Assessing the Contribution of Local and Traded Biodiversity in Community Health Care: A case study from Keelakodankulam village, South India

D. Ahino Mary, F. Merlin Franco and Vivek Babu

Research

Abstract

The study aims to assess the contribution of local and traded biodiversity towards community health care. A total of 106 knowledge holders from the Aatha Pallar community were interviewed and medicinal uses for 70 local plants and 28 plant products purchased from the market were recorded. The Pharmacological Ethnobotanical index was found to be low suggesting knowledge erosion. About 13 plant species used by the community show high Use Value Indices. A majority of the plants used in the community's medicinal system come from the immediate locality and only a minor part comes from the market, though ones from the market tend to have high use value indexes. The study illustrates that local medicinal plant diversity is important for community health care, which in turn, ensures conservation of the local medicinal plant diversity.

Introduction

Food, shelter, clothing and medicine are the indispensable basic needs of any human being. All are derived from earth's biodiversity either directly or indirectly. Humans use various forms of knowledge to harvest biodiversity of which traditional knowledge is the most basic and widely employed form. The importance of traditional knowledge is most pronounced when applied to medicinal plant diversity. This specialized knowledge has helped human beings survive and propagate since their origin on earth (Toledo *et al*. 2009). For health care needs, humans are known to exploit local as well as remote biodiversity for therapeutic purposes. Local biodiversity is accessed directly while remote biodiversity is accessed through various agencies, of which trade is most ubiquitous.

Exploiting local biodiversity for therapeutic purposes requires specialized traditional knowledge that is location-specific; whereas, exploitation of remote biodiversity is enabled by commonly prevailing knowledge from a wide geographic area. For a biological resource to be successfully traded, it has to be sought by a wider population, a demand which would never materialize without the prevalence of common knowledge (pan-community knowledge). Though widely prevalent, this knowledge varies within the system due to the very dynamic nature of non-codified systems. Trade brings biodiversity otherwise inaccessible due to factors such as exoticness, rarity, or physical distance from the user (Bussmann *et al*. 2007, Revene *et al*. 2008). However, modified forms of a local biological resource might also be traded. For instance, *Zingiber officinale* Roscoe (Ginger) is widely cultivated in tropical regions of India, yet local medicinal herb dealers trade dried ginger which is used extensively both in codified and non-codified systems of Indian medicine. Likewise, *Azadirachta indica* A. Juss. (Neem) is also found naturalized throughout tropical regions of India, yet neem seed oil is widely traded. Mostly, traded plants are collected from their natural habitats, though cultivated species also might be accepted by the consumer (Dold

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Ethnobotany Research & Applications 9:275-286 (2011)

Published: July 30, 2011

www.ethnobotanyjournal.org/vol9/i1547-3465-09-275.pdf

& Cocks 2002). It is generally believed that commercial plant trade has eroded medicinal plant biodiversity, owing to unsustainable harvest methods employed when collecting plants from the wild (Hoareau & DaSilva 1999).

Localized/specialized traditional knowledge is more prone to loss than common knowledge. Since common knowledge is put into practice by a wider population, it is relatively safer and more stable than knowledge dependent on a smaller population. However, when concerning local/specialized traditional knowledge there is a relationship between the biological resource and the prospector that doesn't exist with common knowledge. While human beings readily test locally available biological resources, testing a traded resource requires external stimulus like endorsements by traders, media, non-government organizations (NGOs) or health workers. The direct relationship between local biological resource and local prospector, a traditional healer for instance, is also mutual. Continuous demand for a resource by a local prospector ensures its use, a factor vital for the survival of the knowledge and the resource (Hamilton 2004). When a community loses knowledge about a local biological resource, the community ceases to be concerned about the existence of that particular resource to the point the resource may become locally extinct without notice (Narasimhan & Franco 2009). Hence, it could be said that localized, traditional knowledge contributes to the conservation of local biological resources.

Concerning community health care, both localized and traded biological resources are indispensable. Utilization of remote biodiversity through trade is expensive but a local resource is usually freely available. Moreover, achieving biodiversity through trade is complicated by various external factors such as distance, middle men, accessibility of markets, etc. In contrast, local biological resources are readily available. In fact, any disruption of their supply would greatly affect community health care (Alves & Lerece 2007, Colfer *et al*. 2006, Grogan *et al*. 2009, Shanley & Leda 2003).

Understanding medicinal plant usage patterns at an individual/household level is vital for designing policies on biodiversity conservation (Krog 2006). This study examines contributions of local and traded medicinal plant resources toward health care in an indigenous community classified as Scheduled Caste (SC). Scheduled Castes and tribal communities of India are widely recognized as indigenous. They share similar traditions, histories of descent and marginalization, yet only a few ethnobotanical studies, such as Pushpangadan and Atal (1986), have targeted SCs. Instead, Indian ethnobotanical studies have focused either on tribal communities or knowledge available in codified texts of Vedas, Ayurveda, Sidha, etc.

