Trade Development of Medicinal Plants Products in Tanzania: An Overlooked Research Area?

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Abstract

The existence of trade of products of medicinal plants reflects their significance on health care and the local economy. Consumption trends have shifted medicinal plants from local consumptions to economic contexts. However, the engagement of medicinal plants products within the market economy necessitates the understanding of the trade system and management for economy, health and biodiversity securities. This paper used a systematic literature review to assess information on trade of medicinal plants in order to explore its structure and identify research gaps. About 377 research articles were identified where 46 of them were reviewed. The literature indicate the contexts of the trade are natural forests and health sectors which influence supply and demand sides, respectively. The supply chain differ among literatures. The results indicate that, despite the importance of the medicinal plant trade in Tanzania, its understanding rely on isolated bits and pieces of information from other research articles, the evidence of an overlooked research area. The identified research gap was lack of information on the trade like value chain and trade mechanisms. The study recommends further research to combine ethnomedicine, conservation and economics research domains which can ensure sustainable use of scarce resources of medicinal plants to meet the limitless demand of the healthy community.

Keywords: medicinal plants, herbal medicine, trade, Tanzania

Introduction

Tanzania has a wide diversity of flora and fauna ranked fourth in Africa after the Republic Democratic of Congo (DRC), South Africa and Madagascar (Fokunang *et al.* 2011). Tanzania is believed to have more than 1000 species of medicinal plants, compared to about 6000 throughout Africa (Hilonga *et al.* 2019; Delbanco *et al.* 2017). These species of medicinal plants are consumed and processed into various products which are found in different rural and urban markets in the country (Pereus *et al.* 2019; Otieno *et al.* 2015). The markets play important roles in the availability and accessibility of medicinal plants products through various trade chains (Nahashon, 2013). The existence of trade reflects the significance of medicinal plants products on health care and the local economy (Veldman *et al.* 2020; Abihudi, 2014). On health side, medicinal plants products constitute about 95% of traditional medicine (Kayombo *et al.,* 2013). The traditional medicine is used by about 80% of the population for treatment of various illness (Vats and Thomas 2015; Otieno *et al.,* 2008). The use of medicinal plants products in traditional medicine practices dates well before colonial period (Stangeland *et al.,* 2008) and developed later for other uses

some of which is the novel source of modern medicines (Mahunnah and Mshigeni, 1996). About 75% of people living with HIV/AIDS and 60% of children with fever use medicinal plants products (McMillen, 2012).

On local economy side, medicinal plants have shifted from local gifts to traded products which contribute to household income and whereby different supply chains have evolved (Veldman *et al.* 2020; McMillen, 2012). For example, about 400 plant species have been identified to be traded in various markets throughout Tanzania (Hilonga *et al.* 2019). In addition, the quantity of traded non-wood medicinal plants at Kariakoo Market alone in Dar es Salaam in 2017 was more than 30 tons valued to more than USD 200,000 (Posthouwer *et al.,* 2018). Furthermore, the trade in medicinal plants products involves a large number of people in production and processing (Heinrich, 2015). These people include collectors, processors, transporters, and seller (Andel *et al.,* 2015). Therefore, traded products of medicinal plants play significant roles to ensure access, income generation and health improvements of communities in Tanzania.

The engagement of medicinal plants products within the market economy necessitates proper understanding for economy, health and biodiversity securities (Posthouwer, 2015). However, the trade of products of medicinal plants is rarely mentioned in the popular research agenda of products of medicinal plants regarding quality, efficacy and safety (Street *et al.,* 2008). The products of medicinal plants involved in the trade always transit several levels of stakeholders and organizations from cultivation to processing and distribution, before it reaches the final consumers (Heinrich, 2015). Therefore, along this path, there is a possibility that value adding activities and trading processes can affect the quality, efficacy and safety of products of medicinal plants (Andel *et al.,* 2015). This strengthens the need to understand the existing trade practices as one of the efforts to identify areas for improvement in aspects of quality, efficacy, safety and sustainability hence increase the viability of products of medicinal plants.

It is from this context that a systematic review of the literature was done to assess the existing information from previous studies on the trade of products of medicinal plants in Tanzania. This review aimed to explore the conduct of the trade in order to provide an overview and conceptualization of the area, including identifying any knowledge gap. The generated information can be used to clarify hypotheses in the field of trade of products of medicinal plants which can subsequently be explored further in order to understand the trade dynamics in the traditional medicine industry for the improvement of both health and the national economy in general.

