Creating an ethnobotanical garden

A short manual of practical guidelines



Case studied by the KWPLH
Kebun Tanaman Obat,
East Kalimantan,
Indonesia.

Preface

This manual on how to establish an ethnographic-botanical garden is based upon a project in Indonesian Borneo. The setting was an environmental education centre, and the whole process became an education in itself; the lessons we learned and the insights we gained form part of what follows.

I would suggest that this manual be used as a rough guide. Its strength lies in its detail regarding interaction and working with people. It gives suggestions on methodological approaches to problems we encountered. It offers a holistic approach to a small-scale project in an intimate setting with a strong cultural relevance. I suggest it to be used in combination with several documents that inspired much of this content, and which this manual builds upon; "Ethnobotany; A Methods Manual" by Gary Martin, "Attributes of a successful ethnobotanical garden" by Jones and Hoversten, and "BGCI's Manual on Planning, Developing and Managing Botanical Gardens".

I hope this manual can offer insights and inspiration to anyone wishing to carry out a similar project.

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"Come forth into the light of things. Let nature be your teacher" – William Wordsworth

Introduction

Ethnobotany

Plants have always supported our existence, most obviously as sources of food, medicine and construction materials. In addition, their metabolic processes are responsible for our own survival on this planet: offering us oxygen and in return absorbing carbon dioxide. Although scientifically our understanding of the natural world and plants in particular is expanding rapidly (through modern technology) the knowledge of our ancestors holds a deeper understanding, offering a symbiotic relationship that goes back millennia.

The study of ethno-botany explores this connection; 'ethno' referring to the study of people, and 'botany' the study of plants. An ethno-botanical garden represents the traditions and knowledge of a culture, and the ensuing relationship with their natural environment. It can illuminate the stories of the past, or our present connection with the natural world. The value of such a garden is that it can tell a story through time – from the past to the present, and perhaps even suggest insights into the future.

This manual offers a guide which has focused specifically on medicinal plant use. It builds upon Gary Martins' "Ethnobotany; A methods manual", which provided the basis for the author's ethnobotanical methodological knowledge, highlighting ethnobotany in the context of biodiversity conservation and community involvement. It explores possible connections with traditional knowledge, its' documentation and the ensuing benefits for both communities and the forests. Martins' book is recommended for users of this manual who wish to conduct ethnobotanical research as both focus on the above issues. Understanding plant use surpasses simply documentation; it involves understanding and incorporation of a culture at a specific moment of time.

This manual offers insight to the systematic approach towards building a garden. It also builds on Jones and Hoversten's "Attributes of a Successful Ethnobotanical Garden" which offers a framework of 5 attributes that contribute to creating a successful garden:

- 1- Adheres to a clearly defined mission
- 2- Focuses on its visitors while capitalizing on the resources of the site
- 3- Tells a compelling story
- 4- Provides an environment conducive to learning
- 5- Adapts through time

The elaboration of these attributes is extended to steps within the design process, issues to be addressed during implementation, and products of the garden itself. This application of the framework offers guidance and considerations when building a garden. Although written for the field of landscape architecture, the article provides a holistic, integrative basis for a broader field. For further reading, Innerhofer & Bernhardt (2011) offer a nice example of an ethnobotanical garden laid out in a patch of forest in the Ecuadorian Amazon.



Additionally, for more substantial and larger gardens, Botanical Gardens Conservation International (BGCI) have written an extensive manual on 'Planning, Developing and Managing Botanic Gardens' (Gratzfeld, 2016). This manual details information from important policy necessities for officially registered gardens, to in depth horticultural and plant care ideas, and botanic gardens in the context of environmental sustainability and conservation. It is not specific to ethnobotanical gardens however offers an incredibly rich collection of ideas, information and suggestions towards the creation and management of botanical gardens, much of which can be applied and useful for the smaller ethnobotanical garden projects that this manual is targeted towards.

