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Local Knowledge for Mangrove Management in Thailand



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Abstract

Most local knowledge of mangrove management is tacit knowledge, carried in people's minds or shared collectively among group or community members. This study, initiated by the Department of Marine and Coastal Resources, and conducted by the Thailand Environment Institute, sought to compile, analyze and categorize such knowledge, aiming to create a systematic record which can be disseminated and put to practical use. The study was based on eight participatory case studies of communities in different socio-economic and geographic contexts in Thailand.

The study found that local knowledge of mangrove management is increasingly absorbing and blending with outside knowledge. Some topics are restricted to certain communities; others are common to several communities but may differ in detail from community to community. Broadly speaking, local knowledge of mangroves, including knowledge, beliefs and practices, can be divided into four interrelated categories: 1) knowledge of mangrove ecosystem; 2) knowledge of mangrove rehabilitation and conservation; 3) knowledge of mangrove utilization; and 4) knowledge of forming community groups and organizational to manage mangroves.

The daily use of local knowledge plays an important part in adapting it to changing conditions and ensures its persistence. Developing community organizations to manage mangroves is another important mechanism for passing on local knowledge. To support the use of local knowledge, government agencies and other concerned bodies should work together to promote community mangrove management, develop local sources of knowledge, integrate local knowledge into the education and research systems, and develop knowledge management systems.

Keywords: mangrove management, local knowledge, knowledge management

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1. Introduction

Managing mangrove forests and other coastal resources sustainably requires a participatory approach, supported by the applied use of local knowledge and wisdom where appropriate. Together they can contribute to rehabilitating and diversifying coastal ecosystems.

Because most local knowledge is “tacit knowledge”, carried in people’s minds or shared collectively by a group or community, its dispersal and use in building new knowledge depend on proper recording, classification and codification as the “explicit knowledge”. A review of the literature shows that similar terms to local knowledge are widely used, for example village wisdom, traditional wisdom, and so on. Thailand’s Department of Marine and Coastal Resources and the Thailand Environment Institute collaborated in this study and compile local knowledge of mangrove management.

The local knowledge was defined to cover experiential knowledge, learning, knowledge transfer and the application of knowledge to solve problems and manage the mangroves, all of which reflect local conditions and link communities, their livelihoods, and their environments.

2. Methodology

The study process was conducted with a participatory approach. Its methods were literature review, questionnaires, observations, in-depth interviews and group discussions followed by data analysis, classification and codification. The study was based on eight community case studies: 1) Prednai Village, Trat Province; 2) Khao Yi San Village, Samut Songkhram Province; 3) Lilet Sub-district, Surat Thani Province; 4) Khanap Nak Village, Nakhon Sri Thammarat Province; 5) Bang Tip Village, Phang Nga Province; 6) Bang Rong Village, Phuket Province; 7) Thung Tase Village, Trang Province; and 8) Khok Phayom Village, Satul Province. These communities are widely distributed along the Gulf of Thailand and the Andaman Sea.



Figure 1: Location of studied communities

3. Results

3.1 Background information of the studied communities in relation to mangrove

Most studied communities have been collectively managing their mangrove forest areas for more than ten years, except two communities at Lilet and Khok Payom, which have been managing mangrove forest areas for approximately five years. At Khanap Nak and Khao Yi San, the community mangrove forests are managed by individual and households while other mangrove forests are managed by community groups.

The survey found that most studied communities used natural resources from the mangrove forest areas by collecting non-timbers for household consumption. They have a few commercial purposes from natural resources from mangrove forest.

Studied communities are highly realize on functions of mangrove forest as; being food sources, being aquatic animal habitats and being natural barrier from strong wind and wave. With those functions in mind, the community members were willing to participate on activities of mangrove conservation.

3.2. Local knowledge of the mangrove ecosystem

The following issues of local knowledge related to mangrove ecology were identified:

- web of relationships and life cycles in the mangrove ecosystem,
- mangrove forest zonation,
- aquatic animal habitats, and
- tidal phenomena.