Methods

The Aatha Pallar community

This study surveyed the Aatha Pallar community of Keelakodankulam village in the Tirunelveli district, Tamil Nadu. Aatha Pallar is considered one among four sub-groups of the Pallar community. The other sub-groups are: Anja Pallar, Aiya Pallar and Amma Pallar. (All four Pallar prefixes are synonyms for mother.) Each community sub-group is further divided into matrilineal clans. Although the traditional occupation of the Aatha Pallar is mat weaving and animal husbandry, they also work as skilled laborers on plantations. The Aatha Pallar, also referred to as Mallar, speak Tamil as their native language (Thurston & Rangachari 1909, Singh 1999). The Indian government identifies the Pallar community as a Scheduled Caste (Constitution of India 1950). Scheduled Caste is a constitutional term collectively applied to indigenous caste groups which were pushed to the lowest status in Indian society by a dominant Hindu culture (Karade 2008, Mendelsohn & Vicziany 1998, Pande 1986). Today, the Indian constitution recognizes these castes as disadvantaged because of their painful pasts and assigns them certain rights and preferential treatment. Owing to the stigma attached to the term Scheduled Caste, these communities prefer to be known by the Marathi term Dalits, meaning crushed or broken to pieces (Mendelsohn & Vicziany 1998, Premsagar 2002).

Study area

This study was conducted in Keelakodankulam, located in the Nanguneri taluk of Tirunelveli district in Tamil Nadu (Figure 1). The village is populated by 88 families, comprised of 183 males and 185 females. The village's main occupation is farming, followed by raising poultry and making mats. Most houses have home gardens in addition to common grazing land and a community pond. Normally, the pond remains dry all year except October-January when the area receives a brief rainfall.

Sampling and data collection

This study's sample was 61 women and 45 men, chosen on the basis of their willingness to participate. Knowledge holders ranged from 21-93 years in age. Data were collected using a semi-structured interview format (Case 1990). Informal discussions and field trips with informants enhanced understanding of indigenous identification, collection and use of medicinal plants in and around the village.

Sample specimens of all medicinal plants were collected and tagged using local names provided by the village knowledge holders. Specimens were deposited in the St. Xavier's College, Palayamkottai, Tamil Nadu herbarium