Setting the scene - Kalimantan

Many indigenous cultures rely on plants as medicines. Contemporary ethnobotany might differ from the more romantic notion of wild tribes subsisting off the forest, however the culture of harvesting plants for medicinal purposes in daily life is still prevalent. This is the case in East Kalimantan, Indonesian Borneo. This manual case studies the building of an ethnobotanical garden at the KWPLH (Kawasan Wisata Pendidikan Lingkungan Hidup) Sun Bear Education Centre in East Kalimantan; a centre aimed towards sharing environmental knowledge and principles with the general public. Built around a small patch of recovered forest that is a wilderness enclosure for 5 sun bears (the main "drawing point" of the centre) it offers exhibits on illegal wildlife trade and trafficking, environmental problems across Borneo, ecology of sun bears, and the endemic fauna and flora of Kalimantan, in a series of traditional wooden lamins and pergolas, "naturally decorated" with forest plant species. Surrounding it are gardens of fruit trees and flowers, and shaded pergolas for visitors to sit. Visited by over 70,000 Indonesians a year, it is the only one of its kind across in all Indonesia.

The latest addition to the environmental education tour offered at KWPLH is the *Kebun Tanaman Obat*, the medicinal plant garden. This takes the form of a living pharmacy offering the local knowledge of medicinal plant use. The medicinal plants used in this region include trees, herbs, shrubs, lianas, epiphytes and grasses. Many species are commonly cultivated and found growing locally, and the remaining are forest species, less common and with a history of use by the indigenous Dayak peoples of Kalimantan. Our hope is that this garden serves as a stepping stone between the important plants currently used and those of the past.

The idea behind this garden was two-fold; firstly, broadly, to re-connect people with nature. Through the medium of an engaging garden trail, the idea was to show how forests have supported Indonesians for many generations, and therefore how important it is to preserve the forests for the vast amount of provisions they offer to us humans. In a world where people are becoming more distanced from the natural environment, and drawn towards city lives, such a re-connection seems crucial. Secondly, the aim was to document (in the form of the garden) traditional ecological knowledge regarding medicinal plant use and the culture around it. We hypothesized that by exposing people to cultural familiarities (plant species they



know, still commonly used as medicine, in other words things people can relate to) this could help cross the threshold to people being able to understand and hence feel closer to 'nature', igniting in them further understanding of why the forests are important and need conserving.

The strength of this garden is the collaboration of knowledge, skills, and creative design from many individuals who contributed to its creation. It was made possible through the work of the KWPLH staff, researchers from BKSDA Samboja, support from Yayasan ProNatura, and students from Mulawarman University Samarinda (Indonesia) and Wageningen University and Research (The Netherlands). Each aspect, from vision to creation, had multiple inputs from everyone: students, builders, botanists, plant breeders and foresters.

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The stages

What is the point?

It is important that such a project starts with a set intention. Brainstorm beforehand what you want the purpose and message of such a garden to be. What context are you building it in, for which audience, why, what do you want people to take away from their experience in the garden?

All of this can be assembled into a mission statement that defines the project. This mission statement can of course, and perhaps will, change during the course of the work. However it creates a strong basis on which to begin the work, and make decisions regarding for example issues of design, as well as something solid to refer back to in moments when you lack clarity, or get caught up in detail and practicality. During this stage it is useful to establish your available budget, and make a rough layout for what things you will need; materials for building, buying plants, information stands, and other resources.

Ethnobotany itself is a collaboration of disciplines; it reflects inputs from many different areas of expertise and interest. This is something we suggest an ethnobotanical garden simulates. From creative design to multi-disciplinary contributions, the work should be a reflection of the concept. People-plant relationships are diverse, and the garden may chose to reflect one or several. Jones and Hoversten (2004) offer insights into early ethnobotanists and their definitions of traditional botanical knowledge, suggesting: "the most successful ethnobotanical gardens select stories that reinforce their mission, build on their resources, and engage a diverse audience physically, emotionally, and intellectually."

Jones & Hoversten (2004) – Attributes of a successful ethnobotanical garden.

Six characteristics that describe a well-choreographed, successful visitor experience

Arrival – defining the entry to a clearly defined space to signal the start of a new experience;

Decompression – giving visitors an opportunity to relax and rest before beginning the new experience;

Reception – creating a state of mind in which a visitor is ready to receive a new message;

Orientation – preparing the mind so that it can progress from the known to the unknown and providing basic information to maximise the benefits of viewing the exhibit;

Transformation – effecting a change in behaviour, perception or attitude.



