University of Tsukuba
Graduate School of Life and Environmental Sciences

Research topic

Estimation of forest carbon stock in Thua Thien Hue Province, Viet Nam using MODIS EVI time series to support REDD+

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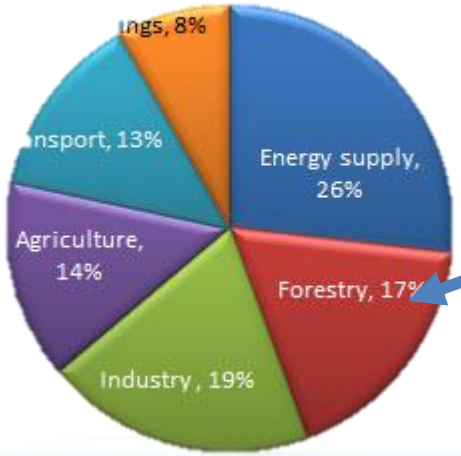
ID: 201225028

1. Background

REDD +?

Global Environmental Degradation

- Climate change effects
- Economic growth
- Rapid growth population
- Urban development/LUC
- Deforestation & forest degradation
- Other causes



Source IPCC 2007

1. Background

What is REDD + ?

REDD

Reducing **Emission** from

Deforestation and

Forest degradation

Conservation

\+ = Sustainable

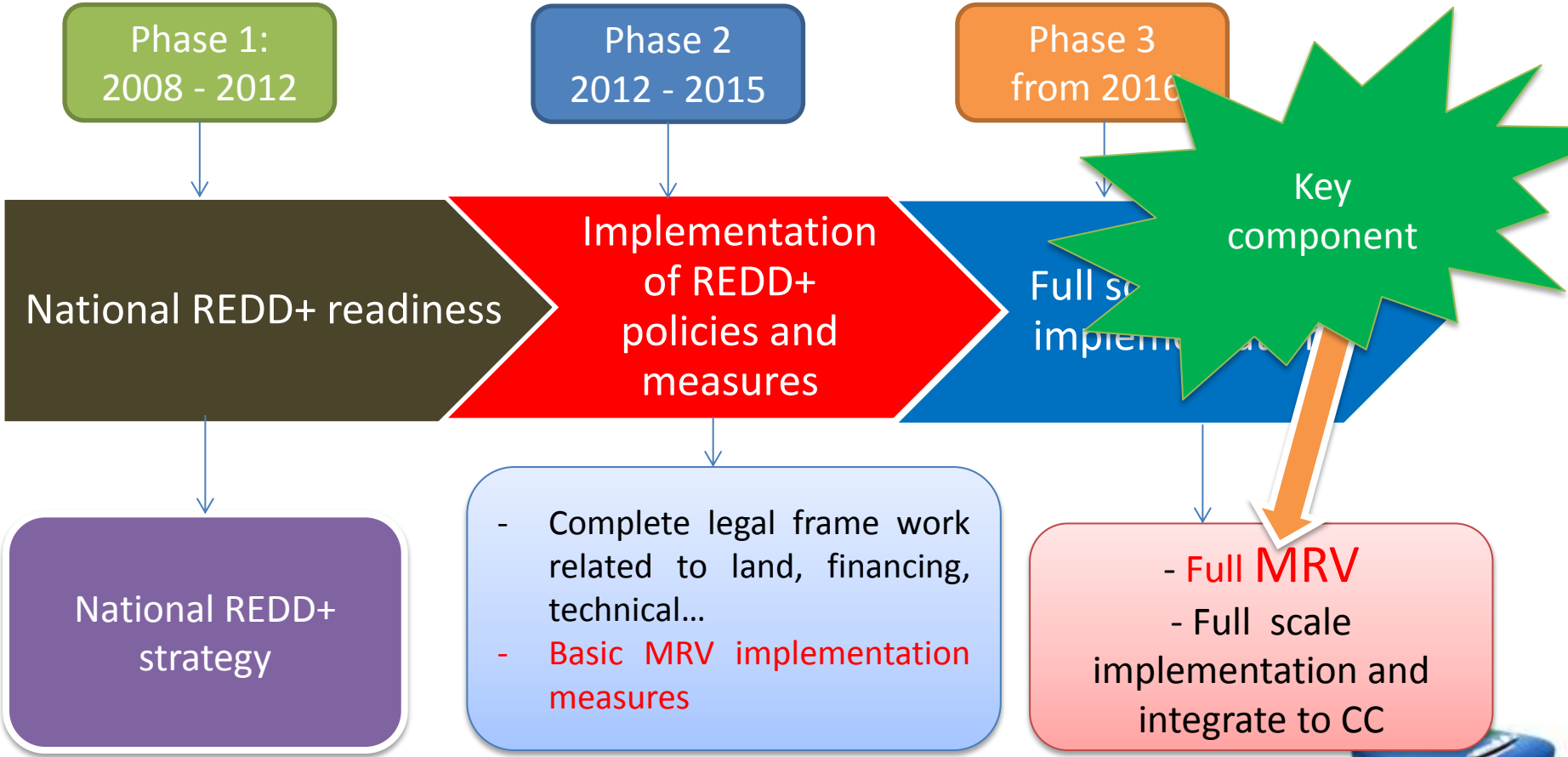
Management of Forest

Enhancement of Forest Carbon Stocks

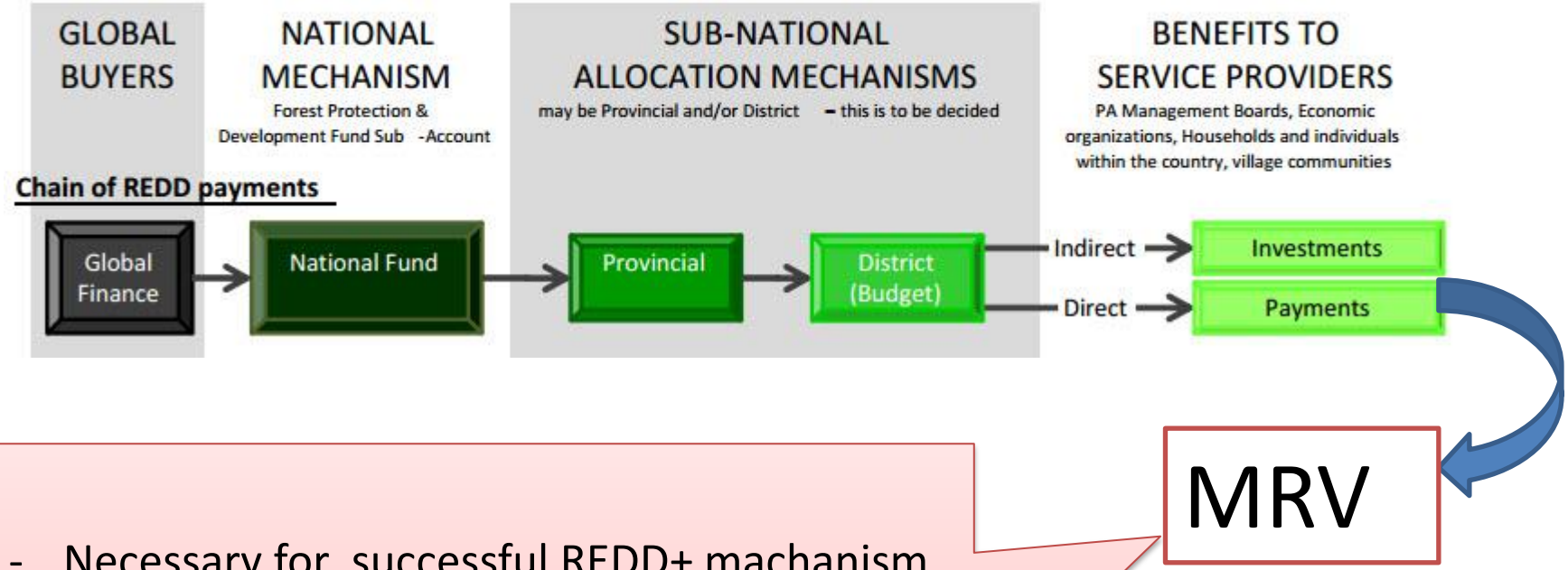
REDD+

1. Background

REDD+ implementation



1. Background



- Necessary for successful REDD+ machanism
- Building RLs and RELs for CO2 mechanism
- Mapping the potential for REDD+
- Payment, reporting for verified performance (How many % of CO2 emission or , removal)
- Payment bases on types of forest

Source: UN-REDD

1. Background

Remote sensing is powerful tool for MRV

Meet standards for REDD+

- Acquire, Monitor, Update forest information at large scales,