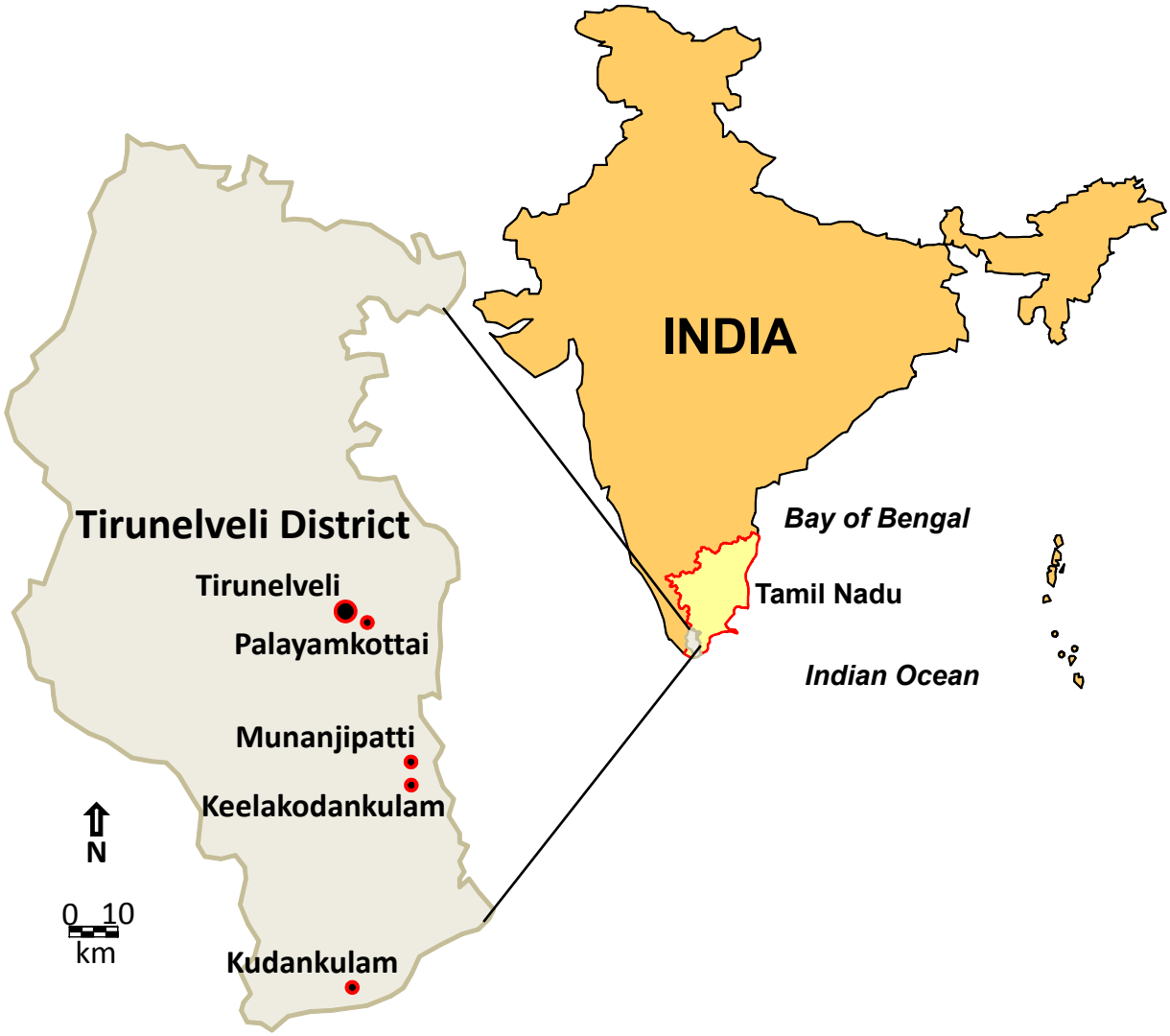

Figure 1. Keelakodankulam village, site of research with Aatha Pallar communities in Tirunelveli District in the state of Tamil Nadu, India.

(XCH), and re-identified using Western standard floras (Gamble 1915-1936, Matthew 1982, 1988, 1991, Nair & Henry 1983). Additionally, samples of all plant products available in local markets were purchased and categorized using the same procedure of dual identification. Prior informed consent was obtained from all participating knowledge holders. The authors are committed towards translating the results of the study into Tamil and sharing it with the community, local government (**panchayat**) and local health workers.

Species inventory

The goal was to inventory every plant species in the village. To that end, specimens were gathered from agricultural areas, road sides, in and around the village pond, home gardens and every house in the village. A total of 347 species were counted. The Porteres Ethnobotanical index was modified to calculate a Pharmacological Ethnobotanical Index (Akerreta *et al*. 2007) that assesses the community's depth of medicinal plant knowledge. This Pharmacological Ethnobotanical Index is defined as the 'ratio between medicinal plants and total flora expressed as a percentage'.

Use Value Index

In order to assess the importance accorded each species in the Aatha Pallar pharmacopeia, use value index was calculated as per the methodology provided by Rossato *et al*. (1999) whereby, Σ

Use value, Uv = ΣUi/n

Where,

Ui → the number of uses mentioned by each informant for a given species.

n → total number of informants.

Results and Discussion

The medicinal plants identified from the Aatha Pallar community in Keelakodankulam village are recorded in Table 1. Some reported medical treatments are unique. For instance, when a child suffers from body pain, *Tamarindus indica* L. (tamarind) leaves are boiled in water later used

Table 1. Plants used by the Aatha Pallar community and their sources in Keelakodankulam village, Tirunelveli District, Tamil Nadu, India. Plant parts of *Azadirachta indica* A. Juss. are harvested from the locality while the seed oil is purchased from the market. Hence it is accounted for twice in the table.

Plant name/plant product name	Family	Local name	Medicinal uses of the plant/ plant product	Source of the raw material
Abutilon indicum (L.) Sweet	Malvaceae	**Thuthi**	Minor tumor, boils	Homestead
Acacia sinuata (Lour.) Merr.	Fabaceae	**Seeyakai**	flatulence	Market
Acalypha indica L.	Euphorbiaceae	**Kuppaimeni**	Cold, scabies, throat pain	Homestead, nearby pond, agricultural field
Achyranthes aspera L.	Amaranthaceae	**Naiyuruvi**	Piles	Homestead, agricultural field
Acorus calamus L.	Acoraceae	**Vasambu**	To help children to speak easily	Market
Aerva lanata (L.) Juss. ex Schult.	Amaranthaceae	**Pongal poo**	Urinary problems	Homegarden
Allium cepa L.	Amaryllidaceae	**Vengayam**	Cold, nasal congestion, throat pain	Market
Allium sativum L.	Amaryllidaceae	**Vellai poondu**	Body pain, diarrhea, tonic, cold	Market
Aloe vera (L.) Burm. f.	Xanthorrhoeaceae	**Kattralai**	To regulate body temperature, ulcer, dandruff	Nearby pond
Alternanthera sessilis (L.) R. Br. ex DC.	Amaranthaceae	**Ponnangani-keerai**	Iron tonic	Homegarden, agricultural field
Amaranthus caudatus L.	Amaranthaceae	**Thandang-keerai**	Iron tonic	Homegarden, agricultural field
Amaranthus roxburghianus H.W. Kung	Amaranthaceae	**Sirukeerai**	Iron tonic	Homegarden, agricultural field
Amaranthus viridis L.	Amaranthaceae	**Araikeerai**	Iron tonic	Homegarden, agricultural field
Annona squamosa L.	Annonaceae	**Seetha**	Anti-lice	Homegarden
Azadirachta indica A. Juss.	Meliaceae	**Vepilai**	Stomach pain, chicken pox, head ache, cold, fever, ulcer	Homegarden, Homestead
Azadirachta indica A. Juss. (oil)	Meliaceae	**Veppennai**	Cold	Market