Collecting the information

This can be done in a variety of ways and depends on the environment as well as the gardens intention. The basis for data collection can be conducting ethnobotanical research; finding informants and carrying out questionnaires, interviews, semi-structured interviews. For more detail on how to carry out methodologies, see Gary Martins' "Ethnobotany. A methods manual".

If there is already a lot of literature on medicinal plant use in an area, it may not be necessary to carry out a full ethnobotanical study. In the case of KWPLH, literature on medicinal plant use in East Kalimantan was summarised, to create an initial database. This information was triangulated with first hand information collected in the study area from a range of informants.

Literature of course offers rich information, however nothing compares with sitting down and hearing an individual's own words, explanations and inevitably, stories. This is the core of ethnobotany, the learning that comes from interacting with someone of another culture. The power of the people-plant relationship comes forth from spoken words; people's stories hold untold depth, living history and personal experiences. This is a way to truly gain insight into a culture and hence it is recommended to combine literature with primary research.

Collect everything into a database – not only does this allow all the information to be easily accessible, but it also shows any trends or repetitions that may be occurring from the different sources.

Be open. Think about what you want your garden to represent. In the case of KWPLH, the idea was to build on common knowledge of medicinal plants, therefore inputs were welcomed from anyone and everyone. Upon hearing about the project, many people living nearby the centre offered their knowledge and plants upon hearing about the project. Almost all were accepted, with the exception for instance of a species known to be invasive but also considered medicinal. The database was in the end contributed to by many unofficial informants. Upon receiving plants, local name was documented, as well as use and method of preparation. If it was an unfamiliar plant, it was researched to find the Latin name, and to check what current knowledge there was on it's medicinal use.

Prepare a nursery, in the event that people bring you seedlings. In the case of KWPLH, we did not grow anything from seed but decided to collect seedlings of all the chosen species, primarily due to time constraints. Planting from seed is more applicable for gardens in tropical climates where seasonal planting is less important. Regardless, having a nursery is necessary for planting, propagation, or keeping seedlings. Recommended is a shaded area in which the conditions for each plant can be modified accordingly (light, shade, dry, wet).



Kebun Tanaman Obat, KWPLH



A construction of shade netting and wooden poles make an ideal plant nursery. Seedlings can be stored in polybags, empty sections of bamboo stem, or even wrapped banana leaves. Seedlings can be either planted in the soil they came out of the ground with, or in a light compost/ topsoil.





Species selection & sourcing

It is likely that not all species you collect through research will be possible and/or desirable to plant in the garden. Therefore it is important to outline initially a set of criteria that will help you with the decision process of which plants a) to search for and b) to reject.

It is also worth considering the horticultural necessities for each plant, will you, for instance, be able to grow them and offer them the conditions that they need? Therefore potential critera for species selection may be:

- wild vs cultivated / locally grown plants
- well known vs rare species
- shade-loving vs open-cover species
- hydrophobic vs hydrophilic species

Depending on the available space, you may have a limited amount of plants you can grow and incorporate into the garden. Think about how best to use the space available to you, and to fill it accordingly. This will be addressed further in section 5: garden layout and design.

As already mentioned, the sourcing of seedlings may happen inadvertently as well as intentionally. Here collaboration is important. Know your area, explore locally 10



who is working with plants: this can be anyone of any place, a Botanical Garden, plant shops, local markets, local independent plant growers/breeders, research institutes, and of course, neighbours. All of the above proved to be invaluable sources and contributors to the KWPLH garden.

Kebun Tanaman Obat. KWPLH

We spread the word for seedlings and the knowledge, information and plants that began to come our way were astounding.

The initial collaborators for the KWPLH garden were a group of agronomist ethnobotanists from a government institute; Balai Penelitian Teknologi Konservasi Sumber Daya Alam (BKSDA), a centre for research and development of natural resources conservation technology. The BKSDA was home to an extensive herbarium, research laboratories exploring ex situ propagation of endangered liana species from the forest, and a large plant nursery. Their research area includes a patch of secondary forest in a small section of which is a short trek where medicinal plant species have been identified and signposted. They contributed much information, seedlings and help towards the KWPLH garden.