- Estimate & assess vegetation biomass
- Set a reference level/ Carbon credit mechanism
- Promote effective REDD+

1. Background

Why MODIS EVI?

$$EVI = G \times \frac{(NIR - RED)}{(NIR + C1 \times RED - C2 \times Blue + L)}$$

C1 = 6 coefficent of resistance
C2 = 7.5
L = 1 (the canopy background adjustment)
G = 2.5 (gain factor)

- RED and BLUE band (visible range): 0,4 – 0,7 **μm**
- **Near-infrared band: 0.7 – 1.3 μm**
- From visible to near-infrared (NIR)range: the reflectance of healthy vegetation increases
- In the range of NIR: plant leaf reflects 40-50% of the energy , 8 layers of leaf in canopy, permit to discriminated between species (Hue., et all 1997)

1. Background

Previous studies

- Have shown positive correlation between vegetation indices: NDVI, RDVI, MSR, RVI, MSAVI, OSAVI with biomass (Das and Singh 2012)
- Several studies with application RS to make forest biomass carbon, make forest biodiversity
- However, there was no report about forest volume with specific types of forest with specific species

2. Hypothesis and Objectives

Hypothesis

EVI has close correlation with carbon stock and its value is different in different forest

Objectives

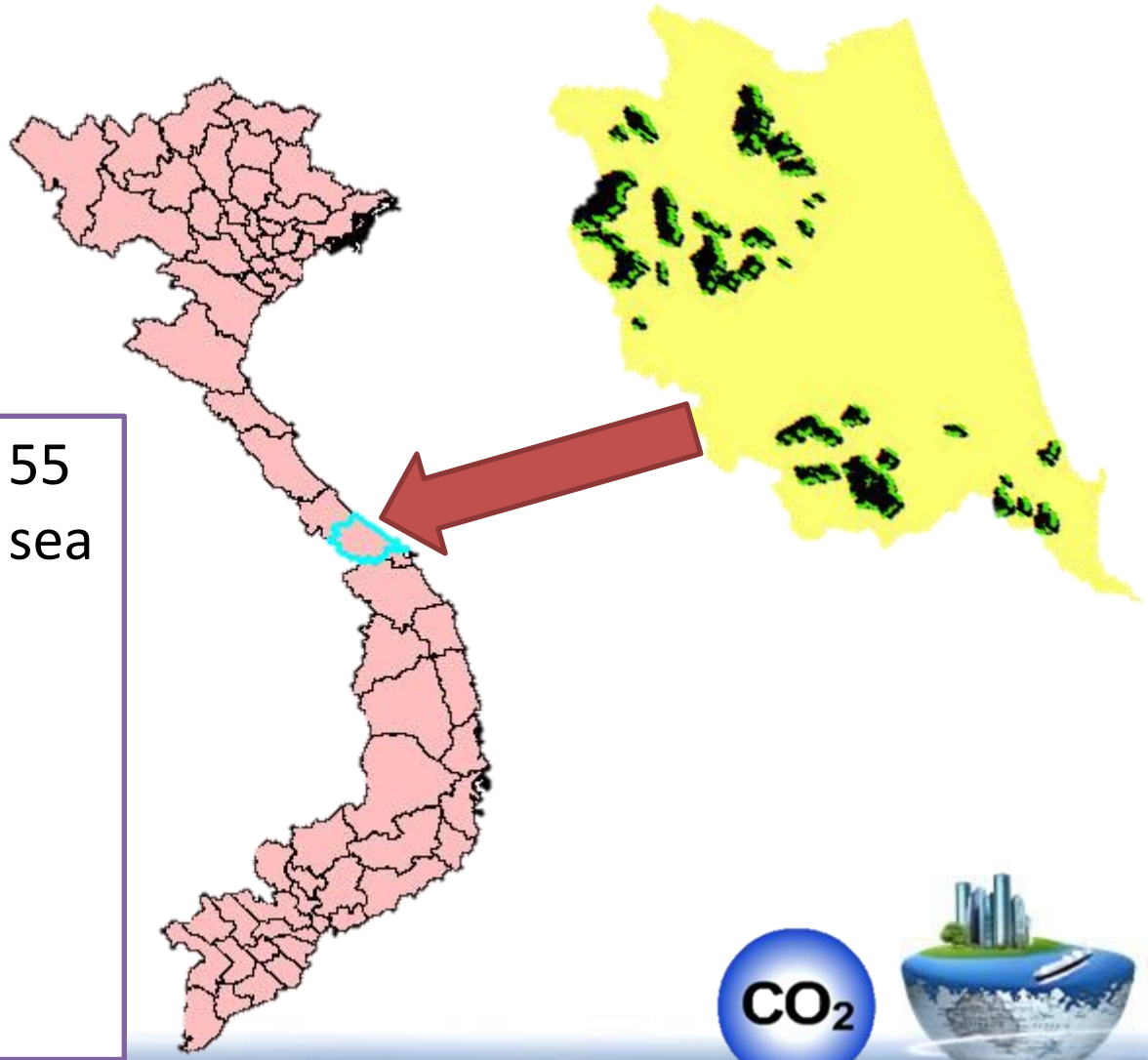
① To find the correlation between MODIS EVI、forest volume and precipitation

