



Article

Global Trends and Local Perspectives in Medicinal Plant Trade: Opportunities and Challenges for Emerging Markets

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Abstract: The trade of medicinal plants is increasingly gaining importance in the global economy, becoming an integral part of the pharmaceutical, cosmetics, and food industries. In recent years, the public's inclination toward a healthy lifestyle and the growing demand for organic and natural products have created new opportunities in this sector. This article analyzes global trends in the trade of medicinal plants and emerging markets, with a particular focus on Uzbekistan. Analyses conducted using the SWOT and PESTEL methods allowed for the identification of the sector's strengths and weaknesses, as well as opportunities and threats arising from the external environment. The results indicate that to expand export potential, sustainable harvesting practices, organic certification, quality control in line with international standards, and the use of digital trade platforms are of significant importance. At the same time, overharvesting, habitat reduction, climate change, and bureaucratic obstacles pose serious risks to the sustainable development of the sector. In conclusion, by aligning global trends with local conditions, developing countries, including Uzbekistan, can achieve high economic efficiency and ecological sustainability in the medicinal plant market.

Keywords: medicinal plants, international trade, SWOT, PESTEL, Uzbekistan, sustainable development

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1. Introduction

Over the past decade, and most notably after COVID-19 pandemic in 2020, the demand for medicinal plants around the world has intensified. The increasing demand for natural therapy, dietary supplements developed from medicinal plants, an inclination not just to treat the ailments but to keep them at bay, restorative efforts to cope up with the aftermath of pandemic, and above all, the emergence of a healthy lifestyle have been identified as the key drivers for this upward growth. According to data provided by the World Health Organization (WHO), today nearly 80% of the world's population relies primarily on plant-based products for daily consumption and in the treatment of various illnesses [1].

The proven health benefits of medicinal plants, their ecological sustainability, and long-standing effectiveness in healthcare solutions have further piqued consumer interest, strengthening the medicinal plant market. The increasing demand for medicinal plants has enabled countries such as India, Germany, China, Canada, and Egypt to become leading global exporters, generating billions in revenue [2]. China and India are among the world's leaders in processing medicinal plants, with their market reach extending to nearly all countries, including the United States, Japan, France, and Singapore [3].

Likewise, in countries endowed with medicinal plants resource; for instance, Nepal, Ethiopia, Uganda, and Bangladesh, where the medicinal plant market has started to grow

as well as demand is being ever more increasing. For this reason, these countries are striving on the home turf for development in this sector and generating new jobs [4].

But this speed of development possesses certain downsides too. The increasing trend of medicinal plants is opened ample opportunities in the field of developmental and growth aspect but on the other hand, it has posed many challenges. Example: over-exploitation of medicinal plants has started to damage the environment. Moreover, quality control constraints in developing countries pursuing to supply its products to global market create more chaos in international markets. Thus, the expansion of the medicinal plant market is not simply an economic opportunity but rather a complete challenge for developing markets.

Today, Uzbekistan is a nation with a need to create all domains and ventures similarly. Abundantly rich in medicines and biodiversity; its natural habitat. It can be. Thus, Uzbekistan is able to provide the world market with drug raw materials from medicinal plants in an] volume. The country still needs to invest in its own capabilities to process medicinal plants but, crucially, it also requires the quality control to match international standards. Local production capacities should be aligned to meet requirements in global markets while remaining sustainable and avoiding ecological problems.

It examines the overall trends globally and locally in the trade of medicinal plants with special attention to the opportunities and challenges facing the emerging market. Combining statistical analysis with case studies and practical examples, this work offers strategic recommendations to boost competitiveness, create responsible trade strategies, and provide lodgings for developing economies to act as players on the global stage of the medicinal plant business.

2. Literature Review

The trade of medicinal plants has always been noteworthy in the global market. According to historical data from the Food and Agriculture Organization (FAO), between 1987 and 1991, the average global export volume of medicinal plants was USD 590,990, while the average import volume reached USD 853,870. In 1991, China accounted for 30% of the total global exports in this market [5]. Over the past decade, literature focusing on the economic aspects of medicinal plants and their trade has increased significantly. As it is well known, early studies regarding medicinal plants mainly covered their traditional uses and a few studies investigated their phytochemical and pharmacological qualities [6]. On the contrary, shed today by research and literature, they refer to a much wider scope of the horticultural and phytoreal trade, focusing not only on elements of economics addressing medicinal plants beyond of drug perception, but also looking for the ecological impacts of such drugs and making an emphasis in trading this material like raw products, instead of therapeutic products.

Developing countries can make productive use of the increasing demand for medicinal plants. In particular, the economic benefits of the medicinal plant sector have been highlighted by the World Health Organization (WHO), which described it as a “sustainable source of income for developing country economies” and emphasized that the sector’s development in developed countries is an important strategic direction through integration with the international pharmaceutical industry. Research based on global trends indicates that, in international markets, the average annual growth of medicinal plant export turnover between 2001 and 2014 was 9.2% in terms of value and 2.4% in terms of volume [7]. According to the 2020 reports of the Food and Agriculture Organization (FAO), a large share of the trade volume in medicinal plants is controlled by countries such as China, India, and Germany. These countries have the capacity to supply medicinal plants both as raw materials and as processed finished products. At the same time, there are countries in Africa and Central Asia with undeveloped export potential for cultivating and processing medicinal plants [8].

There are numerous studies addressing the shortcomings and challenges in the medicinal plant market. In particular, the issues in local markets of various countries have been studied over the years. Researchers such as Ifeoma Nwafor, Christopher Nwafor, and Idah Manduna have shown that in South African countries, there is a shortage of both

proper cultivation techniques and qualified specialists for growing medicinal plants. At the same time, the increasing market demand for medicinal plants has led to their indiscriminate harvesting [9]. Researchers such as Fani Tinitana, Montserrat Rios, Juan Carlos Romero-Benavides, Marcelino de la Cruz Rot, and Manuel Pardo-de-Santayana have examined the issues in traditional markets in southern Ecuador in their scientific articles. Market problems were investigated through interviews with most of the traders. The results indicate that the majority of traders are small vendors, collectors, and inexperienced sellers in the trade sector. The data were analyzed using the FIC and FL indices to assess quality.

Through the article titled "Differences between major medicinal plant markets (raokandro) and pharmacies in Antananarivo, Madagascar," published in the *Journal of Ethnobiology and Ethnomedicine*, we can obtain information about small traders, collectors of medicinal plants, and farmers operating in local markets in Madagascar. Additionally, this scientific article, authored by Maria Nirina Randriamiharisoa, Alyse R. Kuhlman, Vololoniaina Jeannoda, Harison Rabarison, Nivo Rakotoarivelo, Tabita Randrianarivony, Fortunat Rakotoarivony, Armand Randrianasolo, and Rainer W. Bussmann, examines market segments for both dry raw materials and processed products in Madagascar's local markets.