Other contributors were the *Kebun Raya Balikpapan* (Botanical Garden of Balikpapan), a plant breeder from Balikpapan, and numerous locals, staff members, and neighbours from around the area of KWPLH.



Don't be afraid to ask people. You will be surprised at the knowledge that is hidden away, awaiting an outlet. In cultures where people still live apart from the city, almost everyone knows something about medicinal plants. Talking is absolutely the best way to discover new information. Of course the intention of your garden and the criteria for the plants it contains pre-determines what you collect and who from. However if for nothing more than gaining familiarity with cultural nuances and extra information that aids in your own discernment of plant use in the area, talk to people. Such a garden should be about shared knowledge and information!



Garden layout and design

Once again, having a pre-defined mission statement and set intention for the garden can also be useful when it comes to design. The message you want the garden to give can dictate the way it looks and the story visitors follow as they go through the garden both physically and mentally. Allow your creativity to come into play. Think about what inspires you, what do You find aesthetically pleasing, stimulating, intriguing? The garden should be a balance of these notions combined with practicality. What resources are available or accessible, how can they best be used? "Ethnobotanical gardens challenge designers to create settings for experiential learning opportunities in ethnobotany, history, ecology and other fields of human knowledge that communicate how closely plants and people are intertwined....visitors are a botanical gardens most important resource" (Jones & Hoversten, 2004).

The target audience also offers suggestion to the design. If for example it is a place for school visits, it needs to be visually stimulating and interesting for children. Cultural context is essential too: balance is needed between what will keep your audience engaged with what they are seeing, as well as ensuring you are bringing your message across in an educative way.



Innerhofer & Bernhardt (2011) – Ethnobotanic design in the Ecuadorian Amazon

This ethnobotanical garden was set out in 1.5 ha of secondary forest, in which medicinal plant species were identified by local key informants. "The garden acts as a tool to preserve and promote the knowledge of plants. The concept of the ethnobotanical garden conveys the holistic picture drawn from the investigation on people and plants of the Kichwas".

The pathways of the garden show the local representation of a jaguar, which in turn is the epitomic image of the perfect, immortal body, and the form taken by wise men after death. Plant collections are grouped according to the body part they are used to treat. This garden offers a beautiful example of the incorporation of traditional story and culture into the construction of the garden.



Jones & Hoversten (2004) – Attributes of a successful ethnobotanical garden.

The below checklist offers questions that may guide in the planning of the garden, and things to take into consideration:

Congruency

 are there sights, sounds, smells etc, that detract from the featured areas and create an incongruent experience?

Is the entrance/ ethnobotanical garden inviting and welcoming?

 Is there anything about the exhibit design that deters people from entering?

What is it and why does it deter people?

 Do all features of the ethnobotanical garden contribute to a sense of immersion in the specified place and time?

Material/form/line/colour/texture are consistent with theme Material/form/line/colour/texture are consistent within the garden Labels and signage are consistent with theme

Proximity

Are visitors physically separated from the exhibit components?
 How and why are they separated?
 How are visitors protected from the resources?
 How are resources protected from visitors?

- Do exhibit materials help people feel closer to the subject?

Access and way-finding

- Is the ethnobotanical garden featured in the institutions advertising?
 Are visitors explicitly directed to it?
- Is the ethnobotanical garden easy to find?

Are the entrance and exit clearly marked?

Is there a clear beginning and end to the ethnobotanical garden?

– Is there a defined sequence/path that visitors are expected to follow? How is the sequence marked?

Is it obvious and easy to follow?

– Are primary and secondary paths easy to see and follow?

Visitor Comfort

- What type of protection from the elements is provided, e.g. shade, windbreaks?
- How often is drinking water available? How is it delivered?
- What other beverage/food services are available?
- What kind of seating is available?

Is it appropriate for the space and visitors?



Design of the garden has several components; on the macro level, the bigger picture of the garden, and on the micro level, detail of and within each bed.

Macro

The overall layout of the beds may itself portray an image, shape or design. Placement of the beds can be dependent on the landscape and topography of the area for the garden. Here keep in mind the progression people follow as they walk through the garden. Do they follow one main path, are there several, are paths clearly laid out? If the garden is large, is the way marked sufficiently clearly?