② To evaluate accuracy of assessment forest volume by using RS

③ To discuss availability of MODIS EVI to MRV

3. Study site

- **Hue** 16 40 N, 107 68 E, 55 feet (17 meters) above sea level
- Lowland rain forest
- Natural forest (evergreen forest, deciduous forest)



3. Outline of study site

Forest issue in Hue

- Many strength points about forest

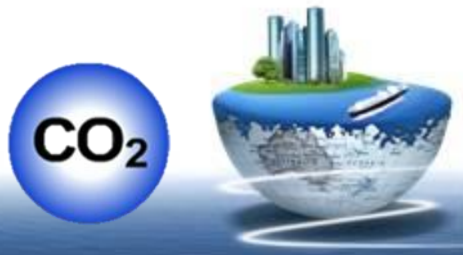
+ Forest cover 56,7% (natural forest 202.600 ha, plantation forest 92 000 ha)

+ Participate Payment Environmental Service (REDD+ (2016))

- **Remain many problems:**

+ New and complex issue

+ **Forest inventory data is expensive, difficult to update forest information as REDD + require**



4. **Materials and Methods**

- MODIS EVI 16 days satellite data in 2011

(from internet)

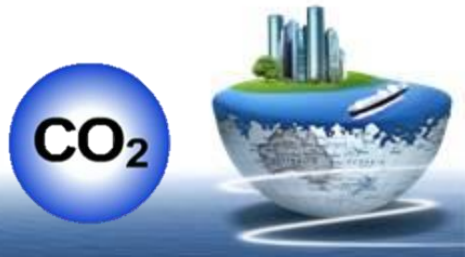
ftp://e4ftl01u.ecs.nasa.gov/MOLT/MOD13Q1.005/

- Forest volume data (field inventory)

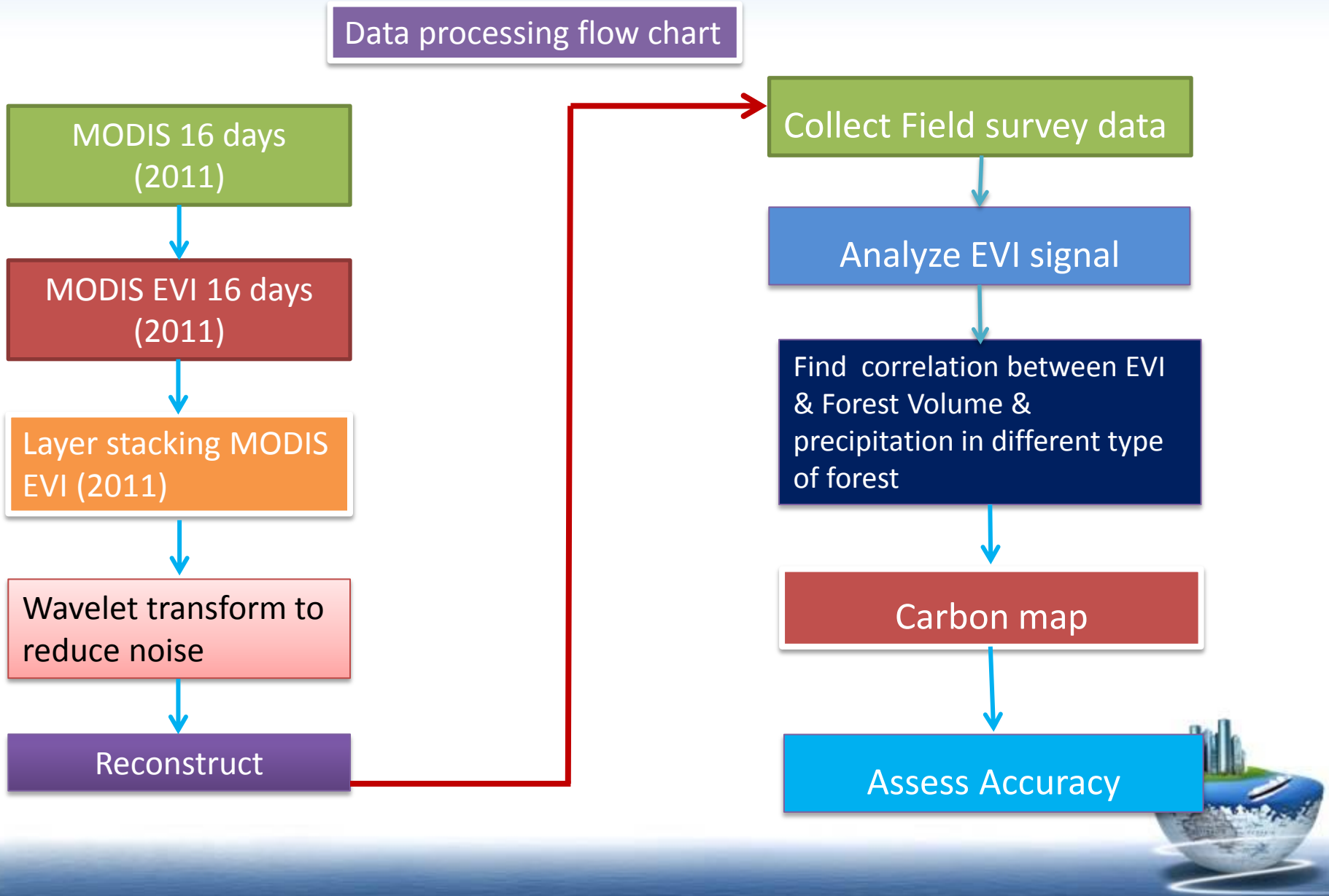
(from Department of Forestry, Agriculture Planning and Projection, Hue)

