Seed to Trees Project: Biodiversity and Indigenous Knowledge

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Prepared by:

Dr. Pimpimon Kaewmanee

Dr. Khuanphirom Naruangsri

Miss. Pornpawee Laohasom

FORRU-CMU Co-Directors

Dr. Stephen Elliott

Dr. Dia Panitnard Shannon

1. Introduction

The “Seed to Tree: Value Chains and Partnerships for Resilient Restored Forests” project is a 2.5-year initiative designed to enhance the effectiveness, carbon sequestration potential, and conservation value of forest restoration efforts. Supported by the UK Mission to ASEAN through the ASEAN–UK Green Transition Fund, the project aims to strengthen restoration value chains by improving the availability and quality of native tree seeds and seedlings while fostering collaboration among restoration actors. A central objective of the project is to promote the meaningful participation of Indigenous Peoples and Local Communities (IPLCs) in restoration initiatives, recognizing their knowledge, experience, and important role in sustainable seed supply systems. While large-scale implementation focuses on priority landscapes in Malaysia, the project also develops methodologies, decision-support tools, and knowledge products intended to be scalable across the ASEAN region, including collaborative knowledge-gathering initiatives with communities in Thailand.

The Forest Restoration Research Unit (FORRU), Chiang Mai University, contributes to the project as a technical partner in Thailand, bringing expertise in tropical forest ecology, native tree propagation, and forest restoration. FORRU’s role includes supporting the documentation of local ecological knowledge of useful tree species, conducting baseline assessments with local communities, and facilitating collaboration among researchers, local stakeholders, and restoration practitioners. Through these activities, FORRU helps ensure that community knowledge, species preferences, and ecological insights from northern Thailand are systematically documented and integrated into the project’s broader restoration knowledge base, contributing to the development of locally appropriate and scalable restoration approaches across the region.

For forest restoration to be resilient and context-specific, it must be grounded in the knowledge and experiences of the communities who interact with the landscape on a daily basis. A foundational component of this project is therefore the systematic documentation of traditional ecological knowledge held by IPLC members. Through targeted surveys and interviews, the project captures detailed agro-ecological insights that may not be readily detected through conventional scientific monitoring. These include local observations on which native species are most tolerant to drought or flooding, which species contribute to soil fertility, and which trees provide important resources for wildlife. Integrating this knowledge into the project’s decision-support tools ensures that restoration planning is both ecologically robust and responsive to local environmental conditions.

A key strategy for strengthening community engagement is the deliberate focus on “useful plants”—tree and shrub species that provide tangible benefits for local households. The project therefore identifies species that are most valued by communities for timber, fuelwood, food, forage, and medicinal uses. Prioritizing these species creates opportunities for IPLC members to participate in native seed value chains, particularly through the collection and supply of

genetically diverse seedstock for restoration activities. Supporting community participation—especially among women—in these seed supply systems not only improves the availability of quality planting material but also creates opportunities for livelihood generation and local economic development. When restoration species provide clear practical and economic benefits, communities are more likely to become active and committed partners in the restoration process.

The long-term sustainability of restored forests is closely linked to the well-being and continued engagement of the communities living alongside them. By documenting species that have disappeared or declined in local landscapes, the project can support efforts to reintroduce culturally and ecologically significant tree species. In addition, aligning restoration with existing agroforestry practices, such as selecting tree species that integrate well with crops in farms and home gardens, ensures that restoration activities complement rather than compete with local livelihoods and food security. By combining traditional ecological knowledge with the development of community-based seed supply systems, the Seed to Tree project promotes restoration strategies that support both ecosystem recovery and community resilience, laying the foundation for long-term success in forest restoration initiatives.

The specific objectives of this baseline and capacity needs assessment are:

- To collect comprehensive information on tree species that are important to IPLC members, including their uses and agro-ecological characteristics.
- To strengthen the project's decision-support tools by integrating traditional ecological knowledge.
- To ensure that species and uses most relevant to local communities are explicitly considered in regional restoration planning.
- To utilize the gathered information to design more effective initiatives that support restoration actors and empower IPLCs in forest restoration activities.

2. Description of the Study Area

The study was conducted in ten villages across northern Thailand, covering parts of Chiang Mai, Chiang Rai, Lamphun, and Mae Hong Son provinces (Figure 1 & Table 1). The sites are distributed a broad geographic range of upland and mid-elevation landscapes in the northern region. Elevation across the study sites ranges from 234 to 1,050 m above sea level, reflecting diverse topographic conditions including mountainous terrain, valley bottoms, and upland slopes. This elevational gradient encompasses several forest ecosystems typical of northern Thailand, including dry dipterocarp forests at lower elevations, mixed deciduous forests in intermediate zones, and evergreen or hill evergreen forests in higher and more humid areas.

The selected villages are located in landscapes with varying land-use and management regimes. Some communities are situated within or adjacent to protected areas and national parks, while others are located in multiple-use landscapes outside protected areas, where agriculture and

community forest management are common. Local land-use systems typically include a mosaic of community forests, agroforestry systems, smallholder farms, and home gardens, reflecting the close relationship between local livelihoods and forest resources. This diversity of ecological conditions and land management contexts provides an opportunity to document a wide range of local knowledge on tree species and their roles in both forest ecosystems and community-based restoration practices.

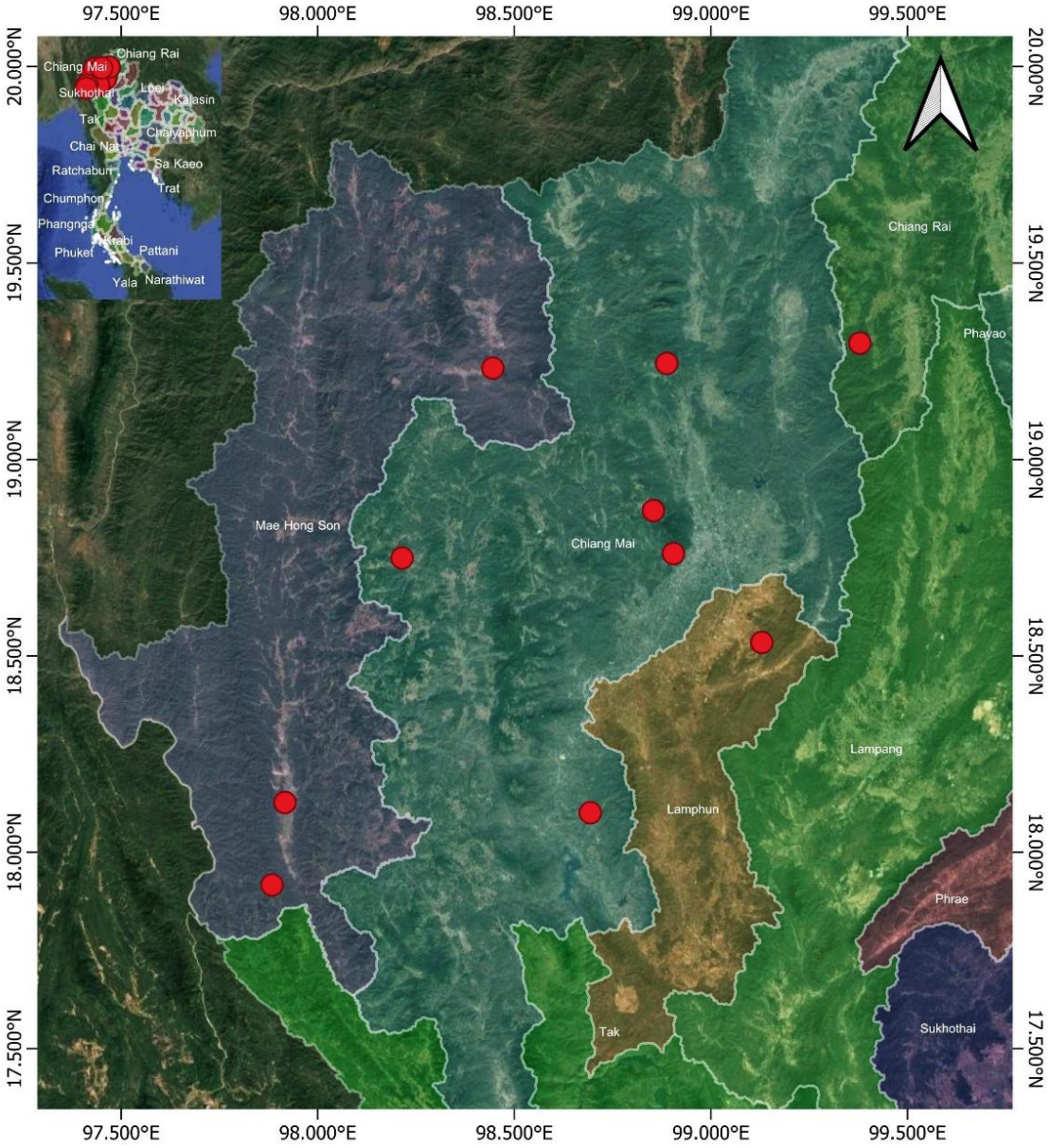

Figure 1 Map of studied sites, red dot (●) represented the location of the observed villages in each province, Northern Thailand

Table 1 List of studied location in four Provinces Northern Thailand.

Village	Sub-District	District	Province	Coordinate
Huay Phak Kut	Mae Suek	Mae Chaem	Chiang Mai	18.749092, 98.173327 **Elevation:** 1050 m
Mae Sa Noi	Pong Yaeng	Mae Rim	Chiang Mai	18.868175, 98.852587 **Elevation:** 1008 m
Mae Hia Nai	Mae Hia	Mueang Chiang Mai	Chiang Mai	18.752515, 98.923506 **Elevation:** 369 m
Tan Nuea	Ban Tan	Hot	Chiang Mai	18.101281, 98.719280 **Elevation:** 600 m
Pha Pu Chom	Kuet Chang	Mae Taeng	Chiang Mai	19.244712, 98.887804 **Elevation:** 773 m
Huay Hin Lat Nai	Ban Pong	Wiang Pa Pao	Chiang Rai*	19.294681, 99.376656 **Elevation:** 909 m
Huay Sai Khao	Si Bua Ban	Mueang	Lamphun	18.537787, 99.128782 **Elevation:** 415 m
Sop Sa	Mueang Paeng	Pai	Mae Hong Son	19.221188, 98.418907 **Elevation:** 469 m
Phae Ta Puang	Mae Yuam	Mae Sariang	Mae Hong Son	18.127331, 97.915913 **Elevation:** 234 m
Huay Kong Mul	Sop Moei	Sop Moei	Mae Hong Son	17.911170, 97.881173 **Elevation:** 871 m

3. Methodology

Sampling Method

Participants were selected using purposive sampling focusing on individuals who recognized locally for their knowledge of tree species and their uses. Informants included village representatives and community members with experience in forest plants, farming, or seed-related activities. Both individual and small group interviews were conducted depending on availability and preference of each village.

In total, 17 participants of 10 villages were interviewed.

Ethical Considerations

Participation was voluntary, and the study objectives were explained before each interview. Informed consent was obtained from all participants. Personal information was kept confidential, and responses were anonymized and aggregated during analysis.

Data Collection

Data were collected through structured interviews lasting approximately 60 minutes, following the Seed to Tree baseline questionnaire. (See Appendix). Participants were asked to identify important tree species, describe their uses (e.g., food, timber, fuelwood, medicine), and share

ecological knowledge such as growth characteristics, environmental tolerance, wildlife interactions, and compatibility with crops.

When possible, field walks were conducted in farms, home gardens, or nearby forests to observe the mentioned species. Photographs were taken for documentation, and GPS coordinates were recorded to support species verification and ecological context.

Data Validation

After the interviews, a validation workshop was conducted to verify and refine the collected information. The workshop brought together local community representatives from the study villages, researchers from the biology department, botanical experts from the Queen Sirikit Botanic Garden (QSBG), Doi Suthep-Pui National Park and representatives from non-governmental organizations working with local communities, and Forest Restoration Research Unit (FORRU) team.

Preliminary list of species, local names, reported uses, and ecological traits obtained from interviews were presented for review. Participants were invited to confirm species identification, clarify local names, discuss species uses, and provide additional ecological knowledge where necessary. Data from the workshop were used to validate and supplement the interview results and were not treated as an independent respondent dataset.

Data Analysis

All recorded plant species were compiled and taxonomically verified where possible. Species were identified to family and scientific name and classified by growth habit (e.g., tree, shrub, bamboo) and origin (native or exotic) using available botanical databases. Descriptive statistics were used to summarize species diversity, family distribution, and the proportion of native and exotic species. In addition, species were categorized into use groups based on the questionnaire (Appendix): food, fuelwood, timber, medicinal, and others. The frequency of citation for each species was defined as the number of respondents who mentioned that species. The number of species and total citations per category were summarized to identify dominant use types. Moreover, multipurpose species were identified by counting the number of use categories associated with each species. Species were compared based on this count to indicate their functional versatility.

