Traditional Herbal Practices as Economic Drivers: Educational Institutions and the Knowledge Society in Assam

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ABSTRACT

The essence of Assam lies in its stunning landscapes and rich cultural diversity. This Northeast Indian state is a vibrant melting pot of ethnicities, each weaving a distinct thread into its unique socio-cultural fabric. The Deori and Sonowal Kachari tribes of Assam have long relied on traditional herbal practices for healthcare, spiritual rituals, and economic sustenance. These communities possess invaluable indigenous knowledge passed down through generations, forming an integral part of Assam's cultural heritage. However, the potential of this herbal knowledge remains largely untapped in the broader economic and scientific landscape. This paper explores how traditional herbal practices can serve as economic drivers by integrating them with scientific research and market mechanisms. The role of educational institutions in bridging the gap between traditional practices and modern economies is examined, focusing on how universities and research centers can facilitate knowledge transfer, preservation, and commercialization of herbal products. Through case studies and empirical data, the paper highlights the significance of fostering a knowledge society that values and sustains indigenous wisdom, ultimately contributing to economic growth and sustainable development in Assam.

Introduction:

Assam exhibits a diverse racial blend of Mongolian, Indo-Burmese, Indo-Iranian, and Aryan origins. The state is home to numerous distinct tribes that coexist harmoniously, each showcasing unique traditions, culture, attire, and vibrant lifestyles (Bharadwaj, 2017; P. Kumar, 2023). The tribal communities have long been custodians of rich traditional knowledge, particularly in the realm of herbal medicine. The Deori and Sonowal Kachari tribes, among others, possess an intricate knowledge of plant-based remedies used for treating ailments, enhancing health, and performing cultural rituals. This indigenous knowledge forms a crucial component of the socio-economic fabric of the region, offering untapped potential for economic growth. However, the lack of systematic documentation, scientific validation, and commercialization has hindered the realization of this potential.

Assam, with its rich ethnic diversity and myriad traditional practices, owes much of its cultural heritage to the biodiverse landscape it harbors. The state's ethnic tribes, deeply rooted in their indigenous knowledge systems, rely heavily on herbal remedies, which play a pivotal role in their healing traditions. Renowned for its vast biodiversity, Assam boasts a wide variety of medicinal plants, herbs, and other botanicals, with approximately 500 plant species from Northeast India being utilized in traditional healthcare systems. Assam has a total forest area of 28,311 square kilometers, which accounts for 36.09% of the total geographical area and includes 23.62% state's total forest area ((FSI), 2021) that encompasses diverse forest types, such as tropical evergreen, semi-evergreen, temperate broadleaf, and mixed forests. This rich forest cover not only sustains the biodiversity of the region but also provides essential habitat for various species of flora and fauna while supporting the livelihoods of local communities through forest-based activities.

Herbal medicine is an interdisciplinary field that encompasses various domains such as botany, medicinal plant research, pharmacognosy, phytochemistry, phytotherapy, botanical medicines, Ayurveda, natural chemistry, agriculture science, Unani medicine, biotechnology, and biochemistry (Sharma et al., 2021). The history of herbal healing techniques dates back to ancient civilizations, including Sumer and Mesopotamia (Sutherland, 2017), where the use of plants for medicinal purposes was well established. This tradition flourished particularly in China and India, countries that are home to a significant portion of the world's biodiversity. In this context, North East India stands out as a region with rich floral and faunal resources, earning its recognition as one of the world's mega biodiversity hotspots. The integration of these diverse scientific fields with the region's rich botanical diversity provides a unique opportunity to explore and develop sustainable herbal healing practices.

In an evolving knowledge society, educational institutions have a pivotal role in the development of a culture that encourages interdisciplinary collaboration and bridging the gap between tradition and modern innovation. These institutions play an important role in bridging the gap between traditional knowledge systems that are being practiced by remote ethnic communities and modern technological advancements. This integration is especially crucial when examining how traditional practices, particularly herbal medicine, can be preserved, enhanced, and adapted to meet contemporary needs. This paper delves into how universities and research bodies in Assam can act as catalysts for maintaining, enhancing, and utilizing traditional herbal practices for economic advancement.