Plant name/plant product name	Family	Local name	Medicinal uses of the plant/ plant product	Source of the raw material
Borassus flabellifer L.	Arecaceae	**Panai**	To regulate body temperature, cough, cold	Agricultural field
Brassica juncea (L.) Czern.	Brassicaceae	**Kadugu**	Body pain, tonic	Market
Calotropis gigantea (L.) W.T. Aiton	Apocynaceae	**Erukku**	To remove thorns from foot	Homestead
Camellia sinensis (L.) Kuntze	Theaceae	**Theyilai**	Diarrhea	Market
Carica papaya L.	Caricaceae	Papaya	Eye tonic	Homegarden
Carum carvi L.	Apiaceae	**Omam**	Body pain, tonic	Market
Cassia auriculata L.	Fabaceae	**Aavaram**	To regulate body temperature	nearby pond, road side
Catharanthus roseus (L.) G. Don	Apocynaceae	**Nithyakalyani**	Skin diseases	Homegarden
Ceiba pentandra (L.) Gaertn.	Malvaceae	**Ilavam pattai**	Cold	Agricultural field
Centella asiatica (L.) Urb.	Apiaceae	**Vallarai**	Indigestion	Agricultural field
Cissus quadrangularis L.	Vitaceae	**Perandai**	Low blood pressure	nearby pond
Citrullus colocynthis (L.) Schrad.	Cucurbitaceae	**Sirukumidi**	Snake poison	Agricultural field
Citrus limon (L.) Osbeck	Rutaceae	**Elumichai**	Diarrhea	Homegarden
Cleome gynandra L.	Cleomaceae	**Thaivalai**	Cold	Homestead, agricultural field
Cleome viscosa L.	Cleomaceae	**Ekkadu**	Head ache	Homegarden
Coccinia grandis (L.) Voigt	Cucurbitaceae	**Kovaikai**	Ulcer	Homestead, agricultural field
Cocos nucifera L.	Arecaceae	**Thennai**	To regulate body temperature	Homegarden, agricultural field
Coffea arabica L.	Rubiaceae	**Caapi**	Wound	Market
Coleus amboinicus Lour.	Lamiaceae	**Thalaivali ilai**	Head ache	Homegarden
Coriandrum sativum L.	Apiaceae	**Kothamalli**	Cold	Market
Crateva religiosa G. Forst.	Capparaceae	**Mavilanga-pattai**	Cold, tiredness	Market
Crocus sativus L.	Iridaceae	**Kunkumam**	Pregnancy-foetal care	Market
Cucumis sativus L.	Cucurbitaceae	**Vellari**	To regulate body temperature	Agricultural field
Cuminum cyminum L.	Apiaceae	**Seeraham**	Diarrhea	Market
Curcuma longa L.	Zingiberaceae	**Manjal**	Anti-clot	Market
Cynodon dactylon (L.) Pers.	Poaceae	**Aruhampull**	Diabetes	Agricultural field
Datura metel L.	Solanaceae	**Oomathai poo**	Ear pain	Agricultural field
Delonix elata (L.) Gamble	Fabaceae	**Vathamadaki**	rheumatism	Homegarden

Plant name/plant product name	Family	Local name	Medicinal uses of the plant/ plant product	Source of the raw material
Dodonaea viscosa Jacq.	Sapindaceae	**Virali**	Anti-clot	nearby pond
Eclipta prostrata (L.) L.	Asteraceae	**Karisalankani**	Wound, hair growth	Agricultural field
Enicostema littorale Blume	Gentianaceae	**Vellarugu**	Tooth pain, flatulence	Agricultural field
Eucalyptus globulus Labill.	Myrtaceae	Eucalyptus	Cold, headache	Market
Ferula assa-foetida L.	Apiaceae	**Kayam**	tonic	Market
Hibiscus rosa-sinensis L.	Malvaceae	**Chembaruthi**	Hair growth, cardio-tonic	Homegarden
Justicia adhatoda L.	Acanthaceae	**Adathoda**	Cold	Agricultural field
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	**Usilam pattai**	Cold	Agricultural field
Lawsonia inermis L.	Lythraceae	**Maruthani**	To promote hair growth	Homegarden
Leucas aspera (Willd.) Link	Lamiaceae	**Thumbai**	Cold	Homestead
Mentha spicata L.	Lamiaceae	**Pudhina**	Indigestion	Market
Momordica charantia L.	Cucurbitaceae	**Paharkai**	Ulcer	Homegarden
Morinda pubescens Sm.	Rubiaceae	**Manjanathi**	Head ache	Agricultural field
Moringa oleifera Lam.	Moringaceae	**Murungai**	Eye tonic, cold, fever	Homegarden, agricultural field
Mukia maderaspatana (L.) M. Roem.	Cucurbitaceae	**Mosumosukai**	Wound	Agricultural field
Murraya koenigii (L.) Spreng.	Rutaceae	**Karivepilai**	To promote hair growth	Homegarden
Musa acuminata X *balbisiana* Colla	Musaceae	**Vazhai**	urinary problems, ulcer	Homegarden, Agricultural field
Myristica fragrans Houtt.	Myristicaceae	**Jathikai**	Pimples	Market
Ocimum basilicum L.	Lamiaceae	**Karunthulasi**	Cold, fever	Homegarden
Ocimum gratissimum L.	Lamiaceae	**Thulasi**	Cough, cold, fever	Homestead, nearby pond, agricultural field
Ocimum tenuiflorum L.	Lamiaceae	**Naithulasi**	Cold, fever	Agricultural field
Opuntia vulgaris Mill.	Cactaceae	**Sapathikalli**	Boils	Nearby pond
Oryza sativa L.	Poaceae	**Nellu**	Anti-clot	Agricultural field
Papaver somniferum L.	Papaveraceae	**Kasakasa**	Diarrhea	Market
Pergularia daemia (Forssk.) Chiov.	Apocynaceae	**Veliparuthi**	**Varma** (Tamil system of treatment similar to acupressure)	Homestead, agricultural field
Phyllanthus amarus Schumach. & Thonn.	Phyllanthaceae	**Keezha nelli**	Jaundice	Homestead, agricultural field
Phyllanthus emblica L.	Phyllanthaceae	**Muzhuu nelli**	Diabetes	Homegarden, agricultural field
Phyllanthus polyphyllus Dalzell & Gibson	Phyllanthaceae	**Arai Nelli**	Bleeding gums	Homegarden