Workshop data were compared with questionnaire results to assess agreement in species use patterns. The comparison focused on the presence and distribution of species across use categories. Workshop data were used to validate and refine species uses rather than for independent quantitative analysis.

Agro-ecological traits were analyzed using qualitative classification based on reported characteristics, including growth rate, ecological functions, and environmental tolerance. Trait frequencies were summarized to identify common patterns relevant to restoration and agroforestry applications.

4. Results

4.1 Respondent Demographics and Background

Majority of respondents were male (71%), with women accounting for 29% of participants. The ethnic composition was diverse, comprising mainly Thai-Karen (59%), followed by Thai-Indigenous (29%) and Thai-Hmong (12%). Educational levels varied ranging from no formal education to postgraduate degrees, however most participants had no schooling or primary schooling only. (Table 2)

Most respondents managed land through a combination of private ownership, ancestral land claims, or community-based allocation systems. All respondents reported access to mobile phones and cellular networks, indicating a high level of basic digital connectivity, but only half of them had unlimited internet data access.

Participants generally demonstrated strong proficiency in the Thai language, while English proficiency was limited (only 3) and typically confined to basic technical terms. Overall, the demographic profile reflects a group of knowledgeable community members with diverse backgrounds and direct engagement in land-based livelihoods.

Table 2 Respondent Characteristics

Variable	Category	n	%
Gender	Male	12	71%
	Female	5	29%
Ethnicity	Thai-Karen	10	59%
	Thai-Indigene	5	29%
	Thai-Hmong	2	12%
Education	None	4	24%
	Primary	4	24%
	Secondary	2	12%
	High school	3	18%
	Bachelor's degree	3	18%
	Postgraduate	1	6%
Smart phone ownership	Yes	17	100%
Internet assess	Yes	17	100%
	Unlimited data	8	47%
	Limited data	9	53%
Thai language proficiency	Basic	8	47%
	Fluent	9	53%
English proficiency	Basic	3	18%

4.2 Use Patterns of Useful Tree and Shrub Species

4.2.1 Recorded Useful Species

A total of 204 useful plant species from 58 families were recorded across the study areas based on information obtained from questionnaire interviews and subsequently verified and supplemented during the validation workshop. Of these, 204 species were identified to species level, while a small number remained unresolved due to insufficient information. The compiled dataset reflects a broad range of plant resources recognized by local communities as important for subsistence and livelihood activities.

Most recorded species were trees, accompanied by a smaller number of shrubs, palms, bamboos, and other plant forms. The majority were native species, while introduced or commercially planted species constituted a smaller proportion. This pattern indicates a strong reliance on native plant resources within local production systems, particularly those associated with farms, home gardens, and nearby forest areas.

Species belonged to a wide range of botanical families, with Fabaceae representing the largest group (29), followed by Moraceae, Fagaceae, Euphorbiaceae, and Dipterocarpaceae (Figure 2). These families include many species which normally found in northern Thailand and contain species widely used for timber, food, fuelwood, and other purposed.

The large number and diversity of useful species recorded demonstrate the depth of local ecological knowledge regarding plant resources and highlight the central role of tree species in supporting subsistence, livelihood resilience, and forest ecosystem functioning within the study area. A complete list of recorded species and their attributes is provided in the Appendix.

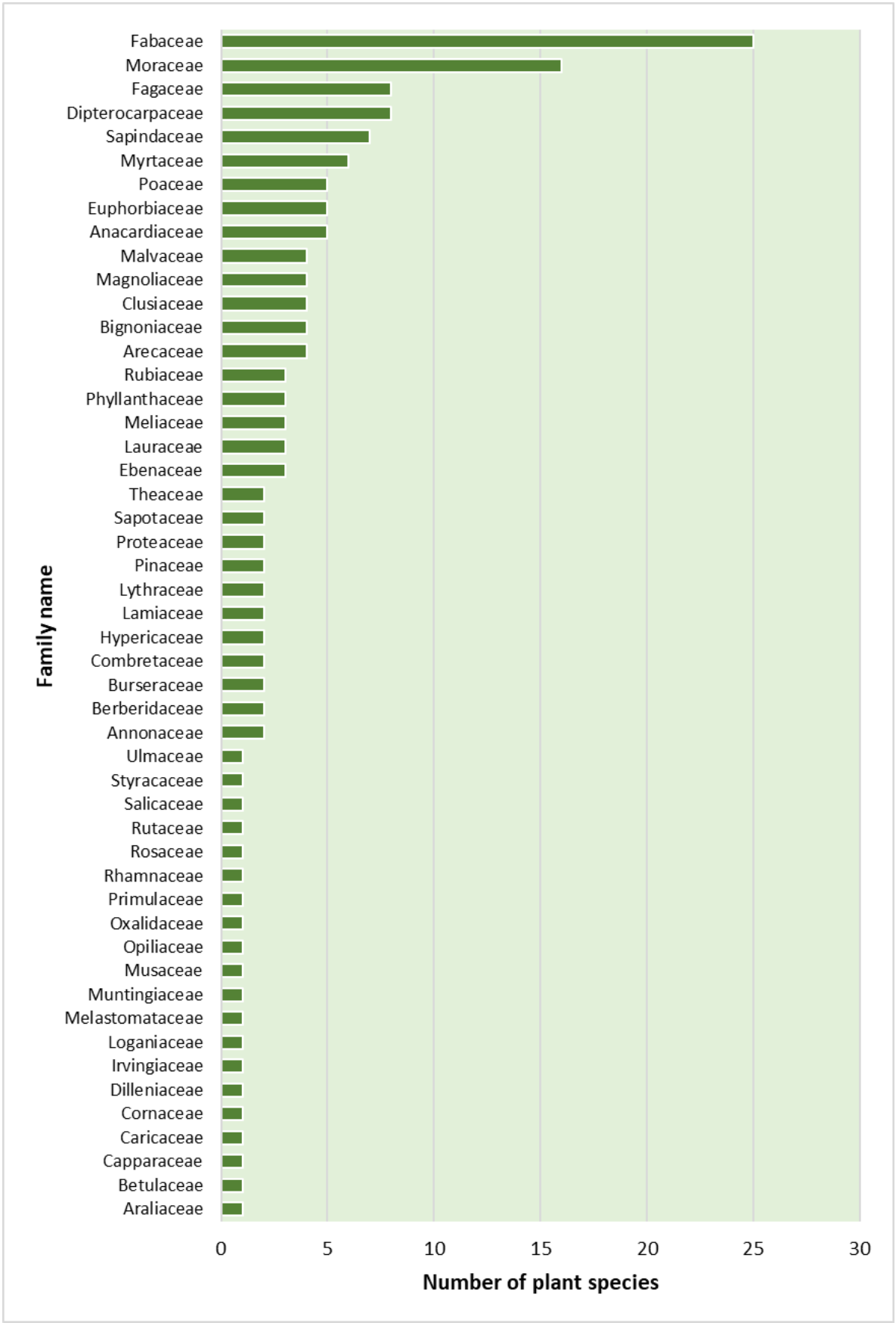

Figure 2 Distribution of useful plant species across different families.

4.2.2 Use categories of recorded species

The analysis presented in this section is based only on responses obtained from the questionnaire interviews, prior to the validation workshop. A total of 85 plant species were reported by respondents, reflecting locally recognized useful trees and shrubs.

Species were classified into six use categories: 1) food, 2) fuelwood, 3) timber, 4) fodder, 5) medicinal, and 6) other uses. Across all responses, timber use was the most frequently reported (40 mentions), followed by food (32 mentions) and medicinal uses (23 mentions), while fodder and other uses were less frequently reported.

The distribution of species across use categories is summarized in Table 3. Most species were associated with food, timber, or medicinal uses, while fewer species were reported for fodder and other purposes. Many species served multiple functions.

Additional species and use information were identified during the validation workshop which expanded the total species listed presented in previous section. However, workshop data were used to verify and supplement interview findings.

Table 3 Plant species by use category

Common name	Scientific name	Family	Habit	Origin[1]	Freq.
Timber					40
สัก	*Tectona grandis*	Lamiaceae	Tree	Native	8
แดง	*Xylia xylocarpa*	Fabaceae	Tree	Native	4
รัง	*Shorea siamensis*	Dipterocarpaceae	Tree	Native	4
มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native	2
ก่อแป้น	*Castanopsis diversifolia*	Fagaceae	Tree	Native	2
สมอไทย	*Terminalia chebula*	Combretaceae	Tree	Native	2
ประดู่ป่า	*Pterocarpus macrocarpus*	Fabaceae	Tree	Native	2
ยางนา	*Dipterocarpus alatus*	Dipterocarpaceae	Tree	Native	2
ยมหอม	*Toona ciliata*	Meliaceae	Tree	Native	2
อบเชย	*Cinnamomum spp.*	Lauraceae	Tree	Native	1
สมอพิเภก	*Terminalia bellirica*	Combretaceae	Tree	Native	1
เลี่ยน	*Melia azedarach*	Meliaceae	Tree	Native	1
ตะเคียน	*Hopea odorata*	Dipterocarpaceae	Tree	Native	1
มะเกลือ	*Diospyros mollis*	Ebenaceae	Tree	Native	1
จำปี	*Magnolia alba*	Magnoliaceae	Tree	Native	1
มะมือ	*Choerospondias axillaris*	Anacardiaceae	Tree	Native	1
เต็ง	*Shorea obtusa*	Dipterocarpaceae	Tree	Native	1
จำปา	*Magnolia champaca*	Magnoliaceae	Tree	Native	1

[1] The origin of the species based on POWO (2026). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/

Common name	Scientific name	Family	Habit	Origin[1]	Freq.
นมนาง/นมวัว	*Xantolis cambodiana*	Sapotaceae	Tree	Native	1
ตะแบก	*Lagerstroemia floribunda*	Lythraceae	Tree	Native	1
ตะไคร้ต้น	*Cymbopogon citratus*	Poaceae	Tree	Native	1
Food					**32**
มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native	6
มะขาม	*Tamarindus indica*	Fabaceae	Tree	Introduced	3
เพกา	*Oroxylum indicum*	Bignoniaceae	Tree	Native	3
อบเชย	*Cinnamomum spp.*	Lauraceae	Tree	Native	3
ก่อเดือย	*Castanopsis acuminatissima*	Fagaceae	Tree	Native	2
แดง	*Xylia xylocarpa*	Fabaceae	Tree	Native	2
มะม่วงป่า	*Mangifera caloneura*	Anacardiaceae	Tree	Native	1
ก่อแป้น	*Castanopsis diversifolia*	Fagaceae	Tree	Native	1
มะไฟ	*Baccaurea ramiflora*	Phyllanthaceae	Tree	Native	1
กระบก	*Irvingia malayana*	Irvingiaceae	Tree	Native	1
ยมหอม	*Toona ciliata*	Meliaceae	Tree	Native	1
เลี่ยน	*Melia azedarach*	Meliaceae	Tree	Native	1
ไผ่	*Bambusa spp.*	Poaceae	Bamboo	Native	1
มะเกลือ	*Diospyros mollis*	Ebenaceae	Tree	Native	1
ต้างป่า/ต้างหลวง	*Trevesia palmata*	Araliaceae	Tree	Native	1
ขี้เหล็กป่า	*Senna timoriensis*	Fabaceae	Tree	Native	1
มะหาด	*Artocarpus lacucha*	Moraceae	Tree	Native	1
แคหางค่าง	*Fernandoa adenophylla*	Bignoniaceae	Tree	Native	1
ผักหวานป่า	*Melientha suavis*	Opiliaceae	Tree	Native	1
Medicinal					**23**
ขมิ้นต้น	*Mahonia duclouxiana*	Berberidaceae	Tree	Native	6
มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native	1
มะขาม	*Tamarindus indica*	Fabaceae	Tree	Introduced	1
เพกา	*Oroxylum indicum*	Bignoniaceae	Tree	Native	1
รัง	*Shorea siamensis*	Dipterocarpaceae	Tree	Native	1
อบเชย	*Cinnamomum spp.*	Lauraceae	Tree	Native	1
กระบก	*Irvingia malayana*	Irvingiaceae	Tree	Native	1
เปล้าหลวง	*Croton roxburghii*	Euphorbiaceae	Tree	Native	1
สมอพิเภก	*Terminalia bellirica*	Combretaceae	Tree	Native	1
กำลังเสือโคร่ง	*Betula alnoides*	Betulaceae	Tree	Native	1
ยมหอม	*Toona ciliata*	Meliaceae	Tree	Native	1
เต็ง (แงะ)	*Shorea obtusa*	Dipterocarpaceae	Tree	Native	1
ต้างป่า/ต้างหลวง	*Trevesia palmata*	Araliaceae	Tree	Native	1
ขี้เหล็กป่า	*Senna timoriensis*	Fabaceae	Tree	Native	1
นมนาง/นมวัว	*Xantolis cambodiana*	Sapotaceae	Tree	Native	1
มะหาด	*Artocarpus lacucha*	Moraceae	Tree	Native	1