Aim of the Study:

This study aims to explore the role of traditional herbal practices in Assam as potential economic drivers and to examine how educational institutions in the region can act as catalysts for their preservation, enhancement, and commercial utilization.

Objectives of the Study:

The objectives of the present study are –

- To identify and document the herbs commonly used by the Sonowal Kachari and Deori tribes in Dibrugarh, Assam, and to
- To explore the economic significance of these herbal remedies along with their potential for commercialization.
- To examine how educational institutions in Assam can integrate traditional knowledge with modern science to promote sustainable herbal products, conserve medicinal plant biodiversity, and support economic growth through herbal industries.

Methodology of the Study:

The study employs a comprehensive review of literature and life experiences to document the herbal remedies used by the Sonowal Kachari and Deori tribes in Dibrugarh District, Assam. Data collection on different ethnomedicinal plants viz. their local names; part/s used; vernacular and scientific names, plant families, parts used, diseases treated, and methods of preparation were recorded and presented in **Table 1**. For this purpose, extensive personal interviews and in-depth discussions were held with the traditional medical practitioners who are locally called *Bez*, followed by visiting homestead plantations of the traditional practitioners and surrounding plant resources to have firsthand knowledge of the medicinal plant species. The information gathered from the villages was cross-referenced with existing literature, and after an extensive analysis, the gaps were identified. This paper was then written to bridge the gap between traditional herbal practices and educational institutions, contributing to the development of the knowledge society in Assam.

The study also discusses the role of educational institutions in fostering interdisciplinary collaboration and integrating traditional herbal knowledge with modern scientific research for economic and biodiversity benefits. The findings are evaluated to propose strategies for

utilizing Assam's rich herbal heritage for economic development.

Ethics: Indigenous knowledge (IK) research requires a high level of ethical consideration. Therefore, the prior consent of the knowledge holders was obtained. The purpose of the study was communicated, with efforts made to assure the participants that the aim was to document and preserve their valuable IK traditions. After receiving their verbal approval, the data collected for the study was processed for publication.

Results and Discussion:

Assam boasts a remarkable diversity of medicinal plants, many of which possess potent therapeutic properties. The results of this study provide valuable insights into the herbal remedies commonly used by the Sonowal Kachari and Deori tribes of Assam, highlighting their potential economic significance and commercial viability. **Table 1** includes a record of the vernacular and scientific names, plant families, parts used, diseases treated, and preparation methods.

Traditional Herbal Practices and Economic Contributions:

The Deori and Sonowal Kachari tribes possess a deep understanding of local flora, with a wide array of plants used for medicinal purposes. Common remedies include treatments for digestive disorders, skin conditions, and respiratory ailments. Herbs like *Arjuna (Terminalia arjuna), Bhoot Jolokia (Capsicum chinense),* and *Neem (Azadirachta indica)* hold significant medicinal properties. These herbs and plants contain bioactive compounds such as alkaloids, flavonoids, and terpenoids, which exhibit antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory properties. Pieces of literature and inventories have reported their potency in treating various ailments, including digestive disorders, respiratory ailments, skin conditions, and metabolic disorders (Das, Mitra, 2016; Ghosh et al., 2015; D. G. Kumar et al., 2015)**.** In 2020, a study provided a comprehensive review of the botanical, chemical, and pharmacological attributes of *Citrus limon* (lemon), a species renowned for its pharmaceutical, cosmetic, and culinary merits. The review meticulously examines the utilization of *C. limon* in both the food industry and cosmetology, drawing upon a wealth of published scientific research. Additionally, it delves into considerations regarding the safety of its usage and the potential phototoxicity of its constituents (Klimek-Szczykutowicz et al., 2020). Owing to its unique aroma and antioxidant properties of the indigenous lemon variety, in 2024, the Assam government declared - kaji nemu (*Citrus limon*) as the 'State Fruit' of Assam. **Table 1** presents comprehensive data on selected herbs and the state fruit of Assam, sourced from different interviews, and cross-referenced with literature and existing reports from the India Biodiversity Portal (IBP) and The World Flora Online Database (W: i - ii). Despite the wealth of information presented, it is evident that significant details remain undocumented. Particularly noteworthy is the absence of IUCN Status for numerous medicinal herbs, despite their profound economic importance to Assam. Beyond their medicinal value, the herbal treasures of the Sonowal Kachari and Deori tribes hold significant economic potential (Dutta & Barooah., 2021). It is important to mention the economic viability of cultivating specific plants used by the Deori and Sonowal Kachari tribes in Assam, as these plants not only play a crucial role in traditional medicine. Key plants such as *Neem, Bel, Lemon/kaji nemu, Hilika, Tulokhi/ Tulsi, Madhuri, Pepoli (Piper),* all of which have medicinal, culinary, and cosmetic applications, show significant commercial potential. The cultivation of these plants offers opportunities for the development of industries in sectors like food processing, Ayurvedic medicine, cosmetics, and agro-tourism. Additionally, lesser-known medicinal plants used by these tribes present further avenues for research and economic utilization, highlighting the diverse and untapped potential of Assam's herbal resources. The growing demand for herbal remedies, both domestically and internationally, presents lucrative opportunities for the cultivation, processing, and commercialization of medicinal plants. Small-scale farmers and rural communities in Assam can benefit from the cultivation of medicinal plants as cash crops, providing an additional