Researchers such as Willy Kibet Chebii, John Kaunga Muthee, and Karatu Kiemo, in their study of the market structure in Western Kenya, highlighted that in many developing countries, the informal nature of the traditional medicine industry and regulatory gaps often lead to unregulated trade, resulting in health safety risks and market inequities.

Chandra Prakash KalaPitamber Prasad DhyaniBikram Singh SajwanNorthern India has been studied for markets and their challenges India is one of the few exporting countries with steady performance in the production of medicinal plants, but at the same time, there are serious problems in many local markets. For example, the non selective collection of species like *Taxus baccata* and *Nardostachys grandiflora* has destructed polluting the environment, ruining natural environments that essential for plants and animals, providing conditions for eating, drinking, and breeding. These environmental issues are a real danger to the market.

Researchers such as Ripu M. Kunwar, Laxmi Mahat, Ram P. Acharya, and Rainer W. Bussmann studied the harvesting and use of medicinal plants in markets of Western Nepal through ethnobotanical surveys [10]. In the local markets of Kahramanmaraş, Turkey, researchers Seyran Palabaş Uzun and Cennet Kocalar conducted ethnobotanical analyses to examine species-specific risks and the most frequently sold plants [11]. In Bolivia, local issues and trade trends in the La Paz and El Alto markets were analyzed through interviews with market vendors [12].

Focusing on scholars and their scientific approaches to the medicinal plant sector, ethnobotanist Michael J. Balick has analyzed the importance of medicinal plants through economic indicators. Similarly, economic botanists have assessed the economic value of traditional medicine resources. The results of these studies have been published in works such as *Assessing the Economic Value of Traditional Medicines from Tropical Rain Forests* [13]. Ethnobotanist Ina Vandebroek, who studied medicinal plants in relation to local cultures, analyzed the loss of ethnobotanical knowledge in the context of globalization in her scientific work titled *Globalization and Loss of Plant Knowledge* [14]. Djaja Soejarto conducted scientific research on the discovery of medicinal plants and models for deriving benefits from them [15]. In the markets of Harare, Zimbabwe, the market potential of medicinal plants was scientifically analyzed by Justice Muvengwi and Monicah Mbiba using diversity curves (Shannon, Simpson) in the R and iNEXT packages, ANOSIM analysis (which indicates differences between logistic metrics), as well as UR (Use Report) and ICF (Informant Consensus Factor). These results were also studied during the process of preparing the scientific article.

In addition, researchers' scientific perspectives on the opportunities and potential barriers in the medicinal plant market were also examined. For instance, researchers such as Shohana Parvin and Anika Reza, in their study titled *Potential Role and International*

Trade of Medicinal and Aromatic Plants in the World, analyzed the increasing demand in international markets for cosmetics, herbal remedies, essential oils, and dyes. They presented this growing demand as stable growth and diversification, highlighting it as a significant market opportunity for medicinal plants. Researchers such as Marula Triumph Rasethe, Sebua Silas Semenya, and Alfred Maroyi, in their studies, presented informal plant markets as a market opportunity that provides economic benefits to marginalized and socially vulnerable groups. They emphasized that formalization and quality management can increase these groups' market share. Collectively, this concept has been referred to as "Local Income and Inclusion" [16].

In studies on the development processes and outcomes of the medicinal plant market, researchers such as Sahar Zamani, Mehran Fathi, and Ákos Máthé identified key obstacles, including the ecological damage caused by indiscriminate harvesting and the sharp increase in demand, which may lead to a rise in products in the market that do not meet quality standards [17].

2. Materials and Methods

In the process of preparing this scientific research, quantitative and qualitative methods were combined to analyze current global trends in the medicinal plant market and the opportunities in emerging markets.

As a research design, descriptive and analytical approaches were used to characterize the current state of global and local medicinal plant trade, as well as to analyze market opportunities and existing challenges. The analysis was carried out based on statistical data from the World Health Organization (WHO), production and trade reports on medicinal plants of the Food and Agriculture Organization (FAO), scientific articles from databases (ScienceDirect, MDPI, Springer and Elsevier), and the results of the interview with manufacturers of medicinal plant products currently operating in the Surxondaryo region and reports given by the Surxondaryo State Forestry Department. These sources were applied to SWOT and PESTEL analytical methods.

3. Results and Discussion

The recent growth of the medicinal plant market, along with the steadily increasing demand, naturally brings with it certain challenges and areas requiring improvement, as is common in any product market. Below, after a comprehensive study of the medicinal plant market, its overall situation can be highlighted using a SWOT analysis, see Table 1.

Table 1. SWOT Analysis of the Medicinal Plant Market

Strengths	Weaknesses
<ul style="list-style-type: none"> • Stable growth of global demand; • Widespread use in social life; • Rich local knowledge and biodiversity worldwide. 	<ul style="list-style-type: none"> • High demand in international markets for quality consistency and standardization; • Information gaps due to lack of traceability and data; • Informal markets and deficiencies in their regulation; • Heavy reliance on wild resources as raw materials.
Opportunities	Threats
<ul style="list-style-type: none"> • Indiscriminate harvesting of crops; • Increasingly strict requirements for entry into international markets; • Market demand and unstable supply chains; 	<ul style="list-style-type: none"> • Indiscriminate harvesting of crops; • Increasingly strict requirements for entry into international markets; • Market demand and unstable supply chains;

<ul style="list-style-type: none"> • Strengthened customs control depending on the type of medicinal plant. 	<ul style="list-style-type: none"> • Strengthened customs control depending on the type of medicinal plant.
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Still diving a little deeper, without a doubt, one of the major advantages of the medicinal plant market is the steadily growing worldwide need for raw medicinal plants and their derived products. The continued increase in demand is not confined to just one specific region or certain market segment but rather the whole international market which reflects an increasing awareness of medicinal plants health benefits, their natural properties and other value-added applications. This kind of persistent needs generates a secure environment for producers and merchants and also promises to boost market growth, the economy, and incorporation right into international supply chains. It also promotes more investments in cultivation, processing and quality control, thereby further de-risking and increasing the global competitiveness of the sector.

The stable growth in demand promises good revenue for any type of product. As demand for a product increases, it attracts more attention, which in turn stimulates comprehensive growth in that sector.

Another notable advantage of this field is that medicinal plants have historically brought together people from different cultures around the world, uniting diverse communities. Although these products may have different names in various languages, they are used for the same purposes. This universality provides easier social acceptance. According to the World Health Organization (WHO), even today, medicinal plants, aromatic teas, and herbal infusions continue to be widely used in traditional medicine across many countries worldwide [18]. This, in turn, indicates that no matter how advanced modern medicine becomes or how much synthetic drugs dominate the market, the demand for medicinal plants has remained constant throughout history.