Most communities are familiar with the varieties, life cycles and habitats of useful mangrove plants and animals, as well as the climatic conditions and tidal patterns influencing their distribution and availability. They also understand the web of relationships in the mangrove ecosystems, for example the interdependence between flowering plants and their insect or bird pollinators and seed dispersers. Although the ground plants of the mangrove are sometimes seen as weeds, the communities know that they support molluscs and crabs, and provide shade for animals living on or in the sediments of the forest. Mangrove trees also play an important ecological role, providing a habitat for birds and retaining moisture during the dry season.

Communities use their knowledge of mangrove ecology to plant and demarcate different forest zones according to dominant tree species, the influence of tidal flows or other criteria. They are also aware of the factors that influence mangrove productivity, for example the drainage channel system. According to community members, mangroves with an extensive, intricate channel system have larger populations of returning animal species (such as otters) because they are more productive.

In Bang Tip, community members know that the mud crab - poo dam (*Scylla olivacea*) is vulnerable during a neap tide, when it moults and takes shelter amongst tree roots. Twenty-five days after moulting the crab mates, and once its eggs have matured and been deposited under the female's abdomen it migrates offshore to spawn. The newly hatched larvae move inshore on the current to feed and develop in the mangroves. The grey mullet – pla kraboak (*Mugil cephalus*) spawns in the mangroves, and from May to June every year juvenile mullet can be found throughout the forest. Once mature, however, they swim offshore to feed on the ebb tide and return to the mangroves with the flood tide.

In Prednai, community members recognize two main species of sesarmid crabs – *poo*

samae kam daeng (*Episesarma mederi*) and *poo samae kam khao* (*Episesarma versicolor*). *E. versicolor* is the smaller of the two and has a harder carapace. It is found on either sandy or clayey sediments throughout the mangrove forest. *E. mederi* prefers small, dry hillocks lying above the water in mangroves dominated by *Acrostichum*, *Lumnitzera*, *Avicennia* or *Excoecaria* spp. These sesarmid crabs spawn every June and November during the fourth to sixth nights of the waxing and waning moon.

So, communities normally use this knowledge for their livelihoods, collecting plants and animals in and nearby the mangrove area.

Box 1: Bangrong's knowledge on mangrove plants habitat

- Samae Dam (*Avicennia officinalis*) and Thua (*Bruguiera* spp.)- dry hillocks and sandy site in the middle of mangrove area
- Kongkang Bailek (*Rhizophora apiculata*)- soft mud under tidal influence
- Kongkand Bai Yai (*Rhizophora mucronata*) - deep and soft mud in estuarine rivers and coastal areas
- Pungka Huasum Dong Deang (*Bruguiera gymnorrhiza*)- stiff mud and open site
- Chak (*Nipa* spp.) soft mud along the river and creek edges
- Prong (*Cerios* spp.) (clayey sediment and sandy mud of the middle to inner mangrove area
- Taboon (*Xylocarpus* spp.) – stiff mud in the middle mangrove area

3.3 Local knowledge of mangrove rehabilitation and conservation

The following issues of local knowledge related to mangrove rehabilitation and conservation were identified:

- religious belief,
- forest plantation,
- thinning, monitoring,
- coastal protection and zoning.

Various sources contribute to local knowledge of mangrove rehabilitation and conservation. In the Islamic communities of Bang Rong and Bang Tip, a strong religious belief in conserving nature emphasizes understanding

and respect for the environment, as well as the importance of the middle way to finding a balance in life.

A number of communities are continuously engaged in rehabilitating their mangroves, using tree planting as a strategy to involve community members, raise awareness and build a shared sense of forest ownership. In Bang Rong, the community has used trials to identify the best species for replanting different sites. In Khao Yi san, they also have transferred their knowledge on *Rhizophora* spp. commercial plantation to the next generations.