- Precipitation in 2011

(from: The Vietnam Institute of Meteorology, Hydrology and Environment)

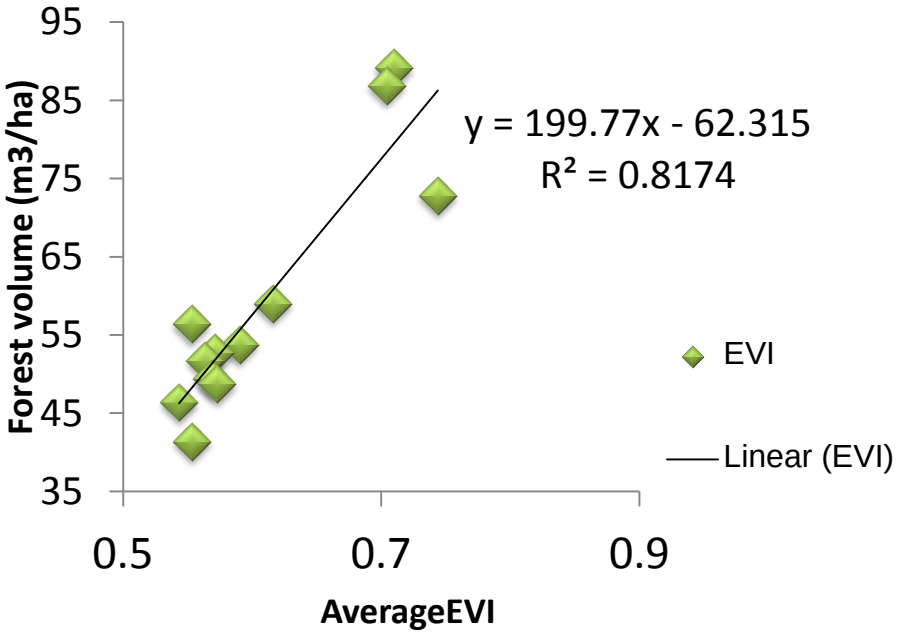


4. Materials and Methods

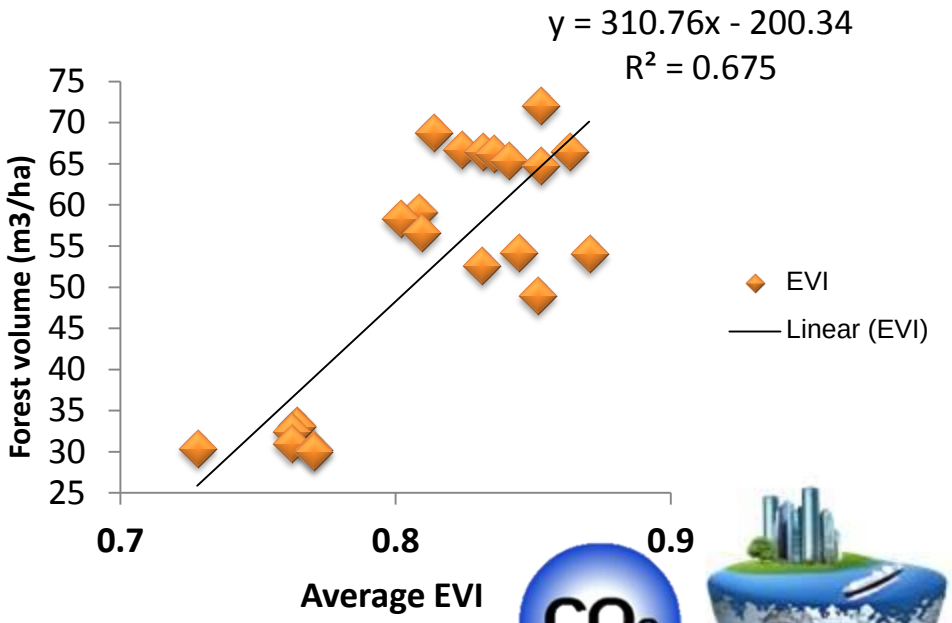


5. Results

Trâm: *Syzygyum cumini (evergreen)*
Vạng: *Endospermun chineses (deciduous)*
Ngát: *Gironniera subaequalis (evergreen)*
Máu chó: *Knema corticosa ()*
Kiền: *Hopea pierrei (evergreen)*



Trâm: *Syzygyum cumini (evergreen)*
Trám: *Canarium tramdeum (**evergreen**)*
Dẻ: *Castanea mollissima (**evergreen**)*
Sim lan: *Rhodomyrtus tomentosa (evergreen)*