Common name	Scientific name	Family	Habit	Origin[1]	Freq.
กำยาน	*Styrax benzoides*	Styracaceae	Tree	Native	1
ฝาง	*Caesalpinia sappan*	Fabaceae	Tree	Native	1
Fuelwood					**18**
สัก	*Tectona grandis*	Lamiaceae	Tree	Native	3
แดง	*Xylia xylocarpa*	Fabaceae	Tree	Native	3
ก่อเดือย	*Castanopsis acuminatissima*	Fagaceae	Tree	Native	2
ก่อแป้น	*Castanopsis diversifolia*	Fagaceae	Tree	Native	2
มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native	1
รัง	*Shorea siamensis*	Dipterocarpaceae	Tree	Native	1
ประดู่ป่า	*Pterocarpus macrocarpus*	Fabaceae	Tree	Native	1
อบเชย	*Cinnamomum spp.*	Lauraceae	Tree	Native	1
กระบก	*Irvingia malayana*	Irvingiaceae	Tree	Native	1
เต็ง (แงะ)	*Shorea obtusa*	Dipterocarpaceae	Tree	Native	1
จำปา	*Magnolia champaca*	Magnoliaceae	Tree	Native	1
ตะไคร้ต้น	*Cymbopogon citratus*	Poaceae	Tree	Native	1
Fodder					**13**
มะเกลือ	*Diospyros mollis*	Ebenaceae	Tree	Native	4
มะกอกป่า	*Spondias pinnata*	Anacardiaceae	Tree	Native	2
มะม่วงป่า	*Mangifera caloneura*	Anacardiaceae	Tree	Native	1
มะไฟ	*Baccaurea ramiflora*	Phyllanthaceae	Tree	Native	1
แดง	*Xylia xylocarpa*	Fabaceae	Tree	Native	1
ไผ่	*Bambusa spp.*	Poaceae	Bamboo	Native	1
มะเดื่อ	*Ficus ssp.*	Moraceae	Tree	Native	1
มะกัก	*Choerospondias axillaris*	Anacardiaceae	Tree	Native	1
มะขาม	*Tamarindus indica*	Fabaceae	Tree	Introduced	1
Other uses					**10**
มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native	1
มะกอกป่า	*Spondias pinnata*	Anacardiaceae	Tree	Native	1
เพกา	*Oroxylum indicum*	Bignoniaceae	Tree	Native	1
แดง	*Xylia xylocarpa*	Fabaceae	Tree	Native	1
รัง	*Shorea siamensis*	Dipterocarpaceae	Tree	Native	1
ยางนา	*Dipterocarpus alatus*	Dipterocarpaceae	Tree	Native	1
มะดำดีควาย	*Sapindus rarak*	Sapindaceae	Tree	Native	1
มะกัก	*Choerospondias axillaris*	Anacardiaceae	Tree	Native	1
จวงหอม	*Cinnamomum caudatum*	Lauraceae	Tree	Native	1
ขมิ้นต้น	*Mahonia duclouxiana*	Berberidaceae	Tree	Native	1

4.2.3 Multipurpose Species

Species associated with more than two use categories were selected for further analysis and are presented in Table 4 to highlight their multipurpose roles. Most of these species are native trees, indicating the importance of indigenous forest resources for local livelihoods. Several species exhibited high multifunction. *Phyllanthus emblica* and *Xylia xylocarpa* (Figure 3) were associated with five distinct uses, while *Shorea siamensis* and *Cinnamomum spp.* were linked up to four different uses.

Timber-oriented species such as *Tectona grandis*, *Pterocarpus macrocarpus*, and Dipterocarpus alatus were also frequently mentioned, reflecting the importance of construction materials and fuelwood. In contrast, some species were valued primarily for specific functions, such as *Mahonia duclouxiana* for medicinal use and *Diospyros mollis* for fodder. Although most species were native, only a small number of introduced or commercial species, notably *Tamarindus indica*, were also recognized for their usefulness.

Table 4 Key multipurpose tree species

Common name	Scientific name	Timber	Foods	Medicinal	Fuelwood	Fodder	Other uses	number of uses
มะขามป้อม	*Phyllanthus emblica*	2	6	1	1		1	5
แดง	*Xylia xylocarpa*	4	2		3	1	1	5
รัง	*Shorea siamensis*	4		1	1		1	4
อบเชย	*Cinnamomum spp.*	1	3	1	1			4
มะขาม	*Tamarindus indica*		3	1		1		3
เพกา	*Oroxylum indicum*		3	1			1	3
ก่อแป้น	*Castanopsis diversifolia*	2	1		2			3
กระบก	*Irvingia malayana*		1	1	1			3
ยมหอม	*Toona ciliata*	2	1	1				3
มะเกลือ	*Diospyros mollis*	1	1			4		3
มะกัก	*Choerospondias axillaris*	1				1	1	3
เต็ง (แงะ)	*Shorea obtusa*	1		1	1			3
มะกอกป่า	*Spondias pinnata*					2	1	2
ก่อเดือย	*Castanopsis acuminatissima*		2		2			2
มะม่วงป่า	*Mangifera caloneura*		1			1		2
มะไฟ	*Baccaurea ramiflora*		1			1		2
สัก	*Tectona grandis*	8			3			2
ประดู่ป่า	*Pterocarpus macrocarpus*	2			1			2
ยางนา	*Dipterocarpus alatus*	2					1	2
สมอพิเภก	*Terminalia bellirica*	1		1				2
เลี่ยน	*Melia azedarach*	1	1					2
ไผ่	*Bambusa spp.*		1			1		2
ต้างป่า/ต้างหลวง	*Trevesia palmata*		1	1				2

จำปา	*Magnolia champaca*	1			1			2
ขี้เหล็กป่า	*Senna timoriensis*		1	1				2
นมนาง/นมวัว	*Xantolis cambodiana*	1		1				2
มะหาด	*Artocarpus lacucha*		1	1				2
ตะไคร้ต้น	*Cymbopogon citratus*	1			1			2
ขมิ้นต้น	*Mahonia duclouxiana*			1			1	2

Figure 3 The useful species for multi-purposes – *Phyllanthus emblica* (left) and *Xylia xylocarpa* (right)

Information obtained from the questionnaire also distinguished between consumption (C) and sale (S). Overall, most species were used primarily for household consumption, particularly for food, fuelwood, and traditional medicine. Only a limited number of species were regularly associated with commercial use. These included fruit-bearing trees such as *Tamarindus indica, Phyllanthus emblica, Baccaurea ramiflora, and Mangifera spp.,* as well as timber species such as *Tectona grandis*. In many cases, species served dual roles, being consumed locally while surplus products were occasionally sold. (See Table 5).

Table 5 Distribution of consumption and sale of useful species by use category

Category	Consumption (C)	Sale (S)	Both (C/S)	Notes
TIMBER	31	1	4	Construction wood, income
FUEL WOOD	11	1	4	Firewood bundles
FOOD	20	1	10	Fruits, shoots, leaves
FORAGE	7	0	0	Livestock support
MEDICINAL	17	0	3	Bark, leaves, roots
OTHER (specify)	7	0	0	Ritual, dyes
Notes		จามจุรี (Samanea saman), เงาะ (*Nephelium lappaceum)*		

Table 5 shows that most plant resources are primarily used for consumption rather than commercial purposes. Across all use categories, the number of species used exclusively for household consumption greatly exceeded those used for sale.

Timber species were predominantly harvested for subsistence needs (31 species) and there were a small number of uses for both consumption and sale. Food resources exhibited the highest level of market interaction, with 10 species reported as both consumed and sold and one species used exclusively for sale.

In contrast, medicinal plants, fodder, and other uses were almost entirely subsistence-based, indicating their primary role in household well-being rather than income generation. Fuelwood was also largely used for domestic consumption, reflecting reliance on forest biomass for daily energy needs.

4.2.4 Validation Workshop Results

To improve the completeness and reliability of the findings, the results from interviews were reviewed and validated through a workshop involving community representatives and experts, 28 people in total. Data from workshop provided species across use categories which food-related uses were most prominent (34 species), followed by medicinal uses (31 species), fodder (27 species), timber (26 species), and fuelwood (21 species), while other uses were not emphasized. Comparing with questionnaire responses, results revealed differences in perceived importance across use categories. Questionnaire data indicated that timber use was most frequently reported (40 species), followed by food (32 species) and medicinal uses (18 species). This contrast may reflect differences between individual reporting and collective priority. It may reflect the broader subsistence roles of useful plants, particularly in food provision, health care, and livestock support.

Table 6 Comparison of use categories in questionnaire and workshop

Use Category	Questionnaire	Workshop
Timber	40	26
Fuelwood	18	21
Foods	32	34
Fodder	13	27
Medicinal	18	31
Other uses	10	0

To identify multipurpose species, only species receiving positive scores in at least one category were considered, and the breadth of use was summarized as the number of use categories in which each species received a positive score. *Turpinia pomifera* emerged as the most multifunctional species, being recognized in five use categories. Other species with broad use profiles included *Irvingia malayana*, *Bambusa spp.*, and *Castanopsis acuminatissima*, each associated with three use categories. Several additional species, including *Clausena excavata*, *Mammea siamensis*, *Spondias pinnata*, and *Diospyros mollis*, were recognized in two use categories. These findings suggest that the workshop emphasized a small group of species with broad livelihood relevance, alongside other species valued more strongly for specific purposes.

Table 7 Species validated with use from workshop

Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses	Count type of use
มะกอกพราน	*Turpinia pomifera*	Tree	Native	1	5	1	2	1		5
กระบก	*Irvingia malayana*	Tree	Native		2	5		2		3
ไผ่	*Bambusa spp.*	Bamboo			3	2	3			3
ก่อเดือย	*Castanopsis acuminatissima*	Tree	Native		1	1	3			3
ส้มป่อง	*Clausena excavata*	Shrub	Native		1			6		2
สารภี	*Mammea siamensis*	Tree	Native		1	4				2
มะกอกป่า	*Spondias pinnata*	Tree	Native			2	3			2
มะเกลือ	*Diospyros mollis*	Tree	Native			1	4			2
มะแฟน	*Protium serratum*	Tree	Native			2	2			2
สมอพิเภก	*Terminalia bellirica*	Tree	Native	3			1			2
ผักเฮือด	*Ficus lacor*	Tree	Native			2	2			2
สลีนก	*Balakata baccata*	Tree	Native			1	3			2
มะตูม	*Aegle marmelos*	Tree	Native			1	2			2
นางพญาเสือโคร่ง	*Prunus cerasoides*	Tree	Native	2	1					2
แดง	*Xylia xylocarpa*	Tree	Native	1				1		2
ก่อแป้น	*Castanopsis diversifolia*	Tree	Native	1	1					2
ประดู่แดง	*Barnebydendron riedelii*	Tree	Introduced			1		1		2
มะดำดีควาย	*Sapindus rarak*	Tree	Native				1	1		2
เต็ง (แงะ)	*Shorea obtusa*	Tree	Native	1	1					2
มะขาม	*Tamarindus indica*	Tree	Introduced					5		1
กฤษณา	*Aquilaria crassna*	Tree	Native	4						1
ขมิ้นต้น	*Mahonia duclouxiana*	Tree	Native					4		1
ดีหมี	*Cleidion javanicum*	Tree	Native	4						1
แคหางค่าง	*Fernandoa adenophylla*	Tree	Native			3				1
ยมหิน	*Chukrasia tabularis*	Tree	Native	3						1
ค่าหด	*Engelhardia spicata*	Tree	Native			3				1

ยาแก้	*Monosis volkameriifolia*	Tree	Native	3					1
กำลังเสือโคร่ง	*Betula alnoides*	Tree	Native					2	1
ปาล์มสิบสองปันนา	*Arenga westerhoutii*	Palm	Native			2			1
ตะเคียน	*Hopea odorata*	Tree	Native		2				1
ตะแบก	*Lagerstroemia floribunda*	Tree	Native					2	1
นมนาง/นมวัว	*Xantolis cambodiana*	Tree	Native		2				1
อบเชย	*Cinnamomum spp.*	Tree	Native	2					1
ข้างน้าว	*Ochna integerrima*	Tree	Native					2	1
ส้มปี้	*Toddalia asiatica*	Climber	Native					2	1
ตับเต่าหลวง	*Diospyros ehretioides*	Tree	Native			1			1
หว้า	*Syzygium sp.*	Tree	Native					1	1
มะกัก	*Choerospondias axillaris*	Tree	Native					1	1
มะหาด	*Artocarpus lacucha*	Tree	Native	1					1
นมแมว	*Melodorum fruticosum*	Shrub	Native				1		1
เสี้ยวดอกขาว	*Bauhinia acuminata*	Tree	Native			1			1
เนียง	*Archidendron pauciflorum*	Tree	Native		1				1
มะเดื่อหว้า	*Ficus auriculata*	Tree	Native			1			1

