Review article

Illegal harvesting and trade of medicinal and aromatic plants: A criminal justice approach

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ABSTRACT

The illegal trade of Medicinal and Aromatic Plants (MAPs) threatens biodiversity, local economy, and traditional knowledge systems worldwide. Many MAP species are threatened by unsustainable harvesting due to herbal remedy demand. This paper explores illegal MAPs collection and trade in Latin America, Africa, and South Asia, where MAP-rich ecosystems are depleting. Certain species' high market value, rural economic difficulties, and organised crime syndicates are key drivers. The environmental and social repercussions are severe, destroying biodiversity, ecosystems, and indigenous cultures. This paper examines CITES and CBD, revealing enforcement and intergovernmental collaboration shortcomings. Criminal networks use corrupt institutions and weak rules to evade law enforcement. Judicial examples show the necessity for tougher punishments and legal professional knowledge.

Keywords: Biodiversity loss, criminal networks, illegal trade, medicinal and aromatic plants

INTRODUCTION

Medicinal and Aromatic Plants (MAPs) include several species renowned for Ayurveda, Traditional Chinese Medicine (TCM), and Unani medicine, as well as modern medicines and cosmetics, use MAPs for their fragrance, medicinal, and cosmetic characteristics. Modern and traditional medicine use them, as does the cosmetics industry. The rising number of people seeking herbal and natural remedies to improve their health is driving global demand for MAPs (Riaz *et al.,* 2021). To meet MAP demand, unsustainable methods like over-harvesting and gathering have evolved (Rathore, 2024). Several species are at risk of extinction or population decline due to this. MAP trafficking is a lucrative industry worldwide (Pathak *et al*., 2024). These criminal-backed enterprises threaten the local ecology and animals. These plants provide food and income to the locals, but illegal commerce threatens their survival. Particular plant species are threatened by illegal commerce for this reason. Combating illicit activities like MAP harvesting and trade is an important function of the criminal justice system. It is the aim to ensure that these things do not happen. The problem can be addressed by the government through a criminal justice approach that includes international coordination, rigorous enforcement of legal frameworks, and prosecution of criminals. This approach can solve the issue. Law enforcement agencies around the world need to step up their efforts to crack down on organised crime syndicates and the illegal trade of goods. More immediate and severe legal action is required in this case. This article discusses current regulatory frameworks, the criminal justice system's role in fighting this trade, and unlawful MAP harvesting. This study

examines police and judicial responses to unlawful MAP trading and how to improve institutional and legal systems. The paper's study highlights gaps in policies and enforcement. This article further examines how the criminal justice system handled this big issue through relevant court cases.

Geographic hotspots for illegal harvesting

Some of these ecosystems are subject to illicit MAPs gathering due to their plentiful fauna and lack of enforcement. Recently, the illegal traffic in Latin American, African, South, and Southeast Asian natural species has skyrocketed. Illegally collecting aromatic and rare medicinal plants is frequent in the South American Amazon and India's Western Ghats (Silalahi *et al*., 2023). This happened in these regions. In certain locations, declining plant numbers have caused species extinction or are close to it.

Key drivers of illegal trade

Illicit MAPs collection and trade are among the causes. The high value of certain plant species motivates people to find them. Wild Ginseng, Sandalwood, Yarshagumba Caterpillar fungus are popular worldwide (Pandey, 2022). Economic pressures from within rural communities may force them to collect illegal MAP (Pathak, 2024). Organised crime groups profit from the illicit MAP trade, making regulation and control harder. Inadequate enforcement and legislative frameworks worsen the situation. As uncontrolled or poorly supervised harvesting procedures increase, authorities are finding it tougher to detect and prohibit criminal activity (Singh *et al,* , 2024). This makes banning unlawful firms harder for authorities. Lack of resources, corruption, and insufficient coordination among flora and fauna protection authorities make it impossible to enforce current limitations in some locations.