Box 2: Khao Yi San's knowledge on *Rhizophora* spp. seedling keeping

Collecting healthy and mature fruit, the fallen fruit have to be pale yellow in color and long in size. If it is still on the tree, the base of the stem should be red-brown and mixed with pink color. The collected fruit can be preserved at least 1 month; however they have to be lined up, and be watered by brackish water 1-2 times a day.

However most of the communities are opposed to thinning their mangroves to increase wood growth and yield. They consider non-wood mangrove products as more important than wood, and moreover believe that the forest structure will reach equilibrium without human intervention.

The concern for protecting mangroves means that each community actively monitors and guards against any forest disturbance. At the outset of management, when encroachment was a serious problem, the communities divided their mangrove forests into different

zones for teams to patrol. Subsequently they concentrated on building the capacity of villagers, fishermen and tour guides to watch over the forests.

In terms of protection, villagers in Prednai have developed a special mechanism to protect against coastal erosion and collapse. Known as a “rubber dice”, it is made from six tires intertwined in a rough cube resembling a dice. Cement is poured into the lower part of the cube to weigh it down and it is then placed on the shoreline to trap sediment and dissipate wave energy. According to villagers the rubber dice also provides a habitat for juvenile marine animals.

To promote sustainable and equitable mangrove use, each community has divided its forest into different zones and drawn up regulations for forest use. These are broadly similar among the communities, and recognize three main zones:

- 1) **A conservation zone** where no human disturbance or activities are allowed (some communities refer to this as an ecosystem study area, or a forest nursery area);
- 2) **A rehabilitation zone** where degraded forest is to be enriched and wildlife habitats restored; and
- 3) **A utilization zone** where non-timber products can be collected and processed, but wood can only be harvested with permission from the community management committee. Furthermore, any harvesting must be followed by replanting as stipulated in the forest use regulations. Some communities subdivide their forest use zone into medicinal herb and food product zones.



Figure 2: Rubber dice at Pred Nai coastal line



Figure 3: Zoning signboard at Thung Tase mangrove area

Table 1: Regulation on forest use in utilization zone

Community	Zone	Timber use	Non- timber use	Penalty
Prednai	<ul style="list-style-type: none"> - Conservation zone - Special conservation zone 	Everyone in the community and outsiders who may suffer and be most in need. Also the public can use mangrove wood if permitted.	Prohibited: sesarmid crab catching during egg laying periods, using illegal fishing gears and catching aquatic animals and harvesting honey within the conservation zone.	Fine: 100-500 Bath/tree, including confiscation of collected resources
Lilet	<ul style="list-style-type: none"> - Conservation zone 	All existing mangrove forest areas strictly identified as conservation zone where a permission to extract timber is needed followed by 5 repeated replacement plantings.	Prohibited: using illegal fishing gears.	Warning or proceeding to legal procedure.
Bang Tip	<ul style="list-style-type: none"> - Aquatic animal protecting zone - Ecological learning zone - Restoration zone - Utilization zone 	All kinds of wood extraction is prohibited in the ecological learning zone; the utilization zone is allowed to be utilized by villagers who are frequently involved in conserving activities if asking for permission and if followed by 10 repeated replacement plantings.	Prohibited: catching aquatic and non-aquatic animals in the aquatic animal protecting zone and the use of any kinds of illegal fishing gear	Warning and confiscation of all collected resources
Thung Tase	<ul style="list-style-type: none"> - conservation zone - restoration zone - utilization zone - herbal zone 	Villagers frequently involved in conservation activities can ask permission to use timber in the utilization zone if followed by 5 repeated replacement plantings.	Un-formulated regulation	Fine: 5,000 – 10,000 Bath, depending on the total amount of confiscated trees
Khok Phayom	<ul style="list-style-type: none"> - The King Jubilee forest zone - seedling forest zone - utilization zone - herbal zone - food and crafting material - production zone 	<p>Allowed for households but the committee must be informed at least 3 days before extractions which must be followed by 5 replacement plantings.</p> <p>Prohibited for outsiders to collect seedlings from the mangrove forest area without asking for permission.</p>	Un-formulated regulation	Fine: 500–1,000 Bath

3.4 Local knowledge of mangrove utilization

The following issues of local knowledge related to mangrove utilization were identified:

- herbal use,
- Nipa palm use,
- charcoal production,
- learning and tourism,
- traditional fishing, and
- traditional products.