Table 8 Species recognized without specific use

No.	Local name	Scientific name	Family	Habit	Origin[2]
1	กำยาน	*Styrax benzoides*	Styracaceae	Tree	Native
2	เพกา	*Oroxylum indicum*	Bignoniaceae	Tree	Native
3	มะขามป้อม	*Phyllanthus emblica*	Phyllanthaceae	Tree	Native
4	มะม่วงป่า	*Mangifera caloneura*	Anacardiaceae	Tree	Native
5	สมอไทย (มะโบ้)	*Terminalia chebula*	Combretaceae	Tree	Native
6	มะไฟ	*Baccaurea ramiflora*	Phyllanthaceae	Tree	Native
7	ค้อ	*Livistona speciosa*	Arecaceae	Palm	Native
8	มะแขว่น	*Zanthoxylum limonella*	Rutaceae	Tree	Native
9	มะตึงป่า แสลงป่า	*Strychnos nux-vomica*	Loganiaceae	Tree	Native
10	สัก	*Tectona grandis*	Lamiaceae	Tree	Native
11	รัง	*Shorea siamensis*	Dipterocarpaceae	Tree	Native
12	ประดู่ป่า	*Pterocarpus macrocarpus*	Fabaceae	Tree	Native
13	ยางนา	*Dipterocarpus alatus*	Dipterocarpaceae	Tree	Native
14	เปล้าหลวง	*Croton roxburghii*	Euphorbiaceae	Tree	Native
15	ยมหอม	*Toona ciliata*	Meliaceae	Tree	Native
16	เลี่ยน	*Melia azedarach*	Meliaceae	Tree	Native
17	จำปี	*Magnolia alba*	Magnoliaceae	Tree	Native
18	มะเดื่อ	*Ficus ssp*	Moraceae	Tree	Native

[2] The origin of the species based on POWO (2026). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/

19	ต้างป่า/ต้างหลวง	*Trevesia palmata*	Araliaceae	Tree	Native
20	จำปา	*Magnolia champaca*	Magnoliaceae	Tree	Native
21	ขี้เหล็กป่า	*Senna timoriensis*	Fabaceae	Tree	Native
22	ตะไคร้ต้น	*Cymbopogon citratus*	Poaceae	Tree	Native
23	ผักหวานป่า	*Melientha suavis*	Opiliaceae	Tree	Native
24	ฝาง	*Caesalpinia sappan*	Fabaceae	Small tree	Native
25	จวงหอม	*Cinnamomum caudatum*	Lauraceae	Tree	Native
26	ทองหลางป่า	*Erythrina subumbrans*	Fabaceae	Tree	Native
27	กระทุ่มเนิน	*Neolamarckia cadamba*	Rubiaceae	Tree	Native
28	กระเจาะ	*Helicia nilagirica*	Proteaceae	Tree	Native
29	พะยอม	*Shorea roxburghii*	Dipterocarpaceae	Tree	Native
30	ตะขบป่า	*Flacourtia indica*	Salicaceae	Tree	Native
31	ตะคร้อ	*Schleichera oleosa*	Sapindaceae	Tree	Native
32	ตะขบ	*Muntingia calabura*	Muntingiaceae	Tree	Introduce
33	เติม	*Bischofia javanica*	Euphorbiaceae	Tree	Native
34	กาสะลอง/ปีบ	*Millingtonia hortensis*	Bignoniaceae	Tree	Native
35	มะกล่ำต้น	*Adenanthera pavonina*	Fabaceae	Tree	Native
36	สนสามใบ	*Pinus kesiya*	Pinaceae	Tree	Native
37	ก่อหรั่ง	*Castanopsis armata*	Fagaceae	Tree	Native
38	แคนา	*Dolichandrone serrulata*	Bignoniaceae	Tree	Native
39	แค	*Sesbania grandiflora*	Fabaceae	Tree	Native
40	มะตาด	*Dillenia indica*	Dilleniaceae	Tree	Native
41	กล้วยฤาษี	*Diospyros glandulosa*	Ebenaceae	Tree	Native
42	กระแจะ	*Naringi crenulata*	Rutaceae	Tree	Native
43	ก่อแดง	*Castanopsis tribuloides*	Fagaceae	Tree	Native
44	ก่อใบเลื่อม	*Castanopsis tribuloides*	Fagaceae	Tree	Native
45	กะทิง	*Calophyllum polyanthum*	Calophyllaceae	Tree	Native
46	กางหลวง	*Albizia chinensis*	Fabaceae	Tree	Native
47	กุ๊ก	*Lannea coromandelica*	Anacardiaceae	Tree	Native
48	เก็ด	*Dalbergia sp*	Fabaceae	Tree	Native
49	คราม่า	*Indigofera tinctoria*	Fabaceae	Shrub	Native
50	คอแลน	*Nephelium hypoleucum*	Sapindaceae	Tree	Native
51	งิ้วแดง	*Bombax ceiba*	Malvaceae	Tree	Native
52	ตะครั้	*Garuga pinnata*	Burseraceae	Tree	Native
53	ต๋าว	*Arenga pinnata*	Arecaceae	Palm	
54	เต่าร้าง	*Caryota mitis*	Arecaceae	Palm	
55	ทองเหลือง	*Erythrina stricta*	Fabaceae	Tree	Native
56	บุนนาค	*Mesua ferrea*	Calophyllaceae	Tree	Native
57	ปรง	*Cycas siamensis*	Cycadaceae	Cycad	Native
58	พญาไม้	*Podocarpus neriifolius*	Podacarpaceae	Tree	Native

59	พลับพลา	*Microcos tomentosa*	Malvaceae	Tree	Native
60	มณฑา	*Magnolia sp*	Magnoliaceae	Tree	Native
61	มะเดื่ออุทุมพร	*Ficus racemosa*	Moraceae	Tree	Native
62	มะเม่า	*Antidesma sp*	Phyllanthaceae	Tree	Native
63	มะรุม	*Moringa oleifera*	Moringaceae	Small tree	Native
64	ยมแดง	*Syzygium nervosum*	Myrtaceae	Tree	Native
65	ละหุ่งเครือ	*Euphorbiaceae sp.*	Euphorbiaceae	Climber	
66	สนสองใบ	*Pinus merkusii*	Pinaceae	Tree	Native
67	ส้าน	*Dillenia obovata*	Dilleniaceae	Tree	Native
68	สีเสียด	*Senegalia catechu*	Fabaceae	Tree	Native
69	เสลา	*Lagerstroemia loudonii*	Lythraceae	Tree	Native
70	หมีเหม็น	*Litsea glutinosa*	Lauraceae	Tree	Native
71	เหมือดโลด	*Aporusa villosa*	Euphorbiaceae	Tree	Native
72	อินทนิล	*Lagerstroemia speciosa*	Lythraceae	Tree	Native

4.3 Agro-ecological Aspects

Species with fast growth vs Slow growing

The survey data covers 35 species, categorizing trees by growth speed. The fastest-growing group is the most diverse, featuring 19 species (23 citations). The most frequent fast-growers include *Oroxylum indicum*, *Afzelia xylocarpa*, and *Tectona grandis*. These species are ideal for rapid reforestation and early-stage timber production.

In contrast, the slowest-growing group contains 16 species, each cited with a frequency of one. This category is dominated by high-value hardwoods such as *Dalbergia cochinchinensis*, *Diospyros mollis*, and *Dipterocarpus alatus*. Notably, *Tectona grandis* appears in both categories, suggesting that its development is highly sensitive to environmental conditions—growing rapidly in managed plantations but much slower in natural forests.

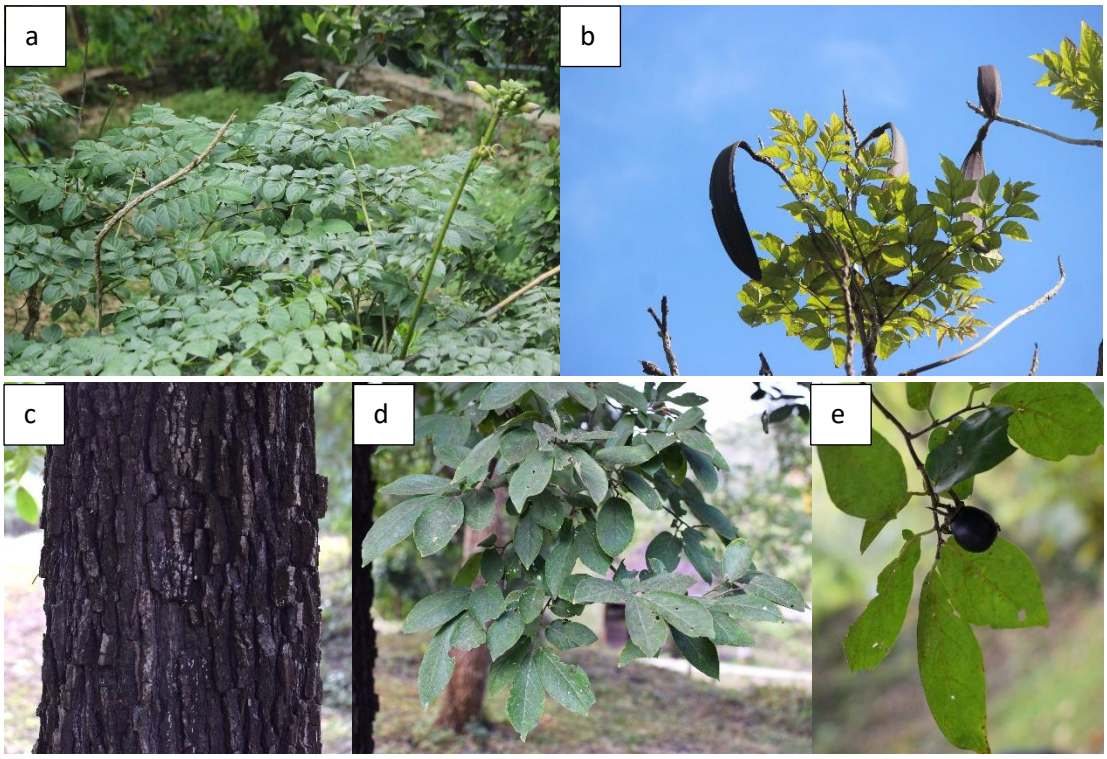

Figure 4 Example of fast-growing species – *Oroxylum indicum* (a-b), and slow growing species – *Diospyros mollis* (c-e).

Species favourite for wildlife

In total, 18 plant species were mentioned as providing food for wildlife. Among these, several species were reported more frequently, indicating their greater importance as wildlife food resources. Most of these species produce fresh fruits that attract animals to feed on them. For example, *Phyllanthus emblica* was mentioned most often, followed by Ficus spp. Other species cited multiple times include *Protium serratum, Schleichera oleosa, Spondias pinnata,*

Mangifera indica, Syzygium sp., Choerospondias axillaris, Gmelina arborea, and *Irvingia malayana*. Additionally, species in the Fabaceae, such as *Castanopsis acuminatissima*, were also mentioned, likely because their seeds contain a rich endosperm that can serve as an additional food resource for wildlife (Figure 5).

Regarding wildlife, respondents identified several animals that consume these fruits. The most commonly mentioned wildlife species were barking deer, wild boar, and birds, each cited four times. Other animals reported include squirrels, elephants, civets, and buffalo.

These results highlight the importance of native fruit-bearing tree species in supporting wildlife. Many of these species serve as key food resources for a variety of mammals and birds, indicating their ecological significance and their potential value for biodiversity-oriented forest restoration.