Plant name/plant product name	Family	Local name	Medicinal uses of the plant/ plant product	Source of the raw material
Physalis minima L.	Solanaceae	**Kutti thakali**	Ulcer	Homegarden
Piper betle L.	Piperaceae	**Vetrilai**	Cold, diarrhea	Market
Piper longum L.	Piperaceae	**Thipili**	Cold	Market
Piper nigrum L.	Piperaceae	**Milagu**	Body pain, antidote for poisons, diarrhea, tonic, cold, throat pain	Market
Psidium guajava L.	Myrtaceae	**Koyya**	Tonic	Homegarden
Punica granatum L.	Lythraceae	**Mathulai**	Blood purification	Homegarden
Ricinus communis L.	Euphorbiaceae	**Aamanaku**	To regulate body temperature	Agricultural field
Santalum album L.	Santalaceae	**Santhanam**	Pimples, facial cosmetics	Market
Sesamum indicum L.	Pedaliaceae	**Ell**	Menstrual problems	Market
Sesbania grandiflora (L.) Pers.	Fabaceae	**Agathi**	Ulcer	Agricultural field
Sida acuta Burm. f.	Malvaceae	**Arivamanai-poodu**	Wound	Road side
Solanum nigrum L.	Solanaceae	**Manathakkali**	Ulcer	Homegarden
Solanum torvum Sw.	Solanaceae	**Sundaikai**	Ulcer	Homegarden
Solanum trilobatum L.	Solanaceae	**Thoothuvalai**	Cold	Relative's home at Munanjipatti
Solanum virginianum L.	Solanaceae	**Kandankathri**	Cold	Homestead
Syzygium aromaticum (L.) Merr. & L.M. Perry	Myrtaceae	**Kirambu**	Tooth pain	Market
Syzygium cumini (L.) Skeels	Myrtaceae	**Naval**	Blood 'purification'	Agricultural field
Tabernaemontana divaricata (L.) R. Br. ex Roem. & Schult.	Apocynaceae	**Nanthiyavattai**	To 'cool' the eyes	Homegarden
Tamarindus indica L.	Fabaceae	**Puli**	Body pain in children	Homegarden
Tephrosia purpurea (L.) Pers.	Fabaceae	**Kolungi**	Cold, diarrhoea	Homestead
Terminalia chebula Retz.	Combretaceae	**Kadukai**	Rain itch	Market
Trigonella foenum-graecum L.	Fabaceae	**Venthayam**	To regulate body temperature	Market
Vigna unguiculata (L.) Walp.	Fabaceae	**Kaanam**	Urinary problems	Agricultural field
Vitex negundo L.	Lamiaceae	**Nochi**	Anti-clot	Munanjipatti road side, agricultural field
Zingiber officinale Roscoe	Zingiberaceae	**Sukku**	Body pain, tooth pain, seasonal fever, tonic, throat pain	Market
Ziziphus jujuba Mill.	Rhamnaceae	**Ilanthai**	Blood 'purification'	Agricultural field

to bathe the afflicted child. Afterwards, the child is rocked in the **vaeshti** of his/her maternal uncle. (A **vaeshti** is a piece of cloth traditionally worn by the men of South India.) Treatment is completed when **Oram Pottu**; **Oram Pottu** ("Let the ache go away; Let the ache go away!") is chanted thrice. Another example of indigenous medical treatment addresses infants (up to 2 years old) suffering with a cold. In this remedy, *Allium cepa* L. (Shallot) juice is taken and applied to the **pathappukuli** (the whorl on an infant's head) and the cold is alleviated immediately.