Environmental and social impacts

Illicit MAPs collection has serious environmental impacts. Overharvesting plant species can damage ecosystems, cause biodiversity loss, and kill indigenous plant types. Overuse usually causes these side effects. Many MAPs are needed to maintain ecological balance. Eliminating these MAPs could devastate ecosystems and other species (Pathak *et al*., 2024). Illicit commerce destroys indigenous peoples' cultural practices and knowledge, harming society. These communities have long benefited from these plants' healing and economic benefits. Corruption in the sector exploits local harvesters. While traffickers and intermediaries split the profits, they work for low wages. Illegal MAPs harvesting is becoming a global issue that requires legislative changes, increased enforcement, and international cooperation. Cutting the problem's scope necessitates this (Pathak *et al*., 2024).

Legal framework for protection of medicinal and aromatic plants

National and International legislation is needed to protect aromatic and medicinal plants. Due to their economic and ecological value, MAPs have been the subject of many international accords and state restrictions to ensure sustainable collecting, trading, and protection (Riaz *et al*., 2021). These treaties and rules protect these resources. These laws' practicality is being questioned due to implementation and enforcement issues.

International frameworks

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has protected endangered Medicinal and Aromatic Plants species (Mozer and Prost, 2023). The convention on International Trading in Endangered Species regulates endangered species trading. Wild Ginseng, Sandalwood, and several orchids are CITES-protected MAP species (*Challender et al*., 2023). MAPs and the CBD (Convention on Biological Diversity) are major international agreements that promote biological resource protection and responsible usage. The CBD stresses that nations must create biodiversity plans. Protocols should be implemented for these

projects to gather MAPs sustainably. Additionally, the Nagoya Protocol to the CBD emphasises equal genetic resource benefits (Ali, 2022).

National legal frameworks

Numerous nations have enacted legislation to prevent the poaching and trade of MAPs, which threatens their endangered species and natural resources (Pathak *et al*., 2024). The populations of many animals have been protected by various statutes. The relevant laws are now in full force across the nation. As an example, Indian legislation protects medicinal plants as well as other endangered and uncommon plant species. The Wildlife Protection Act, 1972 and the Biological Diversity Act, 2002 are two Indian legislation that fall under this category. Countries with rich biodiversity, like Brazil, China, and Nepal, have similar frameworks (Sreeram, 2025). Even in countries where these policies are in existence, their enforcement is hindered by a combination of limited resources, corruption, and a lack of local understanding. Countries with lax legal systems tend to have unregulated MAP trade and collection because of the absence of harsh penalties for violators (Pathak *et al.,* 2024).

Gaps and challenges

These national and international organisations have created a solid framework, but intergovernmental collaboration, monitoring, and enforcement are still lacking. Many worry about MAP smuggling across borders, evading legal restrictions (Silalahi *et al*., 2023). Organised crime groups complicate this situation for law enforcement. Worse, many local harvesters violate the protections without knowing it.

Strengthening enforcement, collaborating internationally, and establishing legal frameworks are essential to ensuring MAP's sustainable use for decades and preventing its illegal trading (Pathak *et al*., 2024).

Criminal networks and supply chains

The illegal sale of medicinal and aromatic plants is sometimes organised by national or regional criminal organisations. All trade occurs on these networks. MAPs are valuable in cosmetics, pharmaceuticals, and traditional medicine, thus criminals target them. Many countries exploit slack laws, corrupt practices, and weak enforcement to support trafficking through complex supply networks (Silalahi *et al*., 2023).

Structure of criminal networks

MAPs criminal organisations usually have a distinct hierarchy, As most harvesting workers come from low-income families and they may not realise the legal ramifications of their acts. This is a problem since harvesting can be destructive. Commercial pressures cause MAPs harvesters to extract unsustainable numbers, reducing natural populations. Middlemen then acquire plants at a bargain to get an advantage over harvesters and profit. Therefore, larger criminal organisations can carry plants across borders since they can avoid limitations. Criminal groups that traffic narcotics, wildlife, and people also smuggle MAPs. Many nations also exchange MAPs (Silalahi *et al.,* 2023). These syndicates deliver MAPs using the same routes and networks. Organised crime groups help these networks dodge law enforcement and transport illicit MAPs worldwide.

Supply chain dynamics

Illicit MAPs trafficking begins with overharvesting plants from environmentally rich areas. Protection areas like reserves often harvest this way. This makes MAPs trafficking illegal (Pathak *et al*., 2024). Processing centres collect, dry, package, and label plants for sale. Before selling the plants, this is done. MAPs are often disguised as real goods to hide their true nature. Thus, authorities are finding it tougher to identify criminal patterns. Cosmetic, pharmaceutical, and herbal remedy manufacturers use the plants. They reach local and global markets. Companies may not know where their plants come from

or may ignore the illegal trade for its huge profits. The space can accommodate both options.

Links to other criminal activities

The MAPs trade, drug trade, illicit logging of forests, and animal poaching are all interconnected types of organised crime. Among numerous, these are only a few instances. Criminal organisations rely on complex transportation and smuggling networks, making it difficult for law authorities to disrupt their operations. Because of corruption inside regulatory agencies and at border checkpoints, illegal MAPs are able to reach markets worldwide (Pathak *et al*., 2024). Some of these reasons will ensure that these endeavours continue. More stringent legislative frameworks, improved law enforcement practices, and globally coordinated operations are necessary to dismantle these criminal networks. This system makes it very easy to disrupt supply networks and hold offenders accountable (Sreeram, 2025).

Criminal justice approach to curb Iilegal MAPs trade

Criminal law enforcement needs a comprehensive plan to stop the illegal medicinal and aromatic plant trade. This plan should include judicial system prosecution, international collaboration, and law enforcement. Deterrence and enforcement must be balanced due to the trade's complexity, which is sometimes fuelled by multinational smuggling and organised crime.

***Prosecution and judicial role**

The prosecution of MAPs traffickers and their imprisonment are essential for stopping the illegal trade. By punishing lawbreakers in court, they pay the price and set a precedent that others should avoid (Silalahi *et al.,* 2023). For the sole reason that it could inspire similar cases. There are many obstacles to prosecuting this activity. One must coordinate globally, collect evidence linking harvesters to trafficking network executives, and prove it. MAPs and their illicit extraction's environmental impact are often unknown to judges and prosecutors. Belief is that this is one of their biggest problems (Pathak *et al*., 2024). This enhances the risk of mishandling or mild punishment. Legal professionals must be reminded of the importance of biodiversity and MAPs enforcement. To bridge this gap and better serve the public, dedicated training programs should be provided to improve judicial responses to illicit MAPs trading.

***Challenges in law enforcement**

Many issues make it harder to pass MAPs legislation to end the illegal trade. Trouble tracing the supply chain from rural harvesters to global markets exacerbates the issue. Local collectors are routinely targeted by law enforcement due to their ignorance and low-income backgrounds (Pathak *et al.,* 2024). The difficulties of finding organised crime syndicates and traffic-coordinating middlemen prevent complete network destruction. Many illegally traded MAP species are unprotected by current laws, and it is equally important to overcome from this difficulty. Weak enforcement or soft sentences will deter future offenders even with restrictions (Silalahi *et al*., 2023). Targeting indigenous harvesters, traffickers, and intermediates who profit from the trade is vital, because harvesting is lucrative.

***Sentencing and Penalties**

To make the trade a more effective deterrent, the punishment should match the economic loss and environmental damage it causes. China and India are among the countries that have toughened penalties for illegally collecting and selling MAPs, especially for endangered species (Silalahi *et al*., 2023). Both the small-scale harvesters and the criminal organisations that enable the trade need to be punished by the criminal justice system for it to be effective.

***International cooperation**

The illicit MAPs trade is a worldwide problem, thus it's critical that governments work together (Silalahi *et al*., 2023). To get over some legislative gaps in different countries, criminal organisations often use international smuggling channels. By doing so, they will be able to go around the rules as they are. Destroying these networks requires the involvement of international allies. Part of this objective is the sharing of information and the coordinating of efforts amongst law enforcement agencies. Strong lobbying organisations that promote international collaboration to combat the illicit trade of MAPs commodities include INTERPOL (The International Criminal Police Organization) and the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (Challender *et al*., 2023).

***Law Enforcement Strategies**

Law enforcement must adopt creative strategies to effectively tackle the illicit traffic in MAPs. The employment of drones and other forms of satellite tracking is one such tactic. One more example would be to step up patrols of areas known to be particularly rich in endangered species. Several Indian forest groups, for instance, use state-of-the-art equipment to keep tabs on illegal harvesting. This is a component of their effort to combat illegal harvesting (Sreeram, 2025). It is asserted that if national authorities and multinational groups cooperated, it would be easier to prosecute key figures in the illicit trade. It is possible to gather this information via establishing connections.

Role of judiciary in curbing illegal harvesting and trade of MAPs

Due to repeated cases, the courts are investigating illegal medicinal and aromatic plant (MAPs) collecting and trafficking. Each case has revealed how widespread the problem is and how the law may help. These prosecutions show that stricter laws and punishments are needed to deter such wrongdoing.

In United States v. Billy Joe Hurley (2014), Great Smoky Mountains National Park Police arrested 46-year-old Billy Joe Hurley for stealing 83 American ginseng roots. Police investigated independently. Hurley was convicted of four ginseng poaching charges in two trials. Demand for American ginseng is high. The Great Smoky Mountain plant is pricey in Asia. This slow-growing plant is illegally stolen, damaging its roots. This greatly reduces the plant's long-term weather resistance. US Magistrate Judge Dennis L. sentenced Hurley to five months plus fifteen days. NPS planted despite only half of healthy roots surviving. To prevent unlawful collecting and raise awareness of poaching's damage to the species, sentences were imposed. Christopher Ian Jacobson was fined $1,000 and imprisoned 80 days for 298 ginseng roots. An independent event. DOJ and NPS want American ginseng banned (United States Attorney Office, 2014),

In the case of Divya Pharmacy vs. Union of India (2018), the provisions of Biological Diversity Act, 2002 were challenged. The Act found Patanjali Ayurveda's Divya Pharmacy in contempt for not disclosing organic resource benefits. The Uttarakhand High Court has ordered that commercial enterprises like Divya Pharmacy must share revenues with local biological resource producers, backing the NBA (National Biodiversity Authority) (Law Bhoomi, 2024).

In State Of Himachal Pradesh vs. Krishan Lal Pardhan And Others, Supreme Court of India (1987), the Special Judge released an order in the light of the available evidence that the respondents should be held accountable for their alleged involvement in a criminal conspiracy involving unlawful tree cutting, forgery, corruption, and associated offences. The Supreme Court found the Special Judge erred in releasing the accused without proof. It was obvious before reviewing the former court's prima

facie case. The Supreme Court rejected the lower court's release of the detainee and ordered the prosecution to file charges and commence trial immediately. The court said the defendant's case circumstances didn't alter its choices. (Casemine, 1987).

In the case of Fresenius Kabi Oncology Ltd And Anr vs The State Of Maharashtra And Anr. (2023), the central issue was illegally chopping of *Mappia foetida* (narkya) trees. Chandoli National Park, Maharashtra, had these trees. Cancer drug development Alkaloid Camptothecin (CPT) plummeted. Narkya tree is vital to chemotherapy, but CPT demand threatens it. Previously, Narkya trees were in abundance. 223 violators were sued under The Indian Forest Act, 1927 and The Wildlife (Protection) Act, 1972. In January 2024, the Bombay High Court acquitted Fresenius Kabi Oncology (formerly Dabur Pharma) after a lengthy trial. The court found that the corporation bought CPT from another company without knowing it was made from unlawfully chopped narkya trees. Interestingly, the court declared CPT as non-wood. Old Supreme Court rulings supported this claim. Corporate prosecution was wrong. The unlawful trade persisted after the forest agency sued, so narkya may expand (Down to Earth, 2024).

Challenges in enforcement

Laws to stop MAPs' unlawful trade face several obstacles. These issues stem from the trade's complexity and organised crime. The wide and remote locations where MAPs are gathered lack proper monitoring resources, which must be addressed. Due to lax enforcement and monitoring, many protected areas and biodiversity hotspots allow illegal harvesting (Pathak *et al*. 2024). This is because these communities lack the resources to oversee and enforce the law. How to involve locals in harvesting is another big issue. Many humans that survive on MAP plants are unaware of their regulatory regimes. As authorities target small scale harvesters, intermediaries and traffickers will remain uncaught (Silalahi *et al.,* 2023). The divide between local police and worldwide criminal groups that manage the illicit market makes us powerless to stop it. This schism prevents clandestine market management. Ineffective enforcement is also caused by institutions that should be accountable for not functioning together. Despite worldwide MAPs trafficking, customs, police, and environmental groups do not cooperate (Silalahi *et al.,* 2023). The unlawful cross-border trade of MAPs is prevalent. Unless one cooperates, traffickers will use regulatory gaps and illegal trade ways to profit. This lets them keep conducting their business. Legal loopholes and weak sanctions reduce deterrence. Unfortunately, state and international laws do not fully protect many MAP species. The sanctions for illegal harvesting and trafficking are too light to dissuade perpetrators. Even after perpetrators are caught, economic and environmental damage requires heavier penalties. Regional corruption helps traffickers evade capture, especially at borders and in police offices (Silalahi *et al.,* 2023). Thus, corruption allows them to circumvent limitations. MAP-trafficking criminal networks are growing harder to stop. Anti-MAP trade rules are notoriously difficult to police for several reasons. Problems include corruption, inadequate agency coordination, insufficient money, and obsolete laws.

Recommendations and way forward

The illegal trade in medicinal and aromatic plants (MAPs) requires an integrated approach. The following suggestions are necessary to fix the issue:

- **Strengthening legal frameworks:** To increase MAP protections, national and international laws must be amended and expanded. Governments must comply with CBD and CITES, two international accords regulating endangered animal trade, to safeguard state residents (Challender *et al.,* 2023).
- **Capacity building for enforcement agencies**: Building the capacity of

enforcement agencies leads to better results. Law enforcement officers should be trained on the financial and environmental benefits of marine protected areas. Providing them with the knowledge and tools to monitor, investigate, and address illegal activities will strengthen enforcement efforts.

- **Community engagement and alternative livelihoods:** People must be involved in conservation efforts because MAPs collects funds at those locations. Offering alternatives to their present subsistence techniques or encouraging environmentally sound harvesting will reduce their reliance on criminal activities.
- **International cooperation:** Due to the global character of MAPs commerce, international coordination is needed immediately. Nation-states can disrupt trader elated crime networks by sharing intelligence, coordinating police, and sharing information.
- **Public awareness and education:** Raising knowledge of illegal MAP trafficking's environmental impacts can reduce demand. To reduce illicit drug demand, customers, especially in traditional medicine markets, must be educated on sustainable MAPs acquisition (Silalahi *et al*., 2023). The traditional medicine market illustrates this.
- **Technology use:** Data analytics, drones, and satellite tracking can increase remote enforcement and surveillance.

Way forward

Better government enforcement of these restrictions will reduce illicit MAP trafficking. New regulations, community involvement, better technology, and international cooperation are needed to preserve these unique plant resources for future generations (Pathak *et al*., 2024). This is the only opportunity to achieve one's goal.

Conclusion

A growing global issue impacts local economies, ecosystems, and species. The illicit medicinal and aromatic plant (MAP) trade is complex and global. Criminal organisations profit from harassing innocent people through harvesting. Insufficient finance, international coordination, and legal gaps hinder compliance notwithstanding statutory frameworks. This problem requires greening, tougher laws, and greater enforcement. Numerous initiatives stand out. One should strengthen MAPs' legislative protections, provide enforcement personnel with specialist expertise and tools, include local populations in conservation, and promote international cooperation to combat cross-border trafficking. Public awareness and cutting-edge technologies will fight unlawful MAPs trade. Prioritising MAPs conservation and coordinating activities can save these plant species. MAPs help biodiversity, culture, medicine, and economy. Health, economic, and cultural benefits will be immense. It can protect these natural treasures and promote responsible use by working together daily.

CONFLICT OF INTEREST STATEMENT

The author declare that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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