This paper is structured into the following sections: the introduction, followed by the methods used in literature search and selection process as section two, results and discussion are presented in section three while section four presents the research gap. The conclusion and recommendation are presented in section five.

Methods

Literature Search Strategy

A systematic literature search was conducted from June to September 2020 and included published scientific literature, thesis and dissertations, and conference proceedings specific for Tanzania and only reviewed papers outside Tanzania. The databases used were LibHub (discovery tool of scholarly literature) and SUAIR (Sokoine University of Agriculture Institutional Repository) of Sokoine National Agricultural Library (SNAL) of Sokoine University of Agriculture – Tanzania. These databases were sought as the focus in Tanzania. However, to widen understanding and facilitating comparison, the following specific journals were also targeted: African Journal of Traditional and Alternative Medicine, Economic Botany, Journal of Ethnopharmacology, and South African Journal of Botany. These journals were selected after tracking references of the earlier reviewed different research papers. The search in specific journals was limited to studies conducted within Sub-Saharan Africa (SSA).

In the articles search process, the following search terms were included (singular or plural forms when necessary): medicinal plants products trade, botanical products trade, ethnobotanical products trade, ethnomedicine

trade, ethnopharmacology trade, herbal products trade, indigenous medicine trade, phytomedicine trade, and traditional medicine treatment. The search was repeated with the term trade replaced with production, industry, commercialization and value chain to increase the access of economic view of the publications. Each search term was followed by Tanzania and SSA to limit the outputs to researches done in the focus area. Searches from SUAIR were confined to some databases terminology and topic categories while the LibHub were not. The articles were also searched by examining references. In the literature search process, the names of the databases searched, the keywords used and the search results collected were used to create the potential reference collection.

Study Selection and Information Extraction

The selection criteria for the article from the potential reference to be included in the reference collection were at least one content of trade parameters of medicinal plants products. These parameters were commodity descriptions, trade actors, factors that influence consumptions, prices, and exchange process without limiting the time of publication.

The exclusion factors were studies that focused solely on medicinal plants researches without any focus on the trade aspects such as documentation of the medicinal plants used for specific diseases or in specific areas, determination of the active chemical compounds and microbial activities which are mostly based on laboratory aspect, and unavailability of the full article. Article selection from reference collection to be included in the reviewed list was based on two steps. The first step was the review based on the title and abstract of the article. In this aspect, three selection options were considered: the article was included, excluded or undecided. For undecided articles, the second step of full article review was conducted and was either included or excluded. The articles that met the inclusion criteria were included in the review list. The articles were then summarized based on the explanations of the medicinal plants trade aspects they covered (See Fig. 1).

Results and Discussions

Study characteristics

In the course of the review, 377 articles were identified whereby 46 of them were qualified for this study (Fig. 1). The reviewed studies were categorized into seven groups

