



**ROYAL UNIVERSITY OF AGRICULTURE**

**Faculty of Forestry Science**

**CARBON STOCK ASSESSMENT FOR UPLAND FOREST IN CAMBODIA:  
CASE STUDIES AT SIEM PANG DISTRICT, STUENG TRENG PROVINCE**

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# INTRODUCTION

- Cambodia covers a total area of 181,035 km<sup>2</sup> .
- Cambodia was able to maintain a relatively high forest cover, with one of the highest levels of forest cover in Southeast Asia. While the current forest cover is still relatively high, Cambodia lost a considerable amount of forest over the last two decades, and the pace of land use and forest conversion has seen acceleration.
- RGC has approved a long vision for forestry sector governance by reducing GHG emissions from the forestry sector to Zero percent by 2040. To achieving these vision, some policies have taken place under the REDD+ mechanism.

# OBJECTIVE OF THE RESEARCH

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- Estimate the total carbon stocks ecosystem
- Contribute the future **National Forest Inventory** (NFI) plan and GHG inventory

# METHODOLOGY

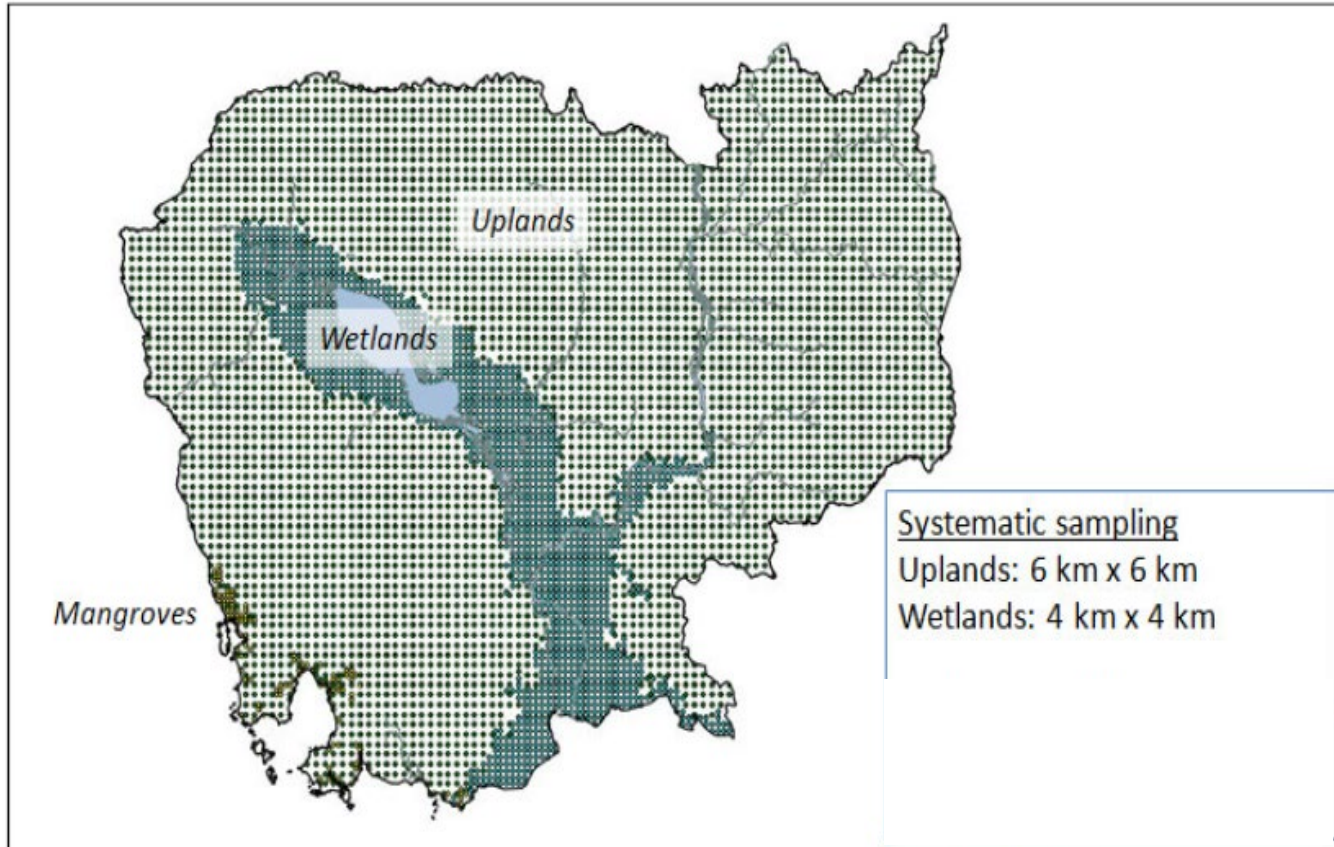
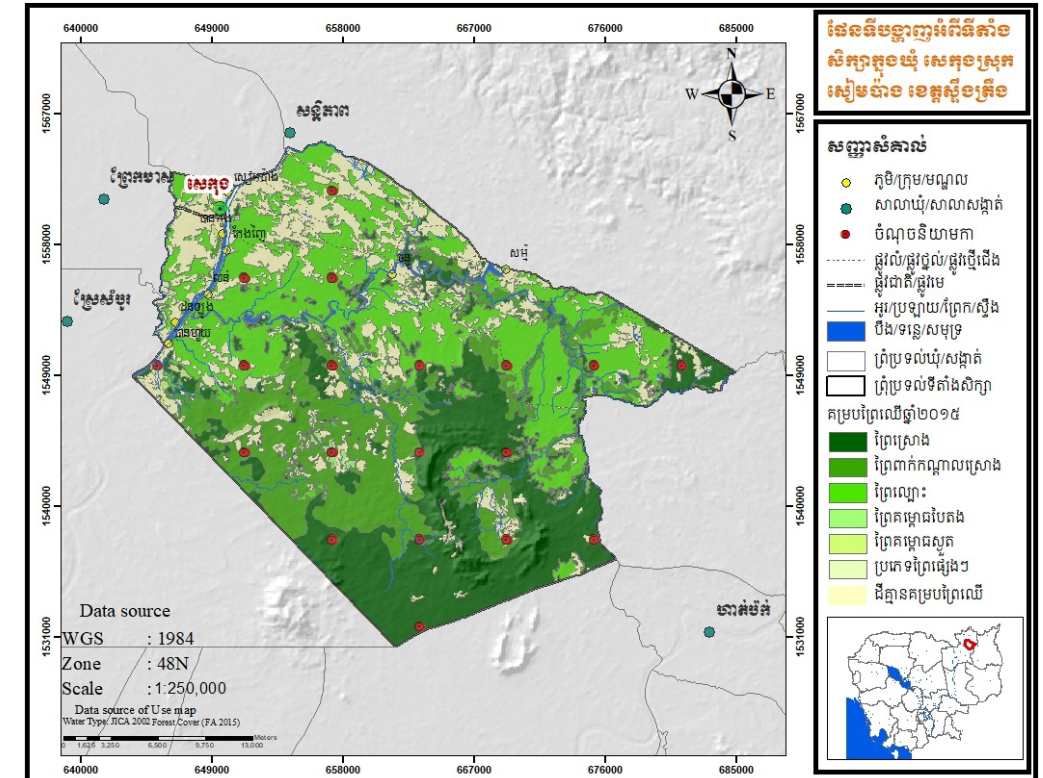


