



# Carbon Sequestration of Rubber Plantations in the Nabanhe National Nature Reserve in Xishuangbanna, China



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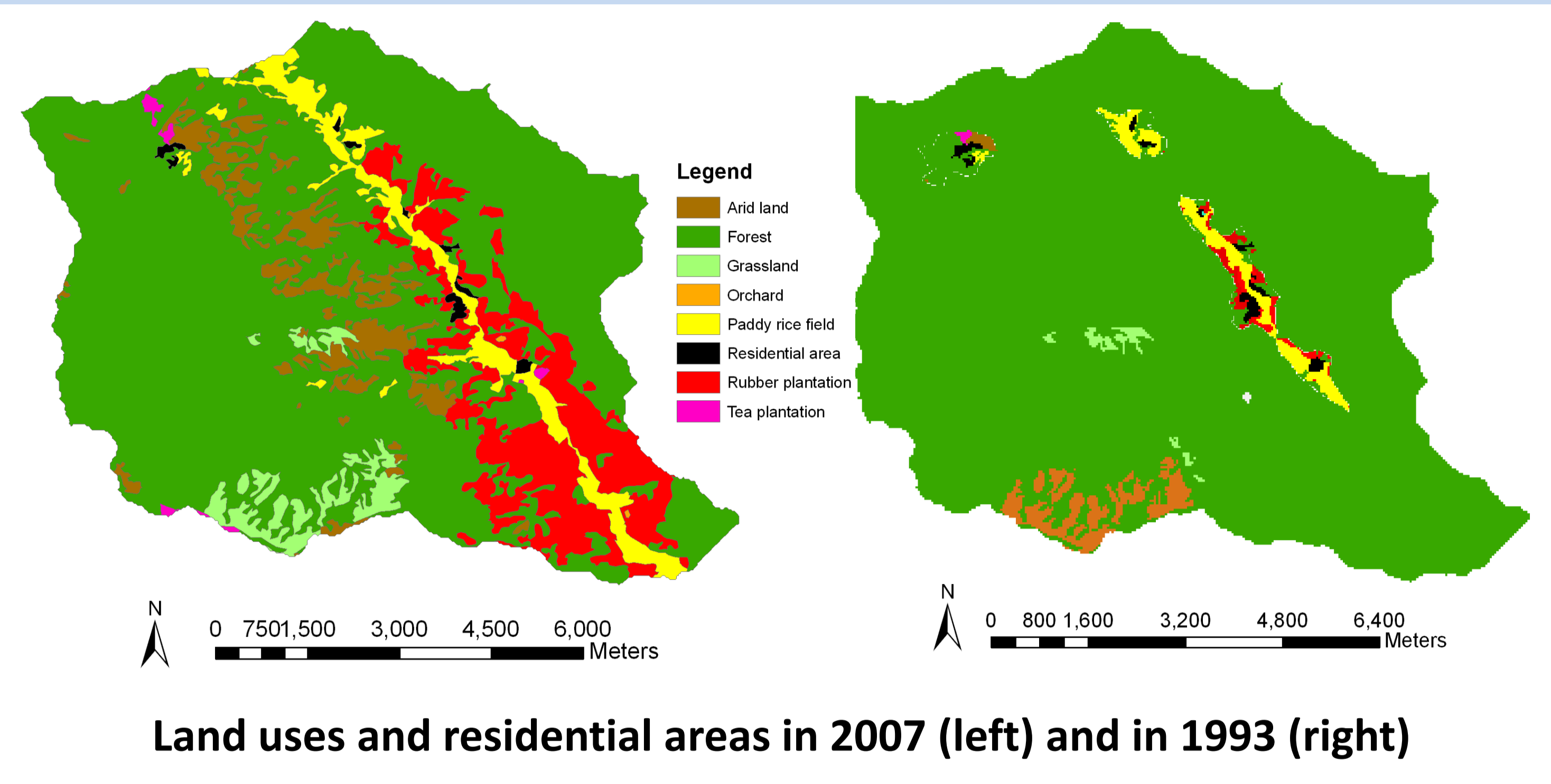
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## Introduction

- Deforestation, land use change and carbon emissions are global issues.
- The study area is at 640 to 2200 m.a.s.l.
- Rubber covers over 10% of it.
- Rubber replaces primary and secondary forests in the study area.
- Land use change alters carbon sequestration and emissions.
- Need for evaluating the resulting carbon balance.