The world of medicinal plants is so diverse that certain species grown in one country may not be found in another. At the same time, some countries are naturally rich in medicinal plant resources. For example, countries like Ecuador and Madagascar have local markets bustling with hundreds of varieties of colorful and diverse medicinal plants. Another important aspect is that the populations in these countries possess extensive traditional knowledge about medicinal plants, which further supports the cultivation, trade, and use of these valuable resources. Such local knowledge, in turn, enriches the value chain.

The analysis of the weaknesses in this sector shows that the rising demand and the pursuit of profit have led to the emergence of counterfeit products in the markets. This instability in quality necessitates stronger standardization efforts. For instance, if chemical profiling, such as "fingerprinting," is not properly standardized, there is an increased risk that products will be rejected in export markets. Unfortunately, even with modern standardization methods, approaches like HPLC/HPTLC and fingerprinting are still not fully perfected [19]. Another weakness in the medicinal plant market is that many countries, in order to meet large-scale demand, handle significant quantities of raw materials. However, there are still gaps in traceability and information in this sector. The existence of such information gaps, along with the occasional disorganization of available data, is particularly evident in supply chains that rely heavily on wild harvesting [20].

This lack of traceability makes it very difficult to perform a quality check of the different raw materials. All of which could create challenges in foreign markets and trouble with the law. Information gaps can lead to challenges in assessing the market demand and supply precisely. Difficulties in calculation of blocks of export and import appear as soon as there is not enough statistical data. Having gaps in databases is also with further consequences, as it slows down scientific research in this area, while it also opens the doors for challenges, and makes it tricky to attract investors.

Also, the growing number of informal medicinal plant markets where products are sold without labels and without any direction of use and the weak nature of market

management will prevent medicinal plant products from complying with the standards for formal export. Today, 60–90% of medicinal plant species that are successfully sold in the markets are harvested from the wild, often in an unregulated and non-compliant manner. This practice introduces inherent weaknesses in sustainability and continuity within the sector [21].

Focusing on the opportunities in the sector, medicinal plant products can benefit from the Traditional Herbal Medicinal Products Directive (THMPD) in European Union countries. Through proper documentation and compliance with this directive, producers gain the opportunity to access European markets [22].

The certification of medicinal plants can also be considered an opportunity within this sector. A well-functioning standardization system ensures that wild harvesting is properly regulated, confirming the legality and sustainability of the supply. It also significantly reduces risks in the supply chain. Consequently, this increases the confidence of partners and buyers in the quality of both products and raw materials.

This sector offers many lucrative opportunities and one among them is value added processing. Today the high demand for medicinal plant raw materials especially for the quality one comes mainly through processors. The conversion of raw medicinal plants to extracts, different essential oils and standard formulations is supported by novel quality control fingerprint methods.

This enables entry into global markets, particularly in segments such as cosmetic products, where demand is high [23]. As in any sector, the digitalization of trade in this field is also considered a highly promising opportunity. The availability of precise data on the best-selling and most profitable medicinal plant species in global markets enables the development of “market-fit” strategies based on evidence, product portfolios, and assortment analysis. This allows producers and traders to make informed decisions and align their offerings more effectively with market demand.

As in every sector and industry, alongside opportunities, there are also obstacles and potential threats or risks that may arise as a result of development. One of the most visible risks in this field today is the reduction of natural habitats and climate change caused by the overharvesting of medicinal plants. Some species of medicinal plants are highly sensitive to climate scenarios, making them vulnerable to the pressures of excessive wild, unregulated harvesting, as well as to challenges posed by agriculture and urbanization, which may prevent their natural regeneration [24]. To put it more simply, medicinal plants in places like Surxondaryo or the Himalayan mountains only grow in specific microclimates. If their natural habitats shrink due to urbanization or industrial development—there is a real risk that these plants could disappear completely.

One of the biggest challenges for small actors in this space is tighter international regulations on medicinal plants. All these markets need compliance to pharmacopeia/THMPD standards and quality and safety proofs. Although this may present a similar opportunity for existing growers, producers, suppliers with some revenue and market presence, it represents an added demand and cost of movement on the small entrepreneur not currently producing an income [25].

External shocks in global markets can have a significant impact on the fragile supply chains in this sector. One example of such an external factor is the pandemic. During this period, demand increased significantly, but border closures and severe restrictions on people’s movement caused major logistical disruptions. In addition, stricter customs procedures, while reducing unauthorized or poorly documented shipments, have increased transaction costs, creating additional obstacles for the sector [26].

To study the global trends and local perspectives in the medicinal plants trade more clearly and in depth, as well as to identify opportunities and challenges for developing markets, the current state of the medicinal plants market was analyzed using a PESTEL framework, see Table 2.

Table 2. PESTEL Analysis of the Medicinal Plants Trade

Political	<ul style="list-style-type: none"> - Many countries are paying political attention to the cultivation and conservation of medicinal plants. - Trade agreements and phytosanitary requirements have both positive and negative impacts on the trade of medicinal plants. - The role of political stability in facilitating the free trade of medicinal plants.
Economic	<ul style="list-style-type: none"> - The steadily growing international medicinal plants market. - Local markets becoming raw material suppliers. - Challenges in leveraging high-potential opportunities (export, logistics, certification, financing).
Social	<ul style="list-style-type: none"> - Increasing demand for natural products among the population. - Stable trust and demand for traditional medicine. - The impact of consumers' growing awareness of quality and safety on the market.
Technological	<ul style="list-style-type: none"> - Processing technologies that increase efficiency. - The important role of digital platforms in the trade of medicinal plants. - Growing demand for high-quality, technologically advanced laboratories.
Environmental	<ul style="list-style-type: none"> - Illegal trade causing the uncontrolled harvesting of medicinal plants, posing ecological risks. - Compliance with international market standards (sustainable harvesting, organic certification, ecosystem protection). - Impact of climate change on medicinal plant species.
Legal	<ul style="list-style-type: none"> - International standards regulating the trade of medicinal plants (WHO, EMA, US Pharmacopeia). - Legal restrictions that may limit the consumption of certain plant species. - Local legislation that poses obstacles for producers.

The results of the PESTEL analysis provide a deeper insight and allow for a more precise description of the current state of the medicinal plants market.

