

## **Pha Tad Ke Botanical Garden - 5 year plan**

### **Proposed Research, Education and Capacity Building Programs**

*Currently the flora of Lao PDR is poorly studied and barely understood. There are many potential avenues of plant research to pursue and over the next five years, research at PTK will be focused along four of them: important plant groups, ecological profiles and biodiversity conservation projects, ethno-botany and sustainable agriculture with a permaculture demo and research farm.*

#### ***Important plant groups***

The plant groups that will be worked on are the Gingers (Zingiberaceae), Orchids (Orchidaceae), Dipterocarp trees (Dipterocarpaceae) and Ferns (various families). PTK has established Orchid and Ginger collections and gardens. These were created and are managed with help from expert collaborators at other institutions. Staff at PTK work with the National University of Laos on Orchids and with Singapore Botanic Gardens and the Royal Botanic Gardens, Edinburgh on Gingers. These plant groups are very diverse in Lao PDR and continued study is crucial.

The Dipterocarps and Ferns are very poorly documented and understood, and yet are of key importance in many ecosystems. The Dipterocarps are under serious threat due to their high timber value, and Lao PDR has a number of Critically Endangered and Endangered species. PTK will research on where to find these trees and how to conserve them, as well as establishing a comprehensive living collection at the garden. The first stages of this work will involve extensive fieldwork. Dipterocarps do not fruit and flower regularly, but only do so when the conditions are exactly right. Each species has a unique phenology, and there will be regular trips to field sites to establish what this is for each tree. Only once this is established will PTK be able to plan ex-situ conservation efforts. The seeds of this family cannot be stored (they are recalcitrant) and they must be collected and planted within about 1 week of maturing. This presents obvious challenges, and it is expected to take many years to perfect horticultural processes and gather all the necessary information. The initial work will be done in collaboration with South East Asian Botanic Gardens network partners.

Work on the ferns of Lao PDR will be undertaken with researchers at Singapore Botanic Gardens, and potentially other institutions, and will include the establishment of a Fern Garden for public display. There are many fern families represented in Lao PDR, and their taxonomy is not always clear. The information gathered from the plants in the collection and from field surveys/collection trips will assist in undertaking more complex botanical taxonomic work in the future. The initial, small field guide on ferns to be published will be a starting point.

All of PTK's planned field guides will be of general use, as well as useful scientific documents.

### ***Ecological profiles***

PTK's work on ecological profiles will result in the publication of six books (80 pages) each dealing with one type of environment. These six profiles books will be created in collaboration with other Lao organisations, National Protected Areas Management and will consider environment types found in Nationally Protected Areas (NPAs). Of general interest, they will include information on key plants and animals, and will provide a foundation for future scientific work in these areas.

Limestone karst areas are unique ecosystems, and have high rates of endemism and speciation, particularly in plant groups such as Gesneriaceae, Balsaminaceae, Orchidaceae, Dracaenaceae and Araceae. They will be a focus for one of the books. Due to the climatic regime of Indochina (particularly the long dry season) many of the species found on these karsts are found nowhere else in the world. The Laotian areas have not yet been greatly disturbed, and there are good-sized areas remaining. Information gathered from this work will be used to inform documents such as the IUCN (International Union for Conservation of Nature) Red List, a globally important conservation document used by governments to decide conservation strategies.

Another important environment to be worked on is the unique forest found in the Nam Nakai Theun National Protected Area (NPA) in central eastern Lao PDR. Project Anoulak, a conservation NGO based in this NPA, will work with us on this. PTK will also work with botanists and field staff from the National University of Laos and international gardens/research institutes such as the Royal Botanic Garden, Edinburgh. PTK is in discussion with a number of other organisations, both national and international, to establish working partnerships for this work in other NPAs.

## ***Ethno-botany***

One of the central themes of our garden is the very rich cultural history of the use of a wide range of different plants by the people of Lao PDR for everything from food and medicine to clothes and construction. The people of Laos are still very connected to this heritage, but the knowledge is being steadily lost as Lao PDR develops. Preserving this ethno-botanical knowledge through PTK's ethno-botanic garden, teaching and publications is something PTK is doing, and it will continue to be developed with the help of PTK's resident ethno-botanist, Dr Biba Vilayleck.

PTK will publish at least two more ethno-botany books during the next five years and collaborate on the National Biodiversity Web Portal. This will be based largely on PTK's existing ethno-botany garden and living collection, which will be expanding and diversifying. Dr Vilayleck has extensive information on plants currently not grown at PTK. New plants will be acquired. PTK staff will continue to gather information from local contacts and through organisations such as the Elephant Conservation Center, whose mahouts are able to provide new information on plants of importance for elephant husbandry.

The garden includes a section dedicated to the medicinal plants of the Hmong ethnic group. This will be expanded to include areas dedicated to some of the other ethnicities found in Lao PDR, such as the Khmu and Akha and an area with the historical Heritage plants of Luang Prabang.

## ***Sustainable agriculture***

PTK's research and education work will focus on sustainable agriculture through permaculture and organic gardening practices. A permaculture demo and research farm will open in 2019, and will provide trainings to local farmers as well as the international public. Sustainable, ecologically sound agricultural practices will be developed in partnership with local and international organisations, as well as proposing international level permaculture design courses.

Climate change and its global impact presents enormous challenges and stress on biodiversity conservation. The climate in Lao PDR presents a challenge for year-round growing due to the long dry season, and there is inadequate knowledge currently available on how to combat this issue without resorting to measures such as large quantities of chemical fertilizer and extensive irrigation. PTK staff are researching and teaching more environmentally friendly organic methods to increase crop yields and to expand the growing season.

PTK will also be running trials of the “Alley Cropping” farming technique pioneered in Central and South America. These trials will be conducted in conjunction with the permaculture farm, and will include investigation of potential local leguminous tree species that are good nitrogen fixers, fast growers, provide good mulch, shade-out weeds and provide secondary products (such as timber). In the future, the results of these trials will be used to intensify alley cropping techniques best suited for the Lao PDR and help mitigate climate change effects and reduce slash and burning.

### ***Capacity Building***

Since the start of our project a major part of our work has focussed on capacity building for our own staff as well as university and agricultural college students, primary and secondary school children. In collaboration with the Royal Botanic Garden Edinburgh, Queen Sirikit Botanic Garden Chiang Mai and the Singapore Botanic Gardens much in and ex-situ training have been provided.

We have published six books in Lao on ecological and ethno-botanic subjects as well as three manuals on horticulture, a teachers’ manual for school gardens and a permaculture manual.

We intend to expand these activities on a larger scale by developing more research projects and collaborations with national and international colleges and universities as well as providing study grants for Lao students and organize regional and international workshops at Pha Tad Ke.