China



## Materials and Methods

- Allometric estimation of rubber biomass.
- Modeling time is from 1992 - 2007.
- The baseline is based on a land use map from 2006/07.
- Forest classification, exact rubber ages, and former land uses are a function of elevation ranges, distance to the villages, slope, and rubber age estimates from other authors.
- Maps were processed with QGIS 1.7.4, ArcGIS 9.3 and PCRaster 3.0.0.
- Carbon sequestration and emissions will be computed with the model Land Use Change Impact Assessment (LUCIA; lucia.uni-hohenheim.de).

### Inputs to LUCIA:

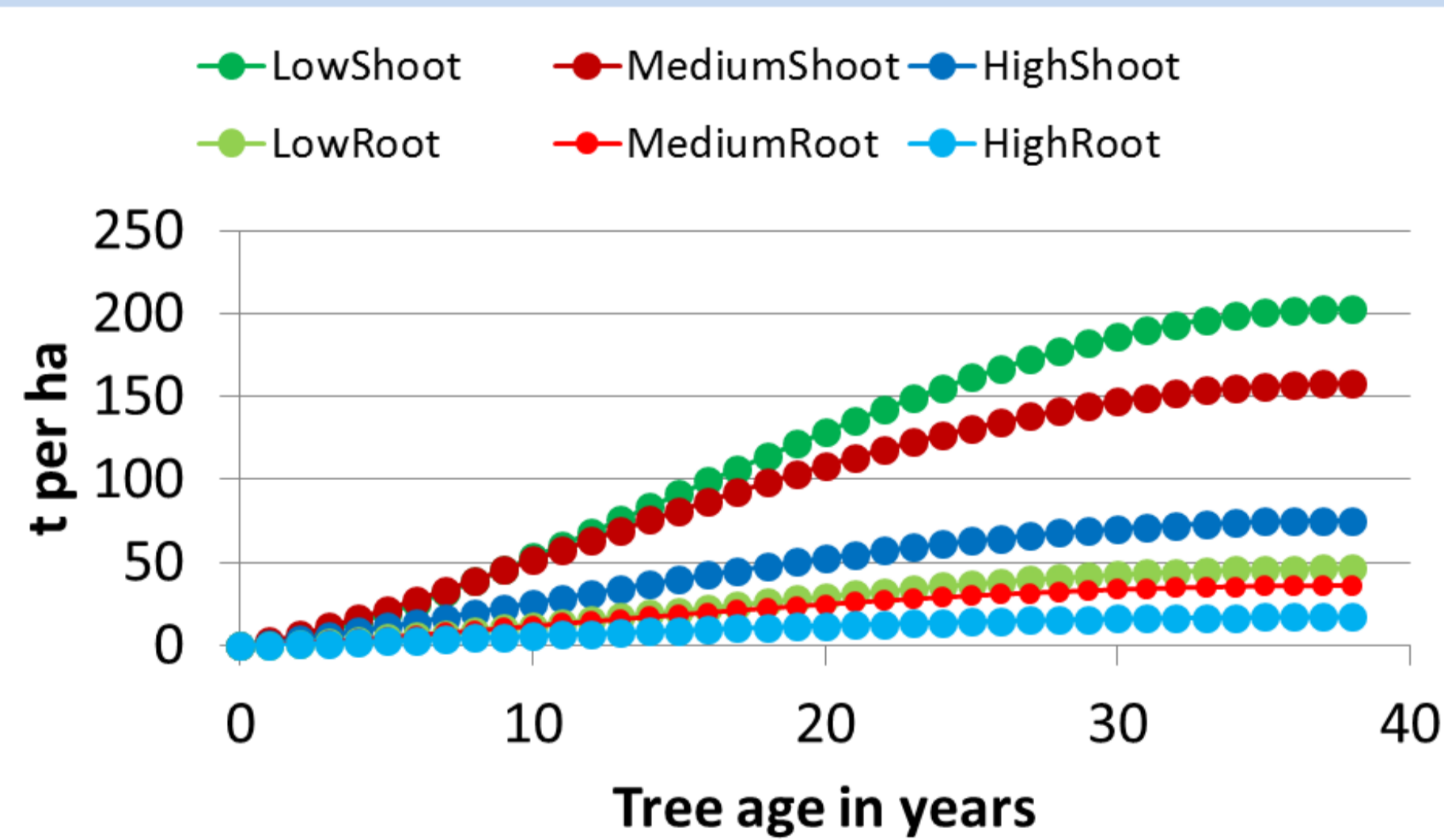
- Weather data
- Maps
- Vegetation and soil parameters