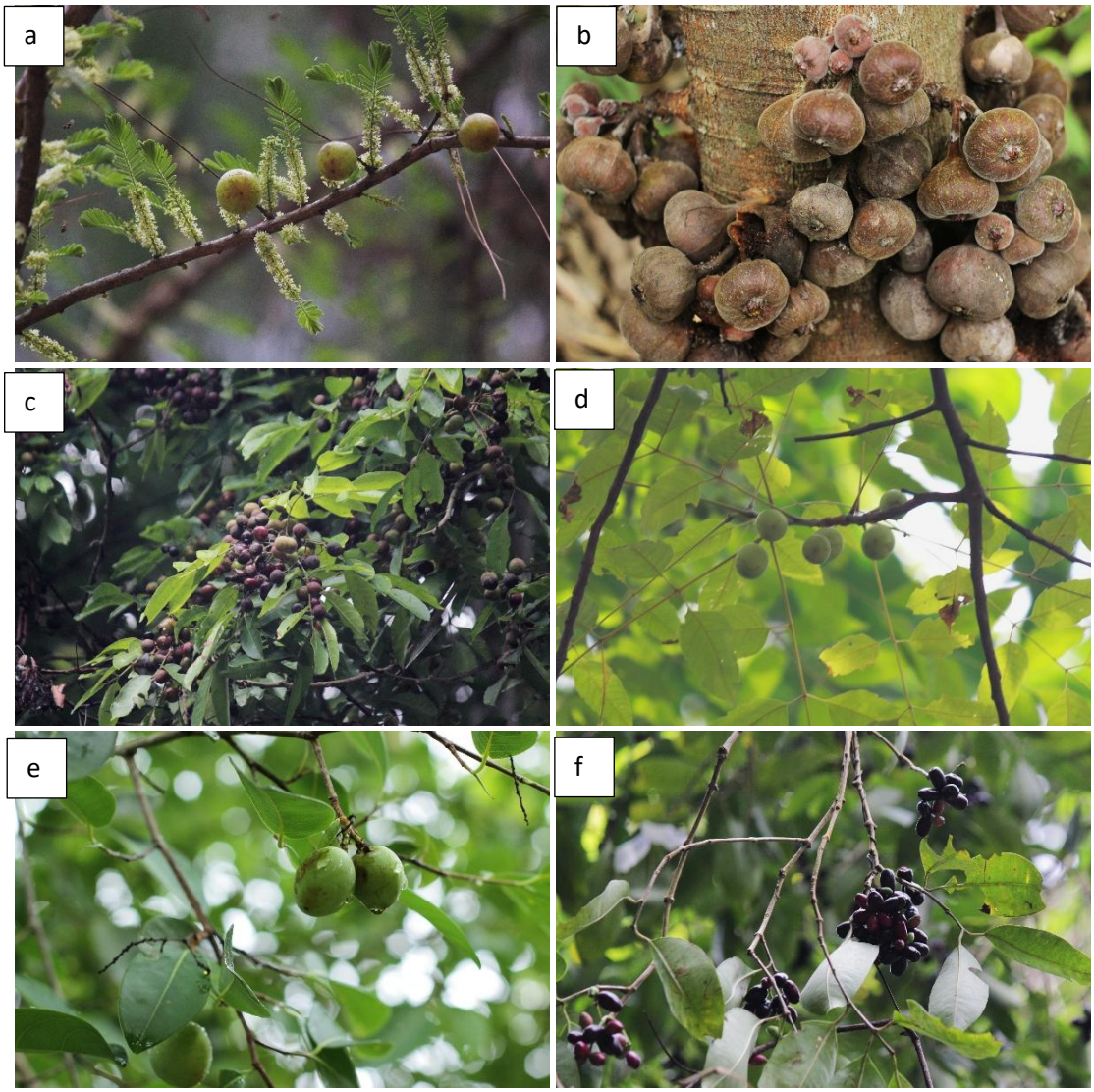

Figure 5 Tree species that provide food resources for wildlife – Indian gooseberry (*Phyllanthus emblica*) (a), fig (*Ficus* sp.) (b), Indian Red Pear (*Protium serratum*) (c), Nepali Hog Plum (*Choerospondias axillaris)* (d), wild almond (*Irvingia malayana*) (e), and *Syzygium* sp. (f).

Species dispersed by birds

In terms of the species with seeds that are dispersed by birds or fruits eaten by birds, in total, twenty species were identified, indicating that birds play an important role in dispersing a wide range of plant species in the landscape. Some species were mentioned multiple times, suggesting that they are well recognized by the community as important bird food sources. For example, figs (*Ficus* spp.) and *Ficus benjamina* were mentioned four times, and *Balakata baccata* was mentioned twice, highlighting their perceived importance for birds. Moreover, there are the native tree species using for forest restoration such as *Bischofia javanica*, *Erythrina subumbrans*, *Michelia baillonii*, *Syzygium* sp. (Figure 6)

Many of the listed species produce fleshy fruits, which are commonly associated with bird dispersal. Species such as figs and *Syzygium* are well known for attracting frugivorous birds that consume the fruits and subsequently disperse the seeds through defecation or regurgitation. Overall, the results highlight the ecological importance of fruiting tree and shrub species in supporting bird populations and facilitating natural forest regeneration through seed dispersal. These species may therefore play a significant role in forest restoration and biodiversity conservation.

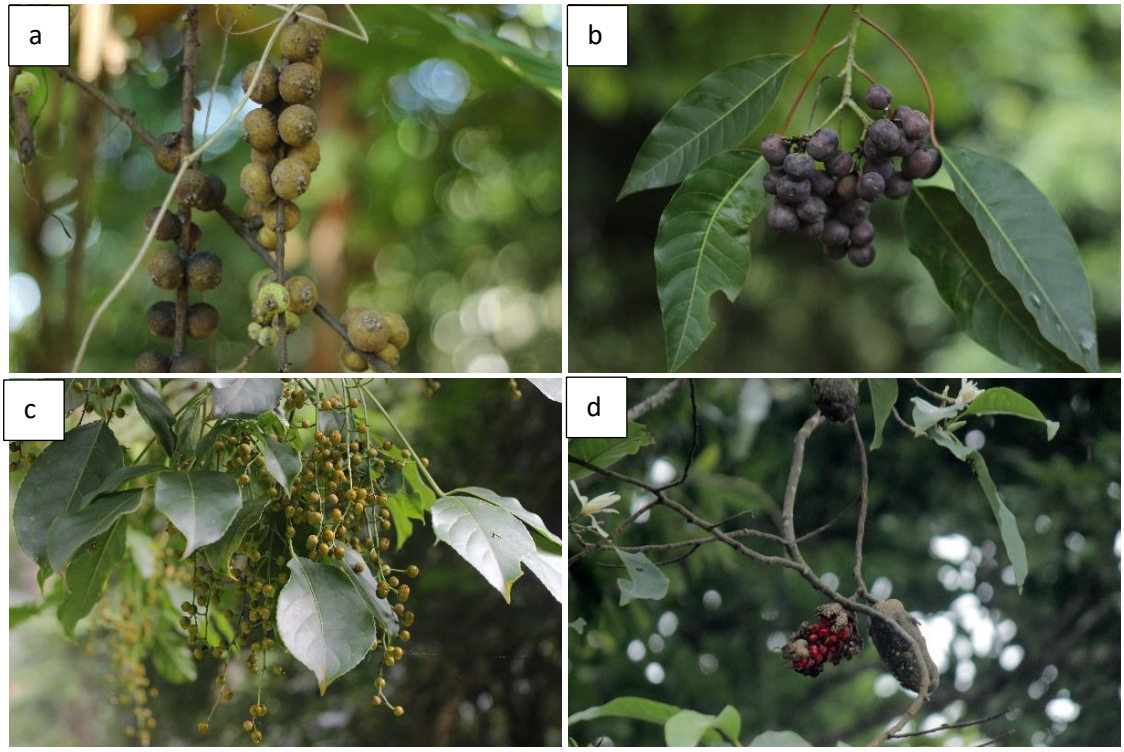

Figure 6 Example of tree species that provide food resources and disperse by birds – fig (*Ficus* sp.) (a), Sali Nok (*Balakata baccata*) (b), Bishop wood (*Bischofia javanica*) (c), Champi Pa *(Michelia baillonii)* (e).

Agro-ecological traits

The agro-ecological traits of recorded species reveal several clear patterns (Table 9). First, native species constitute the majority of useful plants reported by respondents. Second, a large proportion of species were identified as compatible with agroforestry systems which indicate that these plants can be cultivated alongside agricultural crops as well as occurring in forest environments. Many species were also reported as bird-dispersed and bee-pollinated, and several produce fruits regularly. In addition, traits related to environmental tolerance such as drought resistance, riparian association, and soil improvement which were noted for several species.

These all results show that useful plants recognized by the community possess a wide range of agro-ecological characteristics associated with both production and ecological function.

Several species exhibited multiple agro-ecological traits that may support both ecological restoration and agroforestry applications. These include Phyllanthus emblica, Spondias pinnata, Erythrina subumbrans, Duabanga grandiflora, and Samanea saman, which were associated with combinations of characteristics such as compatibility with agroforestry systems, bird-mediated seed dispersal, regular fruit production, environmental tolerance, and soil-related functions. Moreover, traits are commonly considered beneficial for promoting natural regeneration processes while maintaining productivity within managed landscapes. Although the present study did not evaluate field performance, the diversity of functional attributes suggests that these species may have potential as candidate species for community-based restoration and agroforestry initiatives.

Table 9 Species traits in Agro-ecological aspects

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects															
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
สา	*Broussonetia papyrifera*	Native	1		1	1												
มะเกลือ	*Diospyros mollis*	Native		1	1	1												
มะเดื่อ	*Ficus ssp*	Native			1	1					1	1					1	
เดื่อผูก	*Ficus variegata*	Native			1	1						1						
ตะขบป่า	*Flacourtia indica*	Native			1	1												
หว้า	*Syzygium sp.*	Native			1	1												
หาดหนุน	*Artocarpus chama*	Native			1													
ก่อเดือย	*Castanopsis acuminatissima*	Native			1					1	1							
มะกัก	*Choerospondias axillaris*	Native			1													
ซ้อ	*Gmelina arborea*	Native	1		1			1										
กระบก	*Irvingia malayana*	Native			1					1								
เลี่ยน	*Melia azedarach*	Native	1		1													
มะขามป้อม	*Phyllanthus emblica*	Native			1			1			1				1			
มะแฟน	*Protium serratum*	Native			1					1	1							
ตะคร้อ	*Schleichera oleosa*	Native			1					1					1		1	
มะกอกป่า	*Spondias pinnata*	Native	1		1						1					1		
มะม่วง	*Mangifera indica*	Native			1		1	1										
สลีนก	*Balakata baccata*	Native	1			1										1		
เติม	*Bischofia javanica*	Native				1												
ทองหลางป่า	*Erythrina subumbrans*	Native	1			1						1	1				1	

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects															
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
ไทรย้อย	*Ficus benjamina*	Native				1						1						
ไทร/ไม้ไฮ	*Ficus sp.*	Native				1												
ข้าวสารหลวง	*Maesa ramentacea*	Native				1												
จำปีป่า	*Magnolia baillonii*	Native				1									1			
มะม่วงป่า	*Mangifera caloneura*	Native				1	1			1								
นมแมว	*Melodorum fruticosum*	Native				1												
กล้วย	*Musa spp.*	Native				1		1										
มะขาม	*Tamarindus indica*	Native				1		1		1	1							
มะละกอ	*Carica papaya*	Native				1												
เดือปังปอน	*Ficus carica*	Native				1						1						
ตะขบ	*Muntingia calabura*	Native				1												
สะเดาช้าง	*Acrocarpus fraxinifolius*	Native																1
มะกล่ำต้น	*Adenanthera pavonina*	Native					1											
มะค่าโมง	*Afzelia xylocarpa*	Native	1									1			1			
พฤกษ์	*Albizia lebbeck*	Native	1						1									
ขนุน	*Artocarpus heterophyllus*	Native	1					1										
ขนุนป่า	*Artocarpus lanceolata*	Native		1														
สะเดา	*Azadirachta indica*	Native						1										
มะไฟ	*Baccaurea ramiflora*	Native					1	1					1					
ไผ่	*Bambusa spp.*	Native	1						1				1	1				
เสี้ยวดอกขาว	*Bauhinia acuminata*	Native														1		

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects															
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
ทองกวาว	*Butea monosperma*	Native										1					1	
ก่อหรั่ง	*Castanopsis armata*	Native								1								
ก่อหมูดอย	*Castanopsis calathiformis*	Native							1									
ก่อนก	*Castanopsis spp.*	Native		1									1			1		1
งิ้วป่า	*Ceiba pentandra*	Native	1															1
ติ้วขน	*Cratoxylum cochinchinense*	Native		1					1						1			
เปล้าหลวง	*Croton roxburghii*	Native						1		1								
ประดู่ขาว	*Crudia chrysantha*	Native		1														
พะยูง	*Dalbergia cochinchinensis*	Native		1				1										1
มะตาด	*Dillenia indica*	*Native*															1	
ลำไย	*Dimocarpus longan*	*Native*					1	1								1		
ลำไยป่า	*Dimocarpus longan var. Longan*	*Native*								1								
ตะโก	*Diospyros ebenum*	*Native*										1						
กล้วยฤๅษี	*Diospyros glandulosa*	*Native*																1
ยางนา	*Dipterocarpus alatus*	*Native*		1			1		1						1			
ยางปาย	*Dipterocarpus costatus*	*Native*					1											
พลวง	*Dipterocarpus tuberculatus*	*Native*													1			
แคนา (ดอกขาว)	*Dolichandrone serrulata*	*Native*											1		1			
ลำพูป่า	*Duabanga grandiflora*	*Native*						1				1	1		1		1	
กร่าง	*Ficus altissima*	*Native*															1	
มะเดื่อใบใหญ่	*Ficus auriculata*	*Native*										1						