Figure 1. Three strata and cluster design (FAO, NFI manual)

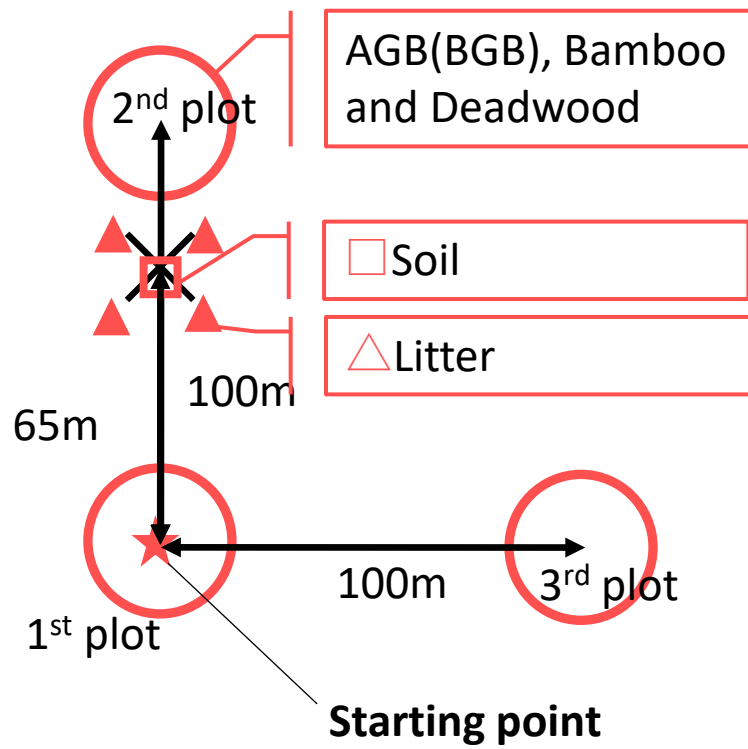


Forest Type	Total (ha)
Evergreen	22444.11
Semi-evergreen	15283.09
Deciduous	25423.21

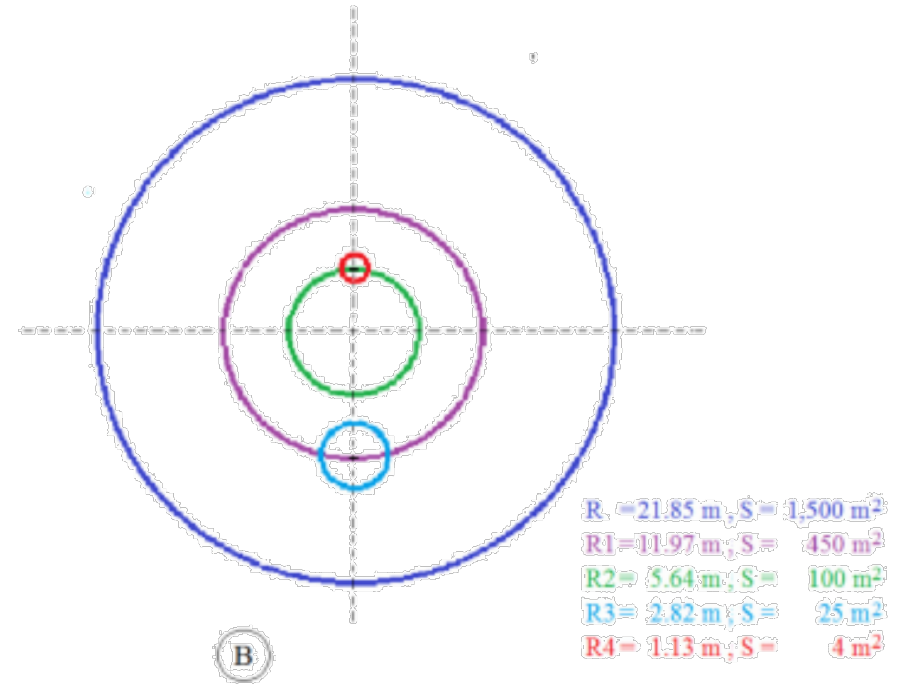


# Method

## Cluster design



## Plot design



# Equation AGB by forest type

## Equation

Evergreen	$AGB = 0.0673 * (DBH^2 * H * WD)^{0.976}$	Cheve, J. (2014)
Semi-evergreen	$AGB = 0.0607 * DBH^{2.2692} * H^{0.5122} * WD^{0.3183}$	Kim, S. (2019)
Deciduous	$AGB = 0.0607 * DBH^{2.2692} * H^{0.5122} * WD^{0.3183}$	Kim, S. (2019)

where AGB = Above ground biomass (t/ha)

DBH = Diameter Breast Height(cm)

H = Height (m)

WD = Wood Density g/cm<sup>3</sup>

Base on IPCC (2006) BGB equal to RS R=0.37 for Evergreen and Other R=0.20

0.47 Carbon fraction t carbon default value IPCC (2006)

1 carbon equal to 44/12 CO<sub>2</sub>

# Dead Wood Equation

## ❖ Stump Dead Wood

- $V = A * L * 100$
- where V is the volume (cm<sup>3</sup>),
- A is the sectional area at the middle (cm<sup>2</sup>),
- and L is the height of the stump (m)

Mass = V \* WDdecomposition class

Source: Chao et al. (2008)