Micro

Plan out roughly how many exhibits or plant beds you will want. This can depend on the number of species you wish to plant, or the dimensions of your designated area. Each bed itself can then be planned or planted around a focal point or message. Plants may be grouped in various ways; medicinal uses, family, or simply aesthetics (a variety of sizes, shapes and colours in each display).

"Signals; telling visitors what type of behavior is expected. Signals can be as subtle as a well-defined edge of a path or as direct as fencing. Regardless of the reason for introducing barriers between people and plants, materials contribute to (or at least do not detract from) the ambiance dictated by the interpretive theme." Jones & Hoversten (2004).



In East Kalimantan, brick and bamboo both offered stylish, affordable and accessible materials to use as borders for the plant beds. Whereas bricks needed buying, bamboo grew on site and therefore was more readily available, however it a less durable material (needs replacing every few years).





The garden site was already a relatively wet area, and therefore attracted mosquitos. The bamboo pieces that weren't hollow collected water in which mosquitos were breeding so required filling with earth, or having holes drilled through so the water wouldn't accumulate.



The walkway is comprised of leaf shaped stepping stones made from cement. This provides a raised area for people to walk on when the ground below is very wet (in the rainy season). Leaf and flower imprints have been cast on the top layer of cement.



BGCI's manual on planning, developing and managing Botanic Gardens (2016)

BGCI's manual offers suggestions of sign material, applicable to certain conditions/climates. The choice for the KWPLH signs was a type of durable, resilient sticker paper, stuck on to wooden sign-boards, used already for signs around the KWPLH grounds. They seem not to fade too quickly in the sunlight however have not been used for the long term so this option for signage is still a trial in progress that will need assessing in the coming year.

RECOMMENDATION Digitally printed vinyl (with artwork and printing being done in house where possible): lasting 5-7 Janelle Hatherly, Education and years (RBG Sydney have used brands such as Versatec and Polycure). These can be applied to Interpretation Specialist, Australia. metal frames and changed as needed. For longer lasting interpretation - etched anodised aluminium Region with temperate climate signs can be used. and mild winters. John Roff, South Africa. Black etched on aluminium is longest lasting If staffing time allows - regularly replaced laminated signs work well (n.b. laminated signs disintegrate Wet temperate climate. after a year or two). Large signs; laminated A3 sheets attached onto permanent supports with double-sided sticky tape. Artem Parshin, Moscow. This is cheap and easy and we use the A3 printer and an A3-plus laminator on-site. Laminated Humid continental climate. properly, these last for a year, snow and low temperatures not being a problem at all, however they with warm humid summers fade, particularly in the sun, lose gloss and become dirty, so they are changed annually. and long cold winters. A3 and A2 format in PVC plastic has been tried outside, however these also need changing annually and are more expensive. Large banners for exhibitions and temporary navigation are made from thin and supple double-sided plastic attached to frames on eyelets. These will last through a cold winter. Permanent plant name labels are A6, printed on plastic and attached to a thin aluminium angle bar with two rivets. The upper bar end is straightened and inclined at 30 degrees, the lower is cut at a sharp angle to go easily into the soil. The bar itself is of different length depending on whether it's destined for a tree, a shrub or a herbaceous plant. These last for 3 years and longer, unless broken or scratched and are easy to wash (better with a pressurised jet than a cloth to avoid scratching). Temporary A6 labels, for example with varieties names for short-lived tulip displays, are laminated and discarded once the display is gone. A last option is two-coloured engraved plastic. These labels seem to last forever (some are 10-years old and are in good shape) but they are considerably more expensive. Metallic labels are used which are etched or painted and these, although expensive, last a long time. Suma Tagadur, India. Plastic / fibre is also good, as these can be moulded or embossed and given shape; they also last Warm, moist conditions. a long time. Laminated interpretation can be used, however these have to be regularly replaced.

Signage

Signage contributes a vital component of the garden. It is this that informs further from the visitors current knowledge. Considerations here should be aimed towards practicality as well as content. In terms of practicality it is important to consider the materials for the signs. When choosing, think about the ease of updating them/the information, durability for relevant weather conditions, accessibility for both visibility and management/maintenance.