Political: The current political landscape of the medicinal plants market can be described based on the following factors:

In many countries around the world, the cultivation, regulated collection, and commercialization of medicinal plants are receiving significant political attention. Specifically, in Uzbekistan, recent years have seen initiatives aimed at developing this sector. For example, the Presidential Decree No. 4670 dated April 10, 2020, "On measures for the protection of wild medicinal plants, their cultivated propagation, processing, and rational use of existing resources," serves as a concrete step in this direction. The implementation of this decree aims to expand the cultivation of rare medicinal plant species, promote the use of advanced technologies for processing plants in accordance with quality standards, and attract investment into the sector [27].

Furthermore, another example of political attention aimed at the extensive development of the medicinal plant sector is the Presidential Decree No. 139 issued in May 2022, titled “On measures to create added value through efficient use of raw materials of medicinal plants and support for processing.”

The provisions of this decree include plans to establish new cultivated plantations on 36,000 hectares during 2022–2026, implement water-saving irrigation technologies, drill wells, and construct pump stations with allocated subsidies. It also provides for multiple tax incentives—for instance, if a legal entity earns at least 80% of its income from medicinal plant cultivation, property, income, and land taxes can be reduced by 50% [28].

If we examine more deeply the positive and negative impacts of trade agreements and phytosanitary requirements on the medicinal plant market, the following can be noted. It is well known that international trade agreements play a key role in the trade of any type of product, and thus they are also crucial for the export of medicinal plants. For instance, WTO agreements or bilateral treaties can reduce tariffs and quotas, while simultaneously promoting exports.

However, failure to meet phytosanitary requirements demanded by international markets such as the European Union’s standards for product quality, safety, and traceability can lead to restrictions on exports and may even result in products being returned from the markets. International agreements expand market opportunities only when strict requirements are fully met; otherwise, the likelihood of product restrictions is high [29].

Surprisingly, political stability is a major element in being able to access export markets. Certainly; in assessing market conditions for any class of product, the political health of the defining countries or their bilateral dependability is critical. Political instability – be it crises, protests or surprise turnover of the government – can limit the trade of at least small and low-risk items, break the delivery of products, delivery routes, customs work, and undermine international confidence, and thus negatively impact exports.

Political stability refers to the absence of civil violence and the presence of broad consistency in both governmental policy and law. Exporters and investors alike need stable political conditions in order to be able to confidently finalize agreements, contracts and long-term financial commitments. In addition, in a politically stable situation, the regulatory processes with customs, tariffs, phytosanitary restrictions and export permits are also stable and predictable. Exporting countries benefit from this predictability, as they are fully aware of all the requirements which have to be complied with in advance [30].

Economic. Analysis of the current economic situation of the medicinal plants market.

Stable growth of the international medicinal plants market.

According to international market reports, the demand for medicinal plants in the global market has been steadily increasing over the past 20 years. In particular, the average annual growth rate of medicinal plants and derived phytopharmaceutical products has been around 6–8% per year [31]. This growth trend has been studied in depth during the research process, and several factors contributing to this increase have been identified and analyzed, see Figure 1.

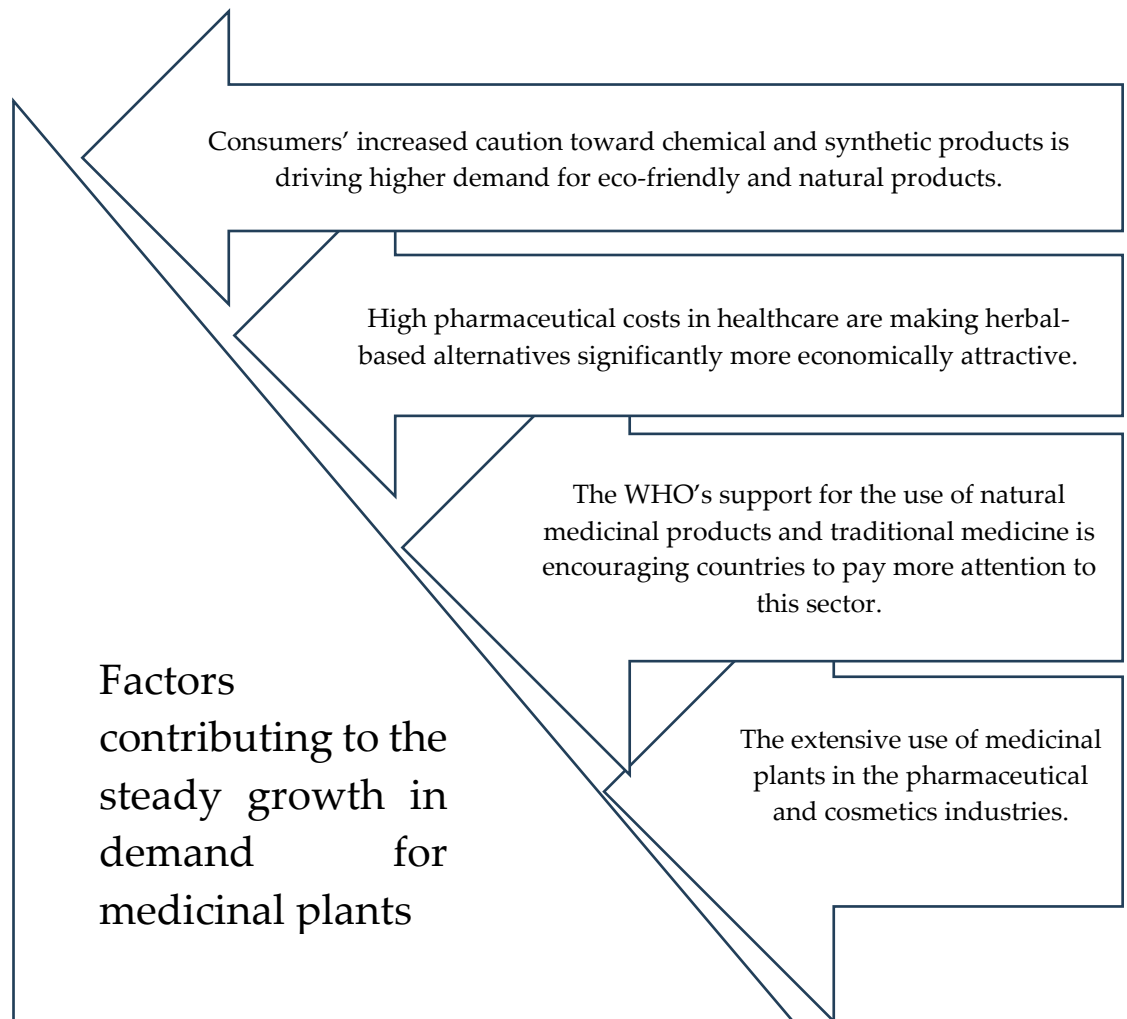


Figure 1. Factors Contributing to the Stable Growth in Demand for Medicinal Plants

Local markets turning into raw material suppliers.

