HERBARIUM *of* NON-TIMBER FOREST PRODUCTS *of* LAO PDR

Selected wild species and their traditional and contemporary uses

Prepared under the Agriculture for Nutrition Phase II (AFN II) Project, co-financed by IFAD, GAFSP and the Government of Lao PDR

With each foraged herb,

the people of Lao PDR honour the land's quiet gifts.

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FOREWORD

Forests play a vital role in sustaining rural livelihoods in Lao PDR. Beyond timber, they provide a remarkable diversity of food, medicines and materials that support nutrition, resilience and cultural traditions. Non-timber forest products (NTFPs) are therefore an essential part of local food systems and an important source of income for many communities.

This illustrated guide celebrates the richness of these resources and the traditional knowledge of the diverse ethnic communities of Lao PDR who have stewarded them for generations. It highlights the close links between biodiversity, nutrition and sustainable livelihoods.

I would like to express my sincere appreciation to all partners for their collaboration in bringing this work together.

Above all, I would like to acknowledge the communities whose knowledge and stewardship continue to sustain these valuable forest resources.

Rachele Arcese

IFAD Country Director a.i., Lao PDR

Non-timber forest products (NTFPs) have long played an important role in the daily lives of rural communities in Lao PDR. They contribute to household nutrition, traditional medicine, local incomes and cultural practices, while also reflecting the deep knowledge that communities hold about their surrounding landscapes.

This publication is an important contribution to documenting that knowledge and highlighting the value of species that are often overlooked, yet remain essential to food systems and rural livelihoods. It also reflects the broader objectives of the Agriculture for Nutrition Project, which seeks to promote diversified diets, sustainable natural resource use and improved resilience for rural households.

Through AFN, we have seen how local knowledge, when recognized and supported, can help strengthen both nutrition outcomes and livelihood opportunities. This guide is therefore not only a record of species and uses in Lao PDR, but also a reflection of the close relationship between people, forests and well-being.

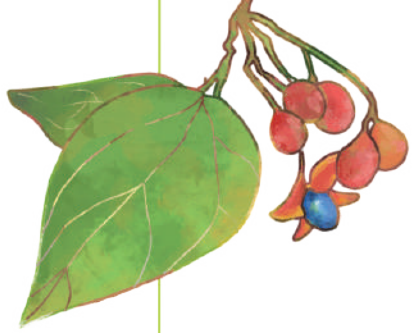
I would like to thank IFAD and all those who contributed to this publication, and especially the communities whose knowledge and experience continue to guide this work.

Sisovath Phandanouvong

National Project Coordinator, Agriculture for Nutrition Phase II

NON-TIMBER FOREST PRODUCTS

Their importance in the Lao People's Democratic Republic



A forest is worth far more than its timber.
From it, communities derive food, medicine, fibre and countless other resources essential to health and well-being. Non-Timber Forest Products (NTFPs) are the berries, the nuts, the honey, the mushrooms, the essential oils, the bamboo, the rattan, the flowers, the herbs, the animals — the unending list of precious species that often play a vital role in food security, livelihoods, incomes and everything from the roof on our heads to the clothes on our backs.

In Lao PDR, NTFPs play an important role as a food safety net for rural communities. Surveys conducted through the Agriculture for Nutrition Project (AFN) found that up to 40% of ingredients in the local diets of rural communities come from the wild, both gathered and hunted. In some remote communities, over 50 different forest products are included in daily diets. The rest comes from either on-farm production or local markets, mainly for items such as salt, sugar, seasoning, cooking oil etc.

With a highly rice-based culture, wild plants — whether from the forest, wetlands or open clearings — are an incredibly important source of nutrients for rural Laotians, especially during wet months when road access is limited. Similarly, in dry months when farm harvests are lower, NTFPs provide a source of income — wild mushrooms, bamboo shoots, edible fruits and vegetables that villagers can sell in markets for cash to buy rice and other items.

NTFPs are also fundamentally embedded in Laotian culture, from the many herbal remedies that come from the wild to the specific plants used for handicrafts and religious events. But NTFPs can only continue to support communities if biodiversity and traditional knowledge are safeguarded.

Since 2016, the AFN Programme has been working to improve nutrition and livelihood security in Lao PDR through Farmer Nutrition Schools, increasing diversity in home gardens, and improving irrigation and road access. Now in its second phase (AFN II 2023-2030), the project is complementing that work by cataloguing the value of NTFPs and domesticating useful species to increase nutrition intake and income from foods previously only available from the wild.

Documentation is a key first step, as nutritional, medicinal and potential income data on indigenous species is still very much in its infancy. Paired with the increased encroachment into wild areas due to deforestation and the transition into permanent agriculture areas, there is an urgency to find more sustainable solutions to harvesting NTFPs, so that communities can continue to benefit from them in the long term. Cultivating these species at home is one strategy to accommodate demand without resulting in further biodiversity loss.

This book includes many of the species being considered by the project for domestication, expanded cultivation and/or sustainable harvest promotion. We hope that it provides a glimpse into the cornucopia of biodiversity that can be found in Lao PDR and the many uses that wild plants provide. Perhaps you will find a familiar plant or two that you can try in your own backyard.

THE FOCUS OF THIS BOOK

Plants and their uses by the people of Lao PDR and beyond

There are thousands of NTFPs used by the people of Lao PDR. In this book, we have selected a sample of over 30 plants and fungi based on their relevance to Lao PDR and potential interest to a wider global audience. Many are regionally native, and thus have a long culinary, medicinal and cultural history with neighbouring countries such as Thailand, China and India.

You will find 9 use categories throughout the book and some special pages featuring recipes, culture and project highlights.

Food & Spice

Medicine

Cosmetic

Dye

Wood & Fibre

Culture

Ornamental

Agriculture & Fishing

Income

CONTENTS

Please note that many plants have lookalikes and identification takes experience.
Never consume anything that you are not 100% sure is safe.

CANOPY LAYER

Trees and Tall Woody Species

TAMARIND TREE

Tamarindus indica ຕົ້ນໝາກຂາມ

The Tamarind tree is known for its sweet, tangy pod-like beans that are a common fruit throughout Africa and Asia. It has dense, evergreen, compound leaves, and a dark red heartwood; producing red and yellow flowers when it blooms.

Native to: *Tropical and dry savannas of East Africa and Madagascar*

Food & Spice

Most commonly used as a paste, Tamarind is used throughout Lao PDR and many parts of Asia to give a sweet, sour taste to dishes. It is a key ingredient in many Laotian dips (known as *jeow*), as well as soups and stews, including Sour Tamarind Soup. It is also used as a marinade in grilled meats.

Medicine

Tamarind is used both in traditional and modern medicine — around 90,000 kg of shelled tamarind pods are imported into the USA per year for the pharmaceutical trade. It is used in Ayurvedic medicine as a drink to help with digestive issues, from diarrhea to constipation and gas. Throughout Southeast Asia, the fruit is used as a poultice placed on the forehead of those suffering from fever, and the leaves are used to promote wound healing. In Lao PDR, women are advised to soak in a bath of tamarind bark and leaves after giving birth.

Wood & Fibre

Tamarind produces a reddish hardwood that can be used to make furniture, boats and other objects, achieving a high, natural shine when polished. Called "*tone kham*" in Lao, which literally translates as "force, invincible", it is often used for objects that need to be hard, like a mortar and pestle. Lao PDR exports *spalted* tamarind wood, which is a natural process caused by fungi colonizing fallen wood, leaving behind high-contrast patterns desired for more artistic woodwork.

HEALING TAMARIND JUICE

To relieve stomach aches and constipation

Peel the shells off the tamarind pods.

Break up the fruit into pieces and place in a bowl.

Boil water on the side, when ready, pour into bowl, covering the tamarinds.

Add a teaspoon of cinnamon powder for flavour. If desired, add sugar or honey at this stage.

Cover with a lid and let soak for 5-10 minutes to allow full infusion.

Strain the juice through a sieve into a jug or bottle to remove all fibre.

Serve hot or refrigerate for at least 30 mins for a chilled drink.

Ingredients

12-15 fresh tamarind pods

3 tbsp honey

1tsp cinnamon powder

3 cups hot water

Honey or sugar to taste

Tip:

Some people like to add grated ginger or lemon juice for an extra kick and to further aid digestion.

MAK KHAM KUAN

Laotian Tamarind Jam ໝາກຂາມກວນ

Mix wet tamarind paste with water until well blended and there are no lumps.

Place the mixture on a low fire until it begins to boil, then lower to a simmer.

In a separate bowl, stir coconut milk until no lumps. Add slowly to tamarind mixture.

Add sugar and stir until well dissolved.

Stir in young coconut skin.

Let simmer until the mixture starts to have a jam consistency.

Once cooled, transfer to a glass jar for using when desired.

Ingredients

400g wet tamarind

1L drinking water

400ml coconut milk

1 tsp salt

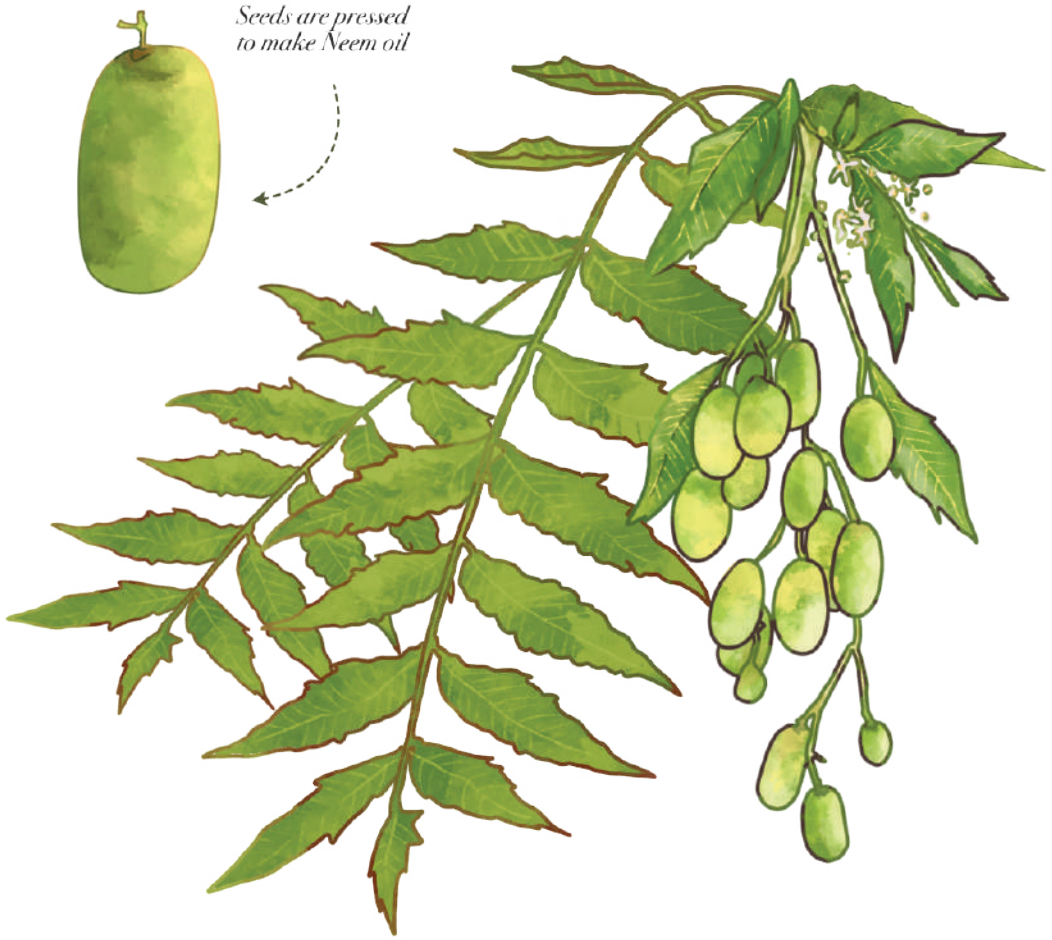
120 ml sugar

(Optional) young coconut skin

NEEM TREE

Azadirachta indica ຂີ້ມາກເດົ່າ

Known for its drought tolerance and medicinal properties, the Neem tree comes from the dry, tropical woodlands of the Eastern Himalayas. It has delicate, fragrant white flowers and long leaves that grow alternately on its branches, acting as an important shade plant in dry landscapes.



Native to: *Indian subcontinent, including northern Myanmar*

Food

While Neem leaves are bitter, the flowers and freshly sprouted leaves are edible and used in Laotian salads and *laaps* (minced meat salad). Any bitterness is considered to have health benefits.

Medicine & Cosmetics

Various parts of the tree, particularly the oil pressed from its seeds (Neem oil), are used in medicine throughout South and Southeast Asia. Neem oil is used in aromatherapy and in skin care for acne treatment, as well in hair products to relieve dry scalps and prevent hair loss. In Lao PDR, the flowers are used as a tonic to boost energy and help indigestion. It is also known as an anti-parasitic and used to treat intestinal worms.

Agriculture

Neem has long been used as an organic insecticide, and helps to combat both pest and fungal infestations in crops. Neem seed cake, made from pressed oil seeds, is also used as a fertilizer, particularly in India where it is endorsed by the government.

ORGANIC NEEM PESTICIDE

A homemade solution for gardeners

Improving agricultural productivity is one of the key components of the AFN Project and part of that includes working with Agriculture Producer Groups to adopt sustainable agriculture practices.

As Neem is a natural pesticide, the project has trained over 20,000 smallholder farmers in creating their own organic mix for use on farm. Crushed neem tree seeds and leaves are mixed together with water, cow urine, tobacco leaves and a range of other, widely available, ingredients. These recipes are adapted from village to village depending on what is available and are mostly used in home gardens, which are typically 100% organically managed.

How to prepare:

If still attached, separate the neem leaves from stems into two bowls. Cut up the neem stems into small pieces.

Wash all parts of the plant well, rinsing 2-3 times.

Place neem leaves into a wok and cover with water. Add in fruits/seeds and cut up stems.

Boil the mixture for 10-15 minutes, stirring occasionally. The water should change to a yellowish-green colour.

Once done, cover with a lid and leave overnight.

After 12 hours, filter the liquid (now brown) into a jug and dispose of the residue (ok for compost).

As this liquid is highly concentrated, mix it 1:1 with water before use. For example, you can fill a spray bottle with 50% water, 50% neem liquid for spraying on leaves. Best used after sunset.

Ingredients

250g of fresh neem leaves

1 cup of green neem fruits

1.5L water

NEEM & ALOE VERA HAIR RINSE

For a healthy, itch-free scalp

In a small saucepan, bring water to a gentle boil.

Add in the neem powder or leaves and allow to simmer for 10 minutes (slightly longer if using fresh leaves).

Remove from heat and let cool.

Strain through a sieve to remove any fibres.

Stir in fresh aloe vera until well combined.

How to use:

After shampooing and conditioning your hair, pour the hair rinse over your scalp and hair.

Massage the mixture into your scalp and leave for a few minutes, before rinsing thoroughly.

Repeat weekly for a happy, healthy scalp.