People's traditional knowledge of medicinal plant biodiversity

Based on interviews with 106 informants, medicinal uses were recorded for a total of 70 plant species (Table 1) and 28 plant products purchased from the local market. One species, *Azadirachta indica* A. Juss, is harvested by the village but its seed oil extract is purchased from the market and, thus, represented twice in Table 1. Market-based medicinal ingredients are generally bought from traders in nearby Palayamkottai's market. The 97 species used for medicinal purposes by this community belong to 44 different plant families. Most species are from the families Fabaceae (8 species) or Lamiaceae (7 species). Most of the other families are represented by one species each (Figure 2).

Several plant species are used for treating more than one disease. For instance, the facility to treat a common cold is ascribed to 24 plant species. Likewise, fever, ulcer, scabies, diarrhoea etc., are treated with multiple plant species. As illustrated in Table 1, the community uses medicinal plant biodiversity to treat at least 43 ailments. Only

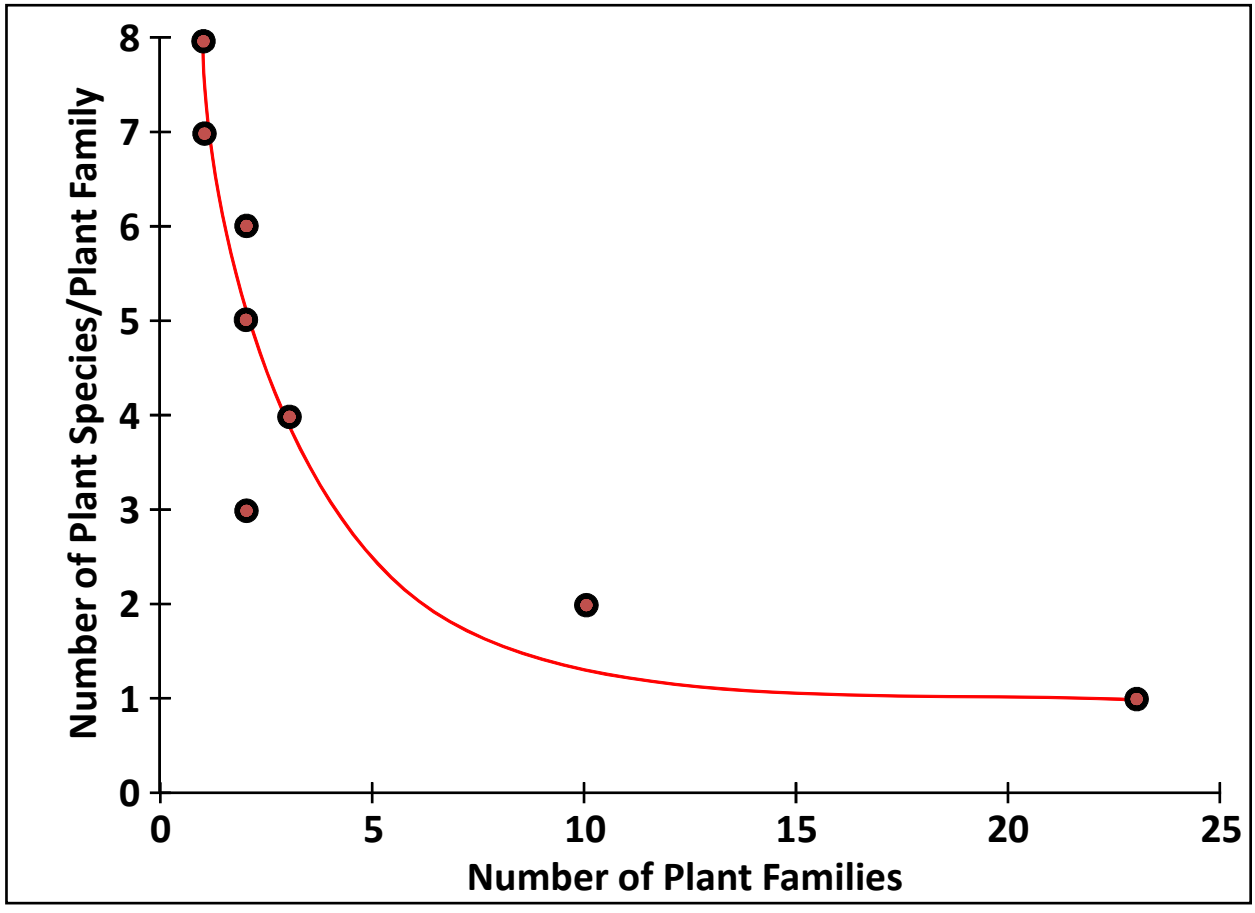

Figure 2. Number of medicinal plant species within each plant family identified at Keelakodankulam village, Tirunelveli District, Tamil Nadu, India. Families with: 8 species (Fabaceae); 7 species (Lamiaceae); 6 species (Amaranthaceae, Solanaceae); 5 species (Apiaceae, Cucurbitaceae); 4 species (Apocynaceae, Malvaceae, Myrtaceae); 3 species (Phyllanthaceae, Piperaceae); 2 species (Amaryllidaceae, Arecaceae, Cleomaceae, Euphorbiaceae, Lythraceae, Meliaceae, Poaceae, Rubiaceae, Rutaceae, Zingiberaceae); and 1 species each (Acanthaceae, Acoraceae, Anacardiaceae, Annonaceae, Asteraceae, Brassicaceae, Cactaceae, Capparaceae, Caricaceae, Combretaceae, Gentianaceae, Iridaceae, Moringaceae, Musaceae, Myristicaceae, Papaveraceae, Pedaliaceae, Rhamnaceae, Santalaceae, Sapindaceae, Theaceae, Vitaceae, Xanthorrhoeaceae).