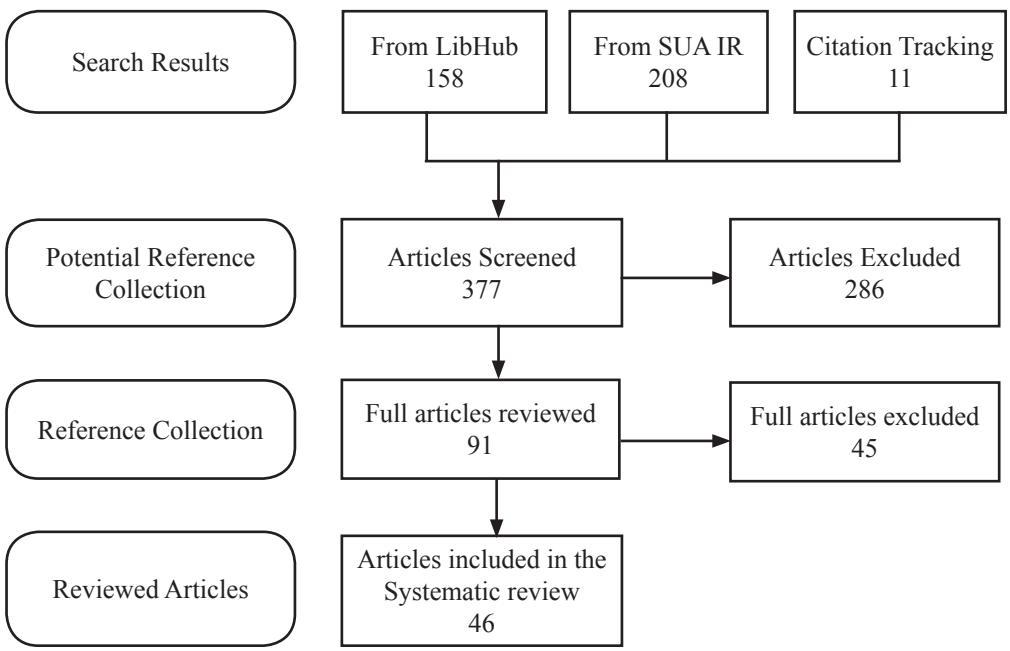

Figure 1: Identification process of 46 articles included in the systematic literature review

based on the themes of the research objectives; ethnomedicine, conservation, anthropology, modern health, policy issues, commercialization and information (Fig. 2).

Ethnomedicine: These articles comprised of studies on the use of medicinal plants, chemical compounds and microbial analysis.

The conservation: These articles comprised of studies on the conservation of medicinal plants with respect to biodiversity and climate change.

Anthropology: These articles comprised studies on knowledge and historical use of medicinal plants.

Modern health: These articles are based on use of medicinal plants for known diseases in parallel to modern medicines.

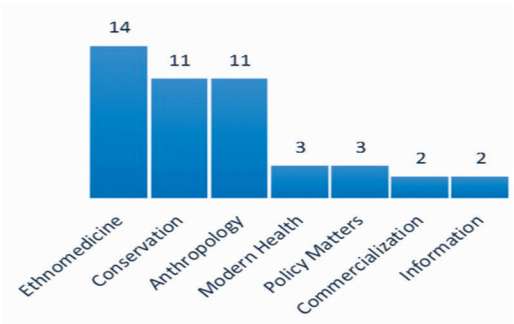

Figure 2: Categories and number of articles reviewed

Policy issues: These articles comprised of studies that focused on the development and regulation of traditional medicines.

Commercialization: These articles are focused on markets and exchange of medicinal plants.

The information category: These articles are focused on information technology application on traditional medicine and WHO 2019 Global Report on Traditional and Complementary Medicine.

The ethnomedicine articles were the largest part of the reviewed literature (14 research articles) while commercialization and information were the least (2 research articles each) (Fig. 2). Conservation and anthropology studies used methods of market survey, interview with practitioners and questionnaires while ethnomedicine studies were dominated by the laboratory works. The coverage of the studies was fairly distributed throughout Tanzania. The distribution of the articles based on the research themes was the first indicator of the scarcity of the research on the trade of products of medicinal plants.

The following sections explore and discuss the trade aspects of medicinal plants products presented in the reviewed articles. The discussion is based on the supply and demand contexts, supply chain and actors involved, nature and status of the traded products, consumers and access to products, and factors leading to consumption of medicinal plants products.

Supply and Demand Contexts

The literature describes products of medicinal plants in two aspects either on the biodiversity side or on the treatment side (Otieno et al. 2008; Mahonge *et al.* 2006; Augustino and Gillah, 2005). Medicinal plants constitute about 95% of traditional medicines components (Kayombo *et al.,* 2013) and about 98% of medicinal plants are wild sourced; from natural forests and bushes (Hilonga *et al.,* 2019). The observed role of medicinal plants in traditional medicine and their sources implies that trade in products of medicinal plants operates under health and natural forests contexts of Tanzania. The health context influences the demand side while the context of natural forests influences the supply side. The literatures are highly fragmented on the effect of each context on the trade of products of medicinal plants. This part synthesizes literature to explain those contexts as explained in various articles.

Tanzania health sector operates the pluralism system which is the combination of the traditional and modern medicines systems (Vähäkangas 2015; Mbwambo *et al.* 2007). Traditional medicine was the only health system of health in Tanganyika before Germany rule in 1882 (Vats and Thomas, 2015; Alexander, 2012; Mhame, 2000). The modern medicine was then introduced to some parts of Tanganyika by missionaries and colonial governments (Vähäkangas, 2015). The little coverage and inaccessibility of the modern health facilities made other parts to continue using the traditional medicine systems (Stangeland *et al.,* 2008). The introduction of modern health facilities went in parallel with detrimental traditional medicine

system (Vats and Thomas, 2015). The negative perception of traditional medicines was carried out by modern health practitioners and some religious leaders, specifically Christians, which still impact the consumption of medicinal plants products hence their trade (Mbwambo *et al.,* 2007). However, even in the areas with modern facilities, the use of both health systems were reported even before and after independence (Feierman, 1981; Swantz, 1979). The situation of using both health systems still exist (Vats and Thomas, 2015).