Ingredients

1 cup water

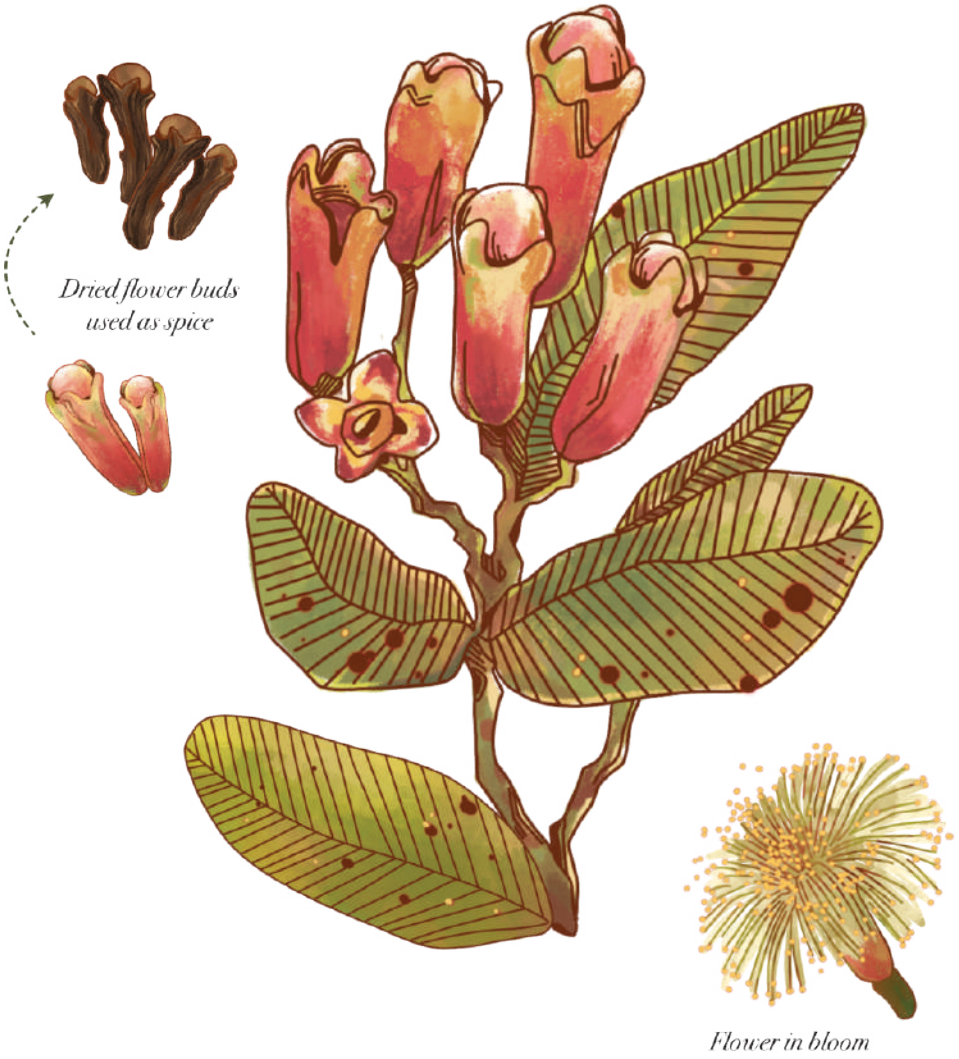
2 tbsp neem powder or neem leaves (dried or fresh)

2 tbsp fresh aloe vera gel

CLOVE

Syzygium aromaticum ກ້ານພູ

A well-known spice used in everything from masala chai to gingerbread, cloves come from the dried, unopened flower buds of the Clove tree. A tropical, evergreen tree, cloves have glossy, aromatic leaves and small red flowers that bloom in clusters.



Dried flower buds used as spice

Flower in bloom

Native to: *The Moluccas of Indonesia*

Spice

In the West, cloves are used primarily in cakes and other baked goods. It is a core ingredient of Chinese Five Spice, and *garam masala*. Indians use it to flavor tea, Indonesians roll it in their slender cigarettes (*kretek*), and in Lao PDR, it is commonly used to add aroma to slow-cooked dishes like *Pho Lao* broth and spicy *Or Lam* stew.

Medicine

Clove oil*, sometimes referred to as *Eugenol*, is widely used in traditional medicine. It is a core ingredient in pain relief creams such as Tiger Balm, and can be used to reduce nausea, aid digestion and combat intestinal parasites.

A powerful antiseptic, it is used in Lao PDR to relieve pain from toothaches and mouth ulcers. Chewing cloves is also meant to freshen breath, and reduce plaque and gum disease.

Income

Clove has been an important part of the spice trade for centuries. So much so that in the 1800s, the Dutch destroyed clove trees in their Indonesian plantations to raise prices and monopolize the business. The industry in Lao PDR is still relatively small, mainly due to strict quality requirements, but it is an income source for many, and the country currently exports the spice regionally at a price of roughly US$3.20 per kilo (2024).

*Due to its potency, it is important to dilute clove oil in a carrier oil before applying to skin.

ANTISEPTIC CLOVE MOUTHWASH

Soothes toothaches and keeps gum disease at bay

For centuries, cloves have been used in Ayurveda to keep healthy teeth and gums. Cloves have strong antiseptic and antibacterial properties, and contain Eugenol, a natural anaesthetic that numbs pain. Combined with cinnamon and peppermint, you have a powerful mix to keep gums healthy and fight bad breath.

How to prepare:

Boil water in a saucepan and remove from heat once it bubbles.

Add in all ingredients.

Leave to infuse for 10-15 minutes.

Strain through a sieve into a glass jar or bottle.

Let cool and store away from sunlight for use whenever needed.

Ingredients

1 cup water

5-6 whole cloves

1 tsp ground cinnamon and/or 1-2 cinnamon sticks

3 drops food-grade (edible) peppermint oil

CLOVE SPICE BLEND

For better digestion, hydration and weight loss

Cloves are known for reducing digestive issues, lowering inflammation, regulating blood sugar levels and promoting fat burning, making them a healthy choice to pair with a healthy diet.

Pre-mixed clove spice blends, also known as *masalas*, can instantly add flavour and improved digestion to drinks and dishes.

Mix the ingredients for the Sweet Spice Blend, to add to oatmeal, yogurt, toast, teas, warm milk, or baked goods.

Mix the ingredients for the Savoury Spice Blend, to add to soups, stews, vegetables and meats.

Or skip the mix and directly drop 2 whole cloves in water overnight to drink throughout the day and promote hydration, boost metabolism and aid weight loss.

Ingredients for a Sweet Spice Blend

1 tsp clove powder

2 tsp cinnamon powder

2 tsp cardamom powder

2 tsp ginger powder

2 tsp sugar (to taste)

Ingredients for a Savoury Spice Blend

1 tsp clove powder

2 tsp cumin powder

2 tsp coriander powder

1 tsp fennel seed powder

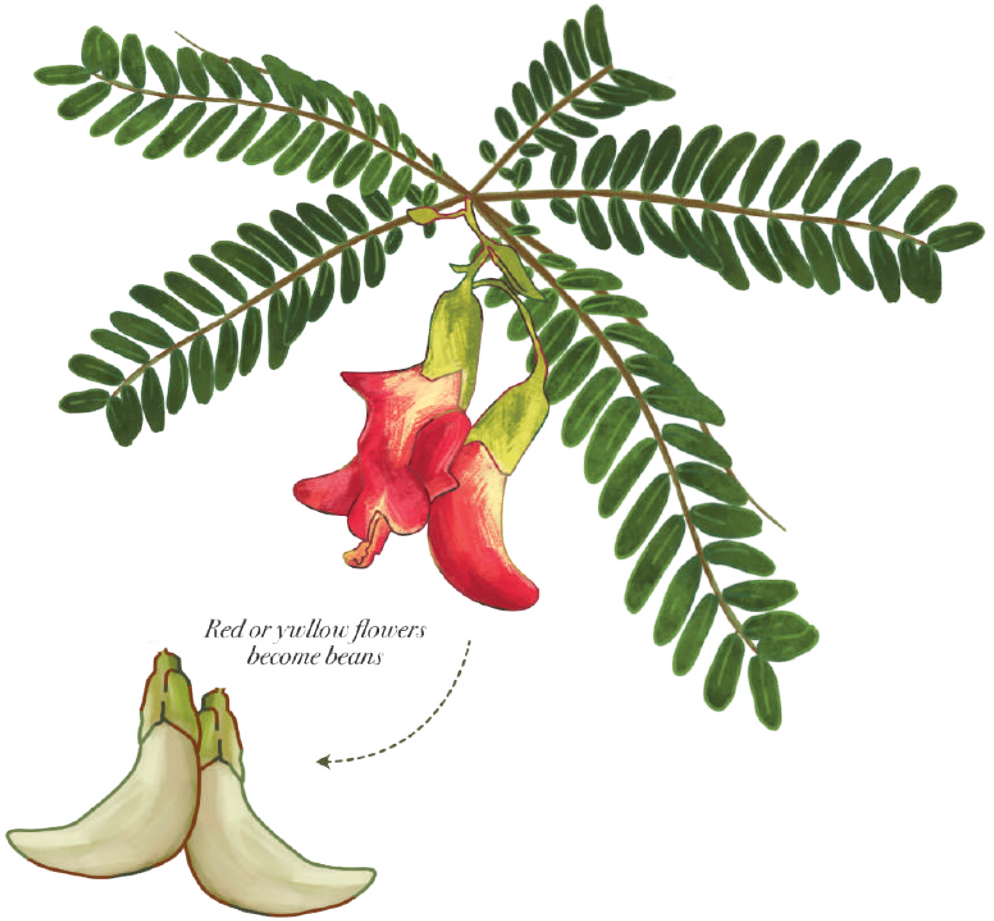
1 tsp black pepper

Sprinkle of salt (to taste)

VEGETABLE HUMMINGBIRD

Sesbania grandiflora ถอกแถะขาอ

With delicate white beans and small, hanging bell-shaped flowers, this multi-purpose tree grows in lowland, wetter areas and helps to improve soil for crops. Depending on the variety, their oval, compound leaves can be adorned by white, red or pink flowers.



Native to: *Malesia, including the Indo-Malay Peninsula, New Guinea and the Philippines*

Food

The leaves, seeds, pods, and flowers of the Vegetable Hummingbird are all edible. Both grown in kitchen gardens and foraged in the wild, the unopened white flowers are a popular vegetable in Lao PDR, typically steamed or cooked in soups and stews such as *Gaeng Pa Sai Dok Kare — "dok kare"* being the Laotian name for the plant. In Thailand, the flowers are also used in salads, and the tender pods are eaten throughout Asia in curries, stir fries, or battered as a fritter.

Medicine

Various parts of the plant are used in a range of ailments. The leaves and flowers are used to make poultices for inflammation, bruises, and skin conditions. Teas made from the bark or leaves are used to help with gastric issues and infections, and is believed to have antibiotic, anti-tumor, and contraceptive effects. In India, the juice extracted from fresh flowers is applied to the eyes for vision clarity and to treat night blindness, both in humans and cattle.

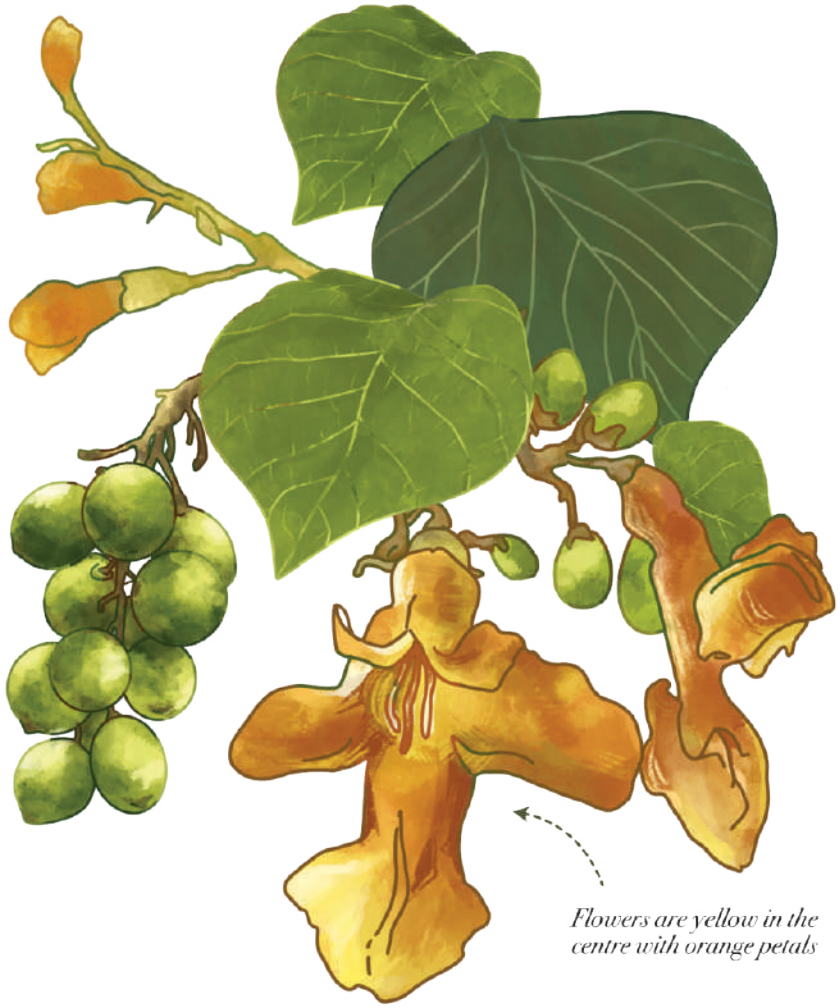
Agriculture

Being a legume, the leaves and pods of the tree are a valuable, protein-rich fodder for livestock (except chickens, for which it is toxic). The tree itself provides nitrogen-fixing properties to improve soil, and all fallen parts (fruits, leaves and flowers) make an excellent green manure or mulch to enhance soil fertility.

GAMHAR

Gmelina arborea ຕົ້ນຊ້

This fast-growing tree with beautiful, velvety flowers is a firm favourite for planting around Laotian homes. It has heart-shaped leaves and a wide crown that brings shade on hot days and grows easily in many conditions.



Native to: *Indian subcontinent, Southeast Asia and Southern China*

Food

Lao people are the first to say that its flowers are delicious. The beautiful yellow flowers are used to make desserts and sticky rice called *Khao Dok Sawh*, a food of the Tai Lue people in Northwestern Laos, typically served during Lao New Year. The flowers also produce a high-quality honey which is sold in both Asia and Africa.

Medicine

Used for centuries in Ayurvedic medicine, the roots, leaves and bark of the Gamhar tree are known to help heal wounds, soothe fevers and have anti-inflammatory properties. The flowers are used for skin diseases and the fruits can be used to treat anemia. In Lao PDR, the leaves are used to treat fungi for people who work a lot in water.

Wood, Fibre & Agriculture

As a fast-growing species, Gamhar is frequently used for reforestation projects and is a useful tree to grow for wood, as a windbreak or to create quick shade for crops. The pale wood is light-weight and durable, mostly used locally as a general-purpose wood and fuel.

KHAO DOK SAWH

Sticky Rice with Gamhar Flowers ເຂົ້າດອກຊໍ້

Gamhar flowers are closely associated with Lao New Year (*Pi Mai*), and are offered during temple visits and family gatherings as a symbol of transition and abundance. The Lue people use them to prepare this delicious sticky rice dessert during festivities.

How to prepare Khao Dok Sawh:

Blend the dry Gamhar flowers in a blender until they become like powder.

Heat up a small saucepan, and melt the two sugars together on low fire. Add a pinch of salt and water to stir thoroughly until it dissolves into a thin, liquid syrup. Let cool.

In a separate bowl, mix together glutinous rice flour and regular rice flour. Add in powdered Gamhar flowers, mix well.

Mix in coconut cream, then slowly add in sugar syrup as you mix to achieve a sticky dough-like consistency.

Cover and let rest for 10 minutes.

Scoop up a small handful of mixture and place into a banana leaf (use double layer for strength if needed). Wrap and press flat into a rectangular packet. Repeat until all done.

Steam for 40 minutes.

Serve warm or cold.

Ingredients

5 cups dried *Gamhar* flowers

6 cups glutinous rice flour

1 cup rice flour

100g brown sugar

100g palm sugar

500ml drinking water

400 ml coconut cream

10-20 banana leaf circles

UNDERSTORY LAYER

Palms, Bamboo and Large Herbs

BENGAL BAMBOO

Bambusa tulda ໄມ້ຍິງ

One of the most useful species of bamboo, Bengal Bamboo can grow as tall as 15m in height, and is famed for its incredible tensile strength, making it a highly resistant and versatile material. Its triangular leaves are distinguished by a covering of fine hairs, as are the sheaths and the base of leaf blades, which have long, white hairs.