In today's technologically advanced era, many countries around the world are still engaged in the trade of medicinal plants without participating in the higher segments of the value chain. That is, they cultivate and harvest medicinal plants and then supply the unprocessed, non-branded, non-standardized wild raw materials for export [32]. Several causes and consequences of this phenomenon have been analyzed, see Table 3.

Table 3. Reasons and consequences of local markets functioning only as raw material suppliers

Reasons	Consequences
Processing technology is lacking and there are shortcomings in financing.	Suppliers who export medicinal plants as raw materials miss the opportunity to capture additional value.
Local suppliers' products do not meet the required quality, standards, and certification in terms of price and quality.	The development of the medicinal plant sector has the potential to create numerous new jobs in processing, branding, and sales. However, due to the shortcomings mentioned earlier, employment opportunities often remain limited to the collection stage.
The sector lacks qualified personnel who understand quality control and logistics. In many cases, collectors and sellers come from ordinary local communities and often have insufficient	In the sales and export processes, the contribution of medicinal plant growers to the market diminishes. The price of raw materials is determined by intermediaries and exporters.

knowledge of trade, economics, and especially marketing.	
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Challenges in Utilizing High-Value Opportunities (Export, Logistics, Certification, Financing)

The increasing demand for medicinal plants in international markets, along with their widespread use not only in pharmaceuticals but also in cosmetic products, indicates significant opportunities for local producers to access global markets. However, in the process of thoroughly studying the market, we observed that there are several challenges in utilizing these opportunities. The table 4 below highlights the challenges faced in leveraging the broad opportunities in the global market.

Table 4. Challenges in Leveraging Opportunities in the Global Medicinal Plant Market

Export restrictions	In developing countries, complex and bureaucratic export regulations are creating additional high costs for small-scale producers.
	The trade of medicinal plants, regulated by international agreements that limit export opportunities, poses challenges. For instance, international conventions like CITES (Convention on International Trade in Endangered Species) make trade even more difficult and inconvenient for small-scale producers [33].
Logistical challenges	The lack of a systematic cold-chain logistics for drying, packaging, and transporting medicinal plant products without compromising their quality significantly reduces export prices below their production costs [34].
	The costs of transporting medicinal plant raw materials, collected in remote areas, to central markets reduce the profits of local producers.
Certification and Standards	The global market requires compliance with GACP (Good Agricultural and Collection Practices), GMP (Good Manufacturing Practices), and the acquisition of organic certifications for products to be accepted
	The standards being demanded pose a significant barrier for many small-scale farmers worldwide, as they often lack the technological and financial capacity to comply with them.
	The certification process requires a long time and considerable expenses, making it difficult for small entrepreneurs to enter large international markets. As a result, this can gradually create a monopolistic situation and unhealthy competition within the sector.
Financing challenges	One of the most common challenges in this sector is financing. Small-scale farmers and medicinal plant growers often face difficulties in obtaining larger loans from commercial banks.
	In this sector, the seasonal nature of raw materials, combined with the fact that the productivity and efficiency of growers largely depend on climatic conditions, leads banks to consider granting them large loans as a risky undertaking [35].
	Financial shortages slow down innovation in this sector. In particular, the introduction of advanced processing technologies becomes more difficult, which in turn creates obstacles for small farmers when trying to export their products.

Social. Analysis of the current social situation in the medicinal plants market.

Increasing demand for natural and organic products among the population is driving the growth of the medicinal plants market.

During the preparation of this article, the steady rise in consumer demand was frequently highlighted. While in the SWOT analysis this growing demand was interpreted

as a **strength** of the industry, in the PESTEL analysis it is examined in greater depth under the **SOCIAL** dimension, reflecting the social factors influencing the market.

Several factors explain the rising demand for natural products. One of the main drivers is the global trend toward a **healthy lifestyle**. In recent years, consumers worldwide have increasingly expressed distrust toward chemical-based pharmaceuticals, which has shifted their attention toward eco-friendly, chemical-free, and naturally sourced products. This social trend plays a crucial role in expanding the market for medicinal plants and related products [36].

This growing focus on natural products has encouraged pharmaceutical and cosmetic manufacturers to develop a variety of products using natural raw materials and offer them to consumers. Naturally, the increase in production of eco-friendly products has also boosted the demand for medicinal plant raw materials.

As the number of natural product manufacturers worldwide rises, products that do not meet quality standards have also begun to appear. This, in turn, has necessitated the establishment of specific inspections and certification processes to ensure access to global markets. Today, consumers show higher trust in naturally derived products, particularly those with organic certification, which also allows these products to command higher prices in the market.

Another reason for the increasing demand for natural products is the rise of the eco-conscious population. In today's era of ecological crises, a significant portion of the global population is choosing to conserve natural resources and adopt sustainable consumption practices.

In Uzbekistan, the growing demand for medicinal plants can be viewed as linked to the intention of generating significant income through their cultivation, processing, and export. Uzbekistan is a developing country, and, like many other sectors, medicinal plants are receiving attention at the policy level. Substantial financial and practical support, as well as various opportunities, are being provided to promote entrepreneurship in this field [37]. Many new national brands are emerging in local markets, and marketing in this sector is developing strongly.

Confidence in Traditional Medicine is High, Ensuring Stable Domestic Demand

Traditional medicine has a place in the history of all countries and, it always enjoys a steady level of public trust. This explains why the medicinal properties of plants literally do not need to advertise most of their parts of use. Medicinal plants that can be obtained through existing markets are usually significantly cheaper than pharmaceutical drugs, which makes them cost-effective.

Moreover, regardless of how advanced modern medicine becomes or how diverse pharmaceutical products are, doctors worldwide acknowledge the benefits of medicinal plants and do not discourage their use. On the contrary, the World Health Organization (WHO) recommends integrating traditional medicine into national healthcare systems, which further strengthens stable domestic demand [38].

As Consumers Become More Aware of Quality and Safety, the Need for Production in Compliance with International Standards Increases

Today, consumers can instantly access thousands of pieces of information about any product via the internet. This means they also have the means to examine information regarding the quality and safety of any product. Consequently, the demand for quality and safety in products presented to the market is steadily increasing. This creates new requirements and expectations for product offerings. Nowadays, consumers are not only interested in the therapeutic benefits of medicinal plants but also in whether they are processed in accordance with international standards and whether they hold organic certification. This makes it crucial for manufacturers to implement international standards such as GMP (Good Manufacturing Practices), ISO, and HACCP, strengthen quality control, and expand export opportunities. Otherwise, low-quality products may be pushed out of the market or lead to a loss of consumer trust [39].