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects															
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
มะเดื่อปล้อง	*Ficus hispida*	*Native*										1						
ผักเฮือด	*Ficus lacor*	*Native*													1			
ชะมวง	*Garcinia cowa*	*Native*																1
มะขม	*Garcinia nigrolineata*	*Native*																1
กระเจาะ	*Helicia nilagirica*	*Native*	1												1			
เหมือดคนตัวผู้	*Helicia nilagirica*	*Native*		1														
ตะเคียน	*Hopea odorata*	*Native*	1															
หมอนหิน	*Hovenia dulcis*	*Native*														1		
ลิ้นจี่	*Litchi chinensis*	*Native*						1										
ตองแตบ	*Macaranga denticulata*	*Native*						1										
จำปี	*Magnolia alba*	*Native*		1			1						1					
จำปา	*Magnolia champaca*	*Native*											1		1			
มณฑาขาว	*Magnolia liliifera*	*Native*										1						
โคลงเคลง	*Melastoma candidum*	*Native*							1					1				
กาสะลอง/ปีบ	*Millingtonia hortensis*	*Native*					1											
กระทุ่มเนิน	*Neolamarckia cadamba*	*Native*	1					1										
เพกา	*Oroxylum indicum*	*Native*	1															
นนทรี	*Peltophorum pterocarpum*	*Native*					1											
สนสามใบ	*Pinus kesiya*	*Native*							1									
สน	*Pinus sp.*	*Native*												1	1			
นางพญาเสือโคร่ง	*Prunus cerasoides*	*Native*														1		

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects															
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
ประดู่ป่า	*Pterocarpus macrocarpus*	*Native*		1			1								1		1	
จามจุรี	*Samanea saman*	*Native*	1						1			1	1				1	
มะดำดีควาย	*Sapindus rarak*	*Native*		1							1							
ขี้เหล็กป่า	*Senna timoriensis*	*Native*														1		
แค	*Sesbania grandiflora*	*Native*											1					
เต็ง	*Shorea obtusa*	*Native*					1								1			
พะยอม	*Shorea roxburghii*	*Native*		1			1											
รัง	*Shorea siamensis*	*Native*					1								1			
ข่อย	*Streblus asper*	*Native*										1						
เสม็ดชุน	*Syzygium gratum*	*Native*										1						
ชมพู่ป่า	*Syzygium megacarpum*	*Native*										1					1	
สัก	*Tectona grandis*	*Introduced*	1	1				1	1					1	1			1
พังแหร่	*Trema orientalis*	*Introduced*	1															
ต้างป่า/ต้างหลวง	*Trevesia palmata*	*Introduced*						1										
แข้งกวาง	*Wendlandia tinctoria*	*Introduced*							1					1				
แดง	*Xylia xylocarpa*	*Introduced*											1		1			
หมาก	*Areca catechu*	*Introduced*						1										
ตาล	*Borassus flabellifer*	*Introduced*						1										
ชา	*Camellia sinensis*	*Introduced*		1														
มะพร้าว	*Cocos nucifera*	*Introduced*						1										
กาแฟ	*Coffea arabica*	*Introduced*						1										
ทุเรียน	*Durio zibethinus*	*Introduced*														1		1

Local name	Scientific name	Native/ Introduced Species	Species traits in Agro-ecological aspects																
			Fast Growing	Slow growing	Fodder	Ornithochory (Bird)	Bee-pollinated	Agroforestry-compatible	Agroforestry-incompatible	Mast-fruiting	Annually fruiting	Riparian species	Soil-improving	Soil-degrading	Drought-resistant	Drought-sensitive	Flood resistant	Less flood resistant
ยูคาลิปตัส	*Eucalyptus camaldulensis*	*Introduced*							1					1				
เงาะ	*Nephelium lappaceum*	*Introduced*														1		
อะโวคาโด้	*Persea americana*	*Introduced*														1		
ชมพู่	*Syzygium samarangense*	*Introduced*								1								
มะเฟือง	*Averrhoa carambola*	*Introduced*									1							
ประดู่แดง	*Barnebydendron riedelii*	*Introduced*		1														
เสี้ยวดอกแดง	*Bauhinia purpurea*	*Introduced*					1											
ราชพฤกษ์	*Cassia fistula*	*Introduced*					1											
กระถิน	*Leucaena leucocephala*	*Introduced*	1															

4.4 Fruit tree species and availability

The seasonal availability of fruit tree species exhibited clear temporal variation throughout the year (Table 10). The number of species with ripe fruits was lowest during the dry season (December–March), when only three species were reported. Availability increased markedly during the early rainy season, reaching a secondary peak between May and August. The highest diversity of edible fruits occurred in November, when eleven species were reported as available, indicating a major seasonal abundance period. A small number of species, notably *Phyllanthus emblica* and *Artocarpus heterophyllus*, were reported to produce fruits for extended periods or nearly year-round. Overall, the staggered fruiting periods of different species contribute to a continuous supply of forest-derived foods, although seasonal fluctuations remain pronounced.

Table 10 Fruit Tree Availability Calendar

Local name	Language	Species name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Total	3	3	3	5	8	5	6	7	5	5	11	4
มะขามป้อม	เซ งา ซ่า	*Phyllanthus emblica*	1	1	1	1	1	1	1	1	1	1	1	1
มะกอกป่า	เสือ กัว ลั๊	*Spondias pinnata*						1	1	1	1	1	1	1
มะไฟ		*Baccaurea ramiflora*						1	1	1				
มะม่วงป่า	จะโม่งกู่/จือซ่ายกำ	*Mangifera caloneura*					1	1						
ก่อเดือย		*Castanopsis acuminatissima*											1	
ก่อแป้น		*Castanopsis diversifolia*											1	
ขนุน		*Artocarpus heterophyllus*	1	1	1	1	1	1	1	1	1	1	1	1
ค้อ		*Livistona speciosa*											1	
นมควาย/นมแรด		*Uvaria grandiflora*											1	
ผักฮ้อน		*Gymnema inodorum*												
เพกา		*Oroxylum indicum*											1	
	ซากูแร่ะ	*Unknown*					1							
มะกอกเกลื้อน		*Canarium subulatum*											1	
มะขามเปรี้ยว		*Tamarindus indica*	1	1										
มะแขว่น		*Zanthoxylum limonella*								1				
มะเดื่อใบใหญ่	สึ จั๊ว ลู้	*Ficus auriculata*												1
มะตึงป่า แสลงป่า	กล้าอือ	*Strychnos nux-vomica*					1							
มะตูน/มะปิน		*Aegle marmelos*												
มะแฟน		*Protium serratum*										1		
มะหลอดป่า	เซทูซ่า	*Elaeagnus latifolia*			1	1								
สมอไทย		*Terminalia chebula*											1	
มะขม		*Pittosporopsis kerrii*								1	1	1	1	
ลิ้นจี่		*Litchi chinensis*				1	1							
ลำไย		*Dimocarpus longan*							1	1	1			
มะม่วง		*Mangifera indica*				1	1							
เงาะ		*Nephelium lappaceum*							1					
	สัค หวี่ ซอ						1							

4.5 Declining or disappearing species

Respondents also identified very few species of each study area that were perceived to have declined or disappeared from their community. (Table 11). These species were primarily valued for subsistence purposes, including edible fruits, edible flowers, medicinal uses, and household materials. Examples include *Crateva magna*, whose young shoots were used as food, and *Bombax ceiba*, valued for its edible flowers. Some species producing edible fruits, such as *Flacourtia indica* and locally named species including "Nom Khwai" *Uvaria grandiflora* and "Nom Raed," *Xantolis cambodiana* were also reported as becoming scarce. Moreover, some species were associated with other functions, such as serving as host trees for edible mushrooms or providing resin used as fuel for lighting. Most of the species reported as declining were not commercially important timber species but plants associated with everyday subsistence uses.

Table 11 the list of species declining or disappearing from local areas

Local name	Scientific name	Language* (Only if not yet mentioned)	Uses or benefits
ตะขบป่า	*Flacourtia indica*	สะ เพ ซ่า	Foods - fruit
ผักกุ่ม /กุ่มน้ำ	*Crateva magna*		Food – young shoot
งิ้วแดง	*Bombax ceiba*		Food - flower
คอแลน	*Nephelium hypoleucum*		Food and Medicine
ดำด่าง	*Dipterocarp sp.*		Timber and Host for mushroom
มะเกลือ	*Diospyros mollis*		Dying
นมควาย	*Uvaria grandiflora*		Foods - fruit
นมแรด	*Xantolis cambodiana*		Foods - fruit
ยาง	*Dipterocarp sp.*		Resin

4.6 Planting Tree Plan

Participants showed a strong intention to plant trees within the next two years, with most respondents (7 out of 10) reporting definite plans to do so, while the remainder were uncertain. None indicated no intention to plant. The primary motivations were subsistence and health-related uses, particularly medicinal plants (5 responses) and fruit consumption (4 responses), followed by timber production (3 responses). Only a small number of responses explicitly mentioned commercial objectives. Several species were cited repeatedly, notably teak (*Tectona grandis*) for timber value, avocado (*Persea americana*) for fruit production, and mango and Indian gooseberry (*Phyllanthus emblica*) for household consumption. Overall, the results

suggest that planned tree planting is driven mainly by household needs rather than market-oriented production.

Table 12 Species intended for planting

No.	Local name	Scientific name	Frequency	Purpose	Habit	Origin
1	กำลังเสือโคร่ง	*Betula alnoides*	1	Medicine	Tree	Native
2	ขนุน	*Artocarpus heterophyllus*	1	Food/Sell	Tree	Native
3	ขี้ผึ้ง	*Polyspora dalglieshiana*	1	Medicine	Tree	Native
4	เงาะ	*Nephelium lappaceum*	2	Sell	Tree	Introduced
5	ทุเรียน	*Durio zibethinus*	1	Sell	Tree	Introduced
6	เนียง	*Archidendron pauciflorum*	1	Food/Sell	Tree	Native
7	ไผ่	*Bambusa spp.*	1	Timber	Bamboo	Native
8	ฝาละมี	*Alangium kurzii*	1	Medicine	Tree	Native
9	พะยูง	*Dalbergia cochinchinensis*	1	Timber	Tree	Native
10	มะขาม	*Tamarindus indica*	1	Food/Sell	Tree	Introduced
11	มะขามป้อม	*Phyllanthus emblica*	2	Food/Medicine	Tree	Native
12	มะคำดีควาย	*Sapindus rarak*	1	Food/Other	Tree	Native
13	มะม่วง	*Mangifera indica*	2	Food	Tree	Native
14	มะยงชิด	*Bouea macrophylla*	1	Food	Tree	Native
15	ยมหอม	*Toona ciliata*	1	Medicine	Tree	Native
16	ยาง	*Dipterocarpus spp.*	1	Timber	Tree	Native
17	ละมุด	*Manilkara zapota*	1	Food/Sell	Tree	Introduced
18	สัก	*Tectona grandis*	5	Timber	Tree	Native
19	อบเชย	*Cinnamomum spp.*	1	Medicine	Tree	Native
20	อะโวคาโด้	*Persea americana*	3	Food	Tree	Introduced

5. Findings

1. Local ecological knowledge is broad and deep.
   This study recorded a wide range of useful plant species recognized by local communities in upper norther Thailand, recording 204 species from 58 families. This amount and diversity of species reflect the local ecological knowledge which remain extensive and encompasses more than a limited set of commonly known plants. Most recorded species were native, highlighting the continued reliance on indigenous plant resources found in forests, farms, and home gardens.
   Agro-ecological data reveal that the community was familiar with the functional plant characteristics, such as their suitability for agricultural systems, seed dispersal by birds, riparian suitability, drought tolerance, and soil improvement. This is a very important finding because it means that local knowledge is not just about utilization but also includes ecological knowledge that can be used to select plant species.
2. Native and multipurpose species as the core of local livelihood systems.
   Most reported plant species are native, and the majority are trees, indicating that the community's crucial resource base remains linked to local plants in forests, agricultural areas, and surrounding homes, rather than relying solely on imported plants or commercially cultivated timber.
3. Many species are multifunctional.
   The results from both questionnaires and workshops consistently indicate that a number of plants play multiple roles simultaneously, such as being used as food, medicine, firewood, or in households. Species like *Phyllanthus emblica, Xylia xylocarpa, Irvingia malayana, or Turpinia pomifera* are therefore not important simply because they are used for only one purpose but because they simultaneously meet multiple needs in households and communities also.
4. Differences between survey responses and workshop results.
   Data from questionnaires highlighted timber as the most important, while workshops placed greater emphasis on food, medicinal, and fodder. This finding is particularly interesting because it suggests that individual responses may reflect “what is used or apparent,” while group discussions involving experts revealed a greater “overall subsistence importance” of plants in community systems.
5. Most are used for consumption rather than for sale.
   Consumption/sales data clearly shows that household consumption exceeds sales in almost every category, especially food, medicine, firewood, and fodder. Even though some crops contribute to income, such as tamarind, Indian gooseberry, rambutan, mango, or teak, the overall system remains subsistence-oriented rather than market-oriented.
6. The availability of wild fruits is seasonal but distributed across the year.
   The fruit calendar indicates that fruit availability is not concentrated in a single month. While November is typically the peak season for various fruit types, several varieties

ripen throughout the year, allowing local crop systems to contribute to food security to some extent throughout the year, especially with long-blooming varieties like Indian gooseberry and jackfruit.

7. Declining or disappearing species
   The species reported as declining or disappearing were primarily those used for food, medicine, fuel, or specific household functions rather than timber species that economically dominant. This is crucial because it indicates that landscape changes may affect not only biodiversity but also the livelihood function of resources.
8. Planting Plan
   Data from tree planting plans over the next two years shows that the primary motivation is for planting herbs, fruit trees, and timber trees, rather than for commercial purposes. This reflects the perception that tree planting enhances household security, rather than just being a profit-generating activity.