four listed ailments - poisonous bites, diabetes, urinary problems and jaundice - can be considered serious health conditions. This indicates that the community depends on medicinal plants mostly for minor ailments. However, health conditions like fever, hypotension, boils, and urinary troubles can be either minor ailments themselves or symptoms of other major ailments. This suggests that the community depends upon traditional medicine for quick treatments. Thus, local plants provide the community with its most immediate, convenient and inexpensive medicine.

State of medicinal plant knowledge

A total of 347 plant species were inventoried in and around the village. Of that total, 194 species were not associated with any use by the community, 70 species had medicinal purposes and 83 species were accorded ornamental value. The Pharmacological Ethnobotanical Index was calculated as 20.17% which means less than one third of the community's plant species are used for medicinal purposes. According to Mesa-Jiménez (1996), when few plants are considered medicinal, communities ascribe higher rates of validation to those plants. However, when the majority of traditional plant treatments are for minor ailments, the low Pharmacological Ethnobotanical Index indicates a low density of medicinal plant knowledge. This suggests erosion of medicinal plant knowledge and warrants revitalization of the community's traditional medicinal system. Systematic revitalization would ensure constant use of more species which, in turn, would conserve local biodiversity (Narasimhan & Franco 2009).

Contribution of local and traded biodiversity in community health care

Many of the medicinal plants (30 species) used by the community are collected from home gardens nurtured by women. This suggests that women and home gardens serve a vital role in conserving medicinal plants and associated knowledge. Finerman and Sacket (2003) emphasise that threats to home gardens also threaten the very foundation of a community's health system as well as degrade women's authority in the home and community. The pattern of conservation provided by home gardens can be termed as 'conservation through use' (Eyzaquirre & Linares 2001). These facts highlight the need for conserving the home gardens.

After home gardens, agricultural fields are the second best source of medicinal plant species and markets are the third important source (28 species) in the community. Additionally, a few plants are collected from other villages (such as Munanjipatti and Kudankulam), showcasing the **bonhomie** between villages linked by mutual need for traditional medicine. Homesteads, home gardens, agricultural fields and roadsides are sources for most of the community's medicinal plant needs. These locations can be collectively classified as human managed or disturbed areas. Voek (2004) believes people in disturbed areas tend to use more local medicinal plants due to familiarity or accessibility. This idea is contested by de Albuquerque (2006) whose study in the north eastern region of Brazil showed those people neglected medicinal plants growing near their homes or on local roadsides. Our study's results, however, agree more closely with the findings of Voek (2004).

To investigate the importance of local biodiversity in this community's health care system, use values of various plant species and products were calculated (Table 2). From the Table 2, it is evident that 13 species have high use values of which 8 eight are accessed through markets. Their reliance on markets suggests a pan-community quality and wider knowledge base since markets and trade

Table 2. Use value indices of species used by the community, both from the locality as well as traded in Keelakodankulam village, Tirunelveli District, Tamil Nadu, India.

Plant name/plant product name	Number of		Use value index
	Uses	Knowledge holders	
Abutilon indicum (L.) Sweet	2	2	1
Acacia sinuata (Lour.) Merr.	1	1	1
Acalypha indica L.	26	25	1.04
Achyranthes aspera L.	1	1	1
Acorus calamus L.	1	1	1
Aerva lanata (L.) Juss. ex Schult.	1	1	1
Allium cepa L.	21	19	1.105
Allium sativum L.	14	12	1.167
Aloe vera (L.) Burm. f.	2	2	1
Alternanthera sessilis (L.) R. Br. ex DC.	1	1	1
Amaranthus caudatus L.	2	2	1
Amaranthus roxburghianus H.W. Kung	2	2	1
Amaranthus viridis L.	1	1	1
Annona squamosa L.	1	1	1
Azadirachta indica (oil)	2	2	1
Azadirachta indica A. Juss.	19	15	1.266
Borassus flabellifer L.	1	1	1
Brassica juncea (L.) Czern.	4	3	1.333

