



# Biodiversity

---

Nongkhan Borlivanh (Di), Viivika Haltia, Emmi Kaislasalmi,  
Worayut Takaew (Nan) & Eshetu Yirdaw



Field Course: Tropical Forests and Agroforests (FOR248)

January 2023



# Table of contents

- Introduction
- Objectives
- Materials & Methods
  - Interview
  - Sampling methods
  - Data analysis
- Results
- Conclusions
- References

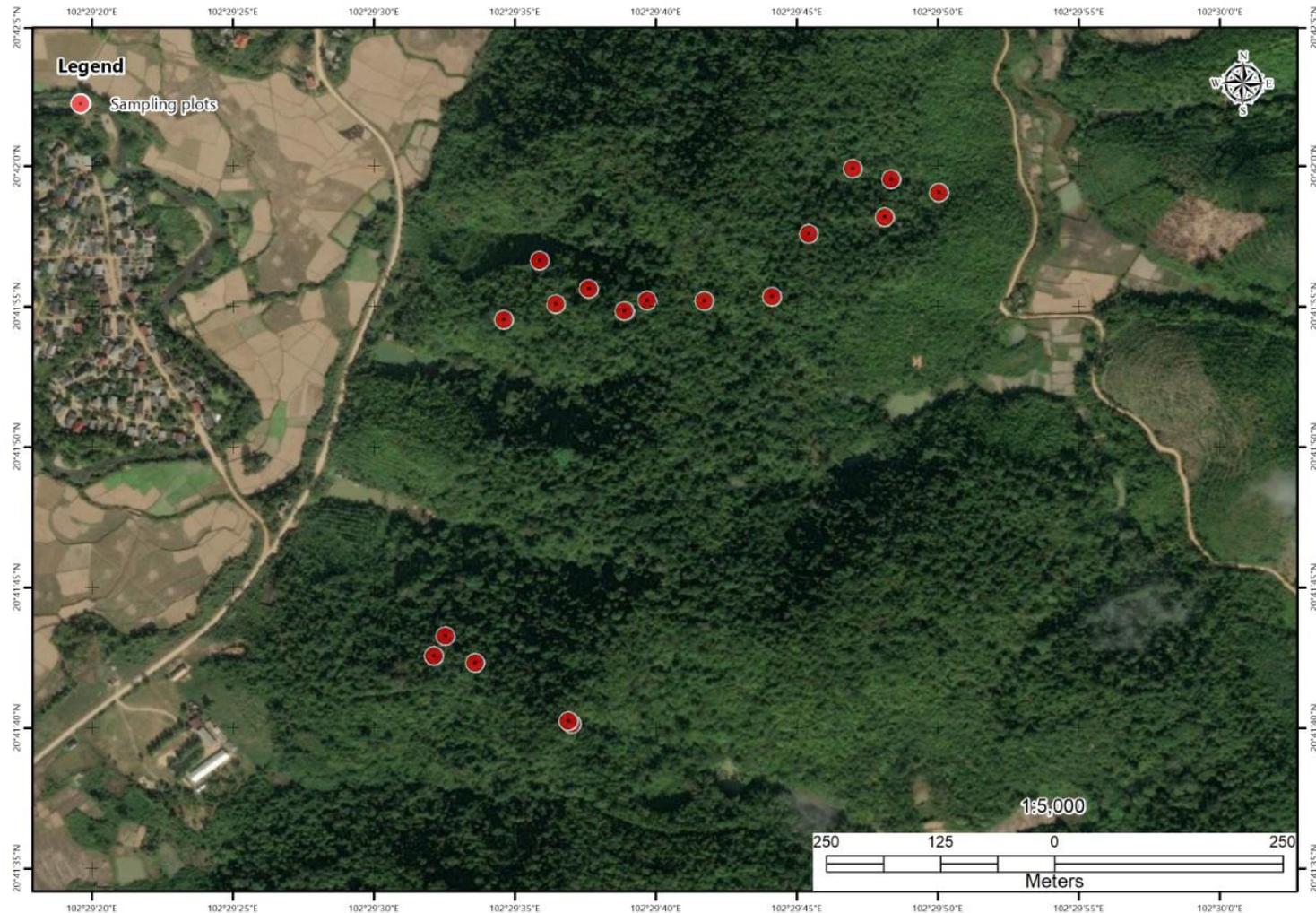
# Introduction – The Study Area

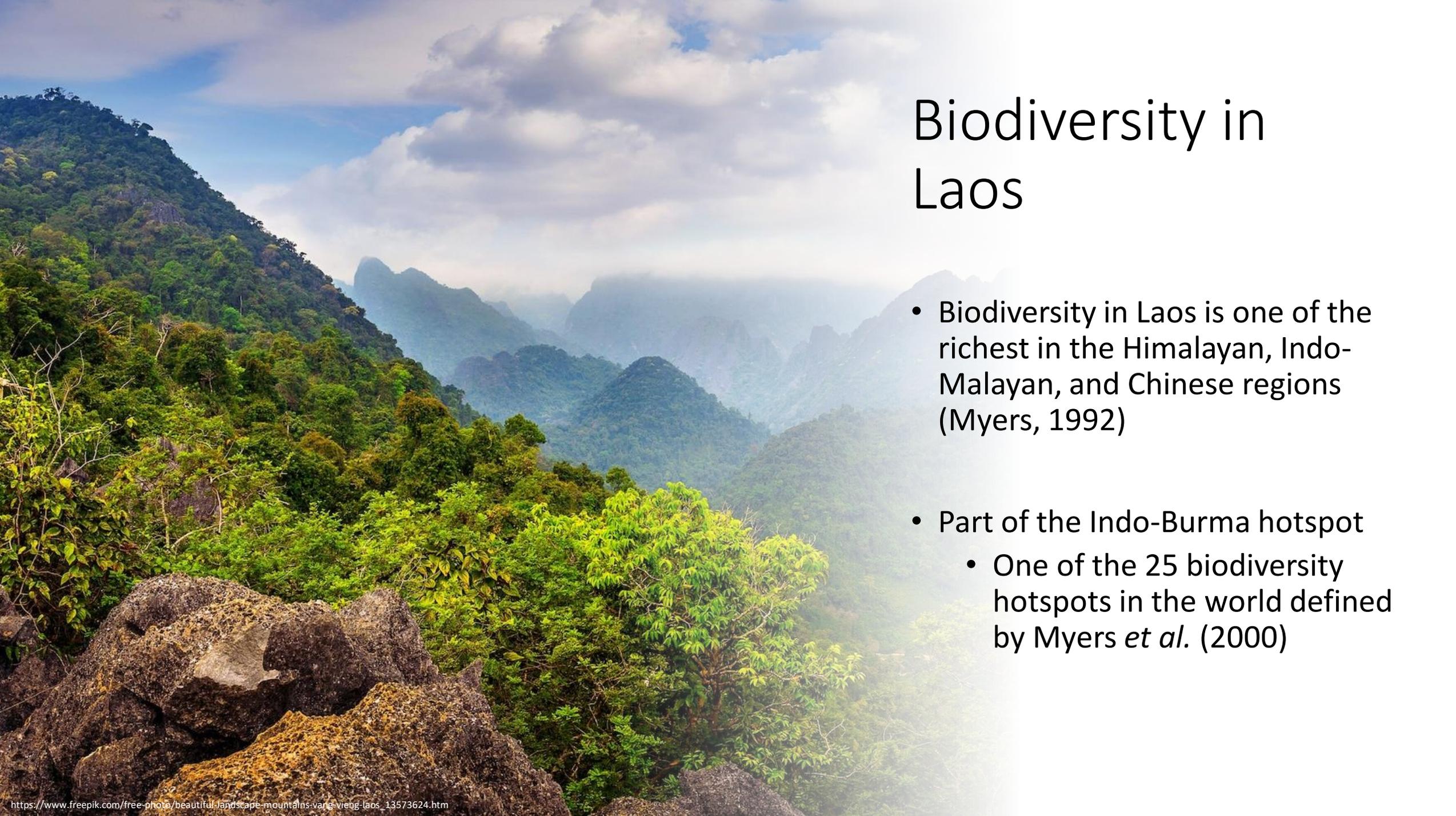
---

- Mixed deciduous forest
- Regrowth forest and homegardens
- Located in Nayang Tai, Luang Prabang Province