From the findings demonstrated above, it shows that useful plant species form an integrated system supporting food security, health care, energy needs, construction materials, and ecological functions. Native and multifunctional tree species play a central role in this system, and local knowledge encompasses both practical uses and ecological characteristics. These results highlight the importance of community knowledge as a foundation for sustainable resource management, agroforestry development, and ecosystem restoration initiatives.

Appendix

Table of plant species list from household survey

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
Anacardiaceae										
1	มะกัก	*Choerospondias axillaris*	Tree	Native	1			1	1	1
2	มะกอกป่า	*Spondias pinnata*	Tree	Native			2	5		1
3	มะม่วงป่า	*Mangifera caloneura*	Tree	Native			1	1		
4	มะม่วง	*Mangifera indica*	Tree	Introduced			1			
5	มะยงชิด	*Bouea macrophylla*	Tree	Native						
6	กุ๊ก	*Lannea coromandelica*	Tree	Native						
Annonaceae										
7	นมแมว	*Melodorum fruticosum*	Shrub	Native				1		
8	นมควาย	*Uvaria grandiflora*	Climber / Shrub	Native						
Araliaceae										
9	ต้างป่า	*Trevesia palmata*	Tree	Native			1		1	
Arecaceae										
10	หมาก	*Areca catechu*	Palm	Introduced			1			
11	ปาล์มสิบสองปันนา	*Arenga westerhoutii*	Palm	Native			2			
12	ค้อ	*Livistona speciosa*	Palm	Native						
13	ตาล	*Borassus flabellifer*	Palm	Introduced						
14	มะพร้าว	*Cocos nucifera*	Palm	Introduced						
15	ต๋าว	*Arenga pinnata*	Palm							
16	เต่าร้าง	*Caryota mitis*	Palm							
17	ยาแก้	*Monosis volkameriifolia*	Tree	Native	3					
Berberidaceae										

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
18	ขมิ้นต้น	*Mahonia duclouxiana*	Tree	Native					5	
Betulaceae										
19	กำลังเสือโคร่ง	*Betula alnoides*	Tree	Native					3	
Bignoniaceae										
20	เพกา	*Oroxylum indicum*	Tree	Native			3		1	1
21	แคหางค่าง	*Fernandoa adenophylla*	Tree	Native			4			
22	แคนา (ดอกขาว)	*Dolichandrone serrulata*	Tree	Native						
23	กาสะลอง/ปีบ	*Millingtonia hortensis*	Tree	Native						
Burseraceae										
24	มะแฟน	*Protium serratum*	Tree	Native			2	2		
25	มะกอกเกลื้อน	*Canarium subulatum*	Tree	Native						
26	ตะคร้ำ	*Garuga pinnata*	Tree	Native						
Calophyllaceae										
27	สารภี	*Mammea siamensis*	Tree	Native		1	4			
28	กะทิง	*Calophyllum polyanthum*	Tree	Native						
29	บุนนาค	*Mesua ferrea*	Tree	Native						
Capparaceae										
30	กุ่มน้ำ	*Crateva magna*	Tree	Native						
Caricaceae										
31	มะละกอ	*Carica papaya*	tree-like	Introduced						
Clusiaceae										
32	มะตูม	*Aegle marmelos*	Tree	Native			1	2		
33	ชะมวง	*Garcinia cowa*	Tree	Native						
34	มะขม	*Garcinia nigrolineata*	Tree	Native						

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
35	มะดะหลวง	*Garcinia xanthochymus*	Tree	Native						
Combretaceae										
36	สมอพิเภก	*Terminalia bellirica*	Tree	Native	4			1	1	
37	สมอไทย (มะโบ้)	*Terminalia chebula*	Tree	Native	2					
Cornaceae										
38	ฝาละมี	*Alangium kurzii*	Tree	Native						
Cycadaceae										
39	ปรง	*Cycas siamensis*	Cycad	Native						
Dilleniaceae										
40	มะตาด	*Dillenia indica*	Tree	Native						
41	ส้าน	*Dillenia obovata*	Tree	Native						
Dipterocarpaceae										
42	รัง	*Shorea siamensis*	Tree	Native	4	1			1	1
43	เต็ง (แงะ)	*Shorea obtusa*	Tree	Native	2	2			1	
44	ยางนา	*Dipterocarpus alatus*	Tree	Native	2					1
45	ตะเคียน	*Hopea odorata*	Tree	Native	1	2				
46	ยางปาย	*Dipterocarpus costatus*	Tree	Native	1	1				
47	พลวง	*Dipterocarpus tuberculatus*	Tree	Native	1					1
48	พะยอม	*Shorea roxburghii*	Tree	Native						
49	ยาง	*Dipterocarpus spp.*	Tree	Native						
Ebenaceae										
50	มะเกลือ	*Diospyros mollis*	Tree	Native	1		1	4		
51	ตับเต่าหลวง	*Diospyros ehretioides*	Tree	Native			1			
52	กล้วยฤาษี	*Diospyros glandulosa*	Tree	Native						

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
53	ตะโก	*Diospyros ebenum*	Tree	Native						
Euphorbiaceae										
54	สลีนก	*Balakata baccata*	Tree	Native			1	3		
55	เปล้าหลวง	*Croton roxburghii*	Tree	Native					1	
56	ดีหมี	*Cleidion javanicum*	Tree	Native	4					
57	เติม	*Bischofia javanica*	Tree	Native						
58	ตองแตบ	*Macaranga denticulata*	Tree	Native						
59	ยางพารา	*Hevea brasiliensis*	Tree	Introduced						
60	เหมือดโลด	*Aporusa villosa*	Tree	Native						
61	ละหุ่งเครือ	*Euphorbiaceae sp.*	Climber							
Fabaceae										
62	แดง	*Xylia xylocarpa*	Tree	Native	5	3	2	1	1	1
63	มะขาม	*Tamarindus indica*	Tree	Introduced			3	1	6	
64	จามจุรี	*Samanea saman*	Tree	Native	1	1		1		
65	ราชพฤกษ์	*Cassia fistula*	Tree	Introduced	1				1	1
66	ประดู่ป่า	*Pterocarpus macrocarpus*	Tree	Native	2	1				
67	ขี้เหล็กป่า	*Senna timoriensis*	Tree	Native			1		1	
68	ประดู่แดง	*Barnebydendron riedelii*	Tree	Introduced			1		1	
69	มะค่าโมง	*Afzelia xylocarpa*	Tree	Native	1				1	
70	เสี้ยวดอกขาว	*Bauhinia acuminata*	Tree	Native			1			
71	เนียง	*Archidendron pauciflorum*	Tree	Native		1				
72	ฝาง	*Caesalpinia sappan*	Small tree	Native					1	
73	พฤกษ์	*Albizia lebbeck*	Tree	Native			1			

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
74	เสี้ยวบ้าน / ป่า	*Bauhinia variegata*	Tree	Native			1			
75	พะยูง	*Dalbergia cochinchinensis*	Tree	Native	2					
76	มะกล่ำต้น	*Adenanthera pavonina*	Tree	Native						
77	ทองหลางป่า	*Erythrina subumbrans*	Tree	Native						
78	แค	*Sesbania grandiflora*	Tree	Native						
79	สะเดาช้าง	*Acrocarpus fraxinifolius*	Tree	Native						
80	ทองกวาว	*Butea monosperma*	Tree	Native						
81	ประดู่ขาว	*Crudia chrysantha*	Tree	Native						
82	นนทรี	*Peltophorum pterocarpum*	Tree	Native						
83	เสี้ยวดอกแดง	*Bauhinia purpurea*	Tree	Introduced						
84	แคฝรั่ง	*Gliricidia sepium*	Tree	Introduced						
85	กระถิน	*Leucaena leucocephala*	Tree	Introduced						
86	กางหลวง	*Albizia chinensis*	Tree	Native						
87	เก็ด	*Dalbergia sp*	Tree	Native						
88	ทองเหลือง	*Erythrina stricta*	Tree	Native						
89	คราม่ป่า	*Indigofera tinctoria*	Shrub	Native						
90	สีเสียด	*Senegalia catechu*	Tree	Native						
91	ถั่วเหลือง	*Glycine max*	Herbaceous	Introduced						
Fagaceae										
92	ก่อเดือย	*Castanopsis acuminatissima*	Tree	Native	1	3	3	3		
93	ก่อแป้น	*Castanopsis diversifolia*	Tree	Native	3	3	1			
94	ก่อหม่น	*Lithocarpus grandifolius*	Tree	Native	1					

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
95	ก่อขี้หมู/ก่อลำขาว	*Lithocarpus polystachyus*	Tree	Native	1					
96	ก่อเหลือง	*Castanopsis tribuloides*	Tree	Native						
97	ก่อหรั่ง	*Castanopsis armata*	Tree	Native						
98	ก่อหมูดอย	*Castanopsis calathiformis*	Tree	Native						
99	ก่อนก (ตะกูลก่อ)	*Castanopsis spp.*	Tree	Native						
100	ก่อแดง	*Castanopsis tribuloides*	Tree	Native						
101	ก่อใบเลื่อม	*Castanopsis tribuloides*	Tree	Native						
Hypericaceae										
102	ติ้ว	*Cratoxylum formosum*	Tree	Native			1			
103	ติ้วขน	*Cratoxylum cochinchinense*	Tree	Native						
Irvingiaceae										
104	กระบก	*Irvingia malayana*	Tree	Native		3	6		3	
Juglandaceae										
105	ค่าหด	*Engelhardia spicata*	Tree	Native			3			
Lamiaceae										
106	ซ้อ	*Gmelina arborea*	Tree	Native	1		1		1	
107	สัก	*Tectona grandis*	Tree	Native	8	3				
Lauraceae										
108	อบเชย	*Cinnamomum spp.*	Tree	Native	3	1	3		1	
109	จวงหอม	*Cinnamomum caudatum*	Tree	Native						1
110	อะโวคาโด้	*Persea americana*	Tree	Introduced						
111	หมีเหม็น	*Litsea glutinosa*	Tree	Native						
Loganiaceae										
112	มะตึงป่า แสลงป่า	*Strychnos nux-vomica*	Tree	Native						

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
Lythraceae										
113	ลำพูป่า	*Duabanga grandiflora*	Tree	Native	1		1			1
114	ตะแบก	*Lagerstroemia floribunda*	Tree	Native	1				2	
115	อินทนิล	*Lagerstroemia speciosa*	Tree	Native			1		1	
116	เสลา	*Lagerstroemia loudonii*	Tree	Native						
Magnoliaceae										
117	มณฑาขาว	*Magnolia liliifera*	Tree	Native						
118	จำปา	*Magnolia champaca*	Tree	Native	1	1				
119	จำปีป่า	*Magnolia baillonii*	Tree	Native	1	1				
120	จำปี	*Magnolia alba*	Tree	Native	1					
121	มณฑา	*Magnolia sp*	Tree	Native						
Malvaceae										
122	งิ้วขาว	*Bombax anceps*	Tree	Native			1			
123	งิ้วแดง	*Bombax ceiba*	Tree	Native						
124	งิ้วป่า	*Ceiba pentandra*	Tree	Native						
125	ทุเรียน	*Durio zibethinus*	Tree	Introduced						
126	พลับพลา	*Microcos tomentosa*	Tree	Native						
Melastomataceae										
127	โคลงเคลง	*Melastoma candidum*	Shrub	Native						
Meliaceae										
128	ยมหอม	*Toona ciliata*	Tree	Native	2		1		1	
129	เลี่ยน	*Melia azedarach*	Tree	Native	1		1			
130	ยมหิน	*Chukrasia tabularis*	Tree	Native	3					

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
131	สะเดา	*Azadirachta indica*	Tree	Native						
Moraceae										
132	มะหาด	*Artocarpus lacucha*	Tree	Native	1		1		1	
133	ขนุน	*Artocarpus heterophyllus*	Tree	Native	2	2	1			
134	ผักเฮือด	*Ficus lacor*	Tree	Native			2	2		
135	มะเดื่อ	*Ficus ssp*	Tree	Native				1		
136	สา	*Broussonetia papyrifera*	Tree	Native						1
137	โพธิ์	*Ficus religiosa*	Tree	Native				1		
138	มะเดื่อหว้า	*Ficus auriculata*	Tree	Native			1			
139	หาดหนุน	*Artocarpus chama*	Tree	Native						
140	ขนุนป่า	*Artocarpus lanceolata*	Tree	Native						
141	กร่าง	*Ficus altissima*	Shrub	Native						
142	มะเดื่อใบใหญ่	*Ficus auriculata*	Tree	Native						
143	ไทรย้อย (ลูกเหลือง) 767	*Ficus benjamina*	Tree	Native						
144	มะเดื่อปล้อง	*Ficus hispida*	Tree	Native						
145	ไทร/ไม้ไฮ	*Ficus sp.*	Tree	Native						
146	เดือผูก	*Ficus variegata*	Tree	Native						
147	ข่อย	*Streblus asper*	Tree	Native						
148	มะเดื่อฝรั่ง	*Ficus carica*	Tree	Introduced						
149	มะเดื่ออุทุมพร	*Ficus racemosa*	Tree	Native						
Moringaceae										
150	มะรุม	*Moringa oleifera*	Tree	Native						