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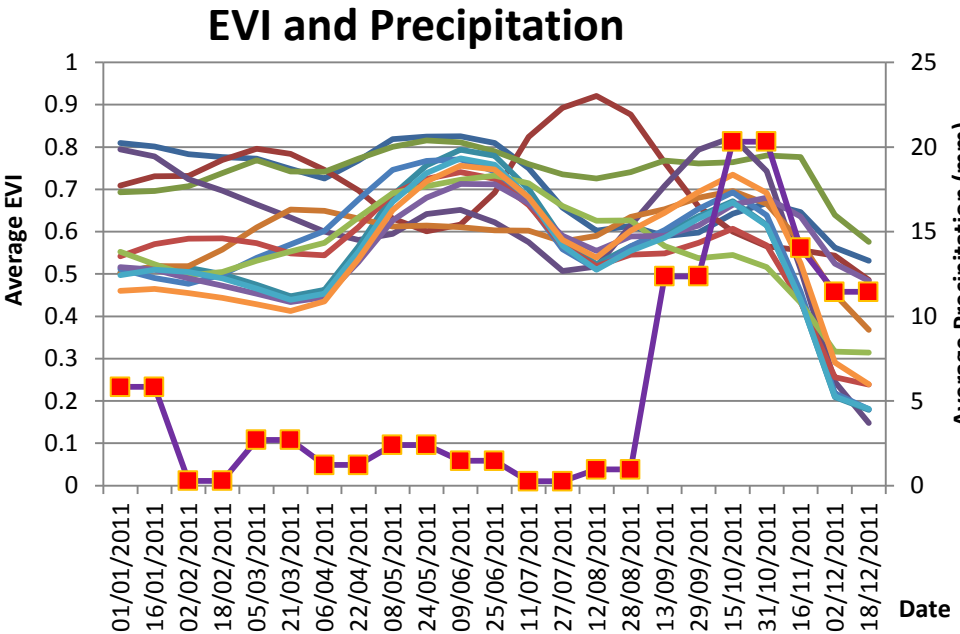

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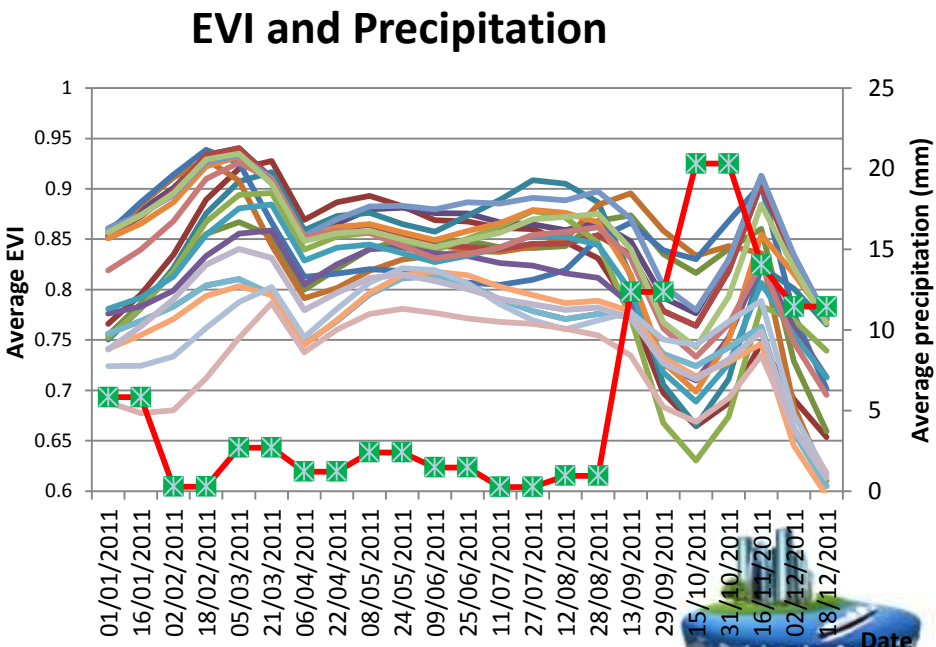
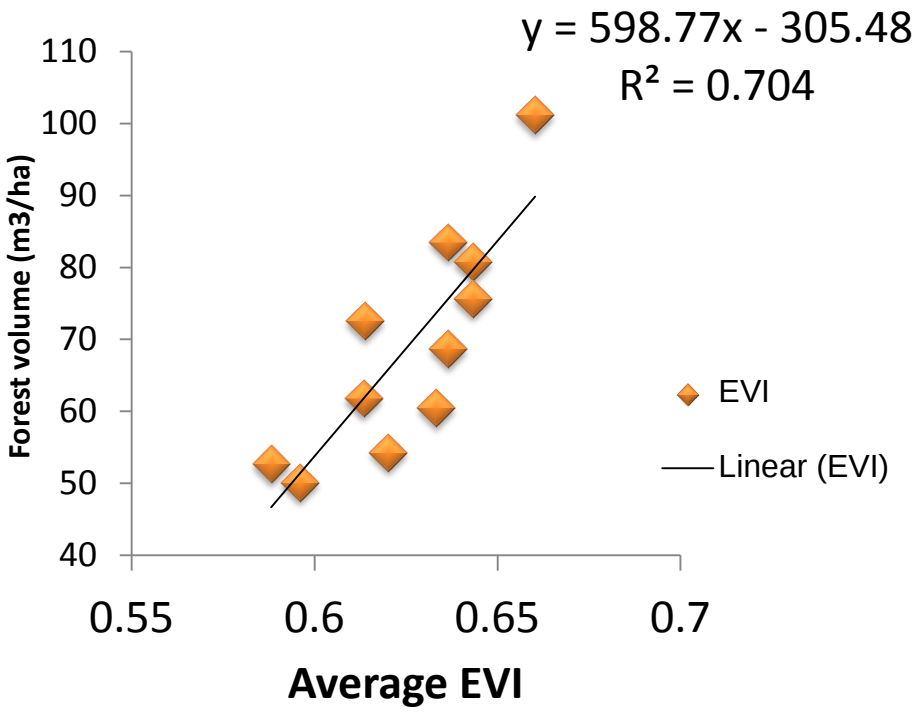
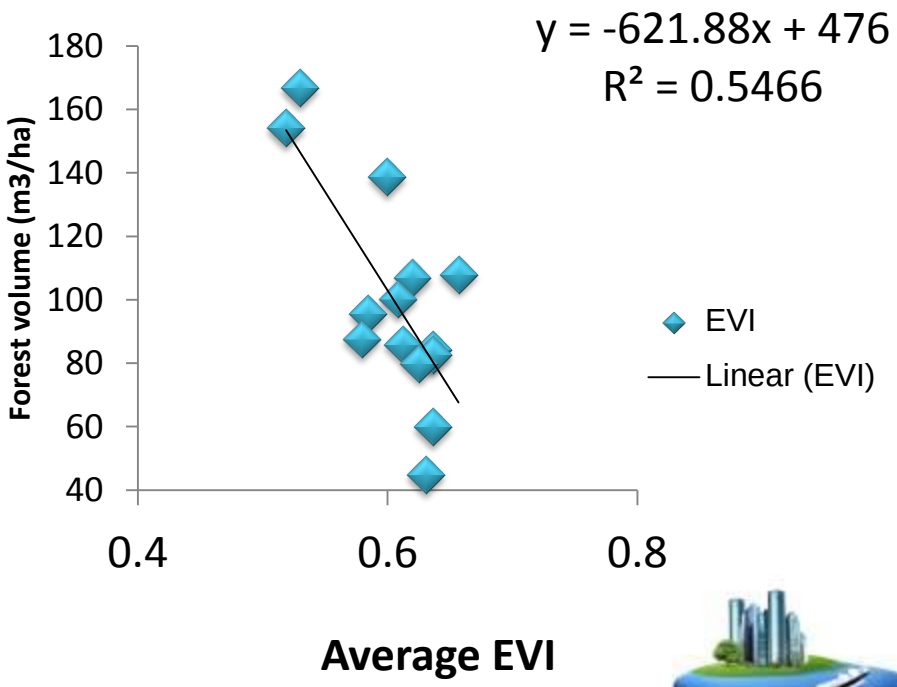