Native to: *Lower Himalayas — Northeast India, Southwest China and Tibet*

Food

The crunchy, young shoots of this bamboo are harvested as they emerge from the soil. While edible, it has a slightly bitter taste, therefore is commonly boiled or pickled. Fermented Bengal bamboo shoots are prepared across Asia, including Thailand, Nepal, Malaysia and Northeast India.

Wood & Fibre

Bengal bamboo is very strong and an important part of the paper pulp industry in India. In Lao PDR, the hollow stems are used to make sticky rice containers, and all sorts of handicrafts and other sturdy tools, from construction and scaffolding to baskets and weaved mats. It is an important resource for daily subsistence in the country.

Income

Bamboo shoots are an important source of income in Lao PDR. Their price in Lao markets is around 15,000 to 30,000 kip per kilogram, close to US$1/kg (2024). When exported to Thailand or China, the market price balloons and reaches closer to US$150/kg (2025).

BITTER RATTAN PALM

Calamus viminalis ຫວາຍຂ່ຕ່ຳ

Defined by its thorny branches and snake-skin like fruit, the Bitter Rattan Palm is just one of the many rattan species that have been harvested from the wild for centuries. With stems growing up to 35m in length, the palm's sheaths are adorned with white hair and features yellow spines with red tips.

Native to: *Southeast Asia and the Indian subcontinent*

Food

The young shoots are considered a delicacy in Lao PDR, where it is enjoyed as a vegetable. It is harvested when the shoot is 1m in height and sold in bundles at markets with the leaf sheaths intact, so that it can remain fresh for a week before cooking. The fruit can also be eaten when ripe and has a sweet, slightly sour flavour. In India, they are sometimes eaten with salt and chili.

Wood & Fibre

A versatile material, this rattan is most used for basket weaving, ropes and binding. It is so strong that it can be made into cables that anchor ships and bind together furniture. The width of the strip varies depending on the intended uses — narrow strips are used for more delicate things such as furniture netting and hats, which wider strips are used for mats and window blinds.

Income

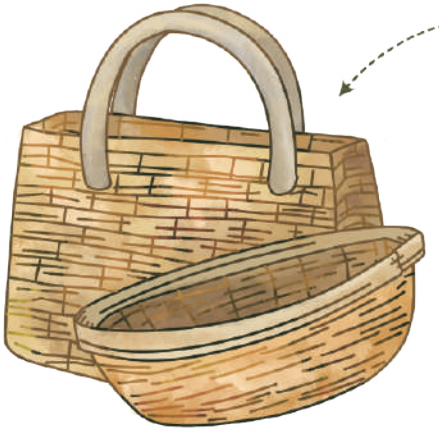
Although traditionally harvested from the wild, this rattan can be propagated from its fruit seeds or by transplanting young shoots for farm cultivation. It is an important value chain in Lao PDR — a single shoot of Bitter Rattan Palm is sold for 2000 – 3000 Kip (approx. US$0.15), and rattan factories in Vientiane sell it for 10 – 24,000 kip per kilogram (US$0.50– $1.20) depending on length and diameter (2024).

WEAVING RATTAN

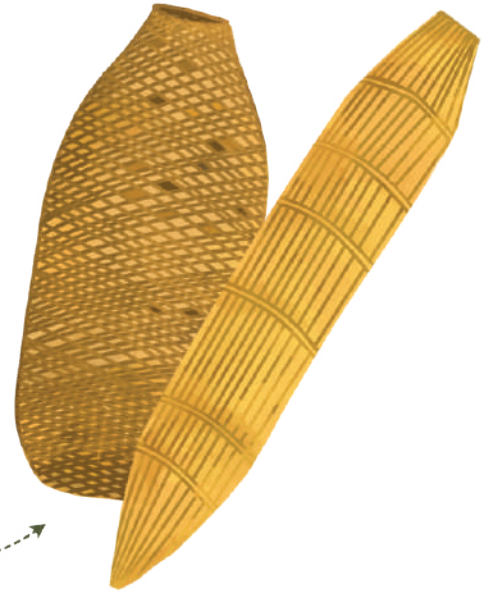
Fast-growing and lightweight, Lao PDR has a long history of weaving rattan, and for many rural families it is an important source of income. How to harvest rattan from the forest and strip it down for fibre before dyeing and weaving into handicrafts are all skills passed down from generation to generation, and today, the tradition lives on through cooperatives and village handicraft groups.

Unlike many other weaving cultures, which are generally the domain of women, rattan is a material crafted by both men and women in Lao PDR, depending on the region and final product. Different groups create baskets, dining trays, mats, furniture and many other accessories.

However, as a predominantly wild plant, sustainable harvest is vital to continue this tradition, and the government is currently working with various NGOs to promote sustainable rattan production in the country.



Rattan is a flexible material that can be made onto all sorts of products



Fishing traps are placed in areas of the river that guide fish in but prevent escape, making it a clever, passive fishing device

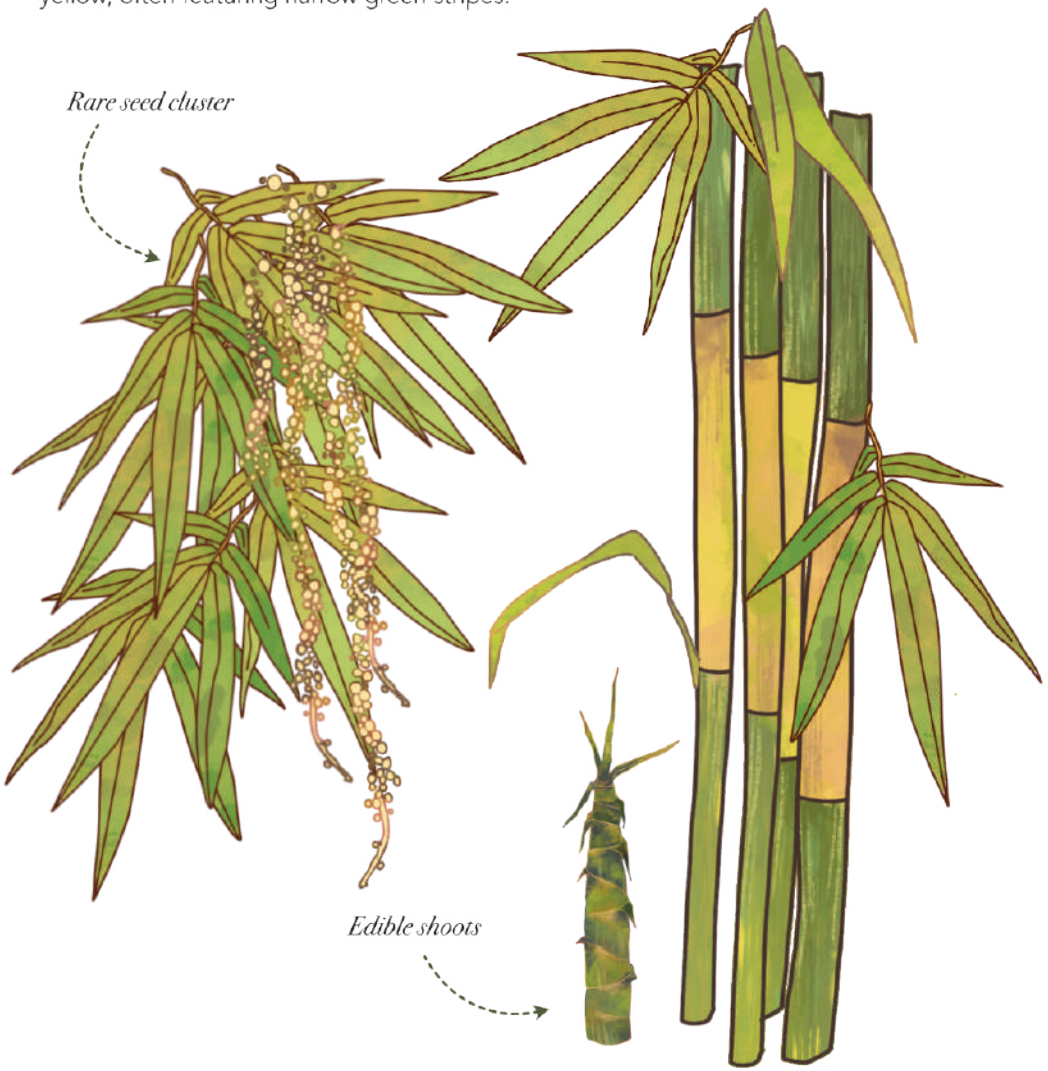
While baskets and weaving mats are more often done by women, rattan furniture is frequently made by men

Bamboo and rattan weaving are similar crafts passed down through generations

MAI HIA

Schizostachyum virgatum ไม้ฮ้ย

Growing in a dense cluster, Mai Hia is just one of many types of bamboos used daily in Lao PDR for weaving and tool making. Its stems have a bluish-green tinge or golden yellow, often featuring narrow green stripes.



Native to: *Lower Himalayas and Indo-China, including Southwest China*

Food

Mai Hia is one of many bamboo shoot species that are eaten in Lao PDR. It is boiled and served with chili paste, added to curries or prepared in a mixed bamboo shoot dish. They can be dried in the sun or canned and stored for year-round use.

Wood & Fibre

Mai Hia is commonly used to make tiles, fishing tools, roofing, bridges and rafts. It is also good for handicraft production and is prized for making the traditional Lao wind instrument known as a *khaen*, which is made up of bamboos of different lengths, assembled in two rows of 3-8 pipes pierced with a hole.

Income

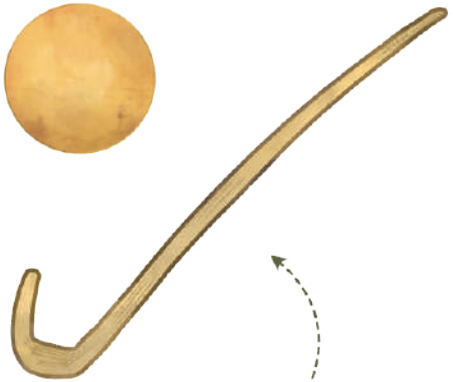
Bamboo shoots are consumed and sold locally at prices ranging from 5000-10,000 kip per kilogram, about US$0.50 (2007). They can be found in markets from the start of the rainy season in May, and throughout the monsoon period.

BAMBOO HANDICRAFTS IN LAO PDR

Different bamboo species in Lao PDR hold a range of cultural significance and uses. While Mai Hia is the bamboo of choice to make *khaen*, Mai Sot *(Gigantochloa parviflora)* and Mai Phai Ban *(Bambusa blumeana)* are used to make percussion, children's blow guns and rockets for the *Boung Bang Fai* or Rocket Festival — the rockets are believed to carry prayers to *Phaya Thaen*, the god of rain. People hope that the higher the rocket goes, the more rain they will receive for a bountiful harvest.

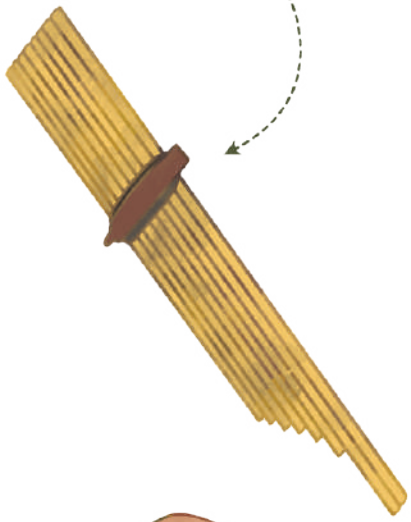
Mai Phai Pa (*Bambusa arundinacea*) and Mai Phouak *(Dendrocalamus sinicus)* are used to make water pipes and opium pipes, depending on the desired size. The clumpy rhizome of *Dendrocalamus* bamboos are used to make the ball for the hockey-like *ti khi* game that opposing teams compete for during the That Louang festival.

Bamboo rockets come in all shapes and sizes during the much loved Boung Bang Fai festival.

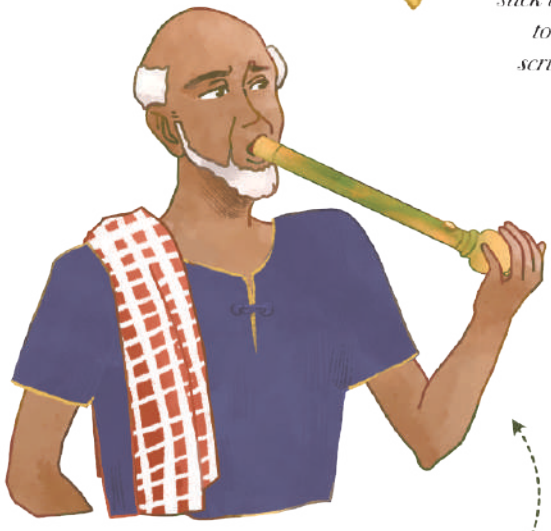


The bamboo Ti Khi ball is painted bright gold and blessed before the game begins.

Made from hollowed out bamboo, the Khaen is the national instrument o Lao PDR, and is used across the region in areas of Vietnam and Cambodia as well.



Bamboo toys guns are popular with rural children and either use an in-built pushing stick to shoot out the "missile" or a mouthpiece to blow out "darts", usually made from scrunched up pieces of paper or dry seeds.

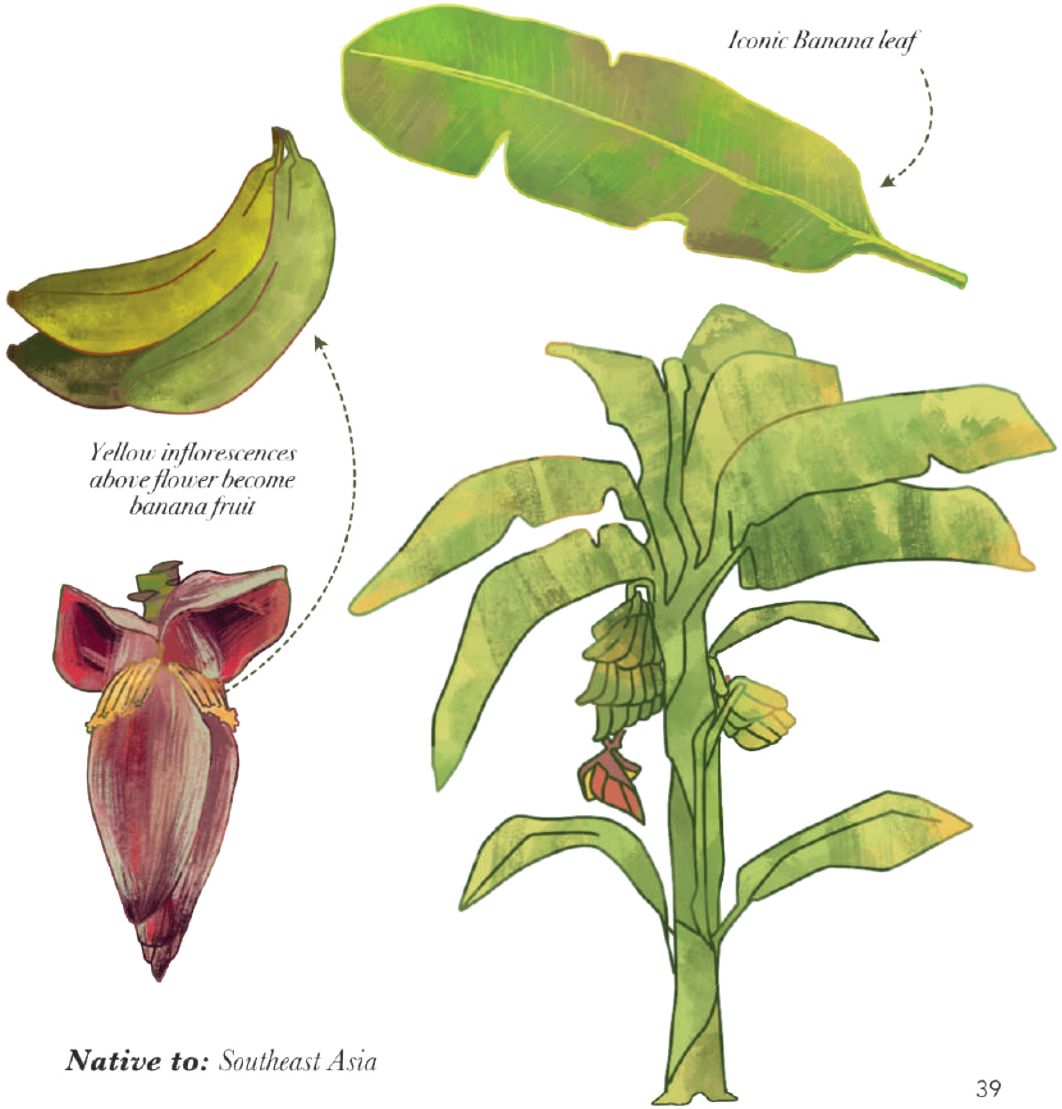


The globally renowned word "bong" actually comes from Lao, meaning "bamboo". While associated with marijuana in other countries, Laotian water or smoking pipes are traditional used for opium and come in many different sizes with unique decorative aspects.