## ❖ Fallen Dead wood Equation

$$V = L \left[ \frac{\pi \left(\frac{D_1}{2}\right)^2 + \pi \left(\frac{D_2}{2}\right)^2}{2} \right]$$

V = Volume (cm<sup>3</sup>)

D<sub>1</sub> = Stump DBH

D<sub>2</sub> = End DBH

Wood Density = Mass/Volume

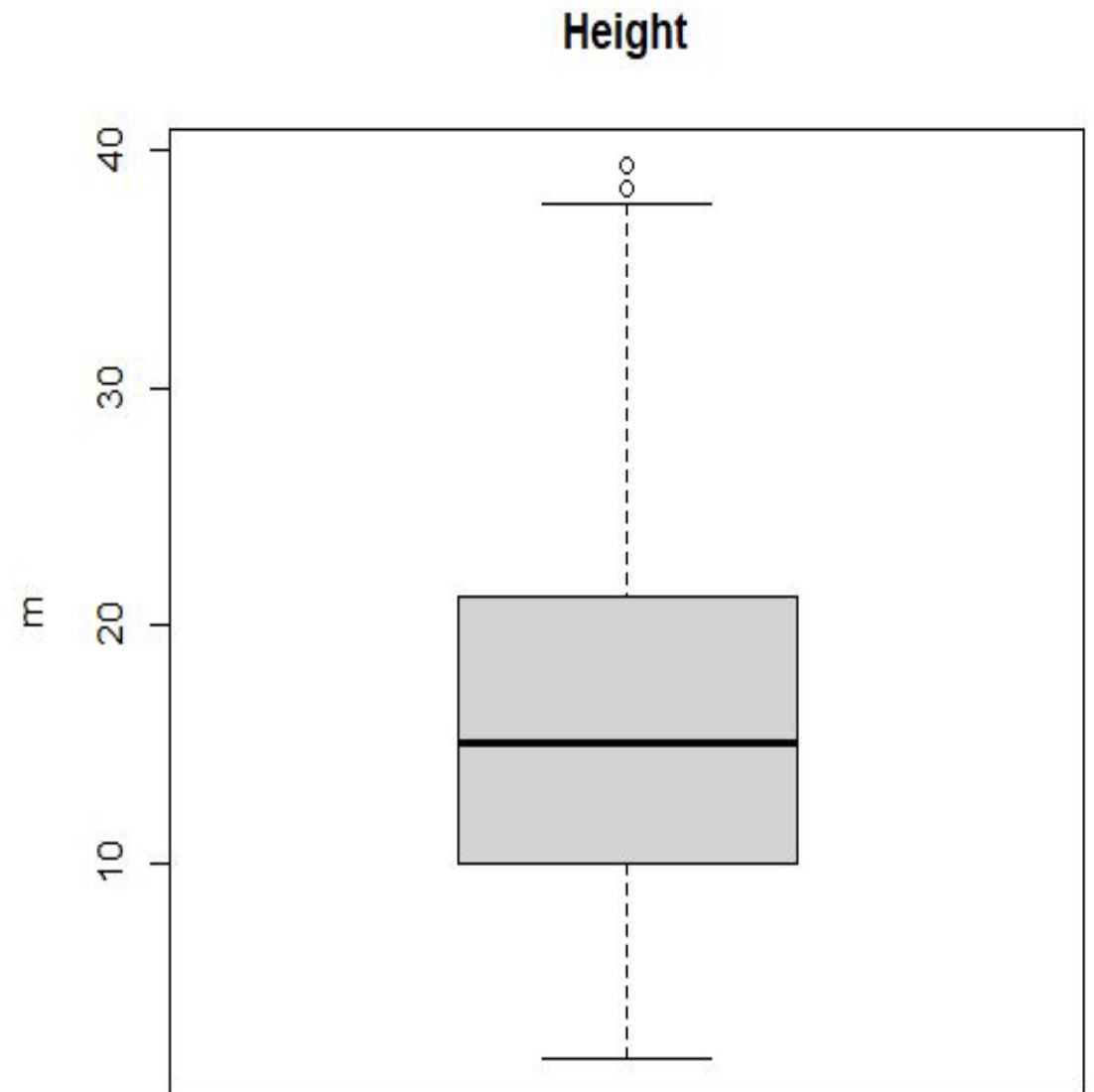
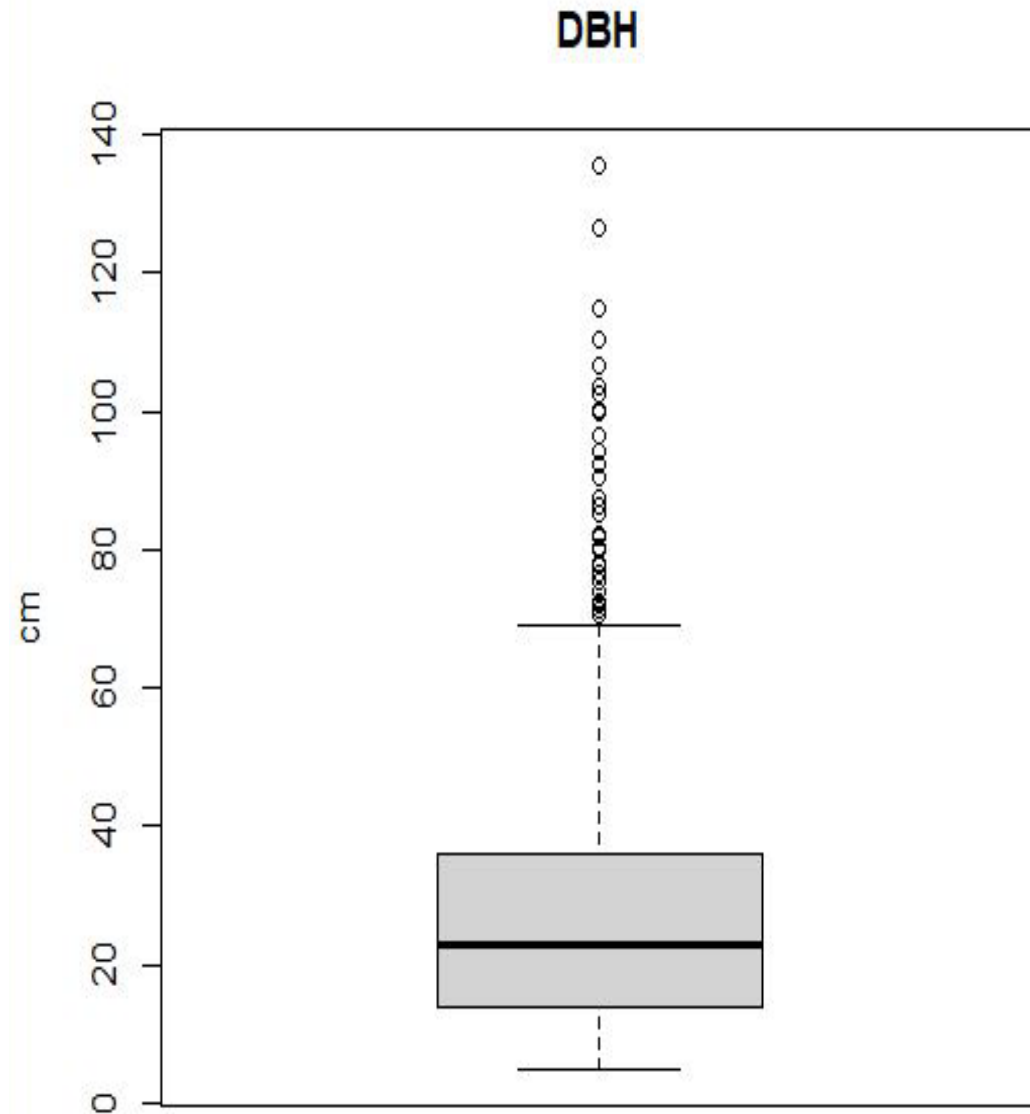
Mass = Wood Density \* Volume