5. Results

Giổi: *Michelia balansae (evergreen)*
Ươi: *Beumee ex* (Deciduous)



Giổi: *Michelia balansae (Evergreen broad leaf)*
Đào: *Persica vulgaris* (Deciduous)



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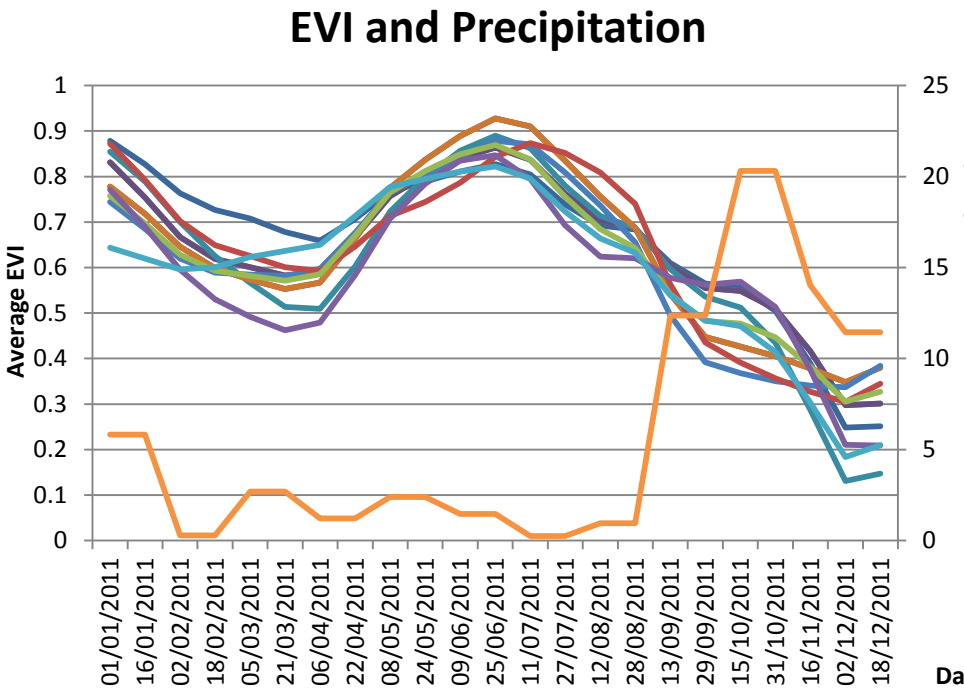