# Geographical locations of the sampling plots

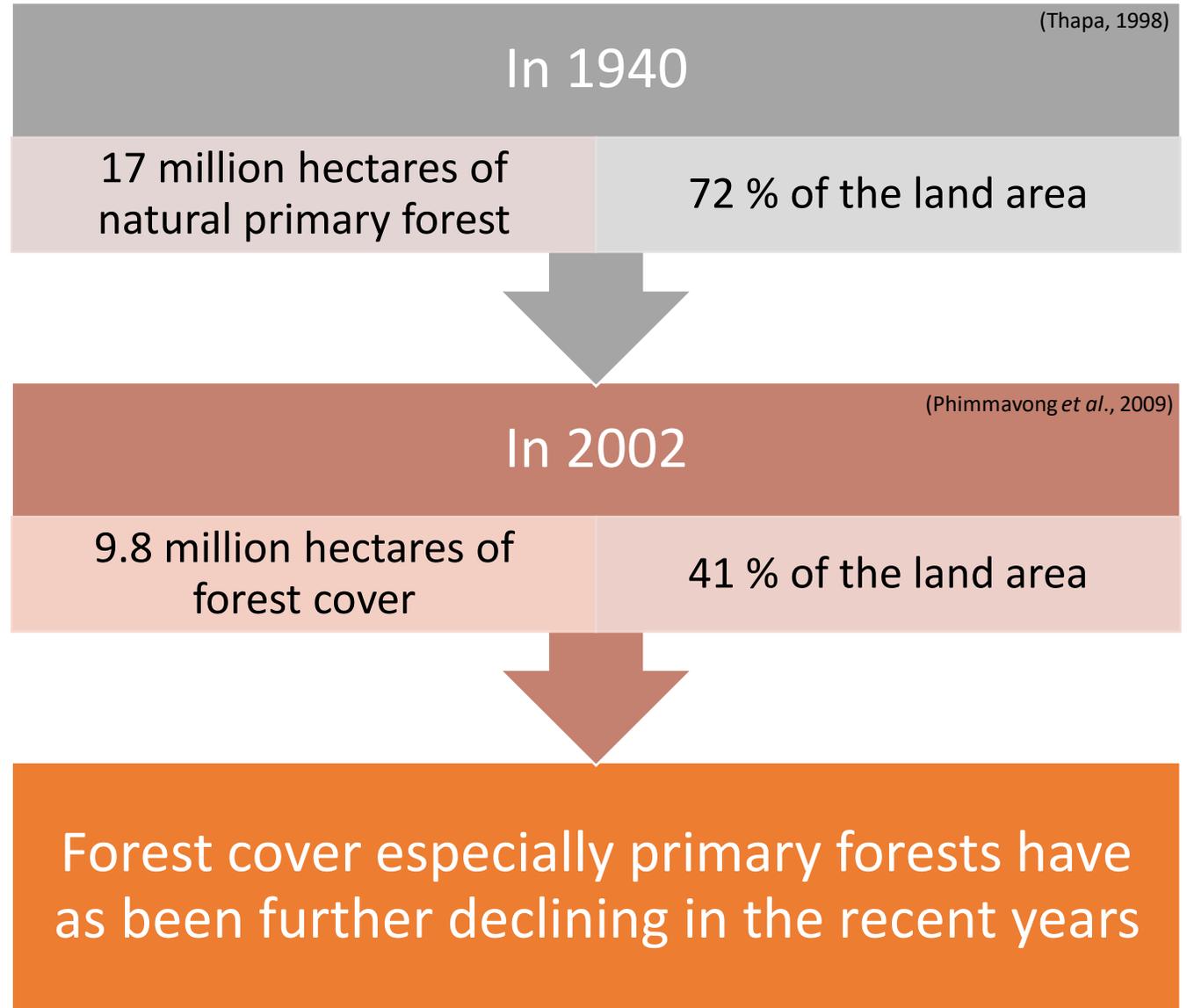




# Biodiversity in Laos

- Biodiversity in Laos is one of the richest in the Himalayan, Indo-Malayan, and Chinese regions (Myers, 1992)
- Part of the Indo-Burma hotspot
  - One of the 25 biodiversity hotspots in the world defined by Myers *et al.* (2000)

# Declining forest cover in Laos



# Loss of biodiversity in Laos

---

- Laos has experienced a severe forest degradation and loss of forest cover particularly loss of primary forests
- Many flora and fauna species have become threatened or extinct due to the forest degradation and deforestation (Thapa, 1998)



# Reasons for biodiversity loss

- Shifting cultivation is considered as one of the main reasons for forest loss as well as forest and land degradation in Laos (Phompila *et al.*, 2017)

## Direct drivers of biodiversity loss

- Agricultural expansion
- Fuel wood consumption
- Slash and burn farming
- Forest fires
- Illegal logging
- (JICA, 2014)

## Indirect drivers of biodiversity loss

- Population growth
- Lack of alternative sources of income
- Inappropriate governance and law enforcement
- Large-scale concessions





# Objectives

- To investigate the woody species diversity in regrowth forests
- To compare of woody species diversity in younger and relatively older regrowth forests
- To investigate the biodiversity present in homegardens



# Methods – Interviewing the locals

---

- A short interview with the local key informants about the site history including:
  - change in the forest conditions,
  - fauna diversity,
  - and access rights.

# Site history – from the locals' perspective

Previously the forest used to be:

- More intact natural forest
- With an abundance of large woody trees and wildlife



These days the forest is:

- Secondary, regrowth forest with an abundance of bamboo, but less big woody trees
- With no large mammals, which disappeared about 10 years ago due to overhunting
- Some birds still remain



# The study site – information from the locals

- The research site is a community owned forest
- The villagers are allowed to:
  - Collect bamboo and small amounts of firewood
  - Collect NTFPs such as bamboo shoot and mushrooms
  - Collect large trees with a special permission given by the village committee
- There is a fire prevention activity on the site

# Sampling methods

---



- Systemic plot sampling method
  - Circular sampling plots, 200 m<sup>2</sup> in size, plots approximately 50 meters apart
- Using the same sampling plots as in 2019, first of which was originally randomly selected
  - To avoid the edge effect, originally the sampling plots were located at least 20 m inside the forest
- In total of 25 plots

# Classification by age group

- Woody species were classified according to size into four different age groups:
  - Germinants, height  $< 5$  cm (not included in the research)
  - Seedlings,  $5$  cm  $<$  height  $< 1.3$  m
  - Saplings, height  $> 5$  cm, DBH  $< 2.5$  cm
  - Mature, height  $> 1.3$  m, DBH  $> 2.5$  cm





# Biodiversity measurements on each plot

- Measuring the physiographic features of the plots
- Counting and identifying all woody species except germinants ( $< 5$  cm)
- Estimating epiphytic flora stem cover
- Determining the structure of the forest including canopy openness and DBH measurements of trees with  $DBH > 2.5$  cm
- Identifying lianas and vines

# Herbaceous species sampling

- 5 times 1 m x 1 m grids inside plots
- Herbaceous cover estimation
- Ground cover percentage of herbs and forbs in each grid was averaged for ground cover estimation of the plot
- Dominant herbs and forbs were identified



# Homegardens

---

- Identifying all existing species and classifying them by use
- Discussions with the owners about the use of the species existing in their homegardens
- A total of 10 homegardens were visited in Nayang Tai village