Decomposition Class	WD g cm <sup>3</sup>
1	0.55
2	0.41
3	0.23

RESUTLS



# Average of DBH and Height



# Relationship Between DBH and Height



# Total Ecosystem Carbon Stock in upland Forest area

## The Research Site

Forest Type	#Plots	ABG* (Ct/ha)	BGB* (Ct/ha)	Deadwood (Ct/ha)	Litter (Ct/ha)	Soil (Ct/ha)	Total (Ct/ha)	Total CO2 (t/ha)
Evergreen forest	17	125.84	46.56	7.59	1.74	68.49	250.22	917.46
Semi-evergreen forest	13	78.10	15.62	9.19	0.94	63.77	167.63	614.63
Deciduous forest	26	39.55	7.91	10.17	1.04	65.24	123.91	454.32

\*Standing tree and bamboo

# Comparison between forest inventory in Stung Treng and national FRL

## The Study Site

Forest Type	#Plot	AGB t/ha	BGB t/ha	(RS)	Total Biomass	Total Carbon	Total CO2
Evergreen forest	17	267.74	99.06	0.37	366.80	162.49	632.13
Semi-evergreen forest	13	166.18	33.24	0.20	199.42	84.75	343.66
Deciduous forest	26	84.15	16.83	0.20	100.98	42.92	174.02

(FLR, 2022)

Forest Type	#Plot	AGB	BGB	(RS)	Total Biomass	Total Carbon	Total CO2
Evergreen forest	446	133.1	49.26	0.37	182.38	85.72	314.3
Semi-evergreen forest	49	165.2	33.05	0.20	198.28	93.19	341.7
Deciduous forest	132	70.87	14.17	0.20	85.04	39.97	146.55