### Outputs:

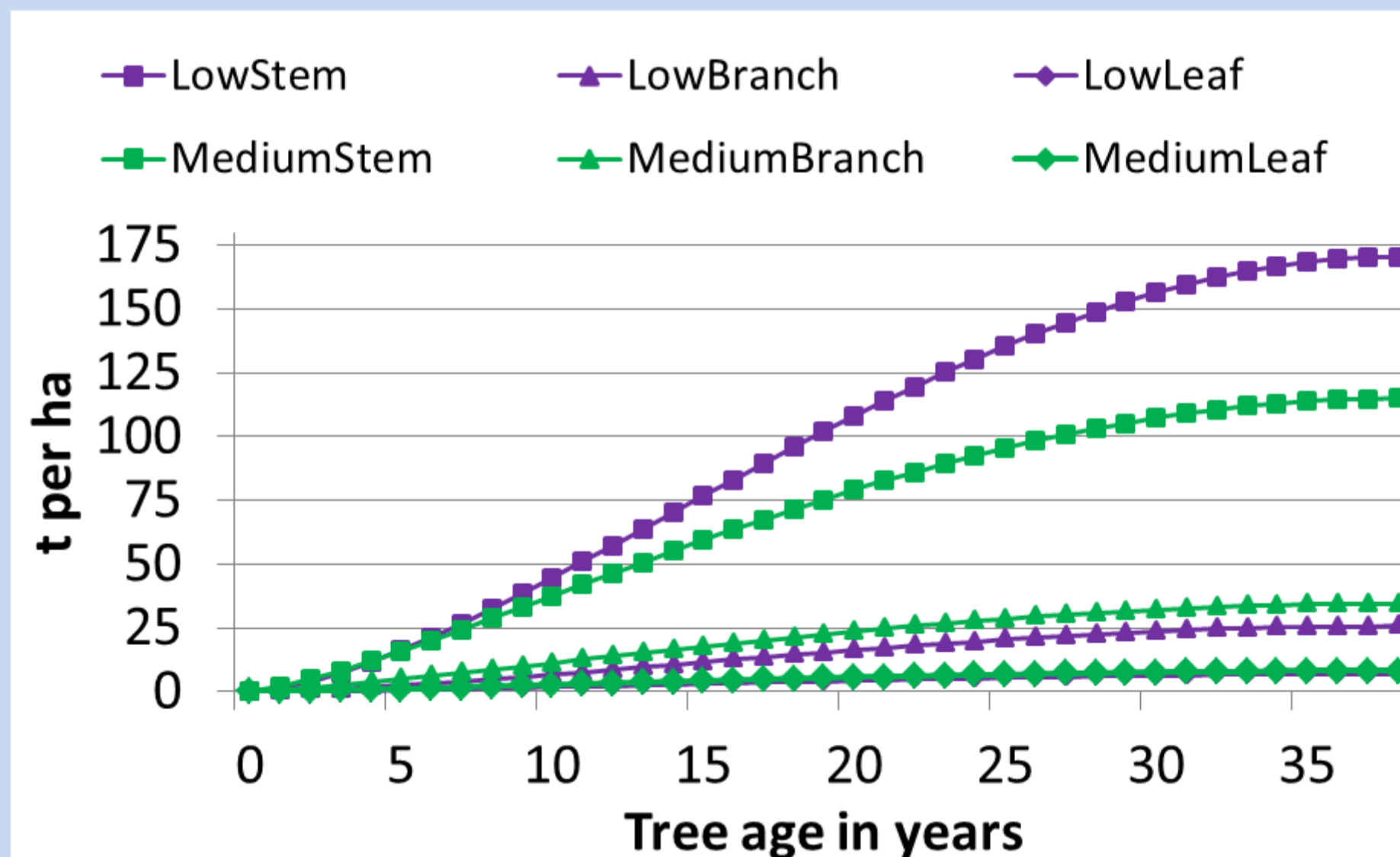
- Biomass
- Carbon sequestration
- Carbon emissions