source of income and livelihood diversification. Moreover, the sustainable harvest and trade of medicinal plants can contribute to poverty alleviation and rural development in the region. These traditional practices not only address local health needs but also provide economic opportunities through the sale of herbal products in local markets. Additionally, such practices contribute to eco-tourism, cultural festivals, and herbal fairs, drawing attention from wider audiences.

Economic Potential and Global Market Expansion:

It is reported that Lemon, also known as *Kaji Nemu*, is the state fruit of Assam. In a significant development, *Kaji Nemu* is now being exported to international markets, including the UAE and London, reflecting its growing commercial potential (Kalita, 2024; Sentinel, 2024). Cultivated extensively across over 15,000 hectares in Assam, this indigenous fruit plays a crucial role in both local agriculture and the global market. Similarly, the Sonowal Kachari tribe has successfully cultivated and commercialized *Bhoot Jolokia* (King Chilli). With its high demand in the global market due to its extreme spiciness, *Bhoot Jolokia*, also known as the world's hottest chili, has been exported to London and gained GI tag recognition in 2008 (Arora, 2021). These initiatives, based on indigenous knowledge, have led to economic growth through agro-tourism, the food processing industry, and the production of various herbal products. Efforts to document and preserve this rich traditional knowledge, with prior consent from the knowledge holders, have contributed significantly to both cultural preservation and economic development.

Role of Educational Institutions in Bridging the Gap:

Through the analysis of the documented herbal practices, this section discusses the interdisciplinary role of educational institutions in Assam in preserving, enhancing, and utilizing these traditional practices. While studies such as Hazarika et al. have reported the anti-cardiac potential of *Terminalia arjuna* through molecular docking (Hazarika et al., 2021), these findings remain largely confined to laboratory settings; such research must reach local communities and government agencies to facilitate large-scale interdisciplinary collaborations, commercialization of products, and the overall upliftment of society. Educational institutions in Assam can play a transformative role in the following ways:

- **Documentation and Preservation:** Universities can initiate projects aimed at documenting the herbal knowledge of the Deori and Sonowal Kachari tribes, creating comprehensive databases and ethnobotanical records.
- **Scientific Validation and Research:** Interdisciplinary research teams comprising botanists, pharmacologists, and social scientists can validate traditional remedies, ensuring their safety and efficacy for broader application.
- **Skill Development and Training:** Collaborations with local healers can lead to the development of training programs, where tribal practitioners educate students and researchers about herbal medicine.
- **Commercialization and Market Linkages:** Universities can partner with industries to develop herbal products, promote branding, and establish market linkages that ensure fair economic returns to the tribal communities.
- **Policy Advocacy and Awareness:** Educational institutions can engage in policy advocacy, promoting the integration of indigenous herbal practices into public health frameworks and rural development programs.

Building a Knowledge Society through Traditional Knowledge:

A knowledge society thrives on inclusivity and diversity of thought, blending traditional and modern forms of knowledge. Integrating the herbal wisdom of Assam's tribal communities into mainstream education and economic frameworks contributes to the creation of a knowledge

society that values heritage, innovation, and sustainable development.