On natural forests, as the sources of medicinal plants as another context of medicinal plants products trade in Tanzania, literature condemn the trade as the main source of degradation (Hilonga *et al.,* 2019; Pereus *et al.,* 2019; Otieno *et al.,* 2015; Abihudi, 2014). Although other sources of biodiversity degradation like climate changes, agricultural activities and human settlements have been mentioned in the literature, the medicinal plant products trade has been presented as the major cause (Mahunnah *et Al.,* 2012). The literature acknowledges the traditional practitioners' role in the conservation of biodiversity (Kayombo *et al.,* 2013) although they are part of the trade. The initiatives taken to reverse degradation on a trade perspective were to identify the most traded medicinal plants in various parts of the country (Veldman *et al.,* 2020; Posthouwer, 2018). Various initiatives have been proposed on the conservation of biodiversity both in situ and ex situ (Nahashon, 2013; Alexander, 2012) with little initiatives on the improvement of the trade. The arrangement to access the medicinal plants in reserve forests has received little attention in the literature. They mention harvesters or collectors to access medicinal plants through payment to village governments (McMillen, 2012). The effect of conservation strategies could affect the medicinal plants products availability, price and quality (Veldman *et al.,* 2020). Therefore, the literature on medicinal plants conservation in relation to trade presume sustainability as a scientific problem and nothing as an economic problem on scarce resources which need to be managed along the value chain. The economic initiatives like increasing efficiency in the processing system also could serve the purpose of medicinal plant conservation more than banning harvesting where most of the time were ineffectively implemented or encouraged switching to other medicinal plants (Otieno *et al.,* 2008).

Supply Chain and actors of Products of Medicinal Products

The literature differs on the supply chains and actors of trade of products of medicinal plants. The actors and supply chains are highlighted in conservation studies of medicinal plants which used the market survey. The number of identified actors and their supply series are as follows: McMillen (2012, 2008) identified four actors namely: harvesters, healers, vendors and customers. Nahashon (2013) identified five actors: harvesters, traditional healers, vendors, exporters and customers. Abihudi (2014) identified four actors: collectors, middlemen, vendors and customers while Hilonga *et al.* (2019) identified four actors: harvesters, middlemen, vendors, and traditional healers. The difference could be attributed to the differences of the local-urban places where studies were conducted. The nature of the studies left aside the value addition activities to further describe other features such as facilitating and regulating activities and their implication to trade and conservation.

The key actors found in the literature were traditional healers. The literatures refer to the traditional healers as the custodian of the knowledge, practices and materials used in traditional medicines and in trade of products of medicinal plant (Kayombo *et al.,* 2013). However, literature recognizes different types of traditional healers with different names in various studies. They have been mainly categorized into three types such as diviners or charlants, herbalists or medicine men, and sooth-sayers or witch doctors or ritualists (Vähäkangas, 2015; Vats and Thomas, 2015; Alexander, 2012). The herbalists are defined as those responsible to describe medicinal plant products to patients. The diviners are responsible to diagnosis and describing the source of diseases. The ritualists are for religious and foretelling aspects. However, during the colonial period, all the three categories were put in one

basket hence brought confusion to traditional medicines practices (Stangeland *et al.,* 2008). The distorted roles have blunted practices of traditional medicines. This is due to the fact that types of traditional healers responsible for the trade of medicinal plant products are not explained in the literatures.

The exchange process and actors relations explanations are missing in the literature. Most of the authors have termed the whole medicinal plants products as informal trade operating in the hidden economy (Veldman *et al.,* 2020; Posthouwer, 2018; McMillen, 2008) without further explanation neither on the trade exchange process nor the value chain. Further, the medicinal plant products have been condemned to fall short of information on quality, efficacy and safety and traded at consumers' risk (Sife *et al.,* 2015), which again poses the question of why they are still consumed and the trade flourishing and ever increasing in the country (Posthouwer *et al.,* 2018). The situation necessities understanding of the medicinal plants trade structure and mechanism in more details.