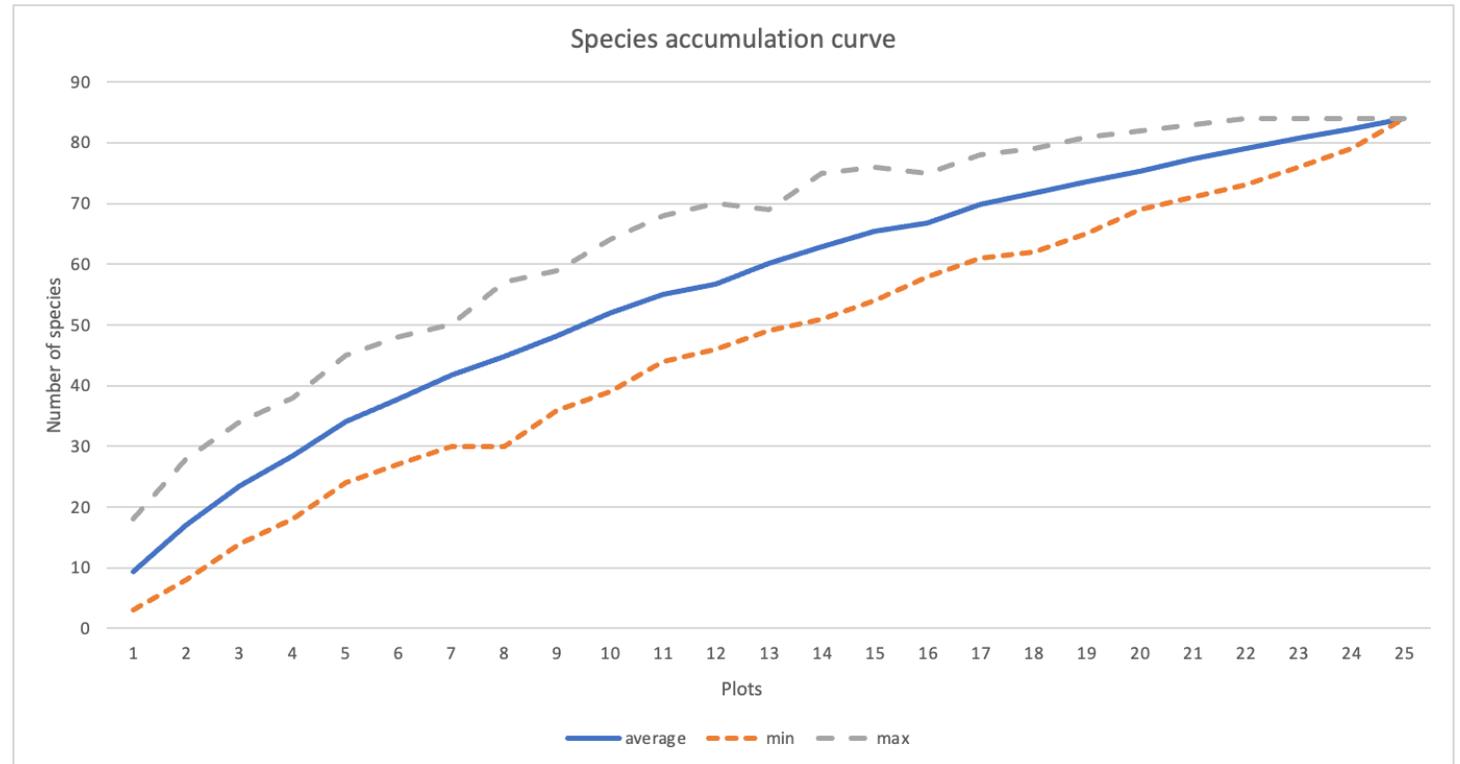
# Data analysis

- Was done with Excel for descriptive data analysis
- Species accumulation curve was done with AccuCurve software
- Diversity indices were calculated using the BiodiversityPro software