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
Muntingiaceae										
151	ตะขบ	*Muntingia calabura*	Tree	Introduced						
Musaceae										
152	กล้วย	*Musa spp.*	Tree	Native						
Myrtaceae										
153	ฝรั่ง	*Psidium guajava*	Tree	Native			1		1	
154	หว้า	*Syzygium sp.*	Tree	Native					1	
155	ไคร้เม็ด/เสม็ดชุน	*Syzygium gratum*	Tree	Native						
156	ชมพู่ป่า	*Syzygium megacarpum*	Tree	Native						
157	ยูคาลิปตัส	*Eucalyptus camaldulensis*	Tree	Introduced						
158	ชมพู่	*Syzygium samarangense*	Tree	Introduced						
159	ยมแดง	*Syzygium nervosum*	Tree	Native						
Ochnaceae										
160	ช้างน้าว	*Ochna integerrima*	Tree	Native					2	
Opiliaceae										
161	ผักหวานป่า	*Melientha suavis*	Tree	Native			1			
Oxalidaceae										
162	มะเฟือง	*Averrhoa carambola*	Tree	Introduced						
Phyllanthaceae										
163	มะขามป้อม	*Phyllanthus emblica*	Tree	Native	2	1	6		1	1
164	มะไฟ	*Baccaurea ramiflora*	Tree	Native			1	1		
165	นมแรด	*Bridelia retusa*	Tree	Native						
166	มะเม่า	*Antidesma sp*	Tree	Native						
Pinaceae										

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
167	สน	*Pinus sp.*	Tree	Native	1					
168	สนสามใบ	*Pinus kesiya*	Tree	Native						
169	สนสองใบ	*Pinus merkusii*	Tree	Native						
Poaceae										
170	ไผ่	*Bambusa spp.*	Bamboo			3	3	4		
171	ตะไครัต้น	*Cymbopogon citratus*	Tree	Native	1	1				
172	ไผ่ไร่	*Gigantochloa albociliata*	Bamboo	Native	1					
173	ไผ่ลวก	*Thyrsostachys siamensis*	Bamboo	Native	1					
174	ไผ่ซางหม่น	*Dendrocalamus sericeus*	Bamboo	Introduced	1					
Podacarpaceae										
175	พญาไม้	*Podocarpus neriifolius*	Tree	Native						
Primulaceae										
176	ข้าวสารหลวง	*Maesa ramentacea*	Shrub	Native						
Proteaceae										
177	กระเจาะ	*Helicia nilagirica*	Tree	Native						
178	เหมือดคนตัวผู้	*Helicia nilagirica*	Tree	Native						
Rhamnaceae										
179	หมอนหิน	*Hovenia dulcis*	Tree	Native						
Rosaceae										
180	นางพญาเสือโคร่ง	*Prunus cerasoides*	Tree	Native	2	1				
Rubiaceae										
181	กระทุ่มเนิน	*Neolamarckia cadamba*	Tree	Native						
182	แข้งกวาง	*Wendlandia tinctoria*	Tree	Native						
183	กาแฟ	*Coffea arabica*	Shrub	Introduced						

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
Rutaceae										
184	ส้มป่อง	*Clausena excavata*	Shrub	Native		1			6	
185	ส้มปี้	*Toddalia asiatica*	Climber	Native					2	
186	มะแขว่น	*Zanthoxylum limonella*	Tree	Native						
187	กระแจะ	*Naringi crenulata*	Tree	Native						
Salicaceae										
188	ตะขบป่า	*Flacourtia indica*	Tree	Native						
Sapindaceae										
189	มะดำดีควาย	*Sapindus rarak*	Tree	Native				1	1	1
190	ลำไยป่า	*Dimocarpus longan var. Longan*	Tree	Native		1				
191	เงาะ	*Nephelium lappaceum*	Tree	Introduced			1			
192	คอแลน	*Nephelium hypoleucum*	Tree	Native						
193	ตะคร้อ	*Schleichera oleosa*	Tree	Native						
194	ลำไย	*Dimocarpus longan*	Tree	Native						
195	ลิ้นจี่	*Litchi chinensis*	Tree	Native						
Sapotaceae										
196	นมนาง/นมวัว	*Xantolis cambodiana*	Tree	Native	1	2			1	
197	ละมุด	*Manilkara zapota*	Tree	Introduced						
Staphyleaceae										
198	มะกอกพราน	*Turpinia pomifera*	Tree	Native	1	5	1	2	1	
Styracaceae										
199	กำยาน	*Styrax benzoides*	Tree	Native					1	
Theaceae										
200	ขี้ผึ้ง	*Polyspora dalglieshiana*	Tree	Native					1	

No.	Local name	Scientific name	Habit	Origin	Timber	Fuelwood	Foods	Fodder	Medicinal	Other uses
201	ชา	*Camellia sinensis*	Shrub	Introduced						
Thymelaeaceae										
202	กฤษณา	*Aquilaria crassna*	Tree	Native	4					
Ulmaceae										
203	พังแหร่	*Trema orientalis*	Tree	Native						

[a]the origin base on Plant of the world online: https://powo.science.kew.org/

Seed to Tree

C1. Baseline and capacity needs assessment: Indigenous Peoples and Local Communities (IPLC)

12 December 2024

INTERVIEW FORMAT

Objectives:

- Collect information about tree species that are important to IPLC, and their uses and traits, for inclusion of species and uses relevant to IPLC in the project's decision support tools and improving the tools by integrating traditional ecological knowledge

Respondents:

- IPLC members in target states who are knowledgeable of tree species, their uses and traits (at least 15-20 IPLC per state, as far as possible)
- Interview at least 30% women, and all women involved in seed or seedling supply where possible

Seed to tree: value chains and partnerships for resilient restored forests in Malaysia

Participant information sheet and consent

Name	Village, state
Interviewer(s)	Date
	……/ ……/ 2024
Contact person for the study:	Contact information

- Thank you for taking the time to talk with us today.
- My name is…. and I come from [organisation name].
- We would like to ask you about your household and activities related to useful tree species and learn from your experience. If you agree, we would also like to visit your farm, see the trees you grow or use, and take photos.
- This is part of a larger research and capacity development project called "Seed to Tree: Value chains and partnerships for resilient restored forests" which is implemented in Malaysia, and in Thailand with about 30 other villagers. The information you share with us today will help us design better initiatives to support restoration actors and local communities in forest restoration activities.
- The interview will take approximately 60 mins.
- Your participation today is voluntary and your responses will be analyzed confidentially. In my report I will use only the information that you give about your household's activities, together with the information I get from all the other households; I will never use your name or your family members name, or the location of your village or home.
- I hope that you will feel free to express your opinions fully and share your knowledge about the topics that we will be discussing. You are of course free not to answer any question, and to leave the discussion whenever you like, and this will not result in any penalty or affect your opportunities to participate in any activities of the project later on. To the best of our knowledge, there is no risk in involving in this activity.
- I cannot promise that you and your community will benefit directly from this study, but the information that I am collecting is meant to help improve research and development activities related to useful tree species and how they are used in your region and country.

Do you agree to participate in the interview? _____ (Please check when informed consent is granted)

Is there anything that you would like to ask me before we start?

Give a filled-in copy of the sheet to the interviewee.

A. BACKGROUND */ LATAR BELAKANG*

District/State	
Village	
Coordinates (decimal degrees)	Latitude: Longitude:
Name	
Gender	
Age	
Ethnicity	
Education level (highest completed)	None / primary / secondary / high school / tertiary education
Land area	Owned (ha) Rented in (ha)
Telephone no.	
Network in village	Phone: Yes/No Internet: Yes/No
Smartphone	Ownership: Yes / Yes (in the family) / No Data availability: No / Limited / Unlimited
Languages spoken	Mother tongue: Thai: basic / fluent English: basic / fluent
Literacy (reading)	Thai: basic / fluent English: basic / fluent

1. Inventory of tree or shrub species used – *one row per each species*

First ask the interviewee to indicate 10 most important tree species they use (cultivated or not) and write them down, then ask to show them if possible.
(Note for Interviewer: More than 10 species can be listed during free listing, but table only needs to be filled for up to 10 most important species. No need to count the trees, asking for the number is enough. If there are doubts about the identity of the species, take photos (especially fruits and/or flowers if possible!) and make a botanical collection.) Photos: Use Conota application (or a similar one) to add **name of species**, interview code, and GPS (automatic with Conota)

No	Common name (Thai) / Name in local language	Specify language	Where?	Origin?	Origin of seed (if known)	Approx. no. of trees?	Products (closed-ended – prompt) C = consumption, S = Sale *Also note harvest volume and frequency if known*						Obs. species identity	Photos with GPS
							TIMBER	FUEL WOOD	FOOD	FORAGE	MEDIC-INAL	OTHER (specify)		
	DURIAN (EXAMPLE)		Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.	Market	10	S	C	C – 30kg/ week				Durio zebenthes	MW
1			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
2			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
3			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
4			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
5			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
6			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										

No	Common name (Thai) / Name in local language	Specify language	Where?	Origin?	Origin of seed (if known)	Approx. no. of trees?	Products (closed-ended – prompt) C = consumption, S = Sale *Also note harvest volume and frequency if known*						Obs. species identity	Photos with GPS
							TIMBER	FUEL WOOD	FOOD	FORAGE	MEDIC-INAL	OTHER (specify)		
7			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
8			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
9			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
10			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
11			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
12			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
13			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										
14			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										

No	Common name (Thai) / Name in local language	Specify language	Where?	Origin?	Origin of seed (if known)	Approx. no. of trees?	Products (closed-ended – prompt) C = consumption, S = Sale *Also note harvest volume and frequency if known*						Obs. species identity	Photos with GPS
							TIMBER	FUEL WOOD	FOOD	FORAGE	MEDIC-INAL	OTHER (specify)		
15			Forest / Farm / Homegard.	Spared / Planted / Nat.Reg.										

2. Agro-ecological aspects *(not economic)- classify all the ≤10 species identified in the inventory*
[traits to be confirmed, to suit local context]

Interviewer: For each trait in the list below, please ask which of the species used by the respondent are the most preferred and least preferred. Write down in the order mentioned by the producer. There is no problem if the respondent does not know the answer to some questions (do not insist, indicate "DNK": does not know). Not all species need to be classified; this is meant to be free listing.

It is important to not suggest species to the respondent.

a) Species with fast growth?	
Fastest growing species	Slowest growing species
b) Species that provide food for key wildlife (depending on the state: hornbills, elephant, orangutan, sun bear)	
Plant species	Wildlife
c) Species with seeds that are dispersed by birds (fruits eaten by birds)?	
d) Species that attract bees?	
e) Species that combine well with crop cultivation (trees inside crop field)? Species they like to have in their home garden together with other crops they grow? (Agroforestry, intercropping, tanaman kontan, taungya)	
Species that combine the best	Species that do not combine well

f) Species that have fruits only every few years?	
Species with fruits only every few years	Species with fruits every year

g) Species that always grow next to rivers/streams?

h) Species with the best and worst effect on soil fertility?		
Best species	Worst species	Why?

i) Species most resistant to drought?		
More resistant species	Less resistant species	Why are they resistant? (only if mentioned spontaneously**)**

j) Species most resistant to floods?		
More resistant species	Less resistant species	Why are they resistant? (only if mentioned spontaneously)

3. What are the most important fruit tree species you consume and in which months are they available?

Species name	Language* (Only if not yet mentioned)	Months with ripe fruits	Obs. species identity	Photos with GPS (Initials of Photographer)

4. Are there some useful tree species that have disappeared from the landscape? (a) What species and (b) what were they good for?

Species name	Language* (Only if not yet mentioned)	Uses or benefits	Obs. species identity* (if available)*	Photos with GPS (Initials of Photographer)

5. Are you planning to plant more trees on your land in the next 2 years?

Yes	No	I don't know

If 'No', move to the next question. If 'Yes' or 'I don't know', ask:
If you had an opportunity to plant new trees on your land, (a) what species would you choose and (b) why?

Species name	Language* (Only if not yet mentioned)	Purpose of Planting / Uses or benefits	Obs. species identity* (if available)	Photos with GPS (Initials of Photographer)

Thank you for taking the time to speak to us.

The ASEAN-UK Green Transition Fund (GTF) is the UK's flagship programme to accelerate ASEAN's transition to a clean and climate resilient economy. ASEAN UK GTF works with ASEAN institutions and supports ASEAN Member States and Timor Leste. This programme is delivered through the UK Partnering for Accelerated Climate Transition (UK PACT) mechanism.

For any enquiries, please get in touch via email at aseangtf@ukpact.co.uk