Nature and status of the traded medicinal plants products

Medicinal plants products have been widely used in different ways such as medicine components in traditional medicines, novel sources of modern medicines specifically to chronic diseases such as cancer and HIV/AIDS, and as an industrial ingredient in aromatic industries (Runyoro *et al.,* 2006). In the case of traditional medicine, the medicinal plants products constitute about 95% of it (Kayombo *et al.,* 2013), the extent of making most literature to use the medicinal plants products interchangeably with traditional medicines (Sife *et al.,* 2015; Kira and Komba, 2012; Stangeland *et al.,* 2008). However, these are two different concepts.

World Health Organization (WHO) defines traditional medicine as the sum total of the knowledge, skill and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness (WHO, 2019). Medicinal plants products, mostly referred to as herbal medicines, include herbs, herbal materials, herbal preparations and finished herbal products that contain active ingredients, as parts of plants, other plant materials or combinations thereof, where sometimes can include inorganic active ingredients that are not of plant origin e.g. animal and mineral materials (WHO, 2019; Vats and Thomas, 2015). The medicinal plant products have been given different names such as customary medicines, local medicines, indigenous medicines and natural medicines (Alexander, 2012).

The literature puts narrow separation on medicinal plant products and their accompanied services in the medicinal plants products trade. These services include diseases diagnosis and medicinal plants products descriptions because these services have been taken by a single person (Vats and Thomas, 2015; Alexander 2012). Faith healing has been included in traditional medicine (Vähäkangas, 2015), which again impact the medicinal plants trade. The result has been the weaknesses associated with the diagnostics methods of traditional medicines such as ramli (indigenous way of diseases diagnosis using spirits), which has been attached to medicinal plants products trade (Ngoma *et al.,* 2003).

The literature explains different status of the medicinal plants products found in the markets. Some have been traded at raw state (leaves, barks, and roots), unprocessed fragmented materials (chips, slices), semi-processed materials (powders, extracts, and teas), and processed materials (lotion, soaps, tinctures, tablets, and syrups) (Hilonga *et al.,* 2019; Otieno *et al.,* 2015; Posthouwer *et al.,* 2018; Abihudi, 2014). The semi processed and processed materials have been a combination of two or more medicinal plants (Otieno *et al.,* 2008). The value chain of the products found in the market is not described in the literature.

The relative prices of the medicinal plants products assessed through traditional medicine services with a comparison of modern medicines services are reported to be cheaper than the modern health services with flexible payments modalities (Mahonge *et al.,* 2006). However, for the market traded products of

medicinal plants and specifically for chronic diseases, information on their pricing policies and mechanisms is lacking in the literature.

Consumers and Access to Medicinal Plants Products

The WHO explains that about 80% of the population in the developing countries uses traditional medicine consequently medicinal plants products (WHO, 2019). Furthermore, about 75% of people living with HIV/AIDS and 60% of children with fever were claimed to use medicinal plants products (Nahashon, 2013; McMillen, 2012). The information portrait the uses of medicinal plants products base in primary health care (Stanifer *et al.,* 2015). Therefore, the use of medicinal plants products is across all socio-economic statuses in communities in both rural and urban areas (Hilonga *et al.,* 2019; Alexander, 2012). However, the literature portraits another group of users that comprised the chronic diseases such as epilepsy, mental health, diabetics, and cancer (Mwanri *et al.,* 2017; Thomford *et al.,* 2016; Winkler *et al.,* 2010; Ngoma *et al.,* 2003; Witte *et al.,* 2000). Also, the literature reveals other uses such as sexually transmitted diseases, gynecological disorder and gastrointestinal afflictions (Alexander, 2012). Another use of the medicinal plants products in ritual practices was also cited in literature although it receives little attention (Posthouwer, 2015). The uses of medicinal plants products explained in the literature expand beyond primary health care as described by WHO (2019), but also as the first level of personal health care (WHO, 2019).

Moreover, about the access points of the medicinal plants products, literature have described to be of vendors at different market places both in rural and urban areas and traditional healers' home or clinics (Amy 2018; Vuorela *et al.,* 2002). However, the literature does not explain among different users of products of medicinal plants who are the dominant customers for the trade. The way customers accessing information about products is depicted in the literature as personal communication and information spread as "concentric ripples in water starting with a word of mouth" as stated by Vähäkangas (2015).

Factors Leading to Consumption of Medicinal Plants Products

The factors leading to the consumption of medicinal plants products found in literatures can be categorized into two; pull factors implying those which attract people to use medicinal plants products and push factors implying those which force people to use medicinal plants products (see Table 1).