WILD BANANA

Musa acuminata ກ້ວຍປ່າ

With large oval leaves towering over a thick green stem, the Wild Banana is a symbol of the humid tropics. Like most bananas we are familiar with, this wild ancestor produces a large red to dark violet teardrop-shaped flower crowned with small yellow white buds, eventually producing sweet edible fruits, often with seeds.



Native to: *Southeast Asia*

Food

Also known as a Dessert Banana, the fruit is enjoyed globally, and Lao PDR is no exception. Aside from simply raw, fried bananas dipped in batter with shredded coconut and black sesame seeds are a Laotian favorite. The leaves are used in numerous steamed dishes from *Khao Tom* (Sticky rice banana parcels) to *Mok Pa* and *Mok Gai*, steamed fish and steamed chicken wrapped in banana leaves respectively. The blossom is also used in stews and stir-fries, often with galangal.

Culture

The leaves of the Wild Banana have some cultural significance in Lao, used in particular for the *Baci* ceremony or *Su Kwan*, meaning "calling of the soul", performed to commemorate special occasions, ranging from births and weddings to severe illnesses. A cone-shaped tree made of banana leaf is placed as the centre piece of this ritual as a monk calls on deities to return spirits back to the body and provide protection and good fortune to the featured person or family.

Wood & Fibre

Banana leaves are used for all sorts of general items around the house — from plates, to lining cooking pits, to wrapping food, or as improvised umbrellas on a rainy day. The fibre, retrieved from the plant's pseudo-stem, is a growing sustainable industry in Lao PDR, with several social enterprises producing clothes, bags and other accessories, often to support local artisans.

THE MANY USES OF BANANA LEAVES

While many of us thinking of bananas from their fruit, all across South and Southeast Asia, banana leaves are used for wrapping food for steaming, quick-to-make disposable plates and religious and cultural rituals.

In Lao PDR, aside from the Baci ceremony, mentioned in the previous page, banana leaves are also used for *Khao Tom* and *Khao Lom* (both steamed sticky rice treats) as part of a basket prepared for monks during Buddhist Lent (*Hor Khaosalark*), and to make small boats (*krathong*) that are launched into rivers to pay respect to spirits during the Festival of Lights in October (*Ork Phansa*).

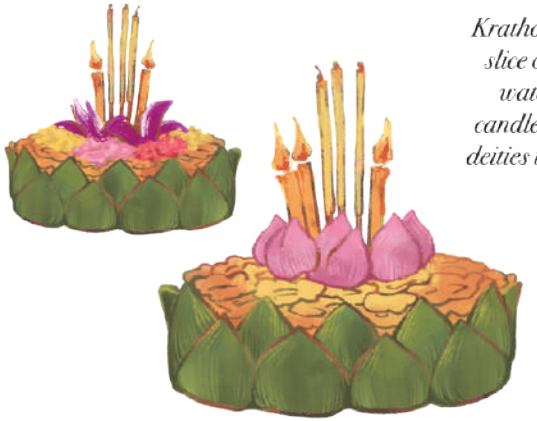
Banana leaves are often used to wrap or cook different foods

Mini morsels of Thai tapioca pudding and Khao Tom

Lao sour pork sausage "Som Muu"

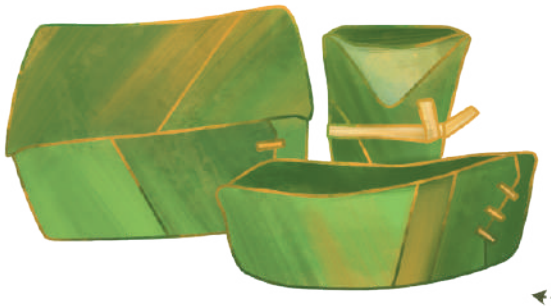
Cambodian Steamed Fish Amok

Street food "plates"



Krathong are small baskets made from a slice of banana trunk (which floats on water) and decorated with flowers, candles and banana leaves in honour of deities to bring good luck and wash away negative emotions.

The centrepiece of the Su Kwan festival, known as the Pha Kwan, is made from banana leaves and acts as the vessel to call guardian spirits. The bowl below usually contains food offerings, and cotton threads tied to the ornament are later given to honoured guests as bracelets for protection.

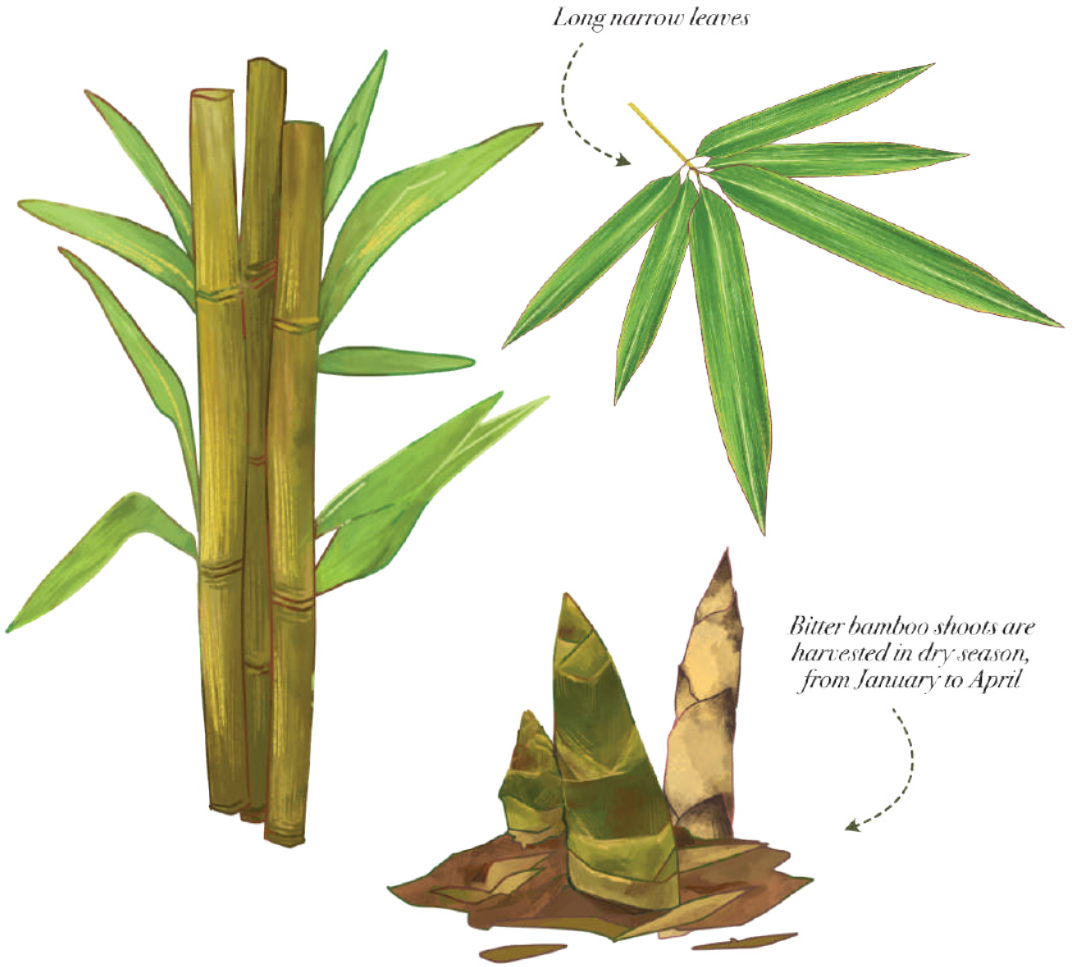


Bananas leaves can offer an alternative form of packaging for many things, like disposable plates, small gifts, and in some countries, wrapping for fruits and vegetables.

BITTER BAMBOO

Indosasa sinica ໄມ້ຂີ້ນ

Little triangular green towers shoot up from the ground in the winter months, making this special bamboo a rare treat for an otherwise bamboo shoot-deprived time of year. Bitter bamboo has straight culms with tough sheaths covered in stiff brown hair and long narrow leaves shaped like a lance.



Native to: *Southern China and northern parts of Lao PDR and Vietnam*

Food

Contrary to its name, Bitter Bamboo is actually sweet and highly sought after, even exported to other countries. It is usually boiled first and then prepared in various ways, from dipping them in a spicy *jeow* (dipping sauce), to slicing long strips for a salad or stir fried with meat and vegetables. It is an essential ingredient of *Gaeng Nor Mai*, a green Lao Bamboo Soup that has a jelly-like texture thanks to another plant in this book, Yanang (*Tiliacora triandra*).

Agriculture & Income

Bitter Bamboo is an important income source for many Lao families and in Vientiane, is sold for no less than 15,000 Kip per kilogram, about US$0.70 (2024). While traditionally harvested from the wild, efforts are being made to grow Bitter Bamboo from cuttings on-farm to prevent over-exploitation, as well as setting up community-based management systems to reduce destructive harvesting.

REGENERATING BITTER BAMBOO

Promoting nutrition, sustainable harvest and domestication

Since early phases of the Agriculture for Nutrition (AFN) Project, Bitter Bamboo has been promoted as part of our Farmer Nutrition Schools and through cooking demonstrations that showcase different recipes that communities can cook with locally available ingredients, especially those benefitting pregnant women and the mother of young children.

AFN I also supported a local company to collect and process Bitter Bamboo (among other products such as cardamom and galangal) for the regional markets in Northern Lao PDR, and its products can now be found in selected shops.

As the plant is traditionally harvested from the wild and there are concerns about its sustainable harvest, there are several organizations in Lao PDR working with farmer networks and dedicated groups to harvest Bitter Bamboo in a way that encourages better regeneration.

AFN II goes one step further and actively supports the domestication and planting of Bitter Bamboo, and other wild foods such as rattan, in common forest areas and home gardens, both for income generation and use within the household.

Farmers in the project are taught how to select and dig up appropriate bamboo stumps for propagation, how to clean the stumps to reduce chance of disease and how to plant them in suitable conditions so that bamboo shoots can be harvested within 2 years.

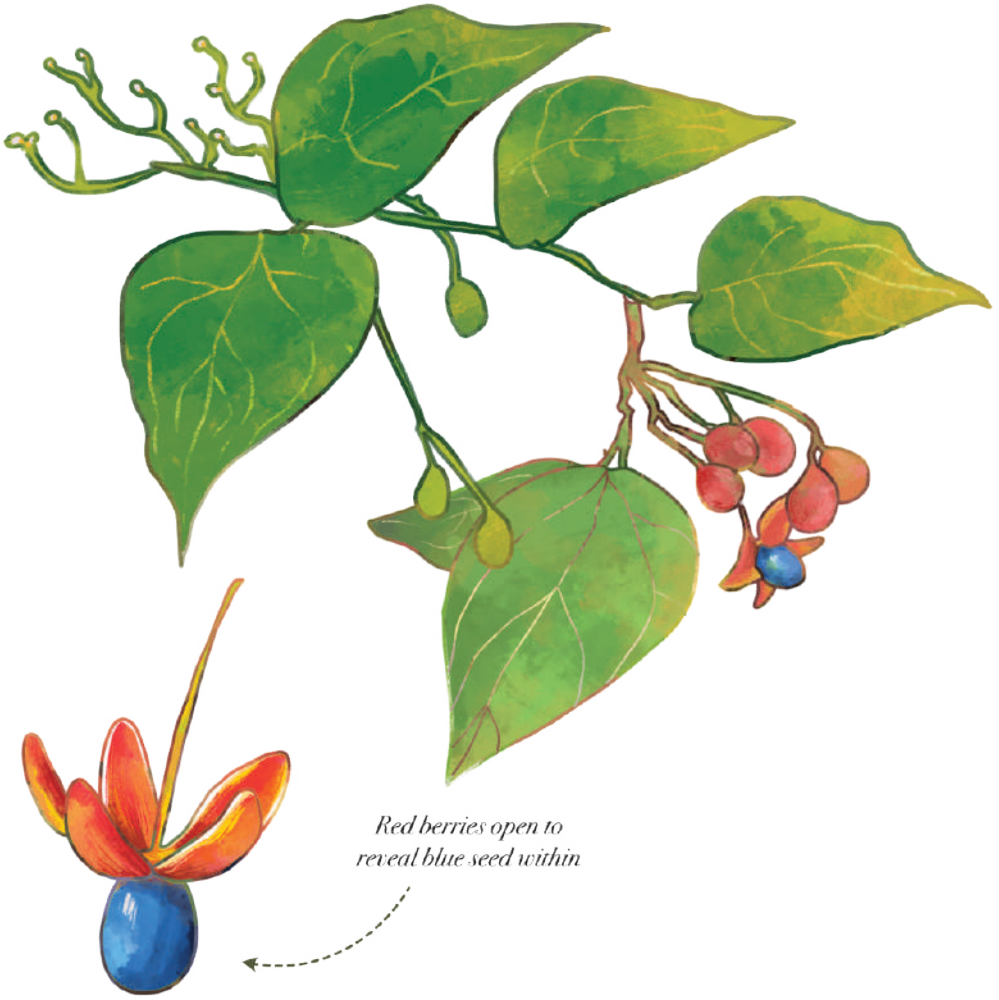
CLIMBING PLANTS

Vines and Lianas

REDSTAKE CLIMBER

Erythropalum scandens ຜັກຮາກ

This climbing plant is hard to notice until the red berries split open like a skirt of petals to reveal an indigo blue seed, reminiscent of small fairies hanging along twine. The leaves are smooth and slightly triangular, with vines growing up to 10m in length.



Native to: *Indian subcontinent, Southern China and Southeast Asia*

Food

The young shoots of this climber are edible and consumed locally in Lao PDR as a vegetable. In Thailand, it is a foraged ingredient that is sometimes added to Papaya Flower Salad. It is also found in dishes served by ethnic communities in Northern Vietnam.