Local knowledge of utilization tends to vary according to location. Most knowledge relates to the use of different mangrove plants, traditional fishing and indirect uses, for example tourism. Different communities use up to 37 different medicinal herb species from the mangroves. The Nipa palm (*Nypa spp.*) has more than 10 different uses. In Khanap Nak, for example, making sugar from Nipa palm is one of the main economic activities. In Khao Yi San, charcoal is produced from mangrove plantations, all of which are under a proper system of management. Other uses include extraction of clothes dye from mangroves in Thung Tase, and production of the sweet known as *look roy* in Khok Phayom (according to a recipe passed down since the Second World War).

Box 3: Use of Nipa palm in Lilet, Thung Tase and Khanab Nak

- Young leaf – tobacco roll covering, mat
- Mature leaf – sweetmeat envelope, basketwork, roofing
- Petiole – roofing, fishing tools
- Mid rib – basketwork, sweep tool
- Fruit – sweetmeat, food
- o Liquid from inflorescence – sugar, vinegar, liquor



Figure 4: The Tao Khaw (*Bruguiera cylindrica*) fruit and its sweetmeat “look roy” in Khok Phayom

Box 4: Thung Tase knowledge on dye colour from mangrove plants

- Taboon Khao (*Xylocarpus granatum*) fruit skin – pale brown
- Pungka (*Bruguiera hainesii*) bark - dark brown
- Pangka leaf (*Bruguiera hainesii*) - pale pink
- Samae Thala (*Avicenia marina*) leaf - pale pink
- Lunpoa Thala (*Intsia bijuga*) stem core - yellow
- o Chak (*Nipa spp.*) ripe fruit – dark gray and black

Mangroves are increasingly becoming a site of learning and ecotourism. A number of communities have carried out surveys, identified sites of interest and laid out study trails for visitors to watch rare plants and animals, traditional fishing methods, firefly displays and food processing of forest products. Some communities offer boat tours and home-stay programmes, both of which provide an alternative source of income. Tourists and visitors interested in local culture and environment are given a warm welcome, though the communities make few preparations for their visits as they fear an adverse social impact. Besides these activities, villagers also emphasize the exchange of knowledge, and always seek new information from visitors to the community.

Traditional fishing gears are still used to collect aquatic animals in mangroves and inshore waters. These do little harm to smaller fish or invertebrates, or bottom-dwelling species, allowing the fisher to catch only the desired size and species. In the community of Lilet, the *kram* (a type of fish trap) provides a home and shelter for certain fish species. Besides the use of traditional gears, the communities also enforce bans on catching key commercial species during their spawning season. In Prednai, for example, a campaign under the slogan “Leave One Hundred – Collect One Million” encourages villagers to stop collecting sesamid crabs during spawning.



Figure 5: Community-based tourism activities in Lilet and in Bangrong mangrove areas

3.5 Local knowledge of forming community groups and organizations to manage mangroves

The following issues of local knowledge related to community groups and organization were identified:

- Local initiatives,
- concepts and scenarios of group/ organizational development, and
- continuous efforts and sustainability.

In most cases, the communities have formed groups or organizations in response to external pressures, or through the process of confronting mangrove charcoal concessions or encroachment by prawn farms. In such cases, community members organized themselves under the leadership of the selected village head and a charismatic natural leader who inspired and mobilized villagers to take action. Though the situation subsequently improved, these communal activities were continued and were later supported by external agencies. The only exception is Bang Tip, where government agencies have supported the community organization since its outset.