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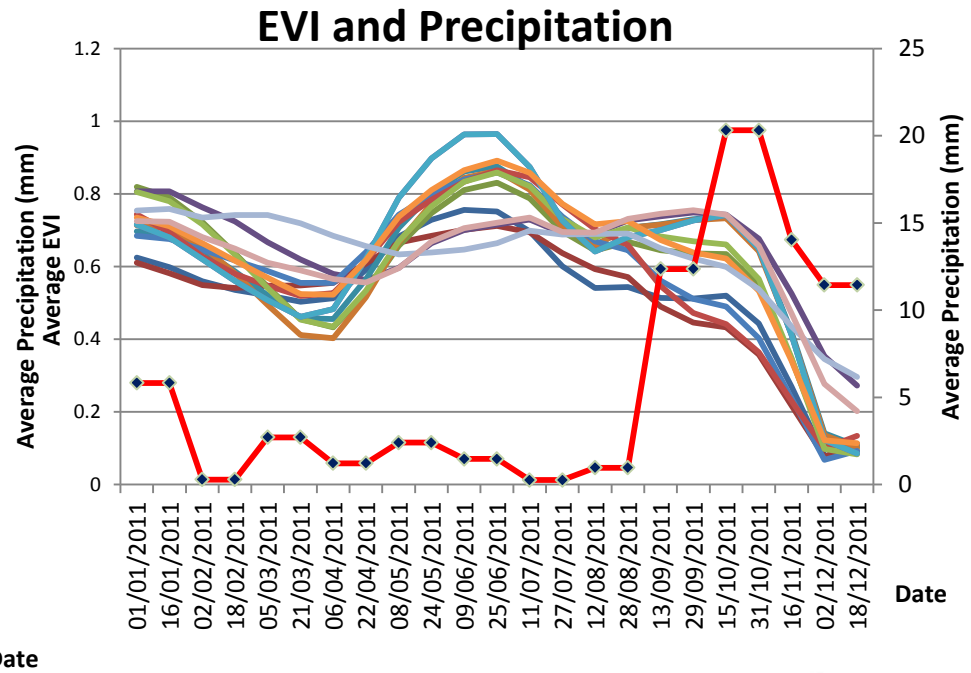
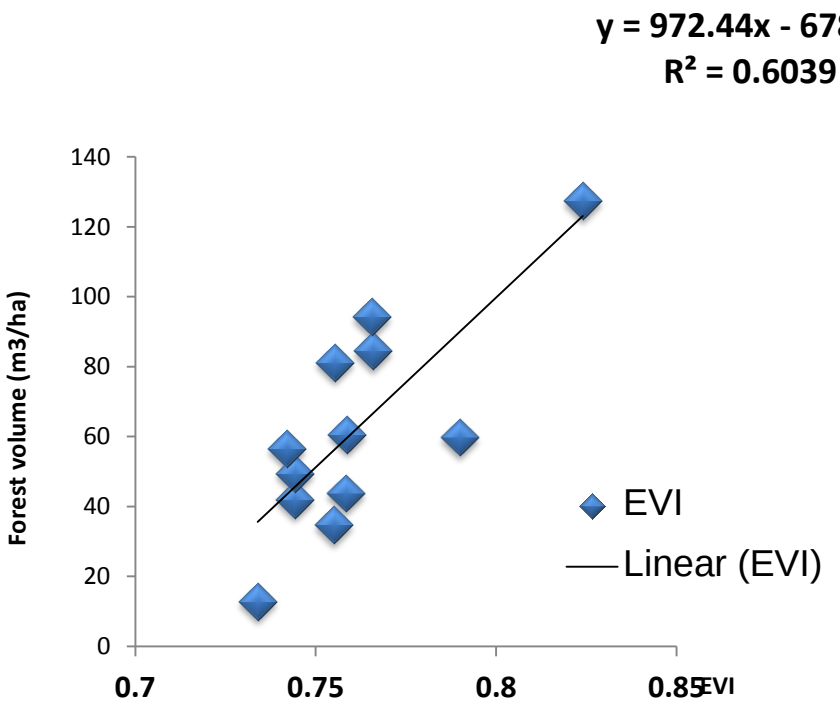
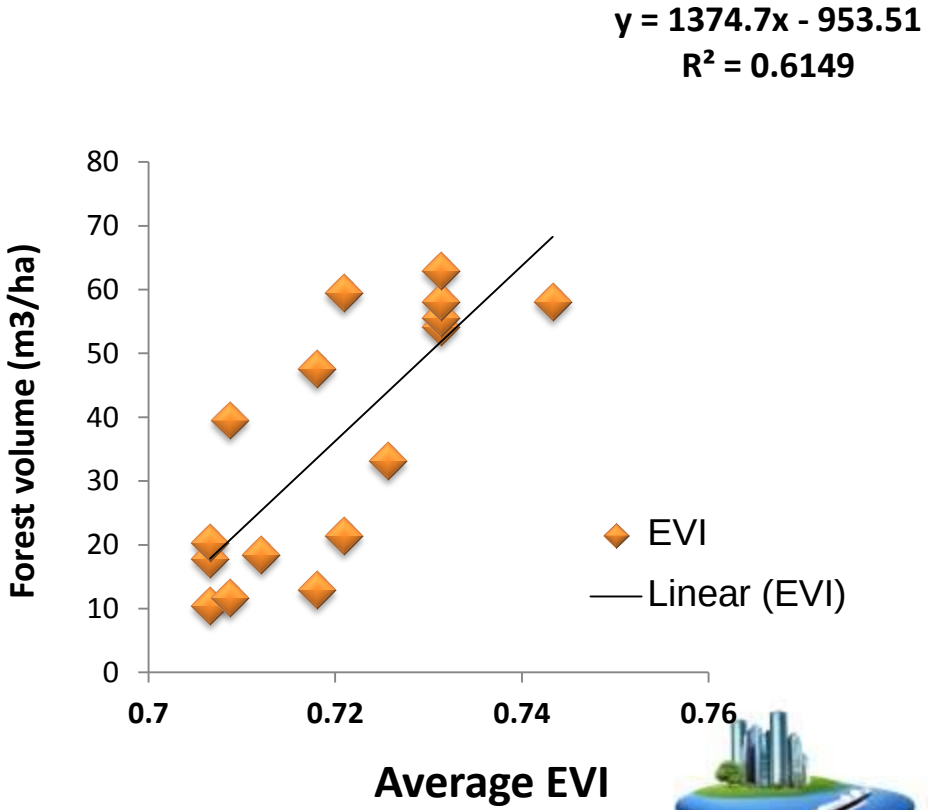


5. Results

Dẻ: *Castanea mollissima*
Chân Chim: Schefflera octophylla



Dẻ: *Castanea mollissima*
Mít nài: Artocarpus rigidus
Chân Chim: Schefflera octophylla