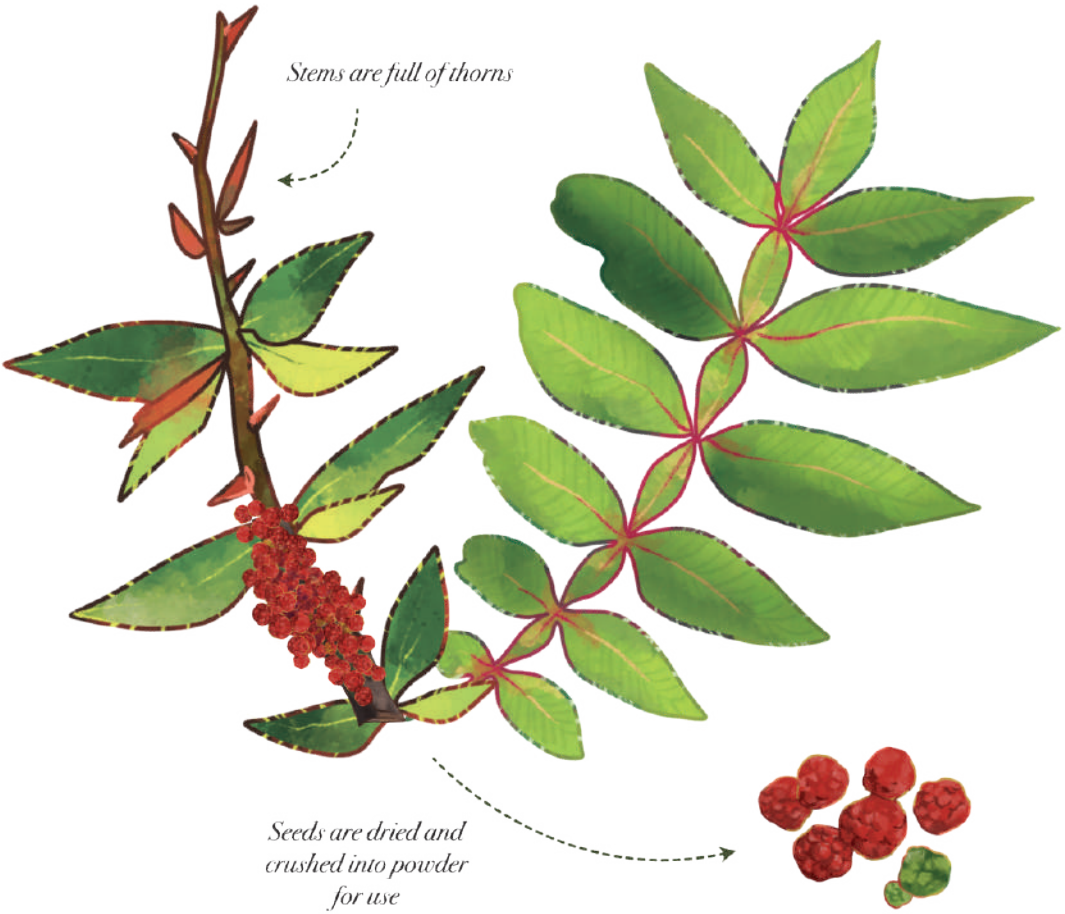
Medicine

The plant is used in traditional medicine across South and Southeast Asia for pain and inflammation, in particular joint and arthritic pain. In India, tribal communities chop up the tender shoots and boil them in water which is then added into a warm bath to relieve rheumatic pain. The patient is subsequently fed a spoon of fresh leaf paste mixed with honey twice a day as treatment.

LEMON PEPPER

Zanthoxylum acanthopodium ໝາກໝາດແດງ

Clusters of pink peppercorns can be found along this thorny, woody climber that can also grow to resemble a tree. Prickly to the touch and to the taste, its sharp leaves are covered in small spikes both on the front and back known as "hairs". Its flowers are small, yellow and full of nectar, making it a favorite of bees when in bloom.



Native to: *Eastern Himalayas, including Northeast India and Southern China*

Spice

Relative of the better-known Sichuan peppercorn, the seeds of the Lemon Pepper are dried and pounded into a powder to add a peppery taste to sauces (*jeow*) or rubbed onto meat for grilling. Its sibling tree, *Zanthoxylum rhetsa* or *Mak khène* (ໝາກແຄ່ນ) is used in a similar way and also has edible young leaves. It is also used widely by the Batak ethnic group in Indonesia as a seasoning for meat and fish.

Medicine & Cosmetics

The seeds of Lemon Pepper are traditionally used to promote sweating, reduce fever, and support the treatment of conditions such as indigestion, anxiety and skin ailments. The oil, also known as *Wartara* Oil, has antimicrobial and anti-inflammatory properties, hence is sometimes used to treat joint pain. It is also cosmetically in fragrances and as a natural mosquito repellent.

ZANTHOXYLUM MASSAGE OIL

To reduce muscle pain and inflammation

Several peppercorns in the *Zanthoxylum* family are used to make essential oils that are a key ingredient for pain-relieving massage oils.

A massage oil typically is made from a base or carrier oil, such as coconut oil, jojoba or almond oil (even olive oil) to improve lubrication, while the essential oils are usually chosen for their therapeutic benefits.

How to prepare:

Using a heat-proof bowl (like tempered glass), add in crushed Lemon Pepper and oil.

Mix until seeds are fully covered by the oil.

Fill a medium saucepan (large enough to hold your bowl without it touching the bottom of the pan), with water level about 1-inch high to create a bain-marie.

Set it on the stove on low fire for 60-90 minutes.

Check every 30 minutes to make sure it doesn't run out of water.

Remove from heat and let cool.

Strain through muslin, a nut milk bag or a clean pair of tights to remove all seed particles.

Pour into a sealable bottle for use when needed.

Ingredients

50g of crushed Lemon peppercorns

250ml olive oil
(can replace with coconut oil or preferred base oil)

SAMBAL ANDALIMAN

An essential relish for Indonesian flavours

Outside of Laos, the most common use of Lemon Pepper is in Northern Sumatra, where it is a key ingredient of a local *sambal*, used as a marinade or dip alongside seafood and anything grilled, even directly on steamed white rice.

How to prepare:

Fry chillies, garlic, shallots and candlenut over medium heat until aroma is released.

Remove from fire and add to a mortar and pestle (or blender).

Add in Lemon Peppercorns and crush/blend all together, leaving some texture (you don't want it to be completely smooth, more grainy).

Add a pinch of salt and sugar adjusting to taste, and finish it off with the lime juice.

Ingredients

1 tsp vegetable oil

2 green bird's eye chillies, chopped

1 red bird's eye chilli, chopped

3 cloves garlic, minced

5 shallots, thinly sliced

2 candlenut kernels

1 tsp Lemon peppercorns

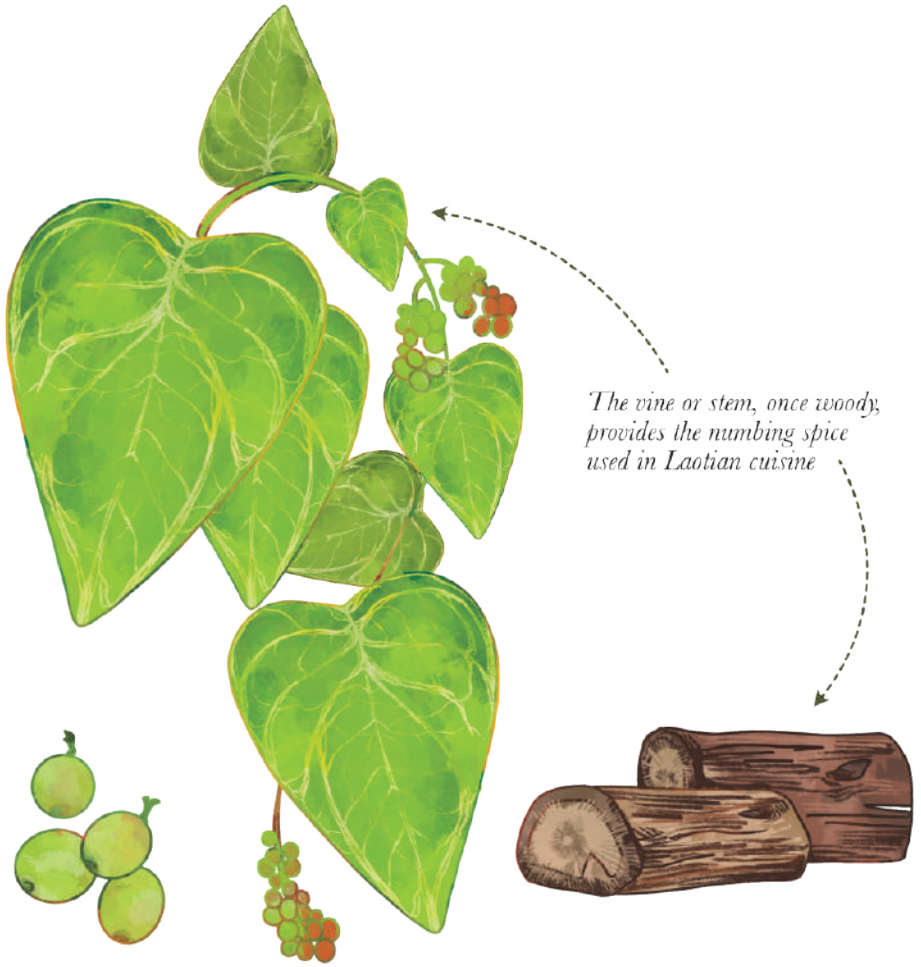
1 lime

Salt and sugar to taste

LAO CHILI WOOD

Piper ribesioides ເຄືອສະຄ່ານນ້ອຍ

This dense vine attaches itself to the bark of other trees as it climbs upwards.The stems look like they have nodes (joint-like points) and contain small air chambers inside. Its heart-shaped leaves are leathery with a distinct 6-vein pattern, and it has white, fragrant flowers that mature into red berries that grow on long stalks.



Native to: *South and Southeast Asia, from India to Indonesia*

Spice

Locally known as *Sakhan*, Lao Chilli Wood is used to enhance a range of meat dishes, soups and curries, most famously, an essential ingredient for Or Lam — a traditional Northern Lao PDR beef stew. The wood of the vine, is responsible for the spice and slight numbing sensation of the dish. It is said that a single splinter of chili wood is as powerful as a whole spice-rack's worth of dried chilis and Szechuan peppercorns.

Medicine

In traditional medicine, Lao Chili Wood is used to combat excess phlegm, chest congestion, flatulence and sweat by adding it to hot baths. It is similarly used for blood-related conditions, including as menstrual medicine.

Income

Typically sold at 22,000 kip per kilogram, about US$1 (2007), Lao Chili Wood is an affordable ingredient for most households and an income source for forest foragers.

CHILI WOOD BEEF STEW

Or Lam ອາຊຫຼາມ

Or Lam is a traditional specialty of Luang Prabang Province. Lao Chili Wood is an essential coponent that adds spice and that tingly numbingness to the dish. It is generally eaten with sticky rice.

How to prepare:

Khao Beau (soaked sticky rice)

Rinse and soak sticky rice in warm water for 1 hour.

Drain and pound in a mortar and pestle until it becomes a gooey-like texture. Set aside.

Beef Rind

Rinse the beef rind and pat dry.

If there is hair on the skin, burn off directly with your stove fire. Boil a pot of water, with salt, and cook for 10-15 minutes until soft. Drain and soak in cold water. Cut into small pieces. Set aside.

Paste

Peel the outer layer of the lemongrass and tie into a knot. Set aside.

In a mortar and pestle, crush the garlic, shallots, chillies and the inner soft part of the lemongrass until it becomes a paste.

Add the *khao beau* and mix well.

Ingredients

STEW

500g beef, cut into small chunks 150g beef rind

500g roast pork crackling, chopped

5 pieces Lao Chilliwood*, remove outer bark, break into pieces and soak in water

HERBS & VEGETABLES

10 green beans, 1-inch pieces

6 Thai round eggplants, quartered

2 cups wood ear mushroom, chopped

1 cup oyster mushroom, chopped

2 tbsp *padaek*

2 tbsp fish sauce

1 cup dill, chopped

1 cup lemon basil leaves

3 spring onions, chopped

1 tsp salt

PASTE

1 stalk lemongrass

3 shallots, chopped

3 cloves garlic, chopped

4 bird's eye chillies, chopped

KHAO BEAU

1/3 cup dry sticky rice, soaked

Stew

Add oil to a pot and sauté the paste until aromatic.

Add the beef, turning the pieces so that all sides are a light brown colour. Fill the pot with water and bring to boil.

Add the chiliwood and lemongrass knot. Simmer for 20 minutes.

Add the *padaek*, fish sauce, eggplants, green beans, mushrooms and pork crackling. Simmer for 5 minutes.

Add salt, mix in half of the dill, spring onions and lemon basil leaves. Use the rest as garnish.

YANANG

Tiliacora triandra ເຄືອຢານາງ

Also known as the Grass Jelly Vine, Yanang is a smooth vine with slightly, wavy triangular leaves. The leaf stalk that attaches the leaf to the vine tends to have a wrinkle or curl, and its yellow flowers grow out in a stalk similar to a fire spike. It produces clusters of edible red berries.

The leaves of the Yanang plant are the source of the prized green jelly

Native to: *Mainland Southeast Asia*

Food

The most common usage of Yanang is to make a green jelly from the juice extracted from its leaves. In Vietnam, the jelly, known as *sương sâm* is generally used in beverages and desserts alongside ingredients such as sago, mango and coconut cream. In Lao PDR, the juice is an essential ingredient in *Gaeng Nor Mai*, a green Lao Bamboo Soup mentioned previously, and is also used in jackfruit soup and mushroom soup to add texture and flavour. Street vendors in Lao PDR and Thailand also sell bottled Yanang water marketing it as a health drink with cooling properties.

Medicine

The mountain people of Lao PDR value Yanang more for its medicinal properties. A decoction of the entire plant is given to mothers postpartum, while its crushed leaves are used for wounds and its roots are used to reduce fever. It is also believed to dispel toxins, and recommended for elderly people or pregnant women who may have ingested something harmful. Early research also suggests it may help prevent the maturation of a malaria parasite — *Plasmodium falciparum*.

YANANG BAMBOO SHOOT SOUP

Gaeng nor Mai ແກ໋ງຫນໍ່ໄມ້

Gaeng Nor Mai is a traditional specialty of Houaphan Province in eastern Lao PDR. This soup is prepared as much for its taste as its medicinal properties and cooling effects.

How to prepare:

Yanang Extract

Yanang leaf extract can be bought in a can, but if you find fresh or frozen leaves, here's what to do:

Wash 2 handfuls of *bai yanang* leaves and soak in 2 cups of water (500ml) for 10 minutes.

Rub the leaves together and squeeze them to make a dark green juice.

Sieve out the leaves and mix in the 2 tablespoons of *padaek*.

Paste

In a mortar, mash chillies, garlic, shallots and lemongrass into a paste.

Stew

Boil 1L of water to have on hold until ready for use. In a separate saucepan, add some oil and the paste.

Keep on low fire and stir until it becomes aromatic.

Add in the catfish, and stir for a few minutes.

Ingredients

YANANG EXTRACT

2 handfuls of *bai yanang* leaves

2 tbsp *padaek* (fermented fish sauce)

PASTE

3 red bird's eye chillies

5 cloves garlic

2 shallots

3 stalks lemongrass, chopped

STEW

2 tbsp cooking oil

900g bamboo shoots, sliced
450g catfish, cut into chunks

3 medium tomatoes, quartered 3 kaffir lime leaves

1 tbsp salt

3 spring onions, chopped

Then add in the *yanang* juice and pour in boiling water until the pot is full. Bring to boil and add salt.

Rinse the bamboo shoots in warm water.

Add to pot and mix in gently, taking care not to break up the fish. Turn fire down to medium low and simmer for 15 minutes.

Add in tomatoes and spring onions. Simmer for another 5 minutes.

Add in the remaining *yanang* leaves. Serve with rice (sticky or other).

Tip:

Yanang leaves are what makes this soup sour. If you cannot find fresh or frozen leaves, replace with 400ml can of Yanang Leaves Extract.