The different organizations in the eight communities fall into three main categories:

- 1) **No group formation.** In this case mangrove management falls under a natural leader and certain community members. For example, Bang Rong does not have a formal mangrove management group but a leader and various community groups who cooperate in looking after the forest.
- 2) **Formation of a loose group.** Here the main role is played by the group leader, for example in the Mangrove Management Committee of Thung Tase and the Lilet Tour Guides for Conservation Group.
- 3) **Formation of a management committee with a formal structure and management plan.** Examples include Prednai's Mangrove Conservation and Development Group, the Resources Management Group of Bang Tip, and the Mangrove and Tourist Site Conservation Group of Khok Phayom.



Figure 6: Thung Tase's Community Learning Center



Figure 7: Bang Tip conservation activity

Table 2: Community group and organizational development

Community	Group Initiative			Community organization formulation		
	Year	Driving force	Initiator	Year	Driving force	Supporter
Prednai	1983	- logging concessions - shrimp farm	Prednai	1983	- logging concessions - shrimp farm	Prednai
Lilet	1992	- clearance before planting in government project	Lilet	1992	- clearance before planting in government project	Lilet
Bang Tip	1995	- logging concessions - destructive fishing gear	Bang Tip	1995	- logging concessions - destructive fishing gear	Bang Tip
Bang Rong	1992	- logging concessions - shrimp farm - land encroachment	Bang Rong	1992	- logging concessions - shrimp farm - land encroachment	Bang Rong
Thung Tase	1991	- logging concessions	Thung Tase	1991	- logging concessions	Thung Tase
Khok Phayom	2002	- imbalance opportunity from government - logging concessions	Khok Phayom	2002	- imbalance opportunity from government - logging concessions	Khok Phayom

The sustainability of the community organizations often depends on the abilities of their leaders and the role played by the community members. These depend in turn on their learning from past experience, or on the external support and encouragement they have received for developing their management approach and direction. Though details vary from place to place, the community groups share some similar characteristics. For example, they use plans to

determine their management direction. They also use ecotourism activities as a tool in managing mangrove resources. Other similarities include linking management approaches at the sub-ecosystem level, for example bays or sub-watersheds; linking conservation with economic activities; promoting the role of youth and women; building external networks of support, and ensuring a continuous programme of action.

4. Discussion

Broadly speaking, local knowledge of mangroves can be divided into four interrelated categories: 1) knowledge of the mangrove ecosystem; 2) knowledge of mangrove rehabilitation and conservation; 3) knowledge of mangrove utilization; and 4) knowledge of forming community groups and organisations to manage mangroves. The first category, ecological knowledge, can be found in all communities with active management systems, although the details differ from area to area depending on mangrove type and

condition. Ecological knowledge can be considered the basic knowledge needed to ensure efficient mangrove management. The fourth category, organizational knowledge, is often transferred or exchanged between communities, resulting in broad similarities between different localities.

It is clear that the categories of knowledge are closely interlinked (Fig. 8). For example, if local knowledge is lacking, management is unlikely to succeed, either in rehabilitation,

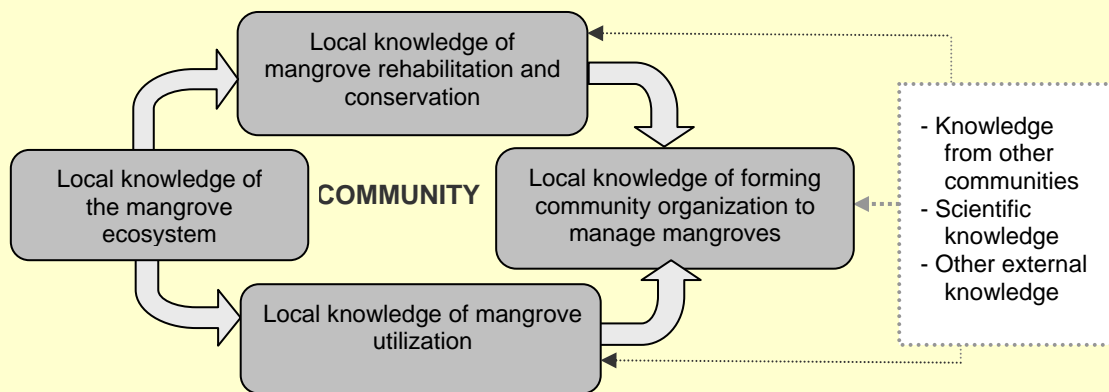


Figure 8: Interlinkages among different elements of local mangrove knowledges.

conservation, sustainable utilization, or community organization. And if management is weak and community organization lacking, both mangroves and local knowledge are likely to be lost.