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Dẻ: *Castanea mollissima*
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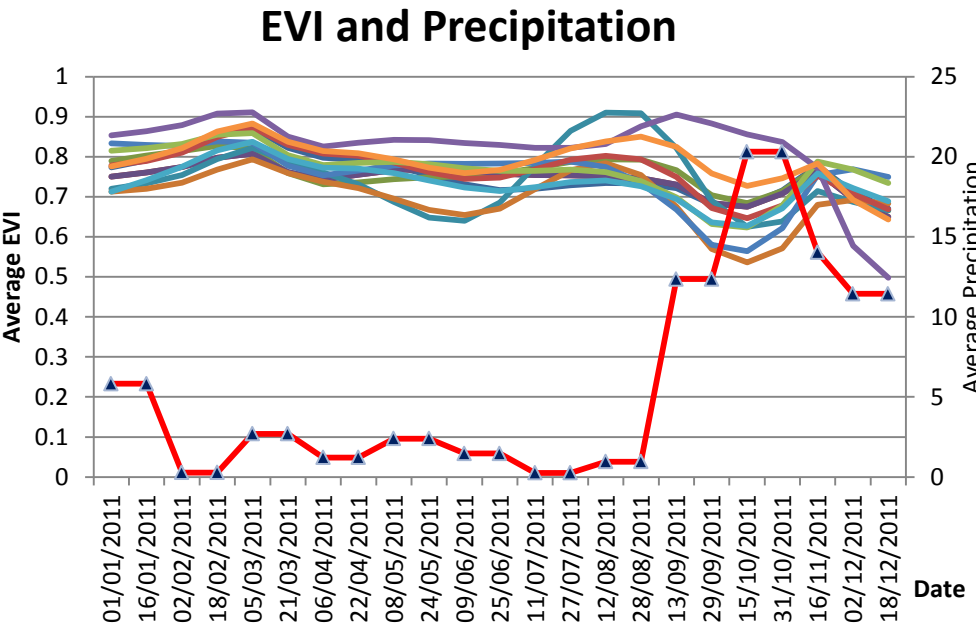
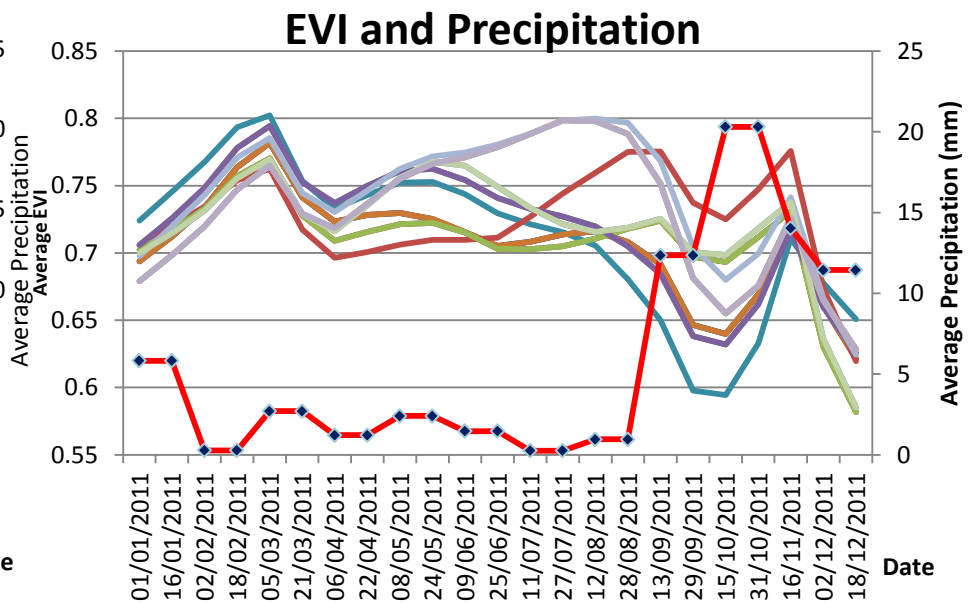


Dẻ: *Castanea mollissima*
Mít nài: Artocarpus rigidus
Chân Chim: Schefflera octophylla



5. Summary of results

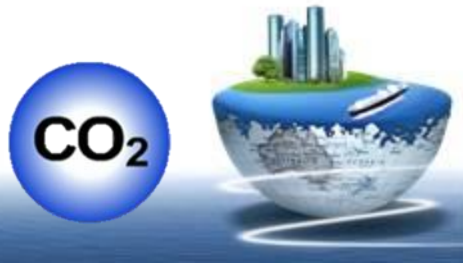
	Type of forests	R^2		Type of forests	R^2
1	Trâm: *Syzygyum cumini*	0.81	5	Dẻ: *Castanea mollissima*	0.7219
	Vạng: *Endospermun chineses*			*Chân Chim: Schefflera octophylla*	
	Ngát: *Gironniera subaequalis*		6	Dẻ: *Castanea mollissima*	0.6149
	Máu chó: *Knema corticosa*			Mít nài: *Artocarpus rigidus*	
	Kiền: *Hopea pierrei*			Chân Chim: *Schefflera octophylla*	
2	Trâm: *Syzygyum cumini*	0.675	7	Giổi: *Michelia balansae*	- 0.5466
	Trám: *Canarium tramdeum*			Đào: *Persica vulgaris*	
	Dẻ: *Castanea mollissima*		8	Giổi: *Michelia balansae*	0.704
	Sim lan: *Rhodomyrtus tomentosa*			Ươi: *Beumee ex*	
3	Dẻ: *Castanea mollissima*	- 0.0224	9	Dẻ: *Castanea mollissima*	- 0.0231
	Chuồn:			Máu Chó:	
4	Chò: *Schima wallichii*	- 0.4377			
	Kiền: *Hopea pierrei*				

6. Conclusion & Discussion

① MODIS EVI has close correlation with volume of forest and precipitation

② The correlation depend on different types of forests with different species

③ In some cases, MODIS EVI has low correlation with forest volume =>need more deeper studies



6. Future work

Activity	09/2012 t0 03/2013	04/2013 to 08/2013	09/2013 to 01/2014	02/2014 to 05/2014
1, Literature review				
2, Data collection	MODIS EVI	Field survey data		
3, Data preprocessing				
4, Results				
5, Writing thesis				

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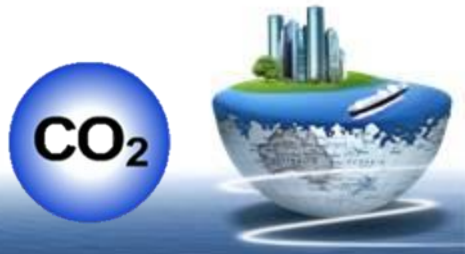

7.Reference

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Thank you for your attention!