowledge of a marginal hill community of Central Himalaya: Diversity, usage pattern, and conservation concerns. *Journal of Ethnobiology and Ethnomedicine*, 16, 29. <https://doi.org/10.1186/s13002-020-00381-5>
- Posthouwer, C., Veldman, S., Abihudi, S., Otieno, J., & Van Andel, T. (2018). Quantitative market survey of non-woody plants sold at Kariakoo Market in Dar es Salaam, Tanzania. *Journal of Ethnopharmacology*. <https://doi.org/10.1016/j.jep.2018.04.019>
- Rasethe, M., Semanya, S., & Maroyl, A. (2019). Medicinal plants traded in informal herbal medicine markets of the Limpopo Province, South Africa. *Evidence-Based Complementary and Alternative Medicine*. <https://doi.org/10.1155/2019.2609532>
- SANNAH, S. W; ADEPOJU, A. O; FEMI-ADEPOJU, A. G; SENAGAH, G. K; WENNAH, A. J. (2024). Intersection of Hygienic Practices and Biodiversity Conservation Attitude among Herbal Medicine Dealers in Liberia. *J. Appl. Sci. Environ. Manage.* 28 (11) 3529-3537
- Tipu, M., Akhtar, M., Anjum, M., & Raja, M. (2006). New dimension of medicinal plants as animal feed. Available at https://scholar.google.com/scholar?hl=en&ndas_sdt=0%C5andq=animal+use+of+medicinal+plants+by+and+andq=#d=gs_qabsandt=1920992160649andu=%23p%3DW05hT NHRTtoMJ
- Van Andel, T., Myren, B., & Van Onselen, S. (2012). Ghana's herbal market. *Journal of Ethnopharmacology*, 140(2), 368-378. <https://doi.org/10.1016/j.jep.2012.01.028>
- Vasisht, K., Sharma, N., & Karan, M. (2016). Current perspective in the international trade of medicinal plant material: An update. *Current Pharmaceutical Design*, 22(27), 4288-4336.
- Worldplace. (2024). Boy's Town, Marshall Road [Blog post]. Available at <https://liberia.worldplaces.me/view-place/62274919-boys-town-marshall-road.html>
- Wyk, B. E. V. (2015). A review of commercially important African medicinal plants. *Journal of Ethnopharmacology*, 176, 118-134. <https://doi.org/10.1016/j.jep.2015.10.031>

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