The use of local knowledge in mangrove management has been impacted by the influx of new knowledge and technology as Thailand has developed. The development of an educational system emphasizing a common approach to learning has given rise to the attitude that only scientific knowledge can be proved empirically and explained rationally. For its part, local knowledge has been devalued or dismissed as uninformed belief.

Furthermore, the economic trends encouraging rural–urban migration for work or education are increasingly separating people from the sources of local knowledge. Less and less knowledge is being passed down from one generation to the next, and modern lifestyles no longer depend on the use of local knowledge.

Government policy is working against this trend, for example by recognizing and

promoting the applied use of local knowledge in national development. For example, under Thailand's Tenth National Economic and Social Development Plan (2007–11), the use of local knowledge is being promoted in education, public health, and the development of science and technology for sustainable environmental and natural resource management. Nevertheless, such plans and policies have yet to be translated into concrete action.

In some areas, however, local knowledge is being transferred to youth groups through local programmes and activities to increase awareness and appreciation of mangroves. Some of the communities have formed youth groups to sustain local knowledge. Others are promoting the role of women in using local knowledge, especially in preparing food and utensils. The communities are also encouraging fishing groups to play a role in maintaining local knowledge, for example by reviving the use of traditional fishing gears. Furthermore, ecotourism and home-stay programmes are helping to transfer knowledge to tourists and outsiders.



Figure 9: Transferring local knowledge to younger generation



Figure 10: Role of women in using local knowledge and practices in preparing food

Most local knowledge is site-specific and, though it may be adjusted to local conditions, remains difficult to understand and use for outsiders or foreigners. Knowledge linked to local culture or beliefs is particularly difficult to translate for outsiders. At present, the use of local knowledge is not widespread because much of it is still tacit, awaiting documentation and transfer to younger generations.

The case study analysis shows that the potential for using local knowledge and wisdom in managing mangroves depends on the strength of community management systems and livelihood links. It is clear that communities still managing and using their mangroves will naturally organize themselves to conserve the forest. In these cases local knowledge and wisdom will always have a role to play. It cannot be denied, however, that the economic value of local knowledge is the key to its use and maintenance, for example in tourism, production and processing, fishing, and so on.

5. Conclusions

The management of Thailand's mangroves emphasizes local participation and the increased use of local knowledge. As a result, local knowledge of mangroves is being surveyed, compiled and codified to enable its continued practical use. Most communities are aware that existing local knowledge could be lost unless it is documented, because much of it is tacit in nature, carried in the minds of village elders, fishers and others who use mangroves, and because little of it is being transferred to younger generations.

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In conclusion, local knowledge of mangrove management comprises knowledge, beliefs and management practices passed down from generation to generation, adapted from external sources, or derived from experience. As such it differs from place to place.

- The knowledge shared by **every community** mostly concerns mangrove ecology, mangrove rehabilitation and conservation, and forest zoning for utilization.
- The knowledge shared by **some communities** concerned locally important plant and animal species, and medicinal herbs.
- Lastly, some knowledge is found only in **specific communities**, for example on the use of religious principles in building awareness of conservation; specific measures against coastal erosion; and the management of mangroves for charcoal production.

Because local knowledge stems from within the community, its promotion and use should begin with strengthening the ability of communities to use their knowledge in managing their resources. Other important aspects of promoting the use of local knowledge in mangrove management are developing sources of knowledge in the community, increasing the acceptance of local knowledge by incorporating it into research and education, and developing database systems. These measures should form part of a coordinated approach that will promote coherence and ensure greater uptake of local knowledge in mangrove management.