While Assam boasts an abundance of medicinal plants, their potential remains largely unknown and unexplored. The cultivation, collection, and sale of these medicinal plants provide livelihoods for many, underscoring their economic significance in Assam. The Sonowal Kachari community has immense knowledge about the utilization and consumption of medicinal plants in providing primary health care to the people (Dutta & Barooah, 2021). In Assam commercialization of these plants also leads to much-needed diversification of agriculture. Assam Horti Vision 2020 has taken some initiatives to increase the productivity of a few selected plants (Horti Vision 2020, W-vii). For example, to increase the productivity of lemon several strategies are taken, one being the increased area under cultivation and multi-storied cropping. They also try to increase the productivity of these plants by creating awareness and training among the farmers, financial support, taking up post-harvest processing, improving packaging, etc. However, underutilization can be attributed to various factors including geographical isolation, limited awareness among the population, and inadequate infrastructure for transportation and marketing, among others (Bhuyan, 2021). To address this issue, raising awareness among the local population, and adequate financial and technological support for activities such as nursery development, plantation, harvesting, and processing are crucial steps. By doing so, productivity and quality can be improved, ultimately maximizing the utilization of these valuable species.

To preserve and enhance the economic potential of traditional herbal practices, universities, and research institutions can play a pivotal role by promoting education and research. The following recommendations link directly to the educational role of universities and the support of government initiatives:

Path to Sustainability: Integrating Traditional Herbal Knowledge with Modern Science

To ensure the sustainable utilization and conservation of medicinal plant resources, fostering collaboration among academic institutions, tribal communities, and policymakers is essential. The following recommendations highlight key strategies to achieve this goal:

1. **Foster Interdisciplinary Research:** Interdisciplinary collaboration among departments such as Botany, Pharmacology, Economics, and Anthropology should be encouraged to comprehensively explore, document, and validate traditional herbal practices.
2. **Establish Herbal Research Centers:** Dedicated research centers focusing on the study, preservation, and potential commercialization of indigenous herbal knowledge can be established within universities to strengthen research capacity.
3. **Promote Community Participation:** Active involvement of tribal communities in research initiatives is recommended to ensure that their traditional knowledge is preserved, their contributions are acknowledged, and economic benefits are equitably shared.
4. **Create Knowledge Hubs:** Regional knowledge hubs can be developed to facilitate the exchange of traditional practices among diverse communities, integrating scientific advancements to enhance the value of indigenous herbal knowledge.
5. **Incorporate Traditional Knowledge in Curricula:** Academic curricula should be designed to include indigenous herbal practices, promoting awareness, respect, and understanding of tribal wisdom among students and future researchers.
6. **Facilitate Policy Dialogues:** Regular conferences and policy dialogues involving policymakers, industry leaders, academicians, and tribal representatives can be organized to discuss strategies for the preservation, sustainable use, and commercialization of traditional herbal knowledge.

Conclusion:

The traditional herbal practices of Assam's Deori and Sonowal Kachari tribes offer valuable insights into sustainable healthcare and economic growth. By bridging the gap between

tradition and modern science, educational institutions can play a key role in fostering a knowledge society that not only preserves indigenous wisdom but also leverages it as an economic driver. Through interdisciplinary collaboration and inclusive policies, Assam can position itself as a leader in blending tradition with innovation for holistic development.

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Table 1: Herbal Remedies common to both the tribes –Sonowal Kachari and Deori. [Websites: (W: i-vi)]

Sl. No.	Vernacular Name (in Assamese)	Scientific Name	Family	Type	Part Used	Diseases Treatment	Methods of preparation
1	Bel	Aegle marmelos Correa	Rutaceae	Plant	Leaves	Nasal Bleeding,	Extraction of juice from 3-4 leaves, mixed with sugar, once daily for 3 days for nasal bleeding.
					Fruit	digestive disorders, ulcers, headache, hypertension, diabetes	Ripe fruit juice or ripe fruit with milk can be taken for treatingother diseases.
2	Duroon bon / Durun	*Leucasaspera (Willd.)*	Lamiaceae	Leucas plant	Leaves	Bronchitis, Jaundice, Inflammations, asthma, indigestion & Worm Infection, pain and paralysis, Sinusitis, Fever, scabies, coughs and cold.	Juice of raw leaves can be taken in case of severe condition For Mild fever. curry preparation or mashed boiled leaves with garlic can be taken. For sinus leaves are held over nose and the strong smell is inhaled. Alternatively 3-4 drops of juice extract from the paste can be put in the nose.