# Results – Woody species inventory

---

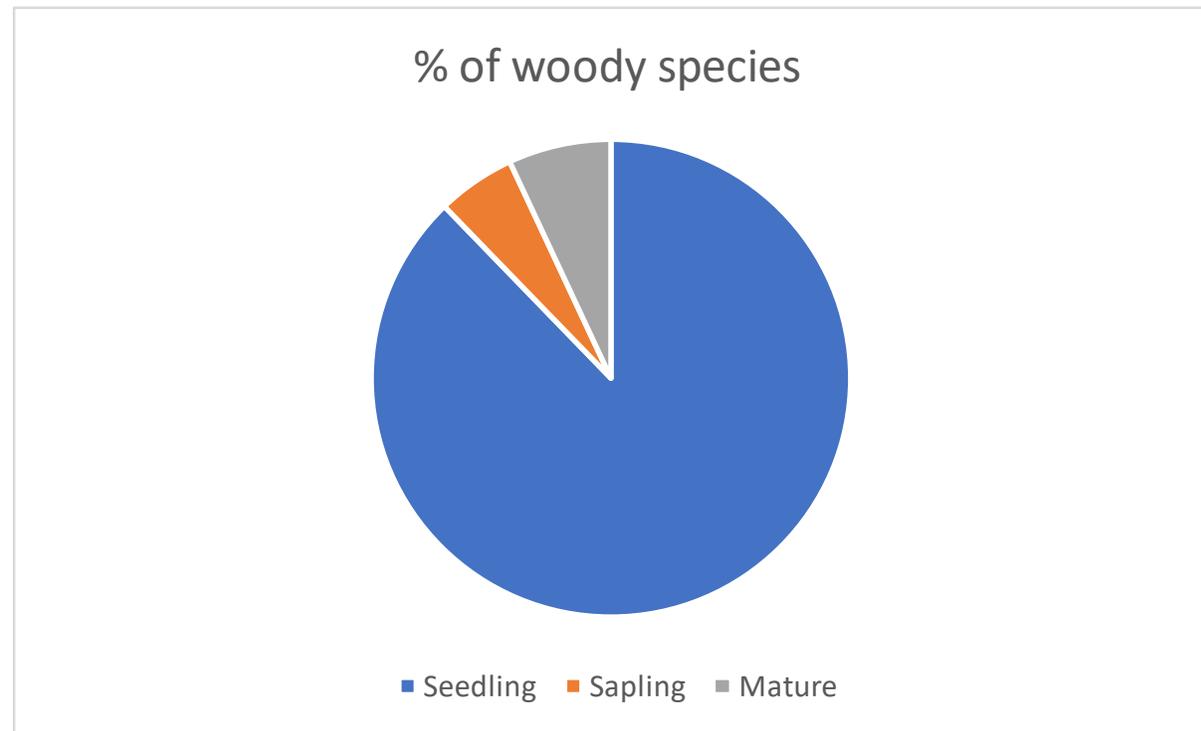
- The woody species count started to level down but did not reach the maximum
- This indicates that we need more sampling



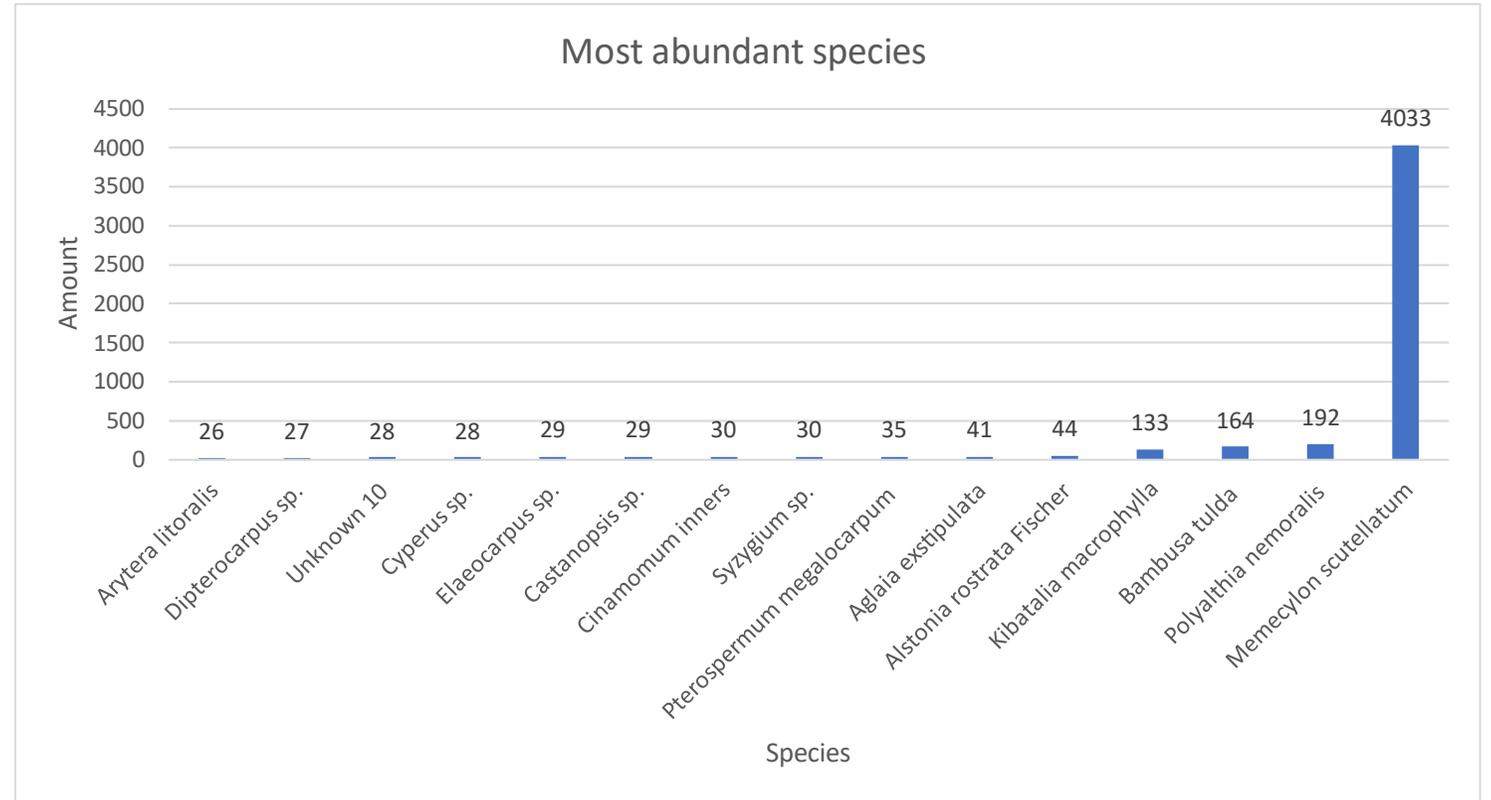
# Results – Secondary forest measurements I