Technological Analysis of the Medicinal Plants Market

Processing Technologies (Extraction, Drying, Separation of Bioactive Compounds)

Increase Efficiency

Today, technology is advancing in every sector, including the field of medicinal plants. Numerous technologies have been developed for extraction, drying, and the separation of bioactive compounds. These technologies process raw medicinal plant materials without causing damage, improving their quality and enhancing their economic efficiency. The modernization of these technologies helps preserve a higher amount of bioactive compounds, maintain the medicinal properties of the plants, and, importantly, facilitates the production of products that comply with international standards. Ensuring that manufactured products fully meet international standards increases their export potential and creates opportunities for local producers to develop high value-added products [40].

Digital Trade Platforms (E-commerce, Online Pharmaceutical Sales) Facilitate Entry of Medicinal Plants into New Markets

The emergence of digital platforms accelerates the entry of medicinal plants and their derived products into larger markets. Examples of this include e-commerce and online sales. Online platforms are particularly convenient for small business owners, especially those who face difficulties allocating separate budgets for marketing. Through these platforms, they can reach their customers via the internet and expand their global customer base. One of the key advantages of e-commerce is product traceability: quality control and certification processes, along with their results, can also be displayed online. This enables producers to gain consumer trust and establish credibility in the market [41].

Technological Laboratories are Essential for Quality Control and Consistency (Methods such as DNA Barcoding, GC-MS, HPLC)

It is well known that quality control and consistency are critical factors in the field of medicinal plants, and these processes must be conducted accurately and transparently. Modern technological laboratories play a key role in ensuring this. Today, DNA barcoding is widely used for in-depth identification of medicinal plants, allowing precise species verification. Additionally, GC-MS (Gas Chromatography–Mass Spectrometry) and HPLC (High-Performance Liquid Chromatography) are extensively employed to determine the quality and concentration of bioactive components. These methods allow producers to assess the extent to which products comply with international standards, and successful results significantly enhance the export potential of these products [42].

Analysis of the Environmental Aspects of the Medicinal Plants Market

Overharvesting and Illegal Trade of Medicinal Plants Pose Environmental Risks

Medicinal plants are important resources for public health and the economy; however, their sustainability is threatened by overharvesting, habitat loss, and climate change. Excessive harvesting reduces the populations of slow-recovering species, increasing their risk of extinction. Because of fragmented habitats, they lose connectivity and their genetic variation is getting lower. Many species are particularly stressed by climate change, which modifies the timing, duration, and distribution of their growth cycles and ranges.

Cumulatively these have a deleterious effect on local incomes, global supply chains, and international trade. Some species, for example, are added to CITES or national protection lists.

Quotas on wild harvesting, domestication to reduce pressure, climate adaptation and monitoring populations regularly will all be necessary for long-term sustainability. This strategy encourages the reasonable utilization and conservation of resources for future generations [43].

Sustainable Harvesting, Organic Certification, and Ecosystem Protection are Key Requirements in International Markets

For medicinal plants to enter international markets, sustainable harvesting practices, organic certification, and ecosystem protection are essential requirements. These criteria

not only ensure product quality but also build consumer trust and expand export opportunities.

Climate Change Limits the Distribution Range of Certain Medicinal Plants

Abstract Climate change affects the distribution ranges of medicinal plants as well. Changes in temperature, changes in the rain, and increasing drought simply make it so that some species of animals have less of their habitat to live in. So, such species may have to move further north, up to higher elevations, or to cooler areas. The process is also more likely to drive population fragmentation, loss of genetic connectivity, and a decrease in regeneration capacity [44].

Legal Analysis of the Medicinal Plants Market

International Pharmacopoeia Standards (WHO, EMA, US Pharmacopeia) Regulate the Trade of Medicinal Plants

The international trade of medicinal plants is strictly regulated by normative legal standards. In particular, international pharmacopoeia standards developed by the World Health Organization (WHO), the European Medicines Agency (EMA), and the United States Pharmacopeia (USP) serve as primary references in this process. These standards play a crucial role in ensuring product quality, safety, the content of bioactive compounds, and consistent supply. This enables manufacturers to maintain competitiveness in the global market, while consumers gain access to safe and high-quality products [45].

Intellectual Property Rights (IPR) and Biodiversity Laws (Nagoya Protocol) May Restrict the Use of Certain Plants

Limiting factor in regards to the use of medicinal plants is in the area of Intellectual property rights (IPR) and Biodiversity laws. The most relevant to our discussion in this context is the Nagoya Protocol, which governs access to genetic resources and the equitable sharing of benefits from their use. This also involves pharmaceutical and biotechnology companies getting the legal right to commercially exploit some plant species. Similarly, new drugs or technologies coming from medicinal plants can be impossible for other producers to market if there are a monopoly through intellectual property rights. Thus, striking a balance in both scientific investigations and international commerce necessitates careful management among eco-interests, local community rights and the international pharmaceutical business [46].

Licenses, Certification, and Export Permits in Local Legislation are Major Barriers for Producers

Local legislation further regulates the cultivation and export of medicinal plants of global importance. Licenses, quality certificates, and export qualification are usually time-consuming, and also come at a price. These procedures, while aimed at making sure that product quality meets international standards, can act as bureaucratic hurdles for our small and medium producers. Then, it slows down the production activities in the local market and makes less competitive in the global one. Consequently, many countries are implementing reforms to simplify licensing and certification procedures in order to facilitate the trade of medicinal plants [47].

The success of medicinal plant trade is ensured not only through raw material supply but also by creating added value along the value chain and integrating sustainability factors. In the conceptual model developed in this study, the value chain consists of five main stages: harvesting, processing, certification, export, and consumption. At each stage, sustainability-supporting factors (depicted below in a circular diagram) play a distinct and critical role. For instance, sustainable harvesting ensures resource regeneration, while laboratory analysis and quality control enable production that meets international standards. Organic certification increases the market value of products, and digital trade (e-commerce) provides access to new market segments. At the final stage, ecosystem protection serves as a guarantee of sustainable development and long-term economic efficiency. This model serves as a methodological framework for analyzing the medicinal plant trade and helps define strategic directions for developing markets.

The results of the SWOT and PESTEL analyses indicate that each stage of the medicinal plants value chain must be reinforced with sustainability factors. This situation is illustrated below in the form of a conceptual model, see Figure 2.