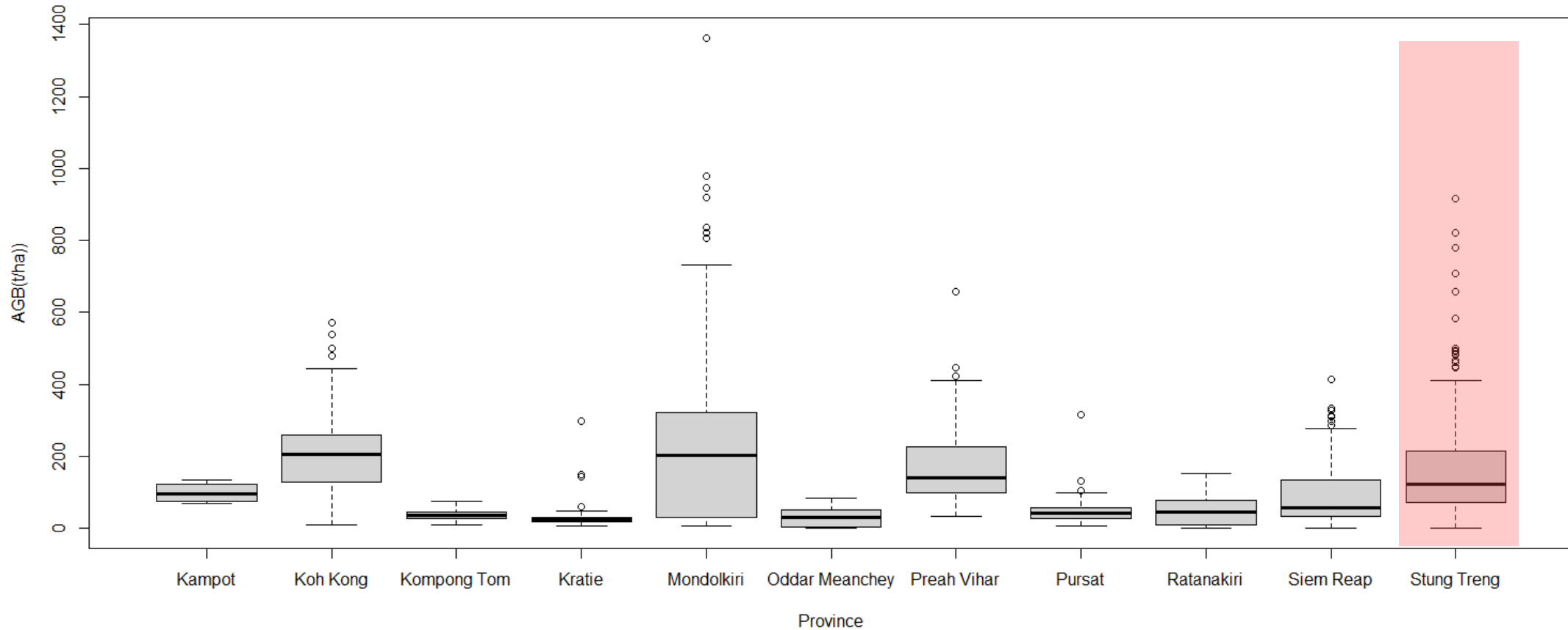


DISCUSSION

# Result of Forest Inventory

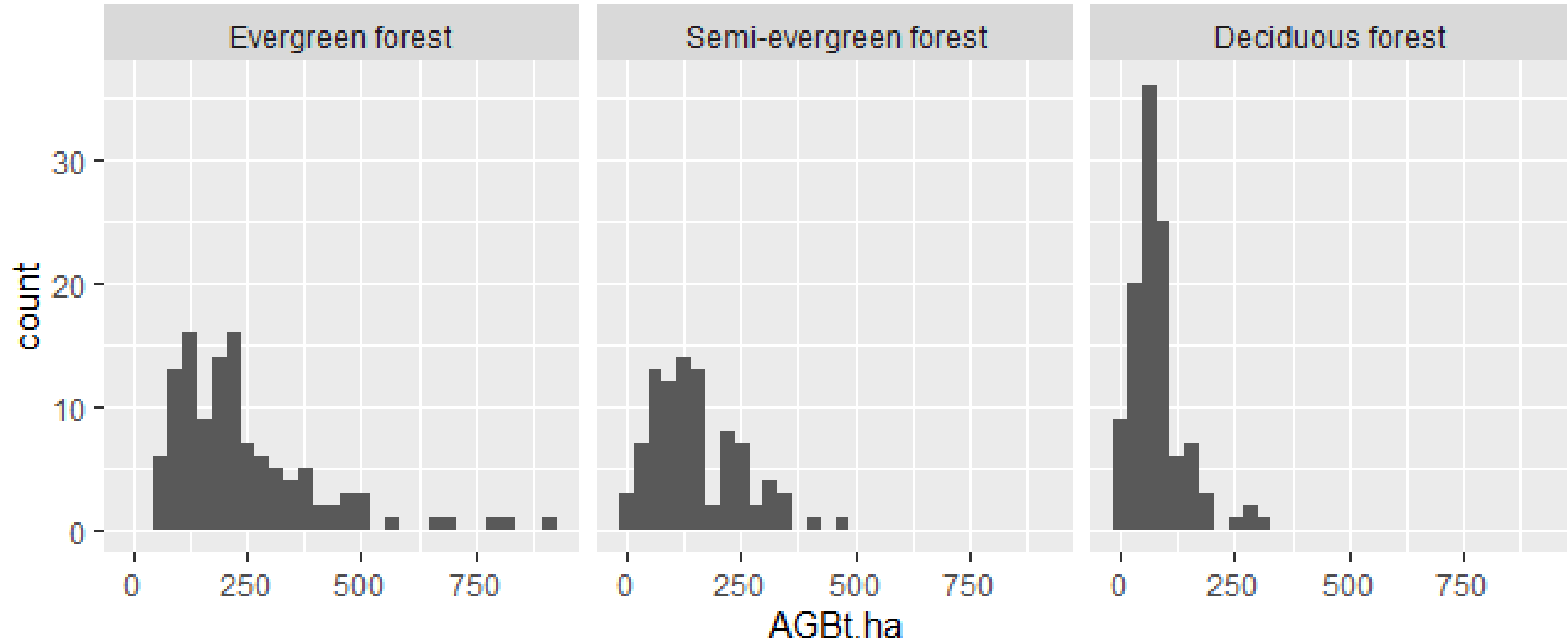
## Result of all AGB data(ton/ha)

Stung Treng's forests are relatively dense





# Result of AGB per plot (t/ha) for each Forest Type



## CONCLUSION AND RECOMMENDATION

- ❑ The NFI field manual lacks some details of survey methods.
  - Improve the NFI field manuals
- ❑ This inventory results are the first kind of sub-national scale random sampling data and it has a tremendous scientific value.
  - The data can be available for academic studies

# Field Survey Activities

## Challenges



Survey Team meets in RUA on 9 Jan 2022



Motor was broken during the field in Nimith Waterfall



Team 3 traveled to Vern Sai on 13 Feb 2022



Inaccessible cluster due to forest fire on 4 Feb 22



The local small boat to reach the cluster



Team 1&4 traveled to Virack Chey on 8 Feb 2022





Thank you for your attention



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