---

- The total number of woody species was 85
  - Seedlings 88 %
  - Saplings 5 %
  - Mature 7 %



# Results – Secondary forest measurements II



- 15 most abundant woody species

# Diversity indices

---

- Woody species richness: 85

Stand	Nayang Tai
Species No.	9.48
Abundance	25.5
Shannon index	0.778
Simpson index	0.216
Shannon evenness	0.830



# Results – Herbaceous species cover

- The average ground cover was ~30 %
- The minimum was ~8 % and the maximum was ~69 %
  - These were the average of five measurements done per plot
- Most popular herbaceous species by frequency:

No	Scientific name
1	<i>Eugenia sp.</i>
2	<i>Diplazium esculentum</i>
3	<i>Aganoneroin polymorphum</i>
4	<i>Ormosia cambodiana</i>
5	<i>Scleropyrum wallichianum</i>
6	<i>Aporosa sp.</i>
7	<i>Amomum sp.</i>



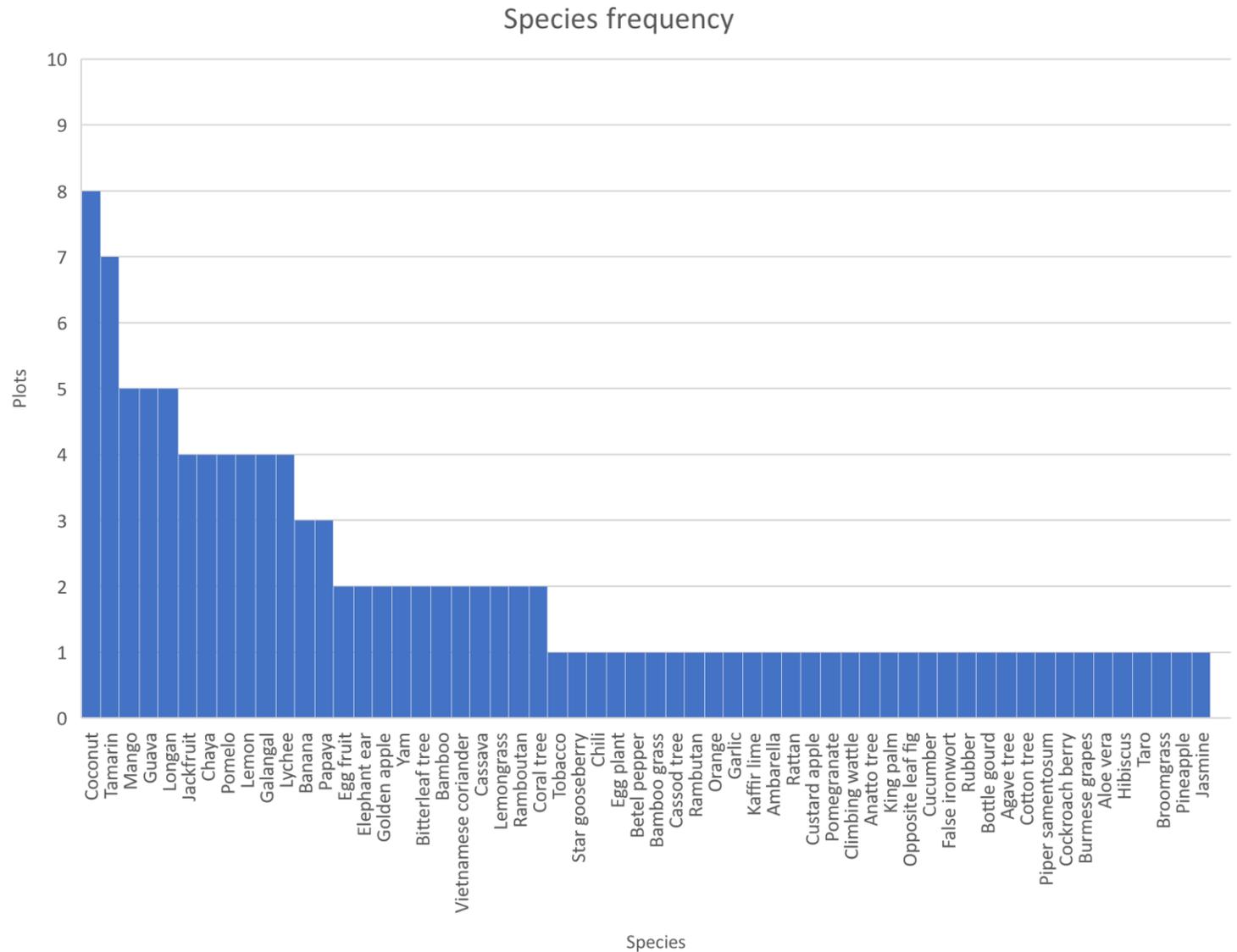


# Results – Lichen cover

- The estimated average lichen cover at all (measured) sites was ~28 %
- The minimum lichen cover was 2 % and the maximum was 90 %
- Other epiphytic species such as mosses and herbs were not found within the sampling plots