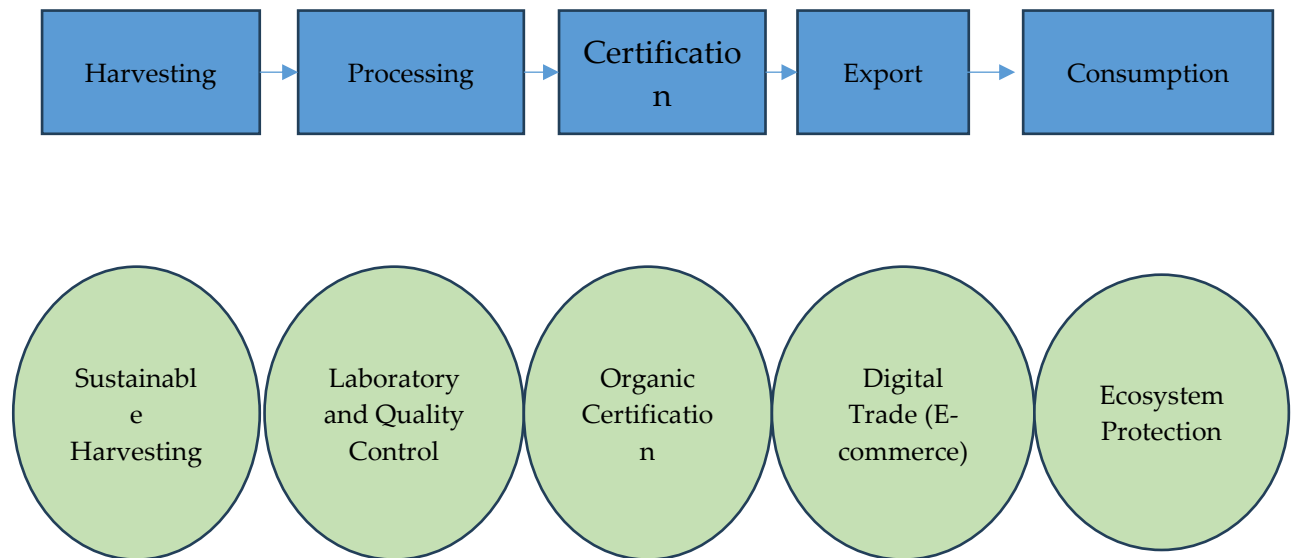


Figure 2. Medicinal Plants Trade: Value Chain and Sustainability Factors

In the model, the stages of the value chain are shown above (in rectangles), while the sustainability factors that support them are displayed below (in circles). The effectiveness of each stage is enhanced when aligned with the corresponding sustainability factors.

4. Conclusion

One of the strategically important sectors of contemporary global economy is the trade of medicinal plants. This sector has become more and more influential over the recent years, in particular, after the effects of the COVID-19 pandemic triggered a motivation in the population to maintain a healthy lifestyle as well as the rise of demand for natural and organic products. As per the report by Globally, World Health Organization, around 80 percentage of population worldwide prefers utilizing medicinal plants for treatment and preventive methods which makes the market grow sustainably in global level.

These SWOT and PESTEL analyses highlight large opportunities for the medicinal plants trade in developing markets. Specifically, the growing preference for organic products, the growth of e-commerce and enabling policies have been singled out as positives. However, meeting international standards, enhancing quality assurance, bureaucratic hurdles in the certification processes, climate change and overexploitation pose major challenges for producers.

This sector is also of considerable importance when it comes to Uzbekistan. It has taken up the "Program for the Conservation and Propagation of Medicinal Plants" which aims at developing the internal market, enhancing its export potential as well as producing drugs to international certification standards. In practice, things are more complicated, for small producers snags into getting licenses, exporting permits and implementing quality standards persist. As a consequence, a better government policy is to favour sustainable management, support local producers and to enforce scientific research.

In summary, finding the right balance between global trends and local perspectives in the medicinal plants trade remains a critical task for developing markets, including Uzbekistan. If quality and certification systems are implemented, digital trade opportunities are leveraged, and domestication and sustainable harvesting standards are established, this sector will not only enhance economic efficiency but also contribute to public health, the income of local communities, and environmental sustainability.

REFERENCES

- [1] WHO, *WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants*, Geneva, 2003. Available online.
- [2] X. Zhang, J. Yu, L. Li, and Q. Wang, "Trade dynamics of medicinal and aromatic plants: Suppliers and exporters of MAPs," *Journal Name*, vol. Volume(Issue), pp. pages, 2025. Available online.
- [3] S. Parvin, A. Reza, S. Das, M. U. Miah, and S. Karim, "Potential role and international trade of medicinal and aromatic plants in the world," *European Journal of Agriculture and Food Sciences*, vol. 5, no. 5, Article 701, 2023. Available online.
- [4] United Nations, "World's poorest countries can improve access to medicines through local production," UNCTAD, May 9, 2011. Available online.
- [5] Food and Agriculture Organization of the United Nations, *International trade in non-wood forest products: Medicinal plants*, FAO, n.d. Available online.
- [6] N. R. Farnsworth, "Screening of plants for new medicines," in E. O. Wilson, *Biodiversity* (Chapter 9), National Academy Press, 1988.
- [7] K. Vasisht, N. Sharma, and M. Karan, "Current perspective in the international trade of medicinal plants material: An update," *Current Pharmaceutical Design*, vol. 22, no. 27, pp. 4288–4336, 2016. Available online.
- [8] Food and Agriculture Organization of the United Nations, *Medicinal plants*, FAO, n.d. Available online.
- [9] I. Nwafor, C. Nwafor, and I. Manduna, "Constraints to cultivation of medicinal plants by smallholder farmers in South Africa," *Horticulturae*, vol. 7, no. 12, p. 531, 2021. Available online.
- [10] F. Tinitana, M. Rios, J. C. Romero-Benavides, M. de la Cruz, and M. Pardo-de-Santayana, "Medicinal plants sold at traditional markets in southern Ecuador," *Journal of Ethnobiology and Ethnomedicine*, vol. 12, Article 29, 2016. Available online.
- [11] F. Tinitana, M. Rios, J. C. Romero-Benavides, M. de la Cruz, and M. Pardo-de-Santayana, "Medicinal plants sold at traditional markets in southern Ecuador," *Journal of Ethnobiology and Ethnomedicine*, vol. 12, Article 29, 2016. Available online.
- [12] F. Tinitana, M. Rios, J. C. Romero-Benavides, M. de la Cruz, and M. Pardo-de-Santayana, "Medicinal plants sold at traditional markets in southern Ecuador," *Journal of Ethnobiology and Ethnomedicine*, vol. 12, Article 29, 2016. Available online.
- [13] F. Tinitana, M. Rios, J. C. Romero-Benavides, M. de la Cruz, and M. Pardo-de-Santayana, "Medicinal plants sold at traditional markets in southern Ecuador," *Journal of Ethnobiology and Ethnomedicine*, vol. 12, Article 29, 2016. Available online.
- [14] F. Tinitana, M. Rios, J. C. Romero-Benavides, M. de la Cruz, and M. Pardo-de-Santayana, "Medicinal plants sold at traditional markets in southern Ecuador," *Journal of Ethnobiology and Ethnomedicine*, vol. 12, Article 29, 2016. Available online.
- [15] A. J. Akinyemi, O. S. Olorunnisola, J. A. O. Ojewole, and M. O. Fowokan, "Ethnobotanical survey of medicinal plants traded in herbal markets of Kahramanmaraş, Turkey," *Journal Name*, vol. Volume(Issue), pp. pages, 2021. Available online.
- [16] R. W. Bussmann, N. Y. Paniagua Zambrana, L. A. Moya Huanca, and R. Hart, "Changing markets — Medicinal plants in the markets of La Paz and El Alto, Bolivia," *Journal of Ethnopharmacology*, vol. 193, pp. 76–95, 2016. Available online.
- [17] The New York Botanical Garden, *Michael J. Balick*. Available online.
- [18] The University of the West Indies Mona Campus, *Ina Vandebroek — Researcher*. Available online.
- [19] N. R. Farnsworth and D. D. Soejarto, "Potential consequence of plant extinction in the United States on the current and future availability of prescription drugs," *Economic Botany*, vol. 39, pp. 231–240, 1985. Available online.