## Preliminary Results

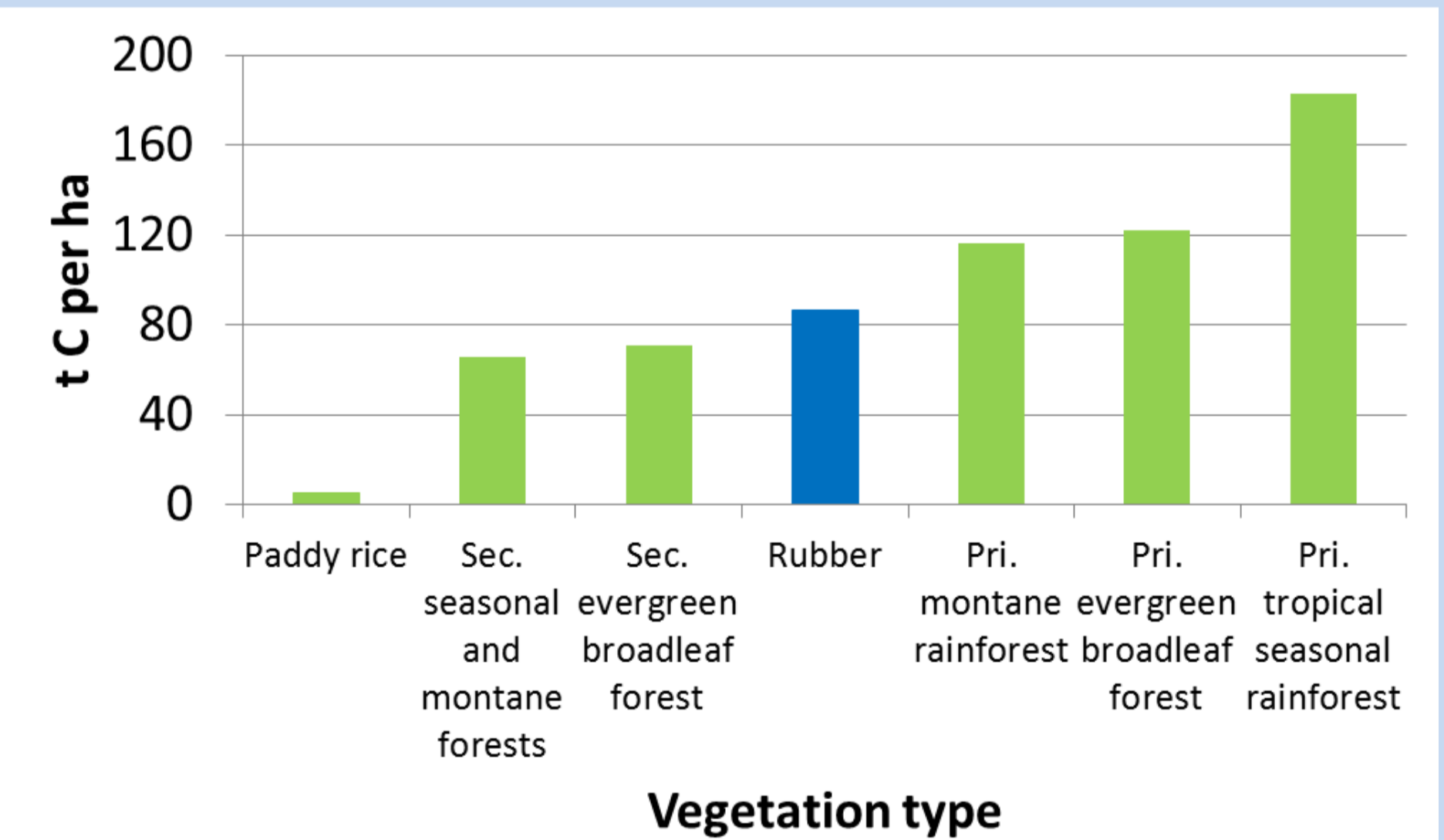
- Rubber shoot and root biomass differs at low, medium and high elevations.
- Biomass of different plant organs is significantly different at different elevations.
- Branch and leaf biomass is higher at medium than at low elevations.
- The C sequestration of rubber is lower than in primary, but higher than in secondary forests and paddy rice.
- Forests are carbon sinks during the dry season, and sources during the rainy season.



Shoot and root biomass in t per ha of 0 to 38 year old rubber plantations at low, medium and high elevations in the reserve



Stem, branch and leaf biomass in t per ha of 0 to 38 year old rubber plantations at low, medium elevations in the reserve



Biomass carbon in t C per ha of mature rubber, forests and rice in the reserve

## Discussion

- Rubber biomass differences are mainly due to temperature differences.
- The higher branch and leaf biomass at medium elevations is probably partly due to the temperature inversion.
- In a 38 year old life cycle, rubber cannot compensate for the biomass carbon loss of any primary forest in the area.

- Biomass carbon loss of secondary forests can only be compensated after 18 to 21 years.
- Biomass carbon storage in rubber is more important compared to rice and secondary forests.
- The loss of biodiversity and other ecosystem services may be a high cost.
- Nevertheless, rubber is expected to keep replacing primary and secondary forests.