Plant name/plant product name	Number of		Use value index
	Uses	Knowledge holders	
Calotropis gigantea (L.) W.T. Aiton	1	1	1
Camellia sinensis (L.) Kuntze	1	1	1
Carica papaya L.	2	2	1
Carum carvi L.	4	3	1.333
Cassia auriculata L.	1	1	1
Catharanthus roseus (L.) G. Don	1	1	1
Ceiba pentandra (L.) Gaertn.	1	1	1
Centella asiatica (L.) Urb.	2	2	1
Cissus quadrangularis L.	1	1	1
Citrullus colocynthis (L.) Schrad.	1	1	1
Citrus limon (L.) Osbeck	1	1	1
Cleome gynandra L.	5	5	1
Cleome viscosa L.	1	1	1
Coccinia grandis (L.) Voigt	3	3	1
Cocos nucifera L.	1	1	1
Coffea arabica L.	1	1	1
Coleus amboinicus Lour.	2	2	1
Coriandrum sativum L.	1	1	1
Crateva religiosa G. Forst.	1	1	1
Crocus sativus L.	1	1	1
Cucumis sativus L.	1	1	1
Cuminum cyminum L.	4	3	1.333
Curcuma longa L.	6	5	1.2
Cynodon dactylon (L.) Pers.	2	2	1
Datura metel L.	1	1	1
Delonix elata (L.) Gamble	4	4	1
Dodonaea viscosa Jacq.	1	1	1
Eclipta prostrata (L.) L.	3	3	1
Enicostema littorale Blume	2	2	1
Eucalyptus globulus Labill.	1	1	1
Ferula assa-foetida L.	6	6	1

Plant name/plant product name	Number of		Use value index
	Uses	Knowledge holders	
Hibiscus rosa-sinensis L.	5	5	1
Justicia adhatoda L.	1	1	1
Lannea coromandelica (Houtt.) Merr.	1	1	1
Lawsonia inermis L.	3	3	1
Leucas aspera (Willd.) Link	18	17	1.058
Mentha spicata L.	1	1	1
Momordica charantia L.	2	2	1
Morinda pubescens Sm.	1	1	1
Moringa oleifera Lam.	9	7	1.285
Mukia maderaspatana (L.) M. Roem.	1	1	1
Murraya koenigii (L.) Spreng.	5	4	1.25
Musa acuminata X *balbisiana* Colla	5	5	1
Myristica fragrans Houtt.	1	1	1
Ocimum basilicum L.	1	1	1
Ocimum gratissimum L.	24	24	1
Ocimum tenuiflorum L.	4	4	1
Opuntia vulgaris Mill.	1	1	1
Oryza sativa L.	5	5	1
Papaver somniferum L.	1	1	1
Pergularia daemia (Forssk.) Chiov.	1	1	1
Phyllanthus amarus Schumach. & Thonn.	7	7	1
Phyllanthus emblica L.	1	1	1
Phyllanthus polyphyllus Dalzell & Gibson	2	2	1
Physalis minima L.	1	1	1
Piper betle L.	17	17	1
Piper longum L.	10	10	1
Piper nigrum L.	19	16	1.187
Psidium guajava L.	1	1	1
Punica granatum L.	1	1	1
Ricinus communis L.	1	1	1
Santalum album L.	1	1	1
Sesamum indicum L.	1	1	1
Sesbania grandiflora (L.) Pers.	1	1	1
Sida acuta Burm. f.	1	1	1

Plant name/plant product name	Number of		Use value index
	Uses	Knowledge holders	
Solanum nigrum L.	1	1	1
Solanum torvum Sw.	2	2	1
Solanum trilobatum L.	3	3	1
Solanum virginianum L.	18	18	1
Syzygium aromaticum (L.) Merr. & L.M. Perry	1	1	1
Syzygium cumini (L.) Skeels	1	1	1
Tabernaemontana divaricata (L.) R. Br. ex Roem. & Schult.	1	1	1
Tamarindus indica L.	1	1	1
Tephrosia purpurea (L.) Pers.	18	18	1
Terminalia chebula Retz.	1	1	1
Trigonella foenum-graecum L.	1	1	1
Vigna unguiculata (L.) Walp.	2	2	1
Vitex negundo L.	3	3	1
Zingiber officinale Roscoe	21	17	1.235
Ziziphus jujuba Mill.	1	1	1

provide only those specialized resources in high demand (Polasky *et al*. 2004). Though plants accessed through trade have high use value, local medicinal plants have greater impact. The fact that markets supply only 28 of the community's 97 medicinal species indicates home gardens, homestead lands and common properties are more than supplementary sources for biodiversity.

Conclusions

This study indicates traditional medicine mostly provides treatments for minor ailments that are immediate, convenient, and relatively cost-free. A majority of medicinal plant biodiversity accessed by the community comes from local surroundings such as home gardens, roadsides and agricultural fields. These sources help make traditional medicines readily available and inexpensive. Traded medicinal plants also contribute significantly towards community health by introducing remote and otherwise unavailable resources. Finally, investing in expanded home garden systems and encouraging wider use of more local species would encourage conservation of local biodiversity while strengthening the community's traditional medicinal system.

Acknowledgements

This study was conducted while the authors AMD and FMF were affiliated to the St. Xavier's college, Palayamkottai. The authors are grateful to the management and faculty of St. Xavier's College, Palayamkottai, South India for providing us with laboratory facilities. We are grateful to the knowledge holders of Keelakodankulam, for participating in this study and for their kind cooperation. We also thank Dr. Rainer W Bussmann for his editing and the reviewers for their kind comments and suggestions. .

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