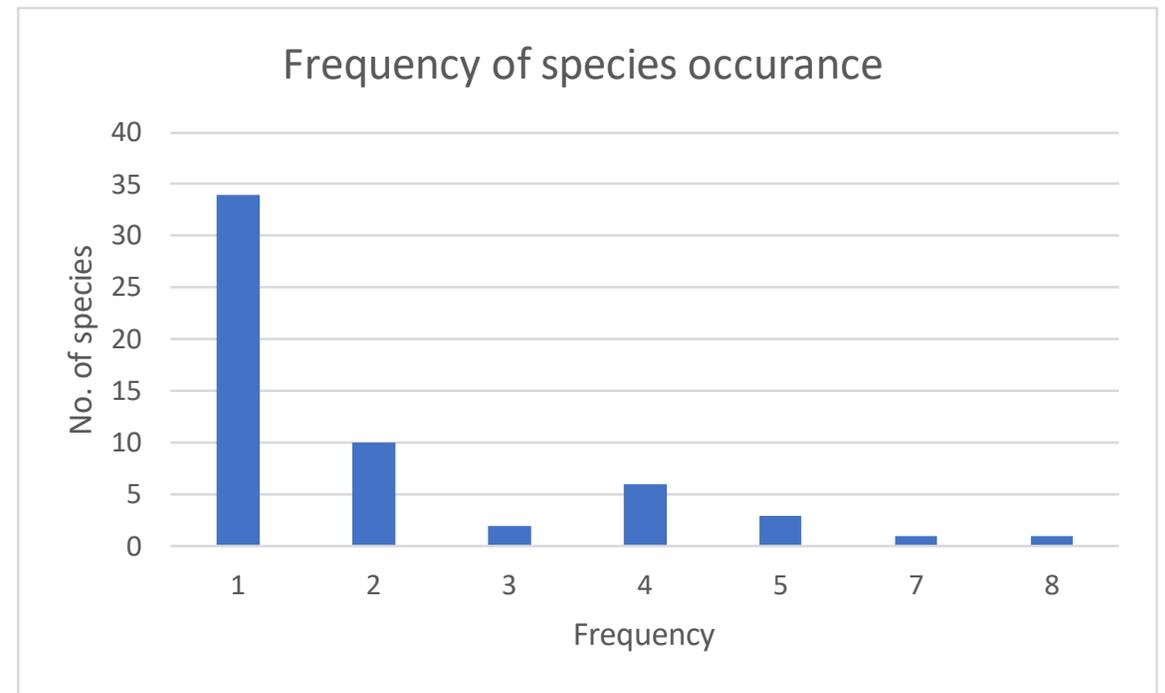
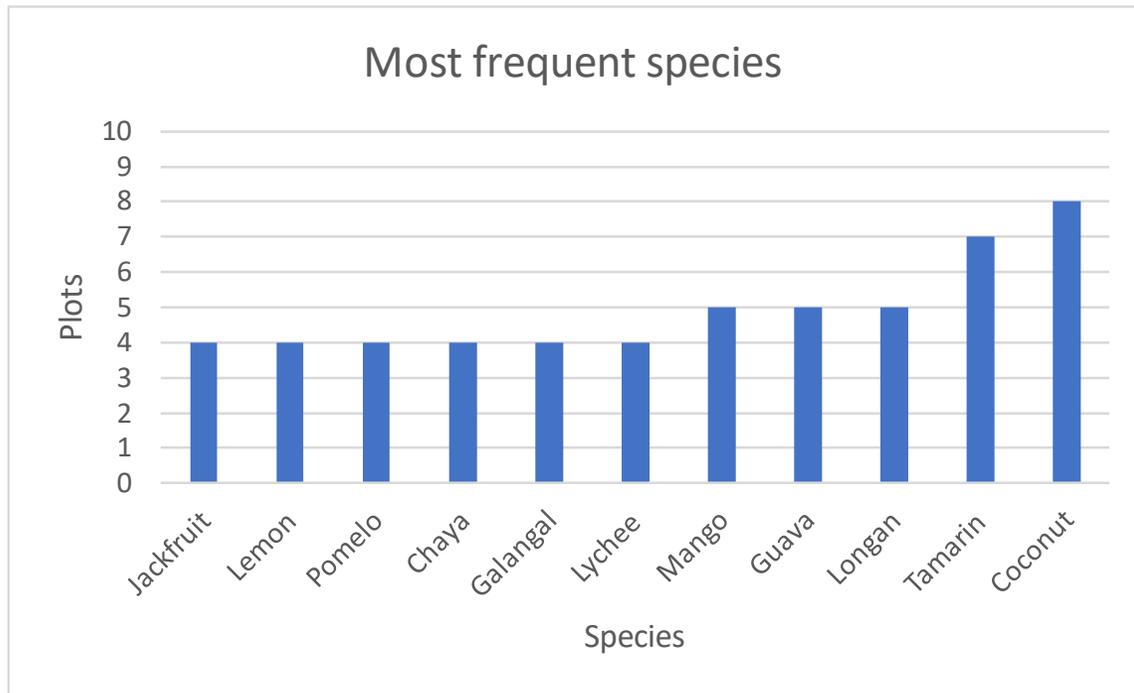
# Results – Homegarden measurements I