- [20] M. Justice and M. Mbiba, "Medicinal plants in Harare markets: Diversity, trade, and conservation perspectives," *Journal of Ethnobiology and Ethnomedicine*, vol. 21, Article 778, 2025. Available online.
- [21] M. Justice and M. Mbiba, "Medicinal plants in Harare markets: Diversity, trade, and conservation perspectives," *Journal of Ethnobiology and Ethnomedicine*, vol. 21, Article 778, 2025. Available online.
- [22] T. Van Andel and M. Fundiko, "Medicinal Plants in the Democratic Republic of Congo: A Review," *Journal of Ethnobiology and Ethnomedicine*, vol. 15, Article 41, 2019. Available online.
- [23] X. Zhang, J. Yu, L. Li, and Q. Wang, "Trade dynamics of medicinal and aromatic plants: Suppliers and exporters of MAPs," *ScienceDirect*, 2025. Available online.
- [24] K. Vasisht, N. Sharma, and M. Karan, "Current perspective in the international trade of medicinal plants material: An update," *Current Pharmaceutical Design*, vol. 22, no. 27, pp. 4288–4336, 2016. Available online.
- [25] R. Hoenders, R. Ghelman, C. Portella, S. Simmons, A. Locke, H. Cramer, D. Gallego-Perez, and M. Jong, "A review of the WHO strategy on traditional, complementary, and integrative medicine," *Frontiers in Medicine*, 2024. Available online.
- [26] M. Justice and M. Mbiba, "Medicinal plants in Harare markets: Diversity, trade, and conservation perspectives," *Journal of Ethnobiology and Ethnomedicine*, vol. 21, Article 778, 2025. Available online.
- [27] E. Noviana, G. Indrayanto, and A. Rohman, "Advances in fingerprint analysis for standardization and quality control of herbal medicines," *Frontiers in Pharmacology*, vol. 13, 2022. Available online.
- [28] World Customs Organization, "Controlling the invisible trade: Wild plant resources and their sustainability," *WCO Magazine*, vol. 92, June 2020. Available online.
- [29] M. Justice and M. Mbiba, "Medicinal plants in Harare markets: Diversity, trade, and conservation perspectives," *Journal of Ethnobiology and Ethnomedicine*, vol. 21, Article 778, 2025. Available online.
- [30] FairWild Foundation, *FairWild Foundation*, September 30, 2023. Available online.
- [31] European Medicines Agency, *Herbal medicinal products*, European Medicines Agency, n.d. Available online.
- [32] European Medicines Agency, *Herbal medicinal products*, European Medicines Agency, n.d. Available online.
- [33] E. Noviana, I. Gunawan, and A. Rohman, "Advances in fingerprint analysis for standardization and quality control of herbal medicines," *Frontiers in Pharmacology*, vol. 13, 853023, 2022. Available online.
- [34] M. Justice and M. Mbiba, "Medicinal plants in Harare markets: Diversity, trade, and conservation perspectives," *Journal of Ethnobiology and Ethnomedicine*, vol. 21, Article 778, 2025. Available online.
- [35] U. B. Shrestha, P. Lamsal, S. K. Ghimire, B. B. Shrestha, S. Dhakal, S. Shrestha, and K. Atreya, "Climate change-induced distributional change of medicinal and aromatic plants in the Nepal Himalaya," *Ecology and Evolution*, vol. 12, no. 8, e9204, 2022. Available online.
- [36] European Medicines Agency, *Herbal medicinal products*, n.d. Available online.
- [37] A. Timoshyna, Z. Ke, Y. Yang, and X. Ling, "Controlling the invisible trade: Wild plant resources and their sustainability," *WCO News*, vol. 92, June 22, 2020. Available online.
- [38] A. Timoshyna, Z. Ke, Y. Yang, and X. Ling, "Controlling the invisible trade: Wild plant resources and their sustainability," *WCO News*, vol. 92, June 22, 2020. Available online.
- [39] O'zbekiston Respublikasi Prezidenti, "PP-4670: Dikoraviy dorivor o'simliklarni himoya qilish...," April 10, 2020. Available online.
- [40] O'zbekiston Respublikasi Prezidenti, "PF-139: Dorivor o'simliklar xom ashyo bazasidan samarali foydalanish...," May 20, 2022. Available online.
- [41] International Plant Protection Convention, *Plant health & safe trade*, n.d. Available online.
- [42] H. Zhou, "Food export stability, political ties, and land resources," *Land*, vol. 12, no. 10, p. 1824, 2023. Available online.
- [43] R. Tiwari and A. Upadhyay, "Herbal products and global market: An overview," *Journal of Applied Pharmaceutical Science*, vol. 9, no. 5, pp. 112–117, 2019.
- [44] A. Djumabayev, "How to increase the export potential of Kyrgyz medicinal herbs?," *CABAR.asia*, August 30, 2019. Available online.
- [45] U. Schippmann, D. J. Leaman, and A. B. Cunningham, "A comparison of cultivation and wild collection of medicinal and aromatic plants under sustainability aspects," *Frontis*, vol. 17, pp. 75–95, 2006.
- [46] A. Booker, D. Johnston, and M. Heinrich, "Value chains of herbal medicines – research needs and key challenges in the context of ethnopharmacology," *Journal of Ethnopharmacology*, vol. 140, no. 3, pp. 624–633, 2012.
- [47] A. C. Hamilton, "Medicinal plants, conservation and livelihoods," *Biodiversity & Conservation*, vol. 13, no. 8, pp. 1477–1517, 2004.