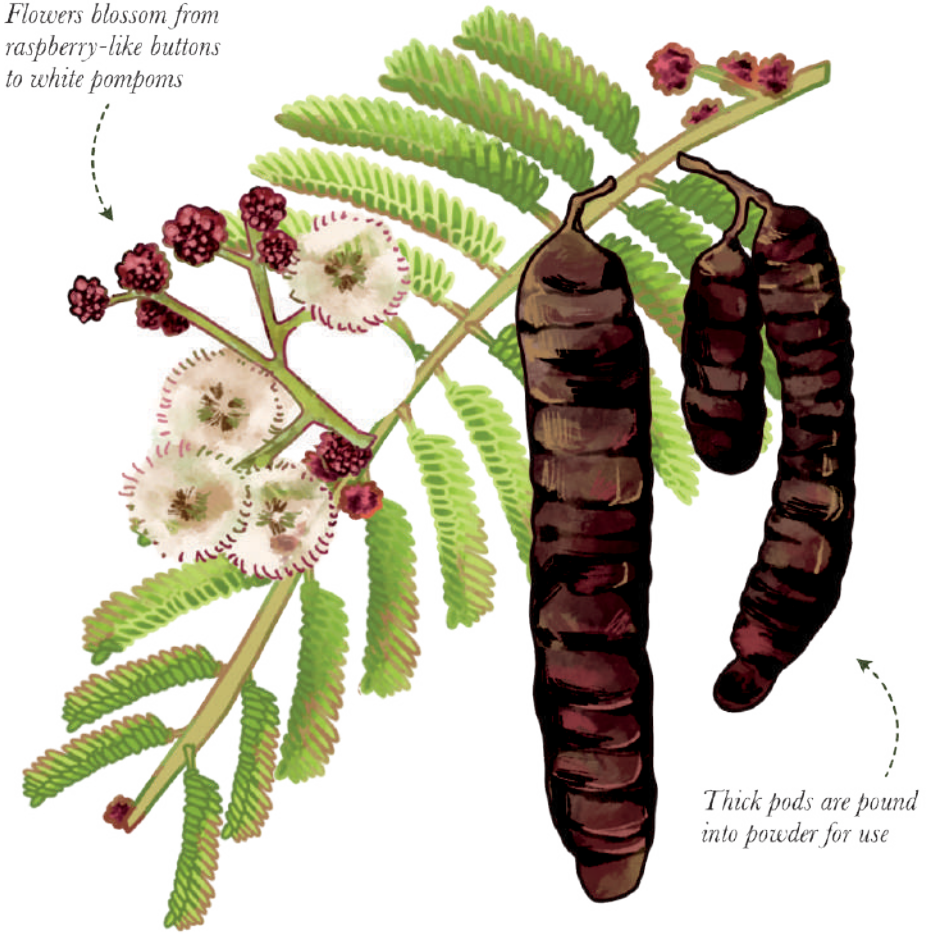
This soup can also be made as a vegetarian dish, without the fish.

You can also add other vegetables to this soup. Some common ingredients include wood ear mushroom, acacia leaves and pumpkin.

SOAP POD

Senegalia rugata ສົ້ມປ່ອຍ

A thorny, woody climber that can sometimes takes the form of a small shrub or tree, the Soap Pod is distinguished by its thick, brown bean pods that became hard and rugged when dry. The green compound leaves are often accompanied by flowers in the form of white, spiky puffs that look like round raspberry buttons before they bloom.



Native to: *Indian subcontinent, Southern China and Southeast Asia*

Food

The young leaves have a sour taste that is used in Laotian soups and curries, or raw in a *laap* (meat salad) or *jeow* (dip). Liquid from its boiled leaves is also used to prepare a Lao dish called *Khao Leng Fuen* — a tangy broth made from tomato, tamarind and fermented bean paste, and filled with chewy rice flour jellies.

Medicine & Cosmetics

Known as *Som poy* in Lao PDR, and *Shikakai* throughout South Asia, the Soap Pod is well known for its use as a soap and shampoo. Dried pods are simply pound into powder and mixed with water (in Lao PDR, sometimes thickened with sticky rice water) to create a basic cleanser that reduces dandruff, improves hair growth and shine. Its cleansing properties also makes it a common ingredient in postpartum baths and to treat skin ailments.

Culture

As the Soap Pod is an important cleansing plant, and hence used in ritual hand washing during Lao New Year celebrations and many other Buddhist rites where it is associated with removing sins of the past. *Som poy* water is also poured over images of Buddha and monks, and the recovered water is carefully carried back to people's homes as good fortune. Similarly, it is common to bathe oneself in Soap Pod when sick, in order to get rid of "the stain of death" or evil spirits.

SOAP POD HERBAL SHAMPOO

Ayurvedic recipe for stronger, glossier hair

The most likely source of ingredients for this recipe is from an Indian grocery store or similar.

Mix all powders together in a glass jar to be stored when ready for use.

To use, add 2 tablespoons of powder to your hand or a small bowl and slowly trickle water in until it becomes a watery enough paste to apply.

Massage into hair, starting from roots and working your way down.

Let sit for 2-3 minutes before rinsing completely.

Tip:

If you cannot find the ingredients in powder form, you can also pound your own powder from whole, dry ingredients (leaves, pods, nuts or seeds).

Or you can make a liquid version by soaking dried ingredients in water overnight, and bring to a boil and simmer for 10 minutes in the morning.

This liquid version requires mashing or blending, before straining into a clean jar or bottle to remove all fibre.

Keep in mind, just using Soap pod on its own is already an effective cleanser, and many DIY shampoo recipes use only 2 or 3 of the ingredients listed above.

Ingredients

4 tbsp soap pod powder (aka *shikakai* or *Acacia concinna*)

1 tbsp soap nut powder (aka *reetha* or *Sapindus trifoliatus*)

1 tbsp amla powder (aka Indian gooseberry or *Phyllanthus emblica*)

2 tsp fenugreek powder

2 tsp rosemary powder

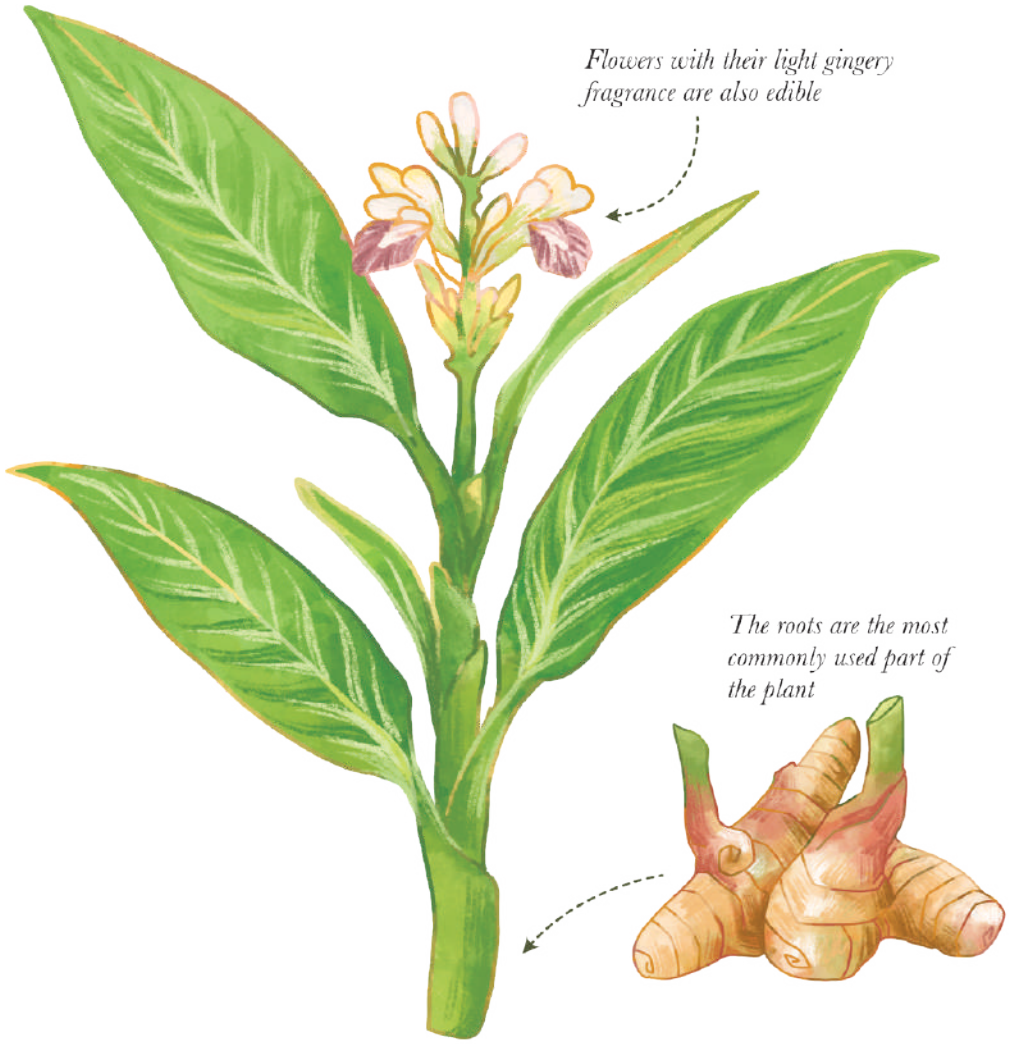
FOREST FLOOR

Herbs, Ferns and Low-Growing Species

GALANGAL

Alpinia galanga ຂ່າຕາແດງ

This ginger relative has beautifully fragrant pendulous white flowers that bees and humans alike love. Broad, wavy green leaves on thin stalks spread up like a crown from its roots — gnarly tuberous rhizomes that sometimes peek out from the forest floor. When ready, its slightly oval berries turn from yellow to red or brown when dry.



Native to: *South and Southeast Asia*

Food & Spice

Unlike ginger, where only the root is eaten, the young shoots and flower buds are also consumed as a vegetable or blanched and added to *laab* and other salads. In Lao PDR and Thailand, the rootstock (rhizome) is commonly used to make sour soups, such as renowned *Tom Yum* soup. It is also added to rice whiskey for fragrance and to aid fermentation. The leaves can also be used to wrap fish, chicken or sticky rice for steaming.

Medicine & Cosmetics

Used widely in traditional Chinese medicine, Galangal is used to treat indigestion, stomach aches, diarrhea, and vomiting — primarily stomach-related issues. Oil extracted from the roots and leaves are also used to treat impotence, anxiety and skin diseases.

Its essential oil is also used extensively by the perfume industry from Bvlgari to Yves Saint Laurent, where it is described as woodsy, earthy, peppery, citrusy, and camphor like.

Dye

Similar to turmeric, Galangal is used as a natural dye, achieving a range of colours from pale yellow, to yellowish-green or brown when treated. It is also used as a food colouring.

TRADITIONAL NATURAL DYES

Turning plants into colour

Lao PDR is known for producing textiles made from silk, cotton, and hemp, and natural dyes have historically paid an important role in making the beautiful patterned designs in woven textiles.

Plants, form the basis of most natural dyes, usually from the leaves, husks or wood that are boiled in water or soaked in alcohol or acid to release their colour. Indigo leaves (from the *Strobilanthes* plant), are crushed and fermented, before being used as a cold dye, where colour is built up through successive dips of the cloth in question. Insects can be another source of dyes, such as the famous *cochineal* insects of the Americas that still play a role in commercial colouring to this day – you may recognize it otherwise as E120 in the ingredients of your products. In Lao PDR, there are similar scaly bugs of *Coccidae* found amongst mango and citrus orchards that are also used for red.

Some Lao ethnic groups believe the process of creating and using dyes to be sacred. Some tribes have a set of social rules around who can process indigo dyes, and master dyers often have secret recipes to produce the perfect shade, using additives such as rice wine, ash or limestone, which also act as a mordant to fix the colour. The Hmong people place red chillies in their dye pots because they believe animist spirits do not like spice. The Tai Lue believe their dye pots to host female spirits that must attract a male spirit in order to produce an effective dye, and thus "dress" their pots in skirts.

Colours themselves also have cultural significance, with the saffron robes of Buddhist monks signifying the truth revealed after purification from golden fire, and red symbolizing good luck and used as a protection against evil spirits, one of the reasons why a red string bracelet (known as *faiy* or *sai sin*) is often tied around the wrists of travellers or during important ceremonies.

Whatever your favourite colour, there is a corresponding plant that with the right knowledge and process, can produce the desired hue. Here are just a few examples from Lao PDR:

Red/Pink/Purple: Coconut husks, Mangosteen, Stick lac, Teak leaves

Yellow/Orange/Brown: Jackfruit, Annatto, Turmeric, Betel palm, Lemongrass

Blue/Green: Indigo, Indian trumpet tree

Grey/Black: Ebony fruit, Indigo

Indigo

Perhaps the most precious and skill-demanding dye, Indigo leaves can produce light to dark blue, green, or even black depending on how long it is fermented for and what it is mixed with. In Lao PDR, it is often referred to as "living colour" since it takes great skill to ensure the dye does not "die" during the many steps to create it.

Turmeric & Galangal

Simmering the grated roots of turmeric or galangal offer a range of hues from a more subtle beige to bright yellow, or even orange depending on the tone desired the time soaked and mordant used.

Sappanwood

Vivid red, pink, purple, depending on the pH of the vat it is prepared in. The dried wood of this tree are chopped into pieces and boiled until a pink brew. Lye is added for purple and alum for red.

Annatto

Seeds of the Annatto plant have long been used for red body paint by Amazonian tribes, the region where it is originally from. But in textiles, the seeds produce an orange hue when mashed and boiled.

JEWEL ORCHID

Anoectochilus lylei ຫຍ້າໃບລາຍ

The dark green leaves with a network of pink and yellow veins are probably more distinct than the small, white flower of this orchid. The flowers twist during development so that they appear almost upside down, with two slanted white wings coming out from the flower base.

Native to: *Southern China and Southeast Asia*

Medicine

The Jewel Orchid has long been used for its medicinal properties, used to treat liver disorders, diabetes, heart diseases, lung infections and snake envenomation. In Lao PDR, it is believed to have anti-ageing properties. Modern medicine has confirmed many of these, as such, efforts are being made to breed these orchids for pharmaceutical use rather than harvest them from the wild.

Ornamental

As a rare orchid with unusually patterned leaves, the Jewel Orchid is highly coveted by orchid collectors for its ornamental value — a small specimen can be sold for US$20-25 on the global market, with some variants costing as much as US$80.

Income

In Lao PDR, Jewel Orchids are sold fresh or preserved in alcohol. In northern Lao PDR, some traders have begun oven-drying its leaves, as 1kg of dried leaves can fetch up to 1,400,000 Kip, about US$65 (2024), later to be exported to Chinese and Taiwanese markets for traditional medicine. As such, villagers will travel 4-6km deep into the forest to harvest these orchids.

Note: Due to overharvesting, Jewel Orchids have become increasingly rare in Lao PDR and based on IUCN criteria, should be treated as Critically Endangered.

SPINY AMARANTH

Amaranthus spinosus ຜັກຫົມໜາມ

Easily mistaken for a weed, Spiny Amaranth has wavy, slightly hairy, diamond-shaped green leaves and stems. The tight-knit, silvery green flowers shoot up at the tip of stems like a pointy stalk, often curling down slightly, turning into beady, black seeds when mature.

Native to: *Lowlands of South and Central America and Mexico*

Food

While seen as a poor man's food, Spiny Amaranth is used in Lao PDR in soups and as a vegetable in stews and stir-fries. It is, like most plants in the Amaranth family, highly nutritious and rich in micronutrients, and considered an underutilized superfood.

Medicine

With anti-inflammatory and anti-microbial properties, the leaves and roots of Spiny Amaranth are used for all sorts of ailments including indigestion, toothaches, improving mother's milk production, regulating menstruation, treating skin infections and stopping bleeding from snake bites. Modern studies show that it has the potential to regulate blood sugar levels, and hence play a role in the treatment of diabetes.

Agriculture

As it is common in Lao PDR and often considered a weed to farmers, Spiny Amaranth is often used for animal fodder. Its ashes are also used as a fertilizer and in some cases, mixed with fat to make shampoo.

HAVE YOUR WEEDS & EAT THEM TOO

Overlooked and often forgotten, in some cases even removed as a nuisance, "weeds" are an undervalued source of food and nutrition for many rural households, particularly during periods when market vegetables are scarce.

During AFN field surveys, women explained that Spiny Amaranth is often the first green to reappear after heavy rains or soil disturbance. While farmers may clear it from rice fields, children and elders gather the tender leaves from field edges and paths.

Likewise, some of the plants you will read about in our last chapter featuring aquatic plants — Water clover, Yellow Burrhead, are essential foraged greens often gathered by children and elderly women. *Kaipen*, Lao PDR' iconic river weed that is dried and spiced into a delicious snack, is an algae reserved for collection and preparation by women.

These unassuming plants are the unsung heroes of the poor and the marginalized, the gap fillers that women add to meals to feed their families and provide essential micronutrients, the essential fodder for farm animals and better soil.

Foragers often say, "the most important plants you need to know are the ones beneath your feet". Here are some examples from Lao PDR, but we invite you to learn about the edible weeds around your home too, wherever that may be.

Spiny Amaranth
(Amaranthus spinosus)

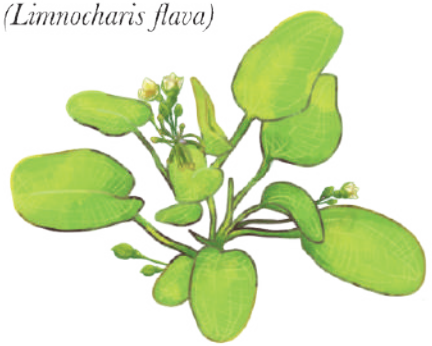
Water Mimosa
(Neptunia prostrata)

Pokeweed
(Phytolacca americana)

Water Clover
(Marsilea quadrifolia)

Geoffray's marshweed
(Limnophila geoffrayi)

Yellow Burrhead
(Limnocharis flava)



Kaipen riverweed
(Cladophora sp.)

TURMERIC

Curcuma longa ຂີ້ໝ້ົນ

A cluster of bright, orange rhizomes form the base of this plant, and large, green, oblong leaves with pointed tips shoot up from each tuber. The pink and white flowers bloom from a central spike like an upside-down pagoda, with some yellow tips, offering pollen and drinking water to insects in the form of small, tubular cups.

Roots shine bright orangey-yellow once the thin layer of skin is removed

Native to: *Indian subcontinent*

Spice

Most frequently used in powder form ground up from its dry root, Turmeric is an essential ingredient in curries throughout South and Southeast Asia, responsible for both taste and a bright yellow colour. In Lao PDR, the flowers are also eaten raw with *laap* (meat salad). In India, turmeric was also traditionally added to warm milk with other spices to help with colds and flus. *Haldi doodh*, has now morphed into a popular drink also found in the West known as a Turmeric Latte.

Medicine

Hot, sharp, bitter, and savory. In Lao PDR, Turmeric is probably more valued for its medicinal properties than for food. Powdered turmeric is mixed with water to drink, it is burned to create fumes for inhaling, boiled for bathing, or tied in a cloth bundle applied to different areas of the body needing treatment. It is used for everything from indigestion to fever to inflammation and toothaches.

Dye & Culture

Turmeric is used globally as a natural dye, as its bright ochre is easily retrieved from boiling the rhizome. Being edible, it is also used as a natural food colouring in everything from mustard to margarine.
In Lao PDR, craftsmen use Turmeric to test materials for the presence of salts, which turns red when pH is too high, making it more susceptible to quality loss.

Its golden colour has also earned Turmeric great significance in Buddhism and Hinduism. Buddhist robes are often dyed with turmeric, and while in Lao PDR, Turmeric water is used for sacred purification rites, in India, it is used in a pre-wedding ritual — Turmeric paste is applied to the bride and groom's face and body to bless them with fertility and good luck.

MEDICINAL TURMERIC TEA

A home remedy for colds, cough and flu

Combine turmeric, ginger, pepper and water into a saucepan.

Gently bring to a boil, then reduce heat and let simmer for 10-15 minutes.

Cover for a few minutes and then strain before serving.

For each cup, add lemon juice and honey.

Can also be served cold.

Tip:

Turn the above into a Turmeric Latte by replacing all or part of the water with milk.

In this case, skip the lemon juice.

Ingredients

1 tsp ground turmeric powder (or 1 tbsp grated fresh turmeric)

1 tbsp fresh ginger, grated

Ground black pepper (to taste)

4 cups water

For each 1 cup serving:

Juice of half a lemon

1/2 tsp honey (to taste)

Optional:

Add cinnamon, cardamom and/or cloves while simmering

TURMERIC FACE MASK

For glowing skin

Making your own homemade turmeric face mask is a great way to give your skin a treat, resulting in soft, glowing, hydrated skin.

Turmeric is meant to help treat scars and acne, while yoghurt hydrates and exfoliates, and lemon adds a vitamin C boost.

How to prepare:

Wash your face so that you are starting with clean, dry skin.

Combine the yogurt, honey, turmeric powder, and lemon juice in a bowl.

Apply the mask evenly all over your face with a paintbrush, avoiding the eyes.

Allow to dry for 10-15 minutes before rinsing with warm water.

Tip:

Some recipes add 1 tablespoon of wheat flour for a thicker consistency, and rose water for scent.

As turmeric stains easily, be careful if using any wash cloths to clean face.

Ingredients

1 tsp greek yogurt

1/2 tsp honey

1/2 tsp turmeric powder

A few drops of lemon juice

FIDDLEHEAD FERN

Diplazium esculentum ຜັກກູດ

Sprawling across the forest floor, this large fern can form very dense vegetation. Young leaf fronds start with curled tips and slowly open into triangular blades that can be over a meter in length, with many small leaf sections along the edges.

Native to: *Throughout tropical and subtropical Asia*

Food

Also called the Vegetable Fern, the Fiddlehead Fern is a popular, foraged vegetable in Lao PDR. Bundles of fresh young leaves are boiled, fried or eaten raw in salads. A common dish in the rainy season is *Koua Pak Goot*, stir-fried fern leaves with garlic, chillies and tomato.

Medicine

Fiddlehead Ferns are used medicinally in many Asian countries for a range of ailments. In India, juice from the leaves is used to treat cough and constipation. In Indonesia, the roots are used to stimulate hair growth. In West Papua, it is used for wound healing and headaches. While in Lao PDR, the leaves are boiled into a drink for women who have just given birth.

Income

Fiddlehead Fern is sold alongside a diverse range of wild edible plants in Lao markets for about 8000 Kip per kilogram, about US$0.40 (2024) and can be dried and stored for later use.

FIDDLEHEAD FERN STIR FRY

Koua Pak Goot

Wash and drain fiddlehead ferns and set aside.

Boil water in a saucepan and blanch ferns for 30–45 seconds until ferns turn a bright green colour. Drain and soak in an ice bath to cool ferns and stop the cooking process.

Drain and set aside.

Heat a wok on high fire and add 3 tablespoons of oil.

Once hot, add the chopped garlic, stirring continuously with a wooden spoon.

After a minute, add the whole chillies.

After another minute, toss in the fern pieces and stir fry. Add in soy sauce, mix for another minute.

Toss in the tomatoes followed by oyster sauce.

Serve immediately.

Tip:

You can add other ingredients to make a richer dish, like sliced pork, tofu or even bacon (before adding the ferns).

Ingredients

3 cups fiddlehead ferns, 10 cm in length from tip to end (young, tender shoots are better, if not, peel and snap into smaller pieces)

3 tbsp oil

2–4 small, fresh green and red chillies, to taste

2 tbsp minced garlic, chopped

2 tbsp soy sauce

1½ medium tomatoes, sliced into eighths

2 tbsp for oyster sauce (or taste)

SOIL & AQUATIC SYSTEMS

Fungi and Water Plants

MUSHROOMS IN LAO PDR

Mushrooms play an important role in Laotian cuisine and there are hundreds of varieties that are foraged and cultivated for food and income. Rainy season (May to October) is also known as mushroom season, and villagers roam the forests in search of mushrooms to sell at local markets. They are used in soups, stews, stir-fries and form the basis of some spicy dipping sauces (*jeow*).

TERMITE MUSHROOM

Termitomyces clypeatus ເຫັດປອກ

Its meaty texture and slightly sweet flavour makes it a popular mushroom for many dishes. It is sometimes ground into a powder to be used as seasoning and can be sold at a high price, as much as 300,000 Kip per kilo (~US$14).

WHITE SHIITAKE

Lentinus squarrosulus ເຫັດຂອນຂາວ

This cup-shaped mushroom is typically dried and grilled in banana leaves, but it is also used in medicine to treat stomach ulcers, anaemia, infertility and reported to boost immunity. It is sold both fresh and dried and an important source of income for many families.

LAO MATSUTAKE

Tricholoma fulvocastaneum ເຫັດຫວາຍ

Found in Northern Lao PDR, this popular mushroom is consumed both dried and fresh. Its dried powder form can also be used in a tea to reduce blood pressure and prevent diabetes. It is also added as a seasoning to rice dishes.

ROSY RUSSULA

Russula rosea ເຫັດກ່ໍແດງ

This strikingly red mushroom is highly nutritious and consumed in many dishes. It is also used to boost immunity, manage diabetes and protect the liver from toxins. Rosy Russula is widely sold in markets and dried for export to China.

CHANTERELLE

Cantharellus cibarius ເຫັດແສດໃຫຍ່

These well-known yellow mushrooms are used globally in all sorts of dishes from pasta to stir fries. They are also a popular choice for Laotian mushroom *jeow*. Chanterelles are highly consumed and traded throughout Eurasia.

BROWN MILK MUSHROOM

Macrocybe crassa ເຫັດເຫຼືອດ

Named after its milky taste when dried, in Lao PDR, this mushroom is commonly used in a sweet potato curry. It is a meaty mushroom that can be cultivated and is very nutrient dense.

SPLIT GILL MUSHROOM

Schizophyllum commune ເຫັດຍີ

This fibrous but tasty mushroom is commonly used in Laotian soups, or sometimes finely chopped in a stir fry. Almost coral-like in its form, it is also used widely in Yunnan, China and Northeast India in a Manipuri pancake.

MUSHROOM CULTIVATION

An important income source for rural households

Mushrooms are both collected from the forest or cultivated by many farmers, as they command a high price in the market. Cultivation is mostly limited to oyster and button-type mushrooms as they are the easiest to grow year-round.

The AFN Project supports over 500 Agriculture Production Groups to produce mushrooms, both for household consumption and for local markets. This includes supporting initial investments for the set up of mushroom cultivation, as well as hands-on training that includes aspects such as:

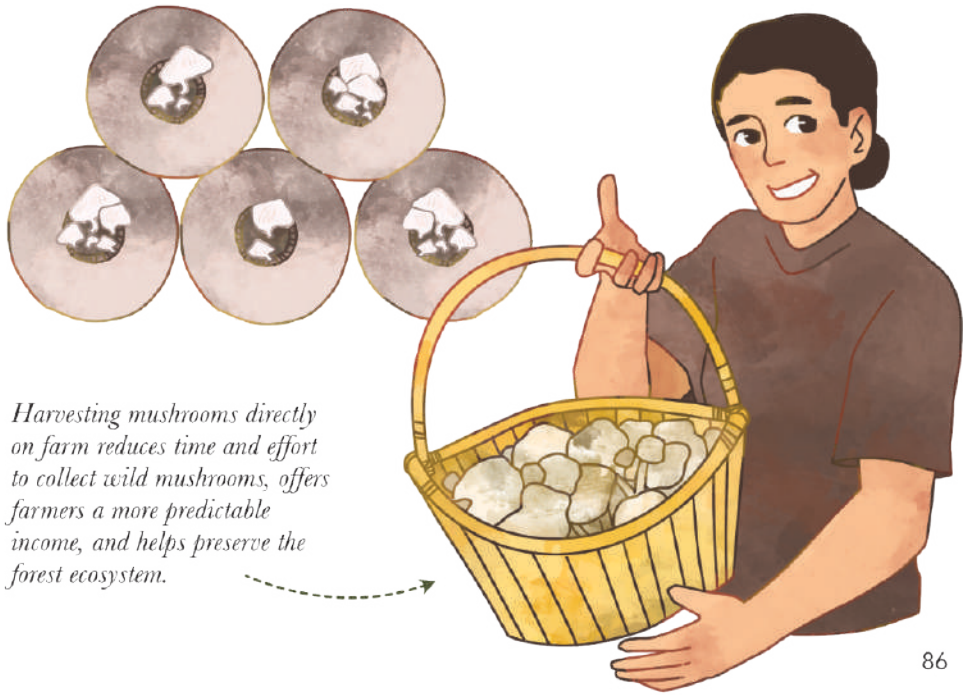
- substrate preparation — what the mushrooms are grown on, e.g. sawdust, straw, coconut coir, wood logs
- the ideal growing environment — light, temperature and humidity, and
- how to select, purchase and plant mushroom blocks that contain fungal spores.

Farmers commonly use small sheds to grow mushrooms or even directly on the ground, under cover.

Together with CDE and NAFRI, the AFN-II project will also experiment with domesticating more valuable mushroom types that can fetch a higher price on the market.

Plastic bags filled with substrate are often stacked one on top of the other for mushrooms to grow out of

With a stable price of around US$4 per kilo (2020), oyster mushrooms are a popular and nutritious mushroom to grow.

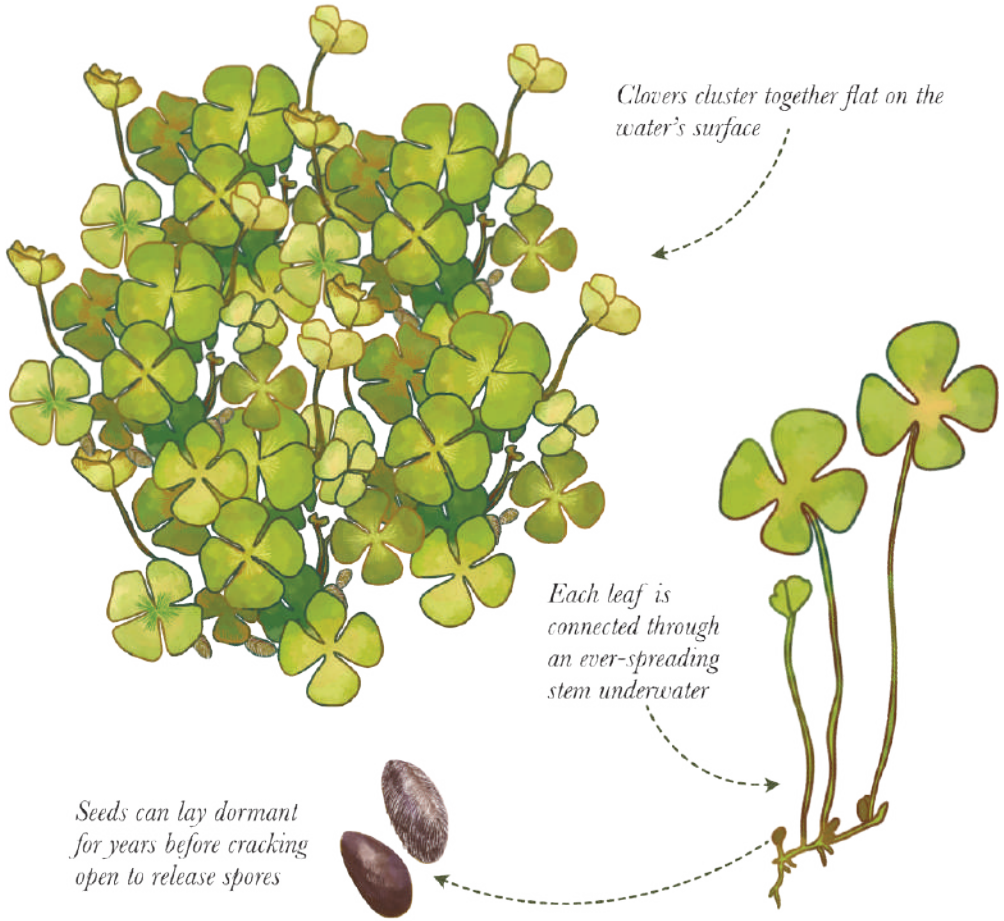


Harvesting mushrooms directly on farm reduces time and effort to collect wild mushrooms, offers farmers a more predictable income, and helps preserve the forest ecosystem.