- A total of 58 species were found in the homegardens

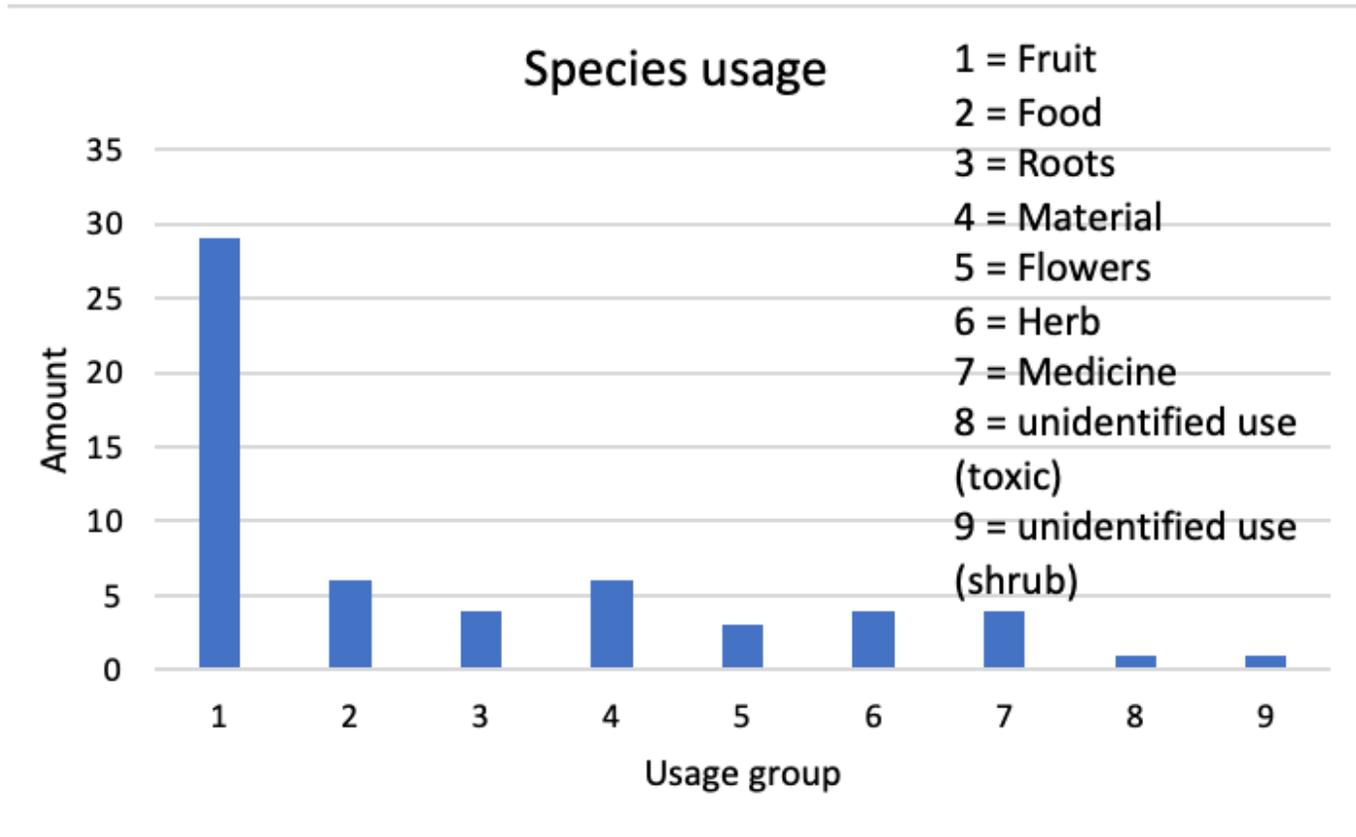


# Results – Homegarden measurements II

- Most species only occurred once in all of the ten homegardens we measured



# Results – Homegarden measurements III





# Conclusions

---

- The regrowth forest had a simpler structure compared to old-growth forest
- The ground was mostly covered with woody species instead of herbaceous species
- Bamboo was found in all regrowth forest sites
- Lichens were almost the only epiphytic flora in the study
- Homegardens were more diverse than expected

# References

---

- JICA: Japan International Cooperation Agency (2014). Participatory Land and Forest Management Project for Reducing Deforestation in Lao PDR (PAREDD).  
[https://www.jica.go.jp/project/english/laos/006/materials/c8h0vm000049tjx8-att/materials\\_03.pdf](https://www.jica.go.jp/project/english/laos/006/materials/c8h0vm000049tjx8-att/materials_03.pdf)
- Myers, N. (1992). Tropical forests: the policy challenge. *Environmentalist*, 12(1), 15-27.
- Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, 403(6772), 853-858.
- Phimmavong, S., Ozarska, B., Midgley, S., & Keenan, R. (2009). Forest and plantation development in Laos: history, development and impact for rural communities. *International Forestry Review*, 11(4), 501-513.
- Phompila, C., Lewis, M., Ostendorf, B., & Clarke, K. (2017). Forest cover changes in Lao tropical forests: physical and socio-economic factors are the most important drivers. *Land*, 6(2), 23.
- Thapa, G. B. (1998). Issues in the conservation and management of forests in Laos: The case of Sangthong District. *Singapore Journal of Tropical Geography*, 19(1), 71-91.



Thank you!