These factors are also synthesized into two attributes; internal and external attributes derived from the pluralism health system operating in Tanzania. The internal attributes are those inherent to medicinal plants products while external attributes are those outside medicinal plants products. These factors as presented in Table 1 have been summarized from Hilonga *et al.,* 2019; Posthouwer, 2015; Stanifer *et al.,* 2015; Vats and Thomas, 2015; Bignante and Tecco, 2013; Mbwambo *et al.,* 2007; and Ngoma *et al.,* 2003.

According to the literatures, most people use medicinal plants products as outcome of the push factors with external attributes (Table 1). This implies that the increase of medicinal plants products consumptions sprouted in the weakness of the modern medicine. Therefore, the modes in which the medicinal plants products trade capitalize in these weaknesses, and is not depicted in the literature.

Furthermore, the literature differs widely on when a person uses traditional or modern medicine systems. Some literatures claim that people do start with traditional medicines, literally consumption of medicinal plants products, before going to modern health facilities (Vats and Thomas, 2015; Stangeland *et al.,* 2008) while other literatures claim that people start with modern health facilities before embarking to traditional medicines (Kayombo *et al.,* 2007).

However, other literatures went further claiming simultaneous use of both medicinal plants products and modern medicines (Thomford *et al.,* 2016; Kayombo *et al.,* 2007). Therefore, with pluralism of health system in Tanzania and increase of modern health facilities, it was expected to decrease uses of traditional medicine and consequently reduction of the trade of medicinal plant products.

Table 1: Summary of factors leading to consumption of medicinal plants products

	Internal Attributes	External Attributes
Pull Factors	The credibility of medicinal plants products/ Perceived little side effects	Flexible payment model in traditional medicines services
	Perceived effectiveness of medicinal plants products to some of the chronic diseases	Lack of bureaucracies in access of medicinal plant products
	Easy accessibility of the medicinal plants products	Change of lifestyle inclined towards natural products consumption
Push Factors	Cultural attachment to traditional medicines	Low coverage of the modern health facilities
	Low cost of medicinal plants products	Diseases failed to be treated in the modern health facilities
		High costs of modern health facilities
		Only available health care system
		The Continual increase of human population

However, that is not the case and the literatures report different scenario, where there is an increase in both modern health facilities and medicinal plant products trade (Veldman *et al.,* 2020; Peter *et al.,* 2014).

Research Gap

Despite the importance of the medicinal plant trade in Tanzania, its understanding relies on isolated bits and pieces of information from other research articles. The main sources of information were from themes of ethnomedicine, conservation, anthropology, modern health, policy matters, commercialization and information whereby the issue of trade was not their main objective. None of the studies focused on improvement and promotion of the medicinal plants products trade, which evident that medicinal plants products trade is an overlooked research area.

The trend of the research led to a lack of key information in medicinal plants trade like the value chain of the medicinal plants products and its business models. Further, the declared informal status of medicinal plants products trade demands more studies to determine the nature of the informality and initiatives to formalize it. The information will facilitate the development and improvement of medicinal plants products trade which can then inform policy and the practitioners on the best way to benefit from the trade in a sustainable manner.

Conclusion and Recommendation

This review was conducted in order to explore the conduct of the trade in products of medicinal plants products so as to provide an overview and conceptualization of the area, including identifying any knowledge gap. The relevance of the review was based on the importance of this trade in biodiversity conservation, health and economy of Tanzania.

The literature were crystal clear on the existence of the medicinal plants products trade all over the country. The supply chain was characterized by a different number of actors who were described to work in the informal sector. The structure of supply and demand operated in the context of natural forests and health contexts, respectively. The forestry nature of supply-side determined the status nature of the products found in the market, which indicate

inadequate of value addition in the middle. This could be the reason that the factors leading to the consumption of medicinal plants products be dominated by the push factors on the external attributes.

Based on both the importance of medicinal plants products trade and identified research gap, the following are recommended: Conducting a business and economics research on medicinal plants products to fill the existing information gaps such as value chain and trade business models. The studies will help to identify value addition activities that are important in the improvement of products and shifting it to formal trade. Further, the perception of medicinal plant trade as a major source of biodiversity degradation demand more economical intervention in additional to environmental conservation. The conservation could be contributed through efficient use of the traded raw materials, an area which emerges to be another domain of agricultural economics in medicinal plants product research. The combination of ethnomedicine, conservation and economics could ensure sustainable use of scarce resources of medicinal plants to meet the limitless demand of the healthy community.

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