We recommend each species should have a sign offering a basic set of information, such as:

- name in latin, the local language, and perhaps English
- family
- origin
- plant part used
- medicinal use

Perhaps some species will require more information and larger signs, however keeping a consistent theme throughout makes it easy for visitors to follow. Be creative with what will keep your visitors stimulated and interested!

Building & planting

In the case of the garden at KWPLH, beds were built according to the guiding principles of permaculture. This is a practice the purpose of which is to enhance soil quality over time, and encourage development of an ecosystem and co-existence between different species (i.e plants and insects). Assess the type and quality of soil at the site, to see if additional nutritious soil (such as compost or top soil) is necessary to enhance growing conditions for the plants. Defining the edge of the beds with a hardy material, such as brick or stone, looks good but also acts a as a barrier to prevent the intrusion of grass roots into the bed from the surrounding area.

Once dug, a layer of mulch (dry organic material) can be added on the top layer of soil as a way to maintain moisture in the soil and stop unwanted weed growth. Once mulched, a bed is ready for planting in.



Kebun Tanaman Obat. KWPLH



These trials signs were designed by a local designer who had worked on the other information panels around KWPLH. He used a traditional Dayak motif to border the information. We experimented with more simple signs of just text, and signs including pictures; mostly more relevant for showing the useful plant part such as roots or rhizomes.





Kebun Tanaman Ohat. KWPLH









The stages of bed preparation:

- digging
- adding top soil
- applying mulch on to dug beds
- planting out seedlings
- watering / seedling care



One of the challenges was very wet, clay soils in the garden site, very difficult to work with and not good for planting seedlings into. We eventually developed a technique of adding highly nutritious topsoil to the clay, in which we planted the seedlings, which greatly enhanced their survival.





Ideal times for planting out seedlings are early morning or late evening when the temperature is cooler and the plants will not be subject to direct sunlight. This minimises stress to the seedlings. Ideally a seedling should be transplanted with the soil it is already being kept in. If the seedling is in a polybag or equivalent, gently roll out the soil, so that it stays clothing the roots of the plant. Place this into the hole dug for the seedling, and then add additional soil to fill it into the space. Don't forget to talk to your seedlings and encourage them to grow! Seedlings require time for adaptation to their new environments, and this may differ per species. Do not be surprised if they first appear to wilt, or leaves turn brown. Every day gently remove any dead material on the plant as this stops the plant having to put energy into maintaining dying material. So long as the stem of the plant remains alive, it will recover and grow new shoots and leaves, this may take days or weeks. Depending on the amount of rainfall, seedlings may require watering daily, again this should be done in early morning or late afternoon, never under direct sunlight.

Adopting, adapting and improving

A garden is an investment; the planning and planting are just the first steps, sowing of seeds for a future of continued care, growth and change. Over the first few months, the seedlings will grow, spread and flourish. During this time, the beds will need weeding, seedlings should still be cared for (removing dead leaves), trimmed if they are growing too big. However, leave space for change. Perhaps new species will appear which may want a space in the garden. When creating this project, leave systems in place for continuation; change, enhancement, additions.





Kehun Tanaman Ohat. KWPLH





Over 70 species of herbs, shrubs, trees, lianas and ferns offer an accumulation of knowledge from many people, offering insights into more commonly known and used medicinal plants to the more obscure forest species unknown to the average person but a remnant of knowledge from the forest-dwellers.



The intention for this garden was to be something that provoked thought; an attempt to precipitate change in people's perceptions of and behaviour towards



It tells a story, illuminating the connection between people and plants within the context of this present moment in time.





Culmination

The beauty of building the garden at KWPLH was the fact that it simply couldn't have been possible without the shared knowledge, skills, inputs and insights of a mixed team of people. This in itself reflects the values of ethnobotany, a holistic approach to learning from someone of an entirely different cultural background. Strength lies in the knowledge of men and women who know their land, their tools and their work. Each person brings something unique and beneficial, making the growth of a garden as organic as the process of building it. This is what this manual aims to advocate and we hope it will provide useful guidance in the establishment of many such gardens.