WATER CLOVER

Marsilea quadrifolia ຜັກແວ່ນ

Akin to the mythical four-leaf shamrock, the Water Clover has four simple petals from a central stalk with leaves ranging from green to yellow or sometimes almost purple. As a creeping rhizome, it sprawls across wetlands and water surfaces, creating new roots that settle as the plant grows.



Native to: *Eurasia — ranging from Central and Southern Europe to East Asia, incl. Russia*

Food

Commonly foraged by children in Lao PDR, Water Clover is eaten raw or cooked. It is often collected alongside other aquatic weeds such as Yellow Burrhead (*Limnocharis flava*) and *phak ka gnièng* (*Limnophila geoffrayi*), all of which act as an important source of nutrients to rural diets throughout Southeast Asia.

Medicine

With anti-inflammatory and anti-oxidant properties, the Water Clover has a wide range of uses in traditional medicine, ranging from cough to reducing fever to increasing the passing of urine. In Lao PDR and parts of India, the juice from the leaves is drunk to help treat snake bites or is applied directly to abscesses. There is also growing research that this plant has potential as a neuroprotector, improving memory, motor skills and learning.

WATER MIMOSA

Neptunia prostrata ผักกะเสด

A floating carpet of green, compound leaves with the occasional yellow pom-pom flowers that shoot up on a stalk above the water. Its sensitive, pinnate leaflets close upon touch, making them a playful plant for children who like to witness the effect of their fingers on the leaves.

Native to: *Unknown. Found in tropical areas throughout the world, including the Americas.*

Food

Eaten raw in salads or cooked, in Lao PDR, this crunchy plant is sometimes blanched with a spicy sauce or pickled for soups and stir-fries. In Thailand, it is believed to help your soup "release its fragrance".

Medicine

In Lao PDR, it is most known to help with pimples — a paste from the leaves is rubbed directly on the skin. In Ayurvedic medicine, the twigs and young shoots are mostly used to treat digestion-related issues, such as constipation, gastric acidity and intestinal infections, whereas the roots are used for nasal infections and STDs.

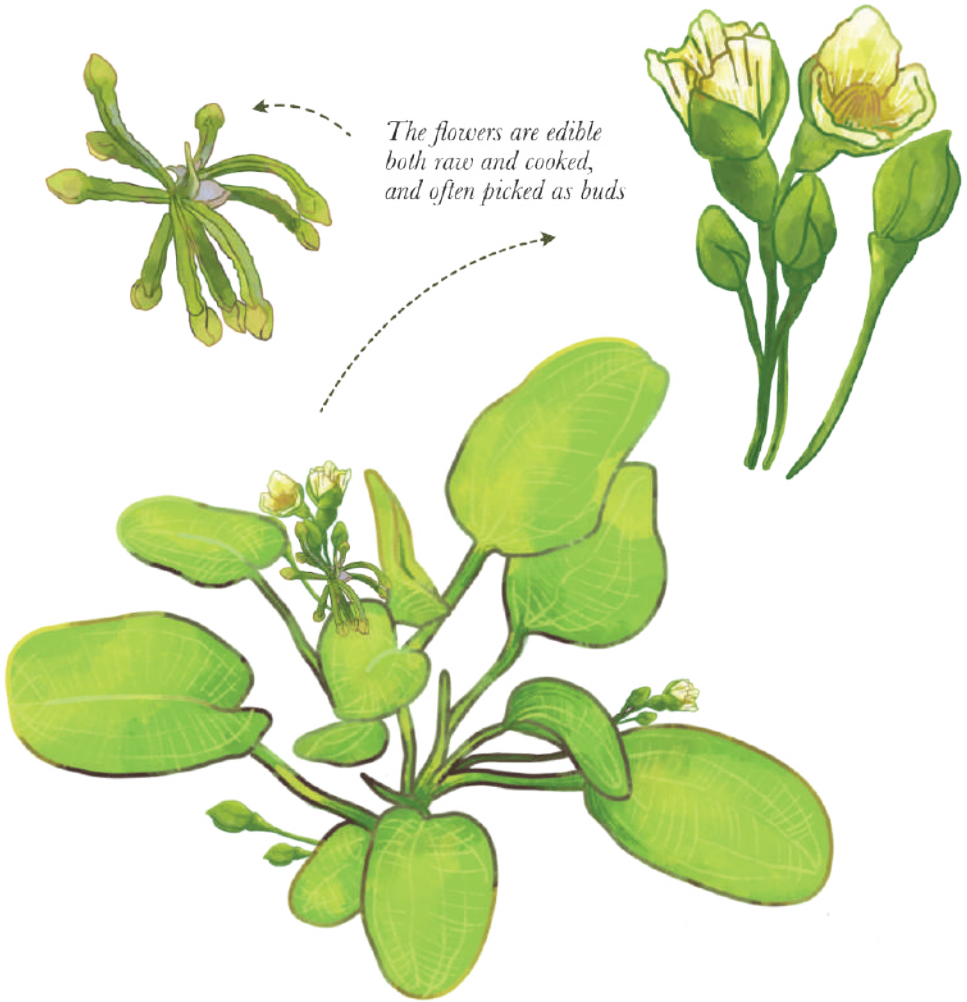
Agriculture

In Thailand, where it is very popular, the plant is also cultivated for consumption (also because there are some concerns of pest flies reducing wild populations). It is also used as a protein-rich animal feed, as it is eaten by plant-eating fish, duck, geese and turtles.

YELLOW BURRHEAD

Limnocharis flava ຜັກກ້າບຈອງ

Spatula-shaped leaves stand upright and spread out from a central stalk. This slightly larger aquatic plant grows directly in water or in muddy areas and has small yellow flowers sometimes nicknamed as water irises or water lilies.



Native to: *Latin America and the West Indies*

Food

Also known as Sawah Lettuce, the young leaves and flower buds are consumed raw, blanched or grilled in Lao PDR, often served with papaya or meat salads (*laab*), or made into its own dipping sause (*jeow*) where the young stems, leaves and flowers are roasted and pureed. In Indonesia, it is a key ingredient of a spicy dish known as *Tumis Genjer*, where it is chopped and stir-fried with tofu, garlic, ginger/galangal,oyster sauce, and of course, chillies. Despite having a reputation as a "poor people's food", eating Yellow Burrhead is good solution to keeping this invasive species at bay!

Agriculture

As an abundant weed, the plant is also used by rural communities as animal fodder, including for pigs, cattle and fish. It is also used as green manure for fertilizing paddies.

Ornamental

It was originally introduced to many water systems as a means to decorate ponds and water features due to its pretty yellow flowers and upright leaves, but has since become a problematic species in Queensland, Australia and Southeast Asia.

ASIATIC PENNYWORT

Centella asiatica ຜັກໜອກ

This water-loving creeper can be recognized by its circular clusters of round leaves, spreading across low-lying wetland areas, with the occasional tiny white-pink flowers.

White flowers have a tinge of pink when very close up or before full bloom

Flat leaves resemble a "penny", and often associated with bringing good luck with money

Native to: *Throughout tropical Asia, incl. northern tropics of Australia*

Food

Sometimes known as *gotu kola*, the Asiatic Pennywort is used throughout Southeast Asia as a vibrant green refreshing drink — diluted and sweetened with water and sugar. The whole plant can be eaten cooked or raw, making it a common addition to Laotian, Thai and Burmese salads, or as a leafy green in Indian and Sri Lankan dishes. In Sri Lanka, it is also made into an iconic green rice porridge called *Kola kanda*, which includes coconut milk, palm sugar and often other herbal leaves.

Medicine

In traditional medicine, the herb is associated with its cooling properties, used in teas to reduce inflammation, fever and anxiety. The leaves are also used for wound healing and skin conditions through topical application, including for ulcers, scars, eczema, anti-ageing and even, leprosy.

Income

As a common vegetable found in Laotian markets, Asiatic Pennywort is sold for about 5000 Kip per kilo when fresh (~US$0.25). It is also exported from Lao PDR as a dried product at up to 110,000 Kip (~US$5) per kilogram, later sold as herbal extract or in capsule form in countries such as China or Thailand at around 150,000 Kip per capsule or packet, around US$7 (2007).

TRADITIONAL PENNYWORT JUICE

A refreshing drink to balance your Yin and Yang

A popular drink in Lao PDR and Vietnam, *Nước Rau Má* is touted for its cooling properties, to help reduce inflammation and the "fire" in your body, particularly in the summer months.

How to prepare:

Wash the pennywort with salt several times to ensure clean and all impurities (bugs) removed.

Drain and set aside.

In a separate bowl, mix sugar with 1 cup water until completely dissolved. Set aside.

In a blender, blend the pennywort and the 1L water (no sugar yet) until completely mixed.

Pour the contents through a sieve into a large bowl. Press the netting of the sieve to squeeze out all juice.

Use a spoon to skim away any surface foam.

Add the sugar syrup and mix well.

Serve with ice or refrigerate for a few hours.

Tip:

In Vietnam, it is also popular to mix this drink with other ingredients like green or red bean, pineapple, lime and apple.

Ingredients

400g fresh Asiatic pennywort (best made the day you buy)

1L drinking water

1/3 cup sugar (or to taste)

1 cup water
(for blending sugar syrup)

PENNYWORT SKINCARE KIT

3 DIY moisturizers to remove scars, tone skin and restore UV damage

Asiatic Pennywort, also known as *gotu kola*, is famed for its skincare benefits from healing, rehydrating and rejuvenating. It has long been used to treat eczema, acne scars and reduce inflammation.

Pennywort & Shea Butter Cream:

Place the shea butter in a heatproof bowl (e.g. Tempered glass) and place into a saucepan with 1-inch level of boiling water (make sure it does not touch bottom of pan). Simmer on low heat.

Once melted, remove from heat and stir in almond oil and pennywort powder until well combined.

Allow to cool and store in a clean container for use after cleansing skin.

Pennywort & Aloe Vera Cream:

Mix all 3 ingredients into a bowl until well combined. Transfer to a clean, airtight container for use on face after cleansing.

Pennywort & Coconut Oil Cream:

In a bowl, whip coconut oil until light and fluffy. Gradually mix in powder and vitamin E oil until well combined. Transfer to a clean, airtight container for use after cleansing.

Ingredients

RECIPE 1

1/2 cup shea butter

1/4 cup almond oil

2 tbsp *gotu kola/centella asiatic* powder

RECIPE 2

1/2 cup aloe vera gel

1 tbsp vegetable glycerin

2 tbsp *gotu kola/centella asiatic* powder

RECIPE 3:

1/2 cup coconut oil

1 tsp vitamin E oil

2 tbsp *gotu kola/centella asiatic* powder

SACRED FORESTS OF LAO

Living sanctuaries where ancestral and guardian deities roam

As we wrap up our book on Non-Timber Forest Products, nothing perhaps highlights the importance of forests to Lao culture as the revered sacred groves scattered across the country. These are ancestral forests, preserved over centuries by local, animist communities for their spiritual significance and are often places of towering trees and incredibly rich biodiversity.

Unlike other forest areas, sacred forests or *pa maheesak* (ປ່າມະເຫສັກ) are treated with the utmost respect and the harvesting or killing of certain species inside is generally considered taboo. Customary laws may differ depending on the community, for example, the Ban Chaleun village in Southern Central Lao PDR revere the monkeys in the forest as spiritual guardians, but may still use it for foraging other NTFP. Nevertheless, these forests are often the last frontiers in a country facing extreme logging pressure.

Ethnic groups will have their own rituals and ceremonies (depending on the region) to appease the protective spirits residing in these spaces, including for things such as getting permission to cut down a tree that is otherwise protected. Each forest will also have their own magical properties, such as the "magic torches" (*Dipterocarpus alatus*) of Dong Na Tad Forest near Savannakhet in south central Lao PDR, whose resin-rich wood is traditionally used for flaming torches.

Sacred forests and sacred trees are by no means unique to Lao PDR. India has its sacred groves (*Orans*), China its Feng Shui woods, Japan its Shinto shrine forests and Myanmar's sacred *bodhi* trees are revered and often treated as the temples of local *Nats* (spirits). But many of these are slowly disappearing in a globalizing and capitalistic world. Given the importance that forests continue to bring to ancient and modern societies, it is ever more important that we work to safeguard this biodiversity through conservation, sustainable use and by valuing and sharing traditional wisdom.

ABOUT THE PROJECT

Agriculture For Nutrition (Phase 2)

The Agriculture for Nutrition – Phase II (AFN II) project (2023–2030) targets around 28,000 vulnerable households in 500 villages across 20 districts in six provinces of Lao PDR: Oudomxai, Phongsaly and Xiengkhouang in the north, and Salavan, Sekong and Attapeu in the south. The programme aims to improve food security, nutrition and rural livelihoods.

The total investment amounts to USD 48.2 million, financed through an IFAD loan blended with a GAFSP grant, together with contributions from the Government and the private sector.

AFN II is implemented by the Ministry of Agriculture and Environment (MAE) of Lao PDR and builds on the achievements of the first phase by promoting nutrition-sensitive agriculture, diversified food production and the sustainable management of natural resources.

Implementation is carried out in partnership with provincial and district authorities, and in collaboration with national institutions including the Ministry of Health, the Ministry of Industry and Commerce, the Lao Women's Union, the National Agriculture and Forestry Research Institute (NAFRI), the Centre for Development and Environment (CDE), and the World Food Programme (WFP).

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

IFAD *Map compiled by IFAD* | 05-10-2022

THANK YOU

This publication and work would not be possible without the tireless project staff at the AFN II project, and the support of our partners.

AFN II Funding Partners

IFAD
Investing in rural people

GAFSP
global agriculture & food security program

Government of Lao PDR

AFN II Key Implementing Agency

Ministry of Agriculture and Environment (MAE), Lao PDR

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Provincial and District Agriculture and Environment Offices (PAEO/DAEO)

Lao Farmer Association

About IFAD

The International Fund for Agricultural Development (IFAD) is the only international financial institution exclusively focused on rural transformation. IFAD invests in rural people and their communities, creating jobs, resilient economies, shared prosperity and stability. Today, IFAD and its partners have nearly US$23 billion invested in ongoing projects transforming food systems.

About GAFSP

The Global Agriculture and Food Security Program (GAFSP) is a multilateral partnership and financing platform dedicated to improving food and nutrition security in the world's poorest countries. Since its inception, GAFSP has deployed US$2.4 billion in grants and concessional finance to countries, producer organizations, agribusinesses, and financial intermediaries for transformative investments across the agrifood system, reaching nearly 32 million people.

Disclaimer

REFERENCES

The content for this publication was compiled and written by Camilla Zanzanaini, with primary source material coming from Pha Khao Lao (a central hub for documenting agrobiodiversity in Lao PDR) and Pha Tad Ke Botanical Garden, who host a Lao-specific Ethnobotanic Database.

All illustrations in this book are by Laotian artist, This is WRA.

Supplementary knowledge was gathered from the following sources:

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