3	Kaji Nemu/ Nemu tenga	Citrus limon (L.) Burm. f.	Rutaceae	*State Fruit of Assam (Citrus Limon)*	Fruit Juice / Peel/seed	Dysentery, Vomiting & Nausea. It is helpful in Anti-inflammatory, Antimicrobial, Anticancer and Antiparasitic activities	Raw juice diluted with warm water and mixing with salt can be taken in case of Dysentary. Sometimes raw juice mixed with sugar is applied to the forehead of patients to get relief from fever. seeds are also used to cure stomach problems like indigestion. Smelling the peel of Lemon helps to reduce vomiting and nausea.
4	Manimuni / Bor manimuni	*Centella asiatica*	Apiaceae	Herbaceous, Perennial plant	Whole plant	Stomach Ailments, and Nutrition Deficiency	For cure of Dysentery, juice mixed with sugar or honey to be taken for a month.
5	Matikathal	*Ananascosmosus Merrill*	Bromeliaceae	Fruit	Fruit/leaves	Tonsilitis, Diarrhoea	Fruit juice to be taken for consecutive 3 days for tonsilitis cure Tender leaves are used for diarrhoea.

6	Masundari / Mahsundary	*Houttuynia cordata*	Saruraceae	Fish mint/ Chameleon Plant, perennial herb	Leaves	Constipation, Reducing gastric problems, Measles, Dysentery, Ascites, Piles, Skin troubles.	Raw or boiled juice of leaves can be taken and curry prepared with garlic is also helpful.
7	Tuloshi / Kola Tulashi	Ocimum Sanctum		Plant	Leaves	Ear Pain	Boiled juice is applied in the ears.
8	Neem	*Azadirachtaindica*	Meliaceae	Plant	Leaves	Scabies	Bathing with boiled juice of neem leaves
9	Letaguti	*Caesalpiniabonducella*	Leguminosae	Plant	Seed	Wounds, Cough	Paste applied in wound Paste is taken with warm water for cough.
10	Nephaphu	*Clerodendrumcolebrookianum*	Verbenaceae	Plant	Leaves	High blood pressure	Boiled leaves or curry prepared with garlic can be taken for High Blood Pressure

11	Halodhi	*Curcuma domestica*	Zingiberacea	Perennial Herb	Rhizome	Jaundice, Anti carcinogenic	Juice extracted can be taken with warm water or milk.
12	Amlokhi	*Emblica Officinalis*	Phyllanthaceae	Plant	Fruit	Diarrhoea Hair growth, Skin glow Immunity booster	Dried fruit is taken with black salt with a glass of water to cure Diarrhoea. For growth of hair and glowing of skin paste can be applied to the specific area like hair and face. Curry can also be prepared.
13	Hilikha	*Terminalia chebula*	Combretacea	Plant	Fruit	Dysentery	Dried fruits in powder form is taken with water.
14	Pipoli	*Piper Longum*	Piperaceae	Flowering Vine	Leaves, Fruit, Barks	Influenza Diarrhoea	Leaves and fruits are used to treat influenza. Barks are taken with misiri water to cure diarrhoea.

15	Gundhuwa Bon	*Ageratum conyzoides*	Asteraceae	Annual herb	Leaves and tender shoots.	Cuts and Wounds	Paste of leaves applied in affected areas.
16	Konibih	*Croton tiglium*	Euphorbiacea	Plant	Young Leaves , buds leaves	Carbuncles	Paste applied
17	Modhuri	*Psidium guajava*	Myrtaceae	Plant	Tender and young Leaves	Dysentery Glossitis	Raw or boiled juice of tender leaves is taken orally for dysentery. Paste of young leaves applied in